3-28-03 10400282.032703

JC520 U.S. PTO 03/27/03

PTO/SB/05 (03-01)
Approved for use through 10/31/2002. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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

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.

UTILITY PATENT APPLICATION TRANSMITTAL

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

Attorney Docket No.	ALPH.P020
First Inventor	Gregory C. Burnett
Title	Microphone and Voice Activity Detection Configurations for Use With Communication Systems
Express Mail Label No.	EV 235 875 739 US

JC887 U.S. PTO 10/400282 03/27/03

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. [X] Fee Transmittal Form (e.g., PTO/SB/17) *(Submit an original and a duplicate for fee processing)*
2. [X] Applicant claims small entity status. See 37 CFR 1.27.
3. [X] Specification [*Total Pages* 47] *(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. [X] Drawing(s) *(35 U.S.C. 113)* [*Total Sheets* 29]
5. Oath or Declaration [*Total Pages*]
   a. [X] Newly executed (original or copy)
   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) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. [ ] Application Data Sheet. See 37 CFR 1.76

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

7. [ ] CD-ROM or CD-R in duplicate, large table or Computer Program (*Appendix*)
8. Nucleotide and/or Amino Acid Sequence Submission (*if applicable, all necessary*)
   a. [ ] Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
      i. [ ] CD-ROM or CD-R (2 copies); or
      ii. [ ] paper
   c. [ ] Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. [X] Assignment Papers (cover sheet & document(s))
10. [X] 37 CFR 3.73(b) Statement *(when there is an assignee)* [X] Power of Attorney
11. [ ] English Translation Document *(if applicable)*
12. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
13. [ ] Preliminary Amendment
14. [X] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
15. [ ] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. [ ] Nonpublication Request under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
17. [X] Other: Assertion of Small Entity Status

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:*

[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No.: ____/____

Prior application information: *Examiner* ____ *Group Art Unit:* ____

For CONTINUATION OR 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.

19. CORRESPONDENCE ADDRESS

[ ] *Customer Number or Bar Code Label* *(Insert Customer No. or Attach bar code label here)* or [X] *Correspondence address below*

Name	Shemwell Gregory & Courtney LLP				
Address	4880 Stevens Creek Boulevard Suite 201				
City	San Jose	*State*	California	*Zip Code*	95129
Country	U.S.A.	*Telephone*	408-236-6646	*Fax*	408-236-6641

Name (Print/Type)	Richard L. Gregory, Jr.	*Registration No. (Attorney/Agent)*	42,607
Signature		*Date*	March 27, 2003

Burden Hour Statement: This form is estimated to take 0.2 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, Box Patent Application, Washington, DC 20231.

[redacted]

10400392 .032703

PTO/SB/17 (01-03)
Approved for use through 04/30/2003. OMB 0651-0032
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.

FEE TRANSMITTAL for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision.

☑ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 586.00

Complete if Known	
Application Number	To be assigned
Filing Date	Herewith
First Named Inventor	Gregory C. Burnett
Examiner Name	To be assigned
Art Unit	To be assigned
Attorney Docket No.	ALPH.P020

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☐ Deposit Account:

Deposit Account Number

Deposit Account Name

The Commissioner is authorized to: *(check all that apply)*

☐ Charge fee(s) indicated below ☐ Credit any overpayments

☐ Charge any additional fee(s) during the pendency of this application

☐ Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	375
1002	330	2002	165	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

		Extra Claims	Fee from below	Fee Paid
Total Claims	39	-20** = 19	x 9	= 171
Independent Claims	3	- 3** = 0	x	=
Multiple Dependent				=

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple dependent claim, if not paid
1204	84	2204	42	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 171

***or number previously paid, if greater; For Reissues, see above*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1401	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	
1403	280	2403	140	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,300	2453	650	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	40
1809	750	2809	375	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 40

SUBMITTED BY				(Complete *(if applicable)*	
Name (Print/Type)	Richard L. Gregory, Jr.	*Registration No. (Attorney/Agent)*	42,607	*Telephone* 408-236-6646	
Signature	R. Gregory			*Date*	March 27, 2003

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.

This collection of information is required by 37 CFR 1.17 and 1.27. 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, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, Washington, DC 20231.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

[redacted]

Attorney Docket No. ALPH.P020

Attorney Docket No. ALPH.P020	Patent

Transmittal of Patent Application for Filing

Certification Under 37 C.F.R. §1.10 (if applicable)

EV 235 875 739 US	March 27, 2003
"Express Mail" Label Number	Date of Deposit

I hereby certify that this application, and any other documents referred to as enclosed herein are being deposited in an envelope with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR §1.10 on the date indicated above and addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231

Richard L. Gregory, Jr.	R. Gregory Jr.
(Print Name of Person Mailing Application)	(Signature of Person Mailing Application)

Microphone and Voice Activity Detection (VAD) Configurations For Use With Communication Systems

INVENTORS:

GREGORY C. BURNETT
NICOLAS J. PETIT
ANDREW E. EINAUDI
ALEXANDER M. ASSEILY

RELATED APPLICATIONS

This application claims priority from United States Patent Application Number 60/368,209, entitled MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH PORTABLE COMMUNICATION SYSTEMS, filed March 27, 2002, which is currently pending.

Further, this application relates to the following United States Patent Applications: Application Number 09/905,361, entitled METHOD AND APPARATUS FOR REMOVING NOISE FROM ELECTRONIC SIGNALS, filed July 12, 2001; Application Number 10/159,770, entitled DETECTING VOICED AND UNVOICED SPEECH USING BOTH ACOUSTIC AND NONACOUSTIC SENSORS, filed May 30, 2002; Application Number 10/301,237, entitled METHOD AND APPARATUS FOR REMOVING NOISE FROM ELECTRONIC SIGNALS, filed November 21, 2002; and Application number 10/383,162, entitled VOICE ACTIVITY DETECTION (VAD)

[redacted]

Attorney Docket No. ALPH.P020

DEVICES AND METHODS FOR USE WITH NOISE SUPPRESSION SYSTEMS, filed March 5, 2003.

TECHNICAL FIELD

The disclosed embodiments relate to systems and methods for detecting and processing a desired acoustic 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 single-microphone 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 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 single-microphone VAD systems are significantly limited in capability as a result of the analysis of acoustic information received by the single microphone, wherein the analysis is performed using typical signal processing techniques. In particular, limitations in performance of these single-microphone VAD

Meta Platforms, Inc. - Exhibit 1002
Page 4 of 686

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 single-microphone VADs.

Many limitations of these typical single-microphone VAD systems were overcome with the introduction of the Pathfinder noise suppression system by Aliph of San Francisco, California (http://www.aliph.com), described in detail in the Related Applications. The Pathfinder noise suppression system differs from typical noise cancellation systems in several important ways. For example, it uses an accurate voiced activity detection (VAD) signal along with two or more microphones, where the microphones detect a mix of both noise and speech signals. While the Pathfinder noise suppression system can be used with and integrated in a number of communication systems and signal processing systems, so can a variety of devices and/or methods be used to supply the VAD signal. Further, a number of microphone types and configurations can be used to provide acoustic signal information to the Pathfinder system.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a block diagram of a signal processing system including the Pathfinder noise removal or suppression system and a VAD system, under an embodiment.

Figure 1A is a block diagram of a noise suppression/communication system including hardware for use in receiving and processing signals relating to VAD, and utilizing specific microphone configurations, under the embodiment of Figure 1.

Figure 1B is a block diagram of a conventional adaptive noise cancellation system of the prior art.

Figure 2 is a table describing different types of microphones and the associated spatial responses in the prior art.

Figure 3A shows a microphone configuration using a unidirectional speech microphone and an omnidirectional noise microphone, under an embodiment.

Figure 3B shows a microphone configuration in a handset using a unidirectional speech microphone and an omnidirectional noise microphone, under the embodiment of Figure 3A.

Figure 3C shows a microphone configuration in a headset using a unidirectional speech microphone and an omnidirectional noise microphone, under the embodiment of Figure 3A.

Figure 4A shows a microphone configuration using an omnidirectional speech microphone and a unidirectional noise microphone, under an embodiment.

Figure 4B shows a microphone configuration in a handset using an omnidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 4A.

Figure 4C shows a microphone configuration in a headset using an omnidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 4A.

Figure 5A shows a microphone configuration using an omnidirectional speech microphone and a unidirectional noise microphone, under an alternative embodiment.

Figure 5B shows a microphone configuration in a handset using an omnidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 5A.

[redacted]

Figure 5C shows a microphone configuration in a headset using an omnidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 5A.

Figure 6A shows a microphone configuration using a unidirectional speech microphone and a unidirectional noise microphone, under an embodiment.

Figure 6B shows a microphone configuration in a handset using a unidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 6A.

Figure 6C shows a microphone configuration in a headset using a unidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 6A.

Figure 7A shows a microphone configuration using a unidirectional speech microphone and a unidirectional noise microphone, under an alternative embodiment.

Figure 7B shows a microphone configuration in a handset using a unidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 7A.

Figure 7C shows a microphone configuration in a headset using a unidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 7A.

Figure 8A shows a microphone configuration using a unidirectional speech microphone and a unidirectional noise microphone, under an embodiment.

Figure 8B shows a microphone configuration in a handset using a unidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 8A.

Figure 8C shows a microphone configuration in a headset using a unidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 8A.

Figure 9A shows a microphone configuration using an omnidirectional speech microphone and an omnidirectional noise microphone, under an embodiment.

[redacted]

Figure 9B shows a microphone configuration in a handset using an omnidirectional speech microphone and an omnidirectional noise microphone, under the embodiment of Figure 9A.

Figure 9C shows a microphone configuration in a headset using an omnidirectional speech microphone and an omnidirectional noise microphone, under the embodiment of Figure 9A.

Figure 10A shows an area of sensitivity on the human head appropriate for receiving a GEMS sensor, under an embodiment.

Figure 10B shows GEMS antenna placement on a generic handset or headset device, under an embodiment.

Figure 11A shows areas of sensitivity on the human head appropriate for placement of an accelerometer/SSM, under an embodiment.

Figure 11B shows accelerometer/SSM placement on a generic handset or headset device, under an embodiment.

In the drawings, the same reference numbers identify identical or substantially similar elements or acts. To easily identify the discussion of any particular element or act, the most significant digit or digits in a reference number refer to the Figure number in which that element is first introduced (e.g., element 105 is first introduced and discussed with respect to Figure 1).

The headings provided herein are for convenience only and do not necessarily affect the scope or meaning of the claimed invention. The following description provides specific details for a thorough understanding of, and enabling description for, embodiments of the invention. 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 invention.

[redacted]

DETAILED DESCRIPTION

Numerous communication systems are described below, including both handset and headset devices, which use a variety of microphone configurations to receive acoustic signals of an environment. The microphone configurations include, for example, a two-microphone array including two unidirectional microphones, and a two-microphone array including one unidirectional microphone and one omnidirectional microphone, but are not so limited. The communication systems can also include Voice Activity Detection (VAD) devices to provide voice activity signals that include information of human voicing activity. Components of the communications systems receive the acoustic signals and voice activity signals and, in response, automatically generate control signals from data of the voice activity signals. Components of the communication systems use the control signals to automatically select a denoising method appropriate to data of frequency subbands of the acoustic signals. The selected denoising method is applied to the acoustic signals to generate denoised acoustic signals when the acoustic signals include speech and noise.

Numerous microphone configurations are described below for use with the Pathfinder noise suppression system. As such, each configuration is described in detail along with a method of use to reduce noise transmission in communication devices, in the context of the Pathfinder system. When the Pathfinder noise suppression system is referred to, it should be kept in mind that noise suppression systems that estimate the noise waveform and subtract it from a signal and that use or are capable of using the disclosed microphone configurations and VAD information for reliable operation are included in that reference. Pathfinder is simply a convenient referenced implementation for a system that operates on signals comprising desired speech signals along with noise. Thus, the use of these physical microphone configurations includes but is not limited to applications such as communications, speech recognition, and voice-feature control of applications and/or devices.

The terms "speech" or "voice" as used herein generally refer to voiced, unvoiced, or mixed voiced and unvoiced human speech. Unvoiced speech or voiced speech is distinguished where necessary. However, the term "speech signal" or "speech", when used as a converse to noise, simply refers to any desired portion of a signal and does not

necessarily have to be human speech. It could, as an example, be music or some other type of desired acoustic information. As used in the Figures, "speech" is meant to mean any signal of interest, whether human speech, music, or anything other signal that it is desired to hear.

In the same manner, "noise" refers to unwanted acoustic information that distorts a desired speech signal or makes it more difficult to comprehend. "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.

The term "Pathfinder", unless otherwise specified, denotes any denoising system using two or more microphones, a VAD device and algorithm, and which estimates the noise in a signal and subtracts it from that signal. The Aliph Pathfinder system is simply a convenient reference for this type of denoising system, although it is more capable than the above definition. In some cases (such as the microphone arrays described in **Figures 8 and 9**), the "full capabilities" or "full version" of the Aliph Pathfinder system are used (as there is a significant amount of speech energy in the noise microphone), and these cases will be enumerated in the text. "Full capabilities" indicates the use of both $H_1(z)$ and $H_2(z)$ by the Pathfinder system in denoising the signal. Unless otherwise specified, it is assumed that only $H_1(z)$ is used to denoise the signal.

The Pathfinder system is a digital signal processing- (DSP) based acoustic noise suppression and echo-cancellation system. The Pathfinder system, which can couple to the front-end of speech processing systems, uses VAD information and received acoustic information to reduce or eliminate noise in desired acoustic signals by estimating the

[redacted]

noise waveform and subtracting it from a signal including both speech and noise. The Pathfinder system is described further below and in the Related Applications.

Figure 1 is a block diagram of a signal processing system 100 including the Pathfinder noise removal or suppression system 105 and a VAD system 106, under an embodiment. The signal processing system 100 includes two microphones MIC 1 103 and MIC 2 104 that receive signals or information from at least one speech signal source 101 and at least one noise source 102. The path s(n) from the speech signal source 101 to MIC 1 and the path n(n) from the noise source 102 to MIC 2 are considered to be unity. Further, $H_1(z)$ represents the path from the noise source 102 to MIC 1, and $H_2(z)$ represents the path from the speech signal source 101 to MIC 2.

Components of the signal processing system 100, for example the noise removal system 105, couple to the microphones MIC 1 and MIC 2 via wireless couplings, wired couplings, and/or a combination of wireless and wired couplings. Likewise, the VAD system 106 couples to components of the signal processing system 100, like the noise removal system 105, via wireless couplings, wired couplings, and/or a combination of wireless and wired couplings. As an example, the VAD devices and microphones described below as components of the VAD system 106 can comply with the Bluetooth wireless specification for wireless communication with other components of the signal processing system, but are not so limited.

Figure 1A is a block diagram of a noise suppression/communication system including hardware for use in receiving and processing signals relating to VAD, and utilizing specific microphone configurations, under an embodiment. Referring to **Figure 1A**, each of the embodiments described below includes at least two microphones in a specific configuration 110 and one voiced activity detection (VAD) system 130, which includes both a VAD device 140 and a VAD algorithm 150, as described in the Related Applications. Note that in some embodiments the microphone configuration 110 and the VAD device 140 incorporate the same physical hardware, but they are not so limited. Both the microphones 110 and the VAD 130 input information into the Pathfinder noise suppression system 120 which uses the received information to denoise the information in the microphones and output denoised speech 160 into a communications device 170.

[redacted]

The communications device 170 includes both handset and headset communication devices, but is not so limited. Handsets or handset communication devices include, but are not limited to, portable communication devices that include microphones, speakers, communications electronics and electronic transceivers, such as cellular telephones, portable or mobile telephones, satellite telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

Headset or headset communication devices include, but are not limited to, self-contained devices including microphones and speakers generally attached to and/or worn on the body. Headsets often function with handsets via couplings with the handsets, where the couplings can be wired, wireless, or a combination of wired and wireless connections. However, the headsets can communicate independently with components of a communications network.

The VAD device 140 includes, but is not limited to, accelerometers, skin surface microphones (SSMs), and electromagnetic devices, along with the associated software or algorithms. Further, the VAD device 140 includes acoustic microphones along with the associated software. The VAD devices and associated software are described in United States Patent Application number 10/383,162, entitled VOICE ACTIVITY DETECTION (VAD) DEVICES AND METHODS FOR USE WITH NOISE SUPPRESSION SYSTEMS, filed March 5, 2003.

The configurations described below of each handset/headset design include the location and orientation of the microphones and the method used to obtain a reliable VAD signal. All other components (including the speaker and mounting hardware for headsets and the speaker, buttons, plugs, physical hardware, etc. for the handsets) are inconsequential for the operation of the Pathfinder noise suppression algorithm and will not be discussed in great detail, with the exception of the mounting of unidirectional microphones in the handset or headset. The mounting is described to provide information for the proper ventilation of the directional microphones. Those familiar with the state of the art will not have difficulty mounting the unidirectional microphones correctly given the placement and orientation information in this application.

Furthermore, the method of coupling (either physical or electromagnetic or otherwise) of the headsets described below is inconsequential. The headsets described work with any type of coupling, so they are not specified in this disclosure. Finally, the microphone configuration 110 and the VAD 130 are independent, so that any microphone configuration can work with any VAD device/method, unless it is desired to use the same microphones for both the VAD and the microphone configuration. In this case the VAD can place certain requirements on the microphone configuration. These exceptions are noted in the text.

MICROPHONE CONFIGURATIONS

The Pathfinder system, although using particular microphone types (omnidirectional or unidirectional, including the amount of unidirectionality) and microphone orientations, is not sensitive to the typical distribution of responses of individual microphones of a given type. Thus the microphones do not need to be matched in terms of frequency response nor do they need to be especially sensitive or expensive. In fact, configurations described herein have been constructed using inexpensive off-the-shelf microphones, which have proven to be very effective. As an aid to review, the Pathfinder setup is shown in **Figure 1** and is explained in detail below and in the Related Applications. The relative placement and orientation of the microphones in the Pathfinder system is described herein. Unlike classical adaptive noise cancellation (ANC), which specifies that there can be no speech signal in the noise microphone, Pathfinder allows speech signal to be present in both microphones which means the microphones can be placed very close together, as long as the configurations in the following section are used. Following is a description of the microphone configurations used to implement the Pathfinder noise suppression system.

There are many different types of microphones in use today, but generally speaking, there are two main categories: omnidirectional (referred to herein as "OMNI microphones" or "OMNI") and unidirectional (referred to herein as "UNI microphones" or "UNI"). The OMNI microphones are characterized by relatively consistent spatial response with respect to relative acoustic signal location, and UNI microphones are characterized by responses that vary with respect to the relative orientation of the

acoustic source and the microphone. Specifically, the UNI microphones are normally designed to be less responsive behind and to the sides of the microphone so that signals from the front of the microphone are emphasized relative to those from the sides and rear.

There are several types of UNI microphones (although really only one type of OMNI) and the types are differentiated by the microphone's spatial response. **Figure 2** is a table describing different types of microphones and the associated spatial responses (from the Shure microphone company website at http://www.shure.com). It has been found that both cardioid and super-cardioid unidirectional microphones work well in the embodiments described herein, but hyper-cardioid and bi-directional microphones may also be used. Also, "close-talk" (or gradient) microphones (which de-emphasize acoustic sources more than a few centimeters away from the microphone) can be used as the speech microphone, and for this reason the close-talk microphone is considered in this disclosure as a UNI microphone.

Microphone Arrays Including Mixed OMNI And UNI Microphones

In an embodiment, an OMNI and UNI microphone are mixed to form a two-microphone array for use with the Pathfinder system. The two-microphone array includes combinations where the UNI microphone is the speech microphone and combinations in which the OMNI microphone is the speech microphone, but is not so limited.

UNI Microphone As Speech Microphone

With reference to **Figure 1**, in this configuration the UNI microphone is used as the speech microphone 103 and an OMNI is used as the noise microphone 104. They are normally used within a few centimeters of each other, but can be located 15 or more centimeters apart and still function adequately. **Figure 3A** shows a general configuration 300 using a unidirectional speech microphone and an omnidirectional noise microphone, under an embodiment. The relative angle *f* between a vector normal to the face of the microphones is approximately in the range of 60 to 135 degrees. The distances d_1 and d_2 are each approximately in the range of zero (0) to 15 centimeters. **Figure 3B** shows a general configuration 310 in a handset using a unidirectional speech microphone and an

Meta Platforms, Inc. - Exhibit 1002
Page 14 of 686

omnidirectional noise microphone, under the embodiment of Figure 3A. **Figure 3C** shows a general configuration 320 in a headset using a unidirectional speech microphone and an omnidirectional noise microphone, under the embodiment of Figure 3A.

The general configurations 310 and 320 show how the microphones can be oriented in a general fashion as well as a possible implementation of this setup for a handset and a headset, respectively. The UNI microphone, as the speech microphone, points toward the user's mouth. The OMNI has no specific orientation, but its location in this embodiment physically shields it from speech signals as much as possible. This setup works well for the Pathfinder system since the speech microphone contains mostly speech and the noise microphone mainly noise. Thus, the speech microphone has a high signal-to-noise ratio (SNR) and the noise microphone has a lower SNR. This enables the Pathfinder algorithm to be effective.

OMNI Microphone As Speech Microphone

In this embodiment, and referring to **Figure 1**, the OMNI microphone is the speech microphone 103 and a UNI microphone is positioned as the noise microphone 104. The reason for this is to keep the amount of speech in the noise microphone small so that the Pathfinder algorithm can be simplified and de-signaling (the undesired removal of speech) can be kept to a minimum. This configuration has the most promise for simple add-ons to existing handsets, which already use an OMNI microphone to capture speech. Again, the two microphones can be located quite close together (within a few centimeters) or 15 centimeters or more away. The best performance is seen when the two microphones are quite close (less than approximately 5 cm), and the UNI is far enough away from the user's mouth (approximately in the range of 10 to 15 centimeters depending on the microphone) so that the UNI directionality functions effectively.

In this configuration where the speech microphone is an OMNI, the UNI is oriented in such a way as to keep the amount of speech in the UNI microphone small compared to the amount of speech in the OMNI. This means that the UNI will be oriented away from the speaker's mouth, and the amount it is oriented away from the speaker is denoted by f, which can vary between 0 and 180 degrees, where f describes the angle between the direction of one microphone and the direction of another microphone in any plane.

Figure 4A shows a configuration 400 using an omnidirectional speech microphone and a unidirectional noise microphone, under an embodiment. The relative angle *f* between vectors normal to the faces of the microphones is approximately 180 degrees. The distance *d* is approximately in the range of zero (0) to 15 centimeters. **Figure 4B** shows a general configuration 410 in a handset using an omnidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 4A. **Figure 4C** shows a general configuration 420 in a headset using an omnidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 4A.

Figure 5A shows a configuration 500 using an omnidirectional speech microphone and a unidirectional noise microphone, under an alternative embodiment. The relative angle *f* between vectors normal to the faces of the microphones is approximately in a range between 60 and 135 degrees. The distances d_1 and d_2 are each approximately in the range of zero (0) to 15 centimeters. **Figure 5B** shows a general configuration 510 in a handset using an omnidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 5A. **Figure 5C** shows a general configuration 520 in a headset using an omnidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 5A.

The embodiments of Figures 4 and 5 are such that the SNR of MIC 1 is generally greater than the SNR of MIC 2. For large values of *f* (around 180 degrees), the noise originating in front of the speaker may not be significantly captured, leading to slightly reduced denoising performance. In addition, if *f* gets too small, a significant amount of speech can be captured by the noise microphone, increasing the denoised signal distortion and/or computational expense. Therefore it is recommended for maximum performance that the angle of orientation for the UNI microphone in this configuration to be approximately 60-135 degrees, as shown in **Figure 5**. This allows the noise originating from the front of the user to be captured more easily, improving the denoising performance. It also keeps the amount of speech signal captured by the noise microphone small so that the full capabilities of Pathfinder are not required. One skilled in the art will be able to quickly determine efficient angles for numerous other UNI/OMNI combinations through simple experimentation.

Meta Platforms, Inc. - Exhibit 1002
Page 16 of 686

Microphone Arrays Including Two UNI Microphones

The microphone array of an embodiment includes two UNI microphones, where a first UNI microphone is the speech microphone and a second UNI microphone is the noise microphone. In the following description the maximum of the spatial response of the speech UNI is assumed oriented toward the user's mouth.

Noise UNI Microphone Oriented Away From Speaker

Similar to the configurations described above with reference to **Figures 4A, 4B, and 4C** and **Figures 5A, 5B, and 5C**, orienting the noise UNI away from the speaker can reduce the amount of speech captured by the noise microphone, allowing for the use of the simpler version of Pathfinder that only uses the calculation of $H_1(z)$ (as described below). Once again the angle of orientation with respect to the speaker's mouth can vary between approximately zero (0) and 180 degrees. At or near 180 degrees noise generated from in front of the user may not be captured well enough by the noise microphone to allow optimal suppression of the noise. Therefore if this configuration is used, it will work best if a cardioid is used as the speech microphone and a super-cardioid as the noise microphone. This will allow limited capture of noise to the front of the user, increasing the noise suppression. However, more speech may be captured as well and can result in de-signaling unless the full capabilities of Pathfinder are used in the signal processing. A compromise is sought between noise suppression, de-signaling, and computational complexity with this configuration.

Figure 6A shows a configuration 600 using a unidirectional speech microphone and a unidirectional noise microphone, under an embodiment. The relative angle *f* between vectors normal to the faces of the microphones is approximately 180 degrees. The distance *d* is approximately in the range of zero (0) to 15 centimeters. **Figure 6B** shows a general configuration 610 in a handset using a unidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 6A. **Figure 6C** shows a general configuration 620 in a headset using a unidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 6A.

[redacted]

Figure 7A shows a configuration 700 using a unidirectional speech microphone and a unidirectional noise microphone, under an alternative embodiment. The relative angle *f* between vectors normal to the faces of the microphones is approximately in a range between 60 and 135 degrees. The distances d_1 and d_2 are each approximately in the range of zero (0) to 15 centimeters. **Figure 7B** shows a general configuration 710 in a handset using a unidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 7A. **Figure 7C** shows a general configuration 720 in a headset using a unidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 7A. One skilled in the art will be able to determine efficient angles for the various UNI/UNI combinations using the descriptions herein.

UNI/UNI Microphone Array

Figure 8A shows a configuration 800 using a unidirectional speech microphone and a unidirectional noise microphone, under an embodiment. The relative angle *f* between vectors normal to the faces of the microphones is approximately 180 degrees. The microphones are placed on an axis 802 that contains the user's mouth at one end (towards speech) and the noise microphone 804 on the other. For optimal performance, the spacing *d* between the microphones should be multiples in space ($d = 1, 2, 3\ldots$) of a sample in time, but are not so limited. The two UNI microphones are not required to be on exactly the same axis with the speaker's mouth, and they may be offset up to 30 degrees or more without significantly affecting the denoising. However the best performance is observed when they are approximately directly in line with each other and the speaker's mouth. Other orientations can be used to those skilled in the art, but for best performance the differential transfer function between the two should be relatively simple. The two UNI microphones of this array can also act as a simple array for use in calculating a VAD signal, as discussed in the Related Applications.

Figure 8B shows a general configuration 810 in a handset using a unidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 8A. **Figure 8C** shows a general configuration 820 in a headset using a unidirectional speech microphone and a unidirectional noise microphone, under the embodiment of Figure 8A.

Meta Platforms, Inc. - Exhibit 1002
Page 18 of 686

When using the UNI/UNI microphone array, the same type of UNI microphone (cardioid, supercardioid, etc.) should be used. If this is not the case, one microphone could detect signals that the other microphone does not detect, causing a reduction in noise suppression effectiveness. The two UNI microphones should be oriented in the same direction, toward the speaker. Obviously the noise microphone will pick up a lot of speech, so the full version of the Pathfinder system should be used to avoid de-signaling.

Placement of the two UNI microphones on the axis that includes the user's mouth at one end and the noise microphone on the other, and use of a microphone spacing *d* that is a multiple in space of a sample in time allows the differential transfer function between the two microphones to be simple and therefore allows the Pathfinder system to operate at peak efficiency. As an example, if the acoustic data is sampled at 8 kHz, the time between samples is a multiple of 1/8000 seconds, or 0.125 milliseconds. The speed of sound in air is pressure and temperature dependent, but at sea level and room temperature it is about 345 meters per second. Therefore in 0.125 milliseconds the sound will travel 345(0.000125) = 4.3 centimeters and the microphones should be spaced about 4.3 centimeters apart, or 8.6 cm, or 12.9 cm, and so on.

For example, and with reference to **Figure 8**, if for an 8 kHz sampled system the distance *d* is chosen to be 1 sample length, or about 4.3 centimeters, then for acoustic sources located in front of MIC 1 on the axis connecting MIC 1 and MIC 2, the differential transfer function $H_2(z)$ would be

$$H_2(z) = \frac{M_2(z)}{M_1(z)} = Cz^{-1},$$

where $M_n(z)$ is the discrete digital output from microphone *n*, C is a constant depending on the distance from MIC 1 to the acoustic source and the response of the microphones, and z^{-1} is a simple delay in the discrete digital domain. Essentially, for acoustic energy originating from the user's mouth, the information captured by MIC 2 is the same as that captured by MIC 1, only delayed by a single sample (due to the 4.3 cm separation) and with a different amplitude. This simple $H_2(z)$ could be hardcoded for this array configuration and used with Pathfinder to denoise noisy speech with minimal distortion.

Meta Platforms, Inc. - Exhibit 1002
Page 19 of 686

Microphone Arrays Including Two OMNI Microphones

The microphone array of an embodiment includes two OMNI microphones, where a first OMNI microphone is the speech microphone and a second OMNI microphone is the noise microphone.

Figure 9A shows a configuration 900 using an omnidirectional speech microphone and an omnidirectional noise microphone, under an embodiment. The microphones are placed on an axis 902 that contains the user's mouth at one end (towards speech) and the noise microphone 904 on the other. For optimal performance, the spacing *d* between the microphones should be multiples in space ($d = 1, 2, 3\ldots$) of a sample in time, but are not so limited. The two OMNI microphones are not required to be on exactly the same axis with the speaker's mouth, and they may be offset up to 30 degrees or more without significantly affecting the denoising. However the best performance is observed when the microphones are approximately directly in line with each other and the speaker's mouth. Other orientations can be used to those skilled in the art, but for best performance the differential transfer function between the two should be relatively simple, as in the previous section described using two UNI microphones. The two OMNI microphones of this array can also act as a simple array for use in calculating a VAD signal, as discussed in the Related Applications.

Figure 9B shows a general configuration 910 in a handset using an omnidirectional speech microphone and an omnidirectional noise microphone, under the embodiment of Figure 9A. **Figure 9C** shows a general configuration 920 in a headset using an omnidirectional speech microphone and an omnidirectional noise microphone, under the embodiment of Figure 9A.

As with the UNI/UNI microphone array described above, perfect alignment between the two OMNI microphones and the speaker's mouth is not strictly necessary, although that alignment offers the best performance. This configuration is a likely implementation for handsets, for both price reasons (OMNIs are less expensive than UNIs) and packaging reasons (it is simpler to properly vent OMNIs than UNIs).

Meta Platforms, Inc. - Exhibit 1002
Page 20 of 686

VOICE ACTIVITY DETECTION (VAD) DEVICES

Referring to **Figure 1A**, a VAD device is a component of the noise suppression system of an embodiment. Following are a number of VAD devices for use in a noise suppression system and a description how each may be implemented for both a handset and a headset application. The VAD is a component of the Pathfinder denoising system, as described in United States Patent Application number 10/383,162, entitled VOICE ACTIVITY DETECTION (VAD) DEVICES AND METHODS FOR USE WITH NOISE SUPPRESSION SYSTEMS, filed March 5, 2003.

General Electromagnetic Sensor (GEMS) VAD

The GEMS is a radiofrequency (RF) interferometer that operates in the 1-5 GHz frequency range at very low power, and can be used to detect vibrations of very small amplitude. The GEMS is used to detect vibrations of the trachea, neck, cheek, and head associated with the production of speech. These vibrations occur due to the opening and closing of the vocal folds associated with speech production, and detecting them can lead to a very accurate noise-robust VAD, as described in the Related Applications.

Figure 10A shows an area of sensitivity 1002 on the human head appropriate for receiving a GEMS sensor, under an embodiment. The area of sensitivity 1002 further includes areas of optimal sensitivity 1004 near which a GEMS sensor can be placed to detect vibrational signals associated with voicing. The area of sensitivity 1002 along with the areas of optimal sensitivity 1004 is the same for both sides of the human head. Furthermore, the area of sensitivity 1002 includes areas on the neck and chest (not shown).

As the GEMS is an RF sensor, it uses an antenna. Very small (from approximately 4 mm by 7 mm to about 20 mm by 20 mm) micropatch antennae have been constructed and used that allow the GEMS to detect vibrations. These antennae are designed to be close to the skin for maximum efficiency. Other antennae may be used as well. The antennae may be mounted in the handset or earpiece in any manner, the only restriction being that sufficient energy to detect the vibration must reach the vibrating objects. In some cases this will require skin contact, in others skin contact may not be needed.

[redacted]

Figure 10B shows GEMS antenna placement 1010 on a generic handset or headset device 1020, under an embodiment. Generally, the GEMS antenna placement 1010 can be on any part of the device 1020 that corresponds to the area of sensitivity 1002 (**Figure 10A**) on the human head when the device 1020 is in use.

Surface Skin Vibration-based VAD

As described in the Related Applications, accelerometers and devices called Skin Surface Microphones (SSMs) can be used to detect the skin vibrations that occur due to the production of speech. However, these sensors can be polluted by exterior acoustic noise, and so care must be taken in their placement and use. Accelerometers are well known and understood, and the SSM is a device that can also be used to detect vibrations, although not with the same fidelity as the accelerometer. Fortunately, constructing a VAD does not require high fidelity reproduction of the underlying vibration, just the ability to determine if vibrations are taking place. For this the SSM is well suited.

The SSM is a conventional microphone modified to prevent airborne acoustic information from coupling with the microphone's detecting elements. A layer of silicone gel 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.

During speech, when the accelerometer/SSM is placed on the cheek or neck, vibrations associated with speech production are easily detected. However, the airborne acoustic data is not significantly detected by the accelerometer/SSM. The tissue-borne acoustic signal, upon detection by the accelerometer/SSM, is used to generate a VAD signal used to process and denoise the signal of interest.

Skin Vibrations In The Ear

One placement that can be used to cut down on the amount of external noise detected by the accelerometer/SSM and assure a good fit is to place the accelerometer/SSM in the ear canal. This is already done in some commercial products, such as Temco's Voiceducer, where the vibrations are directly used as the input to a

communication system. In the noise suppression systems described herein, however, the accelerometer signal is only used to calculate a VAD signal. Therefore the accelerometer/SSM in the ear can be less sensitive and require less bandwidth, and thus be less expensive.

Skin Vibrations Outside The Ear

There are many locations outside the ear from which the accelerometer/SSM can detect skin vibrations associated with the production of speech. The accelerometer/SSM may be mounted in the handset or earpiece in any manner, the only restriction being that reliable skin contact is required to detect the skin-borne vibrations associated with the production of speech. **Figure 11A** shows areas of sensitivity 1102, 1104, 1106, 1108 on the human head appropriate for placement of an accelerometer/SSM, under an embodiment. The areas of sensitivity include areas of the jaw 1102, areas on the head 1104, areas behind the ear 1106, and areas on the side and front of the neck 1108. Furthermore, the areas of sensitivity include areas on the neck and chest (not shown). The areas of sensitivity 1102-1108 are the same for both sides of the human head.

The areas of sensitivity 1102-1108 include areas of optimal sensitivity A-F where speech can be reliably detected by a SSM, under an embodiment. The areas of optimal sensitivity A-F include, but are not limited to, the area behind the ear A, the area above the ear B, the mid-cheek area C of the jaw, the area in front of the ear canal D, the area E inside the ear canal in contact with the mastoid bone or other vibrating tissue, and the nose F. Placement of an accelerometer/SSM in the proximity of any of these areas of sensitivity 1102-1108 will work with a headset, but a handset requires contact with the cheek, jaw, head, or neck. The above areas are only meant to guide, and there may be other areas not specified where useful vibrations can also be detected.

Figure 11B shows accelerometer/SSM placement 1110 on a generic handset or headset device 1120, under an embodiment. Generally, the accelerometer/SSM placement 1110 can be on any part of the device 1120 that corresponds to the areas of sensitivity 1102-1108 **(Figure 11A)** on the human head when the device 1120 is in use.

[redacted]

Two-Microphone Acoustic VAD

These VADs, which include array VAD, Pathfinder VAD, and stereo VAD, operate with two microphones and without any external hardware. Each of the array VAD, Pathfinder VAD, and stereo VAD takes advantage of the two-microphone configuration in a different way, as described below.

Array VAD

The array VAD, described further in the Related Applications, arranges the microphones in a simple linear array and detects the speech using the characteristics of the array. It functions best when the microphones and the user's mouth are linearly co-located and the microphones are located a multiple of a sample distance away. That is, if the sampling frequency of the system is 8 kHz, and the speed of sound is approximately 345 m/s, then in one sample sound will travel

$$d = 345 \text{ m/s} \cdot (1/8000 \text{ s}) = 4.3 \text{ cm}$$

and the microphones should be separated by 4.3, 8.6, 12.9... cm. Embodiments of the array VAD in both handsets and headsets are the same as the microphone configurations of **Figures 8 and 9**, described above. Either OMNI or UNI microphones or a combination of the two may be used. If the microphones are to be used for VAD and to capture the acoustic information used for denoising, this configuration uses microphones arranged as in the UNI/UNI microphone array and OMNI/OMNI microphone array described above.

Pathfinder VAD

The Pathfinder VAD, also described further in the Related Applications, uses the gain of the differential transfer function $H_1(z)$ of the Pathfinder technique to determine when voicing is occurring. As such, it can be used with virtually any of the microphone configurations above with little modification. Very good performance has been noted with the UNI/UNI microphone configuration described above with reference to **Figure 7**.

[redacted]

Stereo VAD

The stereo VAD, also described further in the Related Applications, uses the difference in frequency amplitude from the noise and the speech to determine when speech is occurring. It uses a microphone configuration in which the SNR is larger in the speech microphone than in the noise microphone. Again, virtually any of the microphone configurations above can be configured to work with this VAD technique, but very good performance has been noted with the UNI/UNI microphone configuration described above with reference to **Figure 7**.

Manually Activated VAD

In this embodiment, the user or an outside observer manually activates the VAD, using a pushbutton or switching device. This can even be done offline, on a recording of the data recorded using one of the above configurations. Activation of the manual VAD device, or manually overriding an automatic VAD device like those described above, results in generation of a VAD signal. As this VAD does not rely on the microphones, it may be used with equal utility with any of the microphone configurations above.

Single-Microphone/Conventional VAD

Any conventional acoustic method can also be used with either or both of the speech and noise microphones to construct the VAD signal used by Pathfinder for noise suppression. For example, a conventional mobile phone VAD (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) can be used with the speech microphone to construct a VAD signal for use with the Pathfinder noise suppression system. In another embodiment, a "close talk" or gradient microphone may be used to record a high-SNR signal near the mouth, through which a VAD signal may be easily calculated. This microphone could be used as the speech microphone of the system, or could be completely separate. In the case where the gradient microphone is also used as the speech microphone of the system, the gradient microphone takes the place of the UNI microphones in either of the microphone array including mixed OMNI and UNI microphones when the UNI microphone is the speech microphone (described above with

Meta Platforms, Inc. - Exhibit 1002
Page 25 of 686

reference to **Figure 3**) or the microphone array including two UNI microphones when the noise UNI microphone is oriented away from the speaker (described above with reference to **Figures 6 and 7**).

Pathfinder Noise Suppression System

As described above, **Figure 1** is a block diagram of a signal processing system 100 including the Pathfinder noise suppression system 105 and a VAD system 106, under an embodiment. The signal processing system 105 includes two microphones MIC 1 103 and MIC 2 104 that receive signals or information from at least one speech source 101 and at least one noise source 102. The path s(n) from the speech source 101 to MIC 1 and the path n(n) from the noise source 102 to MIC 2 are considered to be unity. Further, $H_1(z)$ represents the path from the noise source 102 to MIC 1, and $H_2(z)$ represents the path from the signal source 101 to MIC 2.

A VAD signal 106, derived in some manner, is used to control the method of noise removal. The acoustic information coming into MIC 1 is denoted by $m_1(n)$. The information coming into MIC 2 is similarly labeled $m_2(n)$. In the *z* (digital frequency) domain, we can represent them as $M_1(z)$ and $M_2(z)$. Thus

$$\begin{aligned} M_1(z) &= S(z) + N(z)H_1(z) \\ M_2(z) &= N(z) + S(z)H_2(z) \end{aligned} \tag{1}$$

This is the general case for all realistic two-microphone systems. There is always some leakage of noise into MIC 1, and some leakage of signal into MIC 2. Equation 1 has four unknowns and only two relationships and, therefore, cannot be solved explicitly.

However, perhaps there is some way to solve for some of the unknowns in Equation 1 by other means. Examine the case where the signal is not being generated, that is, where the VAD indicates voicing is not occurring. In this case, s(n) = S(z) = 0, and Equation 1 reduces to

$$\begin{aligned} M_{1n}(z) &= N(z)H_1(z) \\ M_{2n}(z) &= N(z) \end{aligned}$$

Meta Platforms, Inc. - Exhibit 1002
Page 26 of 686

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

$$M_{1n}(z) = M_{2n}(z)H_1(z)$$
$$H_1(z) = \frac{M_{1n}(z)}{M_{2n}(z)} \quad (2)$$

Now, $H_1(z)$ can be calculated using any of the available system identification algorithms and the microphone outputs when only noise is being received. The calculation should be done adaptively in order to allow the system to track any changes in the noise.

After solving for one of the unknowns in Equation 1, $H_2(z)$ can be solved for by using the VAD to determine when voicing is occurring with little noise. When the VAD indicates voicing, but the recent history (on the order of 1 second or so) of the microphones indicate low levels of noise, assume 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

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

This calculation for $H_2(z)$ appears to be just the inverse of the $H_1(z)$ calculation, but remember that different inputs are being used as the calculation now takes place when speech is being produced. Note that $H_2(z)$ should be relatively constant, as there is always just a single source (the user) and the relative position between the user and the microphones should be relatively constant. Use of a small adaptive gain for the $H_2(z)$ calculation works well and makes the calculation more robust in the presence of noise.

Following the calculation of $H_1(z)$ and $H_2(z)$ above, they are used to remove the noise from the signal. Rewriting Equation 1 as

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

[redacted]

allows solving for S(z)

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

Generally, $H_2(z)$ is quite small, and $H_1(z)$ is less than unity, so for most situations at most frequencies

$$H_2(z)H_1(z) << 1,$$

and the signal can be calculated using

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

Therefore the assumption is made that $H_2(z)$ is not needed, and $H_1(z)$ is the only transfer to be calculated. While $H_2(z)$ can be calculated if desired, good microphone placement and orientation can obviate the need for $H_2(z)$ calculation.

Significant noise suppression can only be achieved through the use of multiple subbands in the processing of acoustic signals. This is because most adaptive filters used to calculate transfer functions are of the FIR type, which use only zeros and not poles to calculate a system that contains both zeros and poles as

$$H_1(z) \xrightarrow[\text{MODELS}]{} \frac{B(z)}{A(z)}.$$

Such a model can be sufficiently accurate given enough taps, but this can greatly increase computational cost and convergence time. What generally occurs in an energy-based adaptive filter system such as the least-mean squares (LMS) system is that the system matches the magnitude and phase well at a small range of frequencies that contain more energy than other frequencies. This allows the LMS to fulfill its requirement to minimize the energy of the error to the best of its ability, but this fit may cause the noise in areas outside of the matching frequencies to rise, reducing the effectiveness of the noise suppression.

The use of subbands alleviates this problem. The signals from both the primary and secondary microphones are filtered into multiple subbands, and the resulting data from each subband (which can be frequency shifted and decimated if desired, but it is not necessary) is sent to its own adaptive filter. This forces the adaptive filter to try to fit the data in its own subband, rather than just where the energy is highest in the signal. The noise-suppressed results from each subband can be added together to form the final

Meta Platforms, Inc. - Exhibit 1002
Page 28 of 686

denoised signal at the end. Keeping everything time-aligned and compensating for filter shifts is not easy, but the result is a much better model to the system at the cost of increased memory and processing requirements.

At first glance, it may seem as if the Pathfinder algorithm is very similar to other algorithms such as classical ANC (adaptive noise cancellation), shown in **Figure 1B**. However, close examination reveals several areas that make all the difference in terms of noise suppression performance, including using VAD information to control adaptation of the noise suppression system to the received signals, using numerous subbands to ensure adequate convergence across the spectrum of interest, and supporting operation with acoustic signal of interest in the reference microphone of the system, as described in turn below.

Regarding the use of VAD to control adaptation of the noise suppression system to the received signals, classical ANC uses no VAD information. Since, during speech production, there is signal in the reference microphone, adapting the coefficients of $H_1(z)$ (the path from the noise to the primary microphone) during the time of speech production would result in the removal of a large part of the speech energy from the signal of interest. The result is signal distortion and reduction (de-signaling). Therefore, the various methods described above use VAD information to construct a sufficiently accurate VAD to instruct the Pathfinder system when to adapt the coefficients of H_1 (noise only) and H_2 (if needed, when speech is being produced).

An important difference between classical ANC and the Pathfinder system involves subbanding of the acoustic data, as described above. Many subbands are used by the Pathfinder system to support application of the LMS algorithm on information of the subbands individually, thereby ensuring adequate convergence across the spectrum of interest and allowing the Pathfinder system to be effective across the spectrum.

Because the ANC algorithm generally uses the LMS adaptive filter to model H_1, and this model uses all zeros to build filters, it was unlikely that a "real" functioning system could be modeled accurately in this way. Functioning systems almost invariably have both poles and zeros, and therefore have very different frequency responses than those of the LMS filter. Often, the best the LMS can do is to match the phase and magnitude of the real system at a single frequency (or a very small range), so that outside

Meta Platforms, Inc. - Exhibit 1002
Page 29 of 686

this frequency the model fit is very poor and can result in an increase of noise energy in these areas. Therefore, application of the LMS algorithm across the entire spectrum of the acoustic data of interest often results in degradation of the signal of interest at frequencies with a poor magnitude/phase match.

Finally, the Pathfinder algorithm supports operation with the acoustic signal of interest in the reference microphone of the system. Allowing the acoustic signal to be received by the reference microphone means that the microphones can be much more closely positioned relative to each other (on the order of a centimeter) than in classical ANC configurations. This closer spacing simplifies the adaptive filter calculations and enables more compact microphone configurations/solutions. Also, special microphone configurations have been developed that minimize signal distortion and de-signaling, and support modeling of the signal path between the signal source of interest and the reference microphone.

In an embodiment, the use of directional microphones ensures that the transfer function does not approach unity. Even with directional microphones, some signal is received into the noise microphone. If this is ignored and it is assumed that $H_2(z) = 0$, then, assuming a perfect VAD, there will be some distortion. This can be seen by referring to Equation 2 and solving for the result when $H_2(z)$ is not included:

$$S(z)[1 - H_2(z)H_1(z)] = M_1(z) - M_2(z)H_1(z). \quad (4)$$

This shows that the signal will be distorted by the factor $[1 - H_2(z)H_1(z)]$. Therefore, the type and amount of distortion will change depending on the noise environment. With very little noise, $H_1(z)$ is approximately zero and there is very little distortion. With noise present, the amount of distortion may change with the type, location, and intensity of the noise source(s). Good microphone configuration design minimizes these distortions.

The calculation of H_1 in each subband is implemented when the VAD indicates that voicing is not occurring or when voicing is occurring but the SNR of the subband is sufficiently low. Conversely, H_2 can be calculated in each subband when the VAD indicates that speech is occurring and the subband SNR is sufficiently high. However, with proper microphone placement and processing, signal distortion can be minimized and only H_1 need be calculated. This significantly reduces the processing required and simplifies the implementation of the Pathfinder algorithm. Where classical ANC does

Meta Platforms, Inc. - Exhibit 1002
Page 30 of 686

not allow any signal into MIC 2, the Pathfinder algorithm tolerates signal in MIC 2 when using the appropriate microphone configuration. An embodiment of an appropriate microphone configuration, as described above with reference to **Figure 7A**, is one in which two cardioid unidirectional microphones are used, MIC 1 and MIC 2. The configuration orients MIC 1 toward the user's mouth. Further, the configuration places MIC 2 as close to MIC 1 as possible and orients MIC 2 at about 90 degrees with respect to MIC 1.

Perhaps the best way to demonstrate the dependence of the noise suppression on the VAD is to examine the effect of VAD errors on the denoising in the context of a VAD failure. There are two types of errors that can occur. False positives (FP) are when the VAD indicates that voicing has occurred when it has not, and false negatives (FN) are when the VAD does not detect that speech has occurred. False positives are only troublesome if they happen too often, as an occasional FP will only cause the H_1 coefficients to stop updating briefly, and experience has shown that this does not appreciably affect the noise suppression performance. False negatives, on the other hand, can cause problems, especially if the SNR of the missed speech is high.

Assuming that there is speech and noise in both microphones of the system, and the system only detects the noise because the VAD failed and returned a false negative, the signal at MIC 2 is

$$M_2 = H_1 N + H_2 S,$$

where the z's have been suppressed for clarity. Since the VAD indicates only the presence of noise, the system attempts to model the system above as a single noise and a single transfer function according to

$$\text{TF model} = \tilde{H}_1 \tilde{N}.$$

The Pathfinder system uses an LMS algorithm to calculate $\tilde{H}_1$, but the LMS algorithm is generally best at modeling time-invariant, all-zero systems. Since it is unlikely that the noise and speech signal are correlated, the system generally models either the speech and its associated transfer function or the noise and its associated transfer function, depending

Meta Platforms, Inc. - Exhibit 1002
Page 31 of 686

on the SNR of the data in MIC 1, the ability to model H_1 and H_2, and the time-invariance of H_1 and H_2, as described below.

Regarding the SNR of the data in MIC 1, a very low SNR (less than zero (0)) tends to cause the Pathfinder system to converge to the noise transfer function. In contrast, a high SNR (greater than zero (0)) tends to cause the Pathfinder system converge to the speech transfer function. As for the ability to model H_1, if either H_1 or H_2 is more easily modeled using LMS (an all-zero model), the Pathfinder system tends to converge to that respective transfer function.

In describing the dependence of the system modeling on the time-invariance of H_1 and H_2, consider that LMS is best at modeling time-invariant systems. Thus, the Pathfinder system would generally tend to converge to H_2, since H_2 changes much more slowly than H_1 is likely to change.

If the LMS models the speech transfer function over the noise transfer function, then the speech is classified as noise and removed as long as the coefficients of the LMS filter remain the same or are similar. Therefore, after the Pathfinder system has converged to a model of the speech transfer function H_2 (which can occur on the order of a few milliseconds), any subsequent speech (even speech where the VAD has not failed) has energy removed from it as well as the system "assumes" that this speech is noise because its transfer function is similar to the one modeled when the VAD failed. In this case, where H_2 is primarily being modeled, the noise will either be unaffected or only partially removed.

The end result of the process is a reduction in volume and distortion of the cleaned speech, the severity of which is determined by the variables described above. If the system tends to converge to H_1, the subsequent gain loss and distortion of the speech will not be significant. If, however, the system tends to converge to H_2, then the speech can be severely distorted.

This VAD failure analysis does not attempt to describe the subtleties associated with the use of subbands and the location, type, and orientation of the microphones, but is meant to convey the importance of the VAD to the denoising. The results above are applicable to a single subband or an arbitrary number of subbands, because the interactions in each subband are the same.

In addition, the dependence on the VAD and the problems arising from VAD errors described in the above VAD failure analysis are not limited to the Pathfinder noise suppression system. Any adaptive filter noise suppression system that uses a VAD to determine how to denoise will be similarly affected. In this disclosure, when the Pathfinder noise suppression system is referred to, it should be kept in mind that all noise suppression systems that use multiple microphones to estimate the noise waveform and subtract it from a signal including both speech and noise, and that depend on VAD for reliable operation, are included in that reference. Pathfinder is simply a convenient referenced implementation.

The microphone and VAD configurations described above are for use with communication systems, wherein the communication systems comprise: a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including two unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

The two unidirectional microphones are separated by a distance approximately in the range of zero (0) to 15 centimeters.

The two unidirectional microphones have an angle between maximums of a spatial response curve of each microphone approximately in the range of zero (0) to 180 degrees.

Meta Platforms, Inc. - Exhibit 1002
Page 33 of 686

The voice detection subsystem of an embodiment further comprises at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals, and at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.

The voice detection subsystem of another embodiment further comprises at least one accelerometer sensor in contact with skin of a user for receiving the voice activity signals, and at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.

The voice detection subsystem of yet another embodiment further comprises at least one skin-surface microphone sensor in contact with skin of a user for receiving the voice activity signals, and at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.

The voice detection subsystem can also receive voice activity signals via couplings with the microphones.

The voice detection subsystem of still another embodiment further comprises two unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone, wherein the distance is approximately in the range of zero (0) to 15 centimeters and wherein the angle is approximately in the range of zero (0) to 180 degrees, and at least one voice activity detector (VAD) algorithm for processing the voice activity signals and generating the control signals.

The voice detection subsystem of other alternative embodiments further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals.

The communications system of an embodiment further includes a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal

[redacted]

digital assistants (PDAs), and personal computers (PCs). The portable handset can include at least one of the voice detection subsystem and the denoising subsystem.

The communications system of an embodiment further includes a portable headset that includes the microphones along with at least one speaker device. The portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs). The portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings.

The communication device can include at least one of the voice detection subsystem and the denoising subsystem. Alternatively, the portable headset can include at least one of the voice detection subsystem and the denoising subsystem.

The portable headset described above is a portable communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

The microphone and VAD configurations described above are for use with communication systems of alternative embodiments, wherein the communication systems comprise: a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including an omnidirectional microphone and a unidirectional microphone separated by a distance, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform

estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

The omnidirectional and unidirectional microphones are separated by a distance approximately in the range of zero (0) to 15 centimeters.

The omnidirectional microphone is oriented to capture signals from at least one speech signal source and the unidirectional microphone is oriented to capture signals from at least one noise signal source, wherein an angle between the speech signal source and a maximum of a spatial response curve of the unidirectional microphone is approximately in the range of 45 to 180 degrees.

The voice detection subsystem of an embodiment further comprises at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals, and at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.

The voice detection subsystem of another embodiment further comprises at least one accelerometer sensor in contact with skin of a user for receiving the voice activity signals, and at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.

The voice detection subsystem of yet another embodiment further comprises at least one skin-surface microphone sensor in contact with skin of a user for receiving the voice activity signals, and at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.

The voice detection subsystem of yet other embodiments further comprises two unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone, wherein the distance is approximately in the range of zero (0) to 15 centimeters and wherein the angle is approximately in the range of zero (0) to 180 degrees, and at least one voice activity detector (VAD) algorithm for processing the voice activity signals and generating the control signals.

[redacted]

The voice detection subsystem can also include at least one manually activated voice activity detector (VAD) for generating the voice activity signals.

The communications system of an embodiment further includes a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs). The portable handset can include at least one of the voice detection subsystem and the denoising subsystem.

The communications system of an embodiment further includes a portable headset that includes the microphones along with at least one speaker device. The portable headset can couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs). The portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings. In one embodiment, the communication device includes at least one of the voice detection subsystem and the denoising subsystem. In an alternative embodiment, the portable headset includes at least one of the voice detection subsystem and the denoising subsystem.

The portable headset described above is a portable communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

The microphone and VAD configurations described above are for use with communication systems comprising: at least one transceiver for use in a communications network; a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including a first microphone and a second microphone

Meta Platforms, Inc. - Exhibit 1002
Page 37 of 686

separated by a distance and having an angle between maximums of a spatial response curve of each microphone, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

In an embodiment, each of the first and second microphones is a unidirectional microphone, wherein the distance is approximately in the range of zero (0) to 15 centimeters and the angle is approximately in the range of zero (0) to 180 degrees.

In an embodiment, the first microphone is an omnidirectional microphone and the second microphone is a unidirectional microphone, wherein the first microphone is oriented to capture signals from at least one speech signal source and the second microphone is oriented to capture signals from at least one noise signal source, wherein an angle between the speech signal source and a maximum of a spatial response curve of the second microphone is approximately in the range of 45 to 180 degrees.

The transceiver of an embodiment includes the first and second microphones, but is not so limited.

The transceiver can couple information between the communications network and a user via a headset. The headset used with the transceiver can include the first and second microphones.

Aspects of the invention 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 invention include: microcontrollers with memory (such as electronically erasable programmable read only memory (EEPROM)), embedded microprocessors, firmware, software, etc. If aspects of the invention are embodied as software at least one stage during manufacturing (e.g. before being embedded in

[redacted]

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

Meta Platforms, Inc. - Exhibit 1002
Page 39 of 686

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 invention 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 invention 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 invention.

In general, in the following claims, the terms used should not be construed to limit the invention 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 invention is not limited by the disclosure, but instead the scope of the invention is to be determined entirely by the claims.

While certain aspects of the invention are presented below in certain claim forms, the inventors contemplate the various aspects of the invention in any number of claim forms. For example, while only one aspect of the invention is recited as embodied in a computer-readable medium, other aspects may likewise be embodied in a 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 invention.

Meta Platforms, Inc. - Exhibit 1002
Page 40 of 686

Attorney Docket No. ALPH.P020

CLAIMS

What we claim is:

1. A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including two unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

2. The system of claim 1, wherein the distance is approximately in the range of zero (0) to 15 centimeters.

3. The system of claim 1, wherein the angle is approximately in the range of zero (0) to 180 degrees.

4. The system of claim 1, wherein the voice detection subsystem further comprises:

at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.

[redacted]

5. The system of claim 1, wherein the voice detection subsystem further comprises:

at least one accelerometer sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.

6. The system of claim 1, wherein the voice detection subsystem further comprises:

at least one skin-surface microphone sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.

7. The system of claim 1, wherein the voice detection subsystem receives voice activity signals via couplings with the microphones.

8. The system of claim 1, wherein the voice detection subsystem further comprises:

two unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone, wherein the distance is approximately in the range of zero (0) to 15 centimeters and wherein the angle is approximately in the range of zero (0) to 180 degrees; and

at least one voice activity detector (VAD) algorithm for processing the voice activity signals and generating the control signals.

9. The system of claim 1, wherein the voice detection subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals.

10. The system of claim 1, further including a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones,

Meta Platforms, Inc. - Exhibit 1002
Page 42 of 686

wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

11. The system of claim 10, wherein the portable handset includes at least one of the voice detection subsystem and the denoising subsystem.

12. The system of claim 1, further including a portable headset that includes the microphones along with at least one speaker device.

13. The system of claim 12, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

14. The system of claim 13, wherein the portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings.

15. The system of claim 13, wherein the communication device includes at least one of the voice detection subsystem and the denoising subsystem.

16. The system of claim 12, wherein the portable headset includes at least one of the voice detection subsystem and the denoising subsystem.

17. The system of claim 12, wherein the portable headset is a portable communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

18. A communications system, comprising:

[redacted]

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including an omnidirectional microphone and a unidirectional microphone separated by a distance, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

19. The system of claim 18, wherein the distance is approximately in the range of zero (0) to 15 centimeters.

20. The system of claim 18, wherein the omnidirectional microphone is oriented to capture signals from at least one speech signal source and the unidirectional microphone is oriented to capture signals from at least one noise signal source, wherein an angle between the speech signal source and a maximum of a spatial response curve of the unidirectional microphone is approximately in the range of 45 to 180 degrees.

21. The system of claim 18, wherein the voice detection subsystem further comprises:

at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.

Meta Platforms, Inc. - Exhibit 1002
Page 44 of 686

22. The system of claim 18, wherein the voice detection subsystem further comprises:

at least one accelerometer sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.

23. The system of claim 18, wherein the voice detection subsystem further comprises:

at least one skin-surface microphone sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.

24. The system of claim 18, wherein the voice detection subsystem further comprises:

two unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone, wherein the distance is approximately in the range of zero (0) to 15 centimeters and wherein the angle is approximately in the range of zero (0) to 180 degrees; and

at least one voice activity detector (VAD) algorithm for processing the voice activity signals and generating the control signals.

25. The system of claim 18, wherein the voice detection subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals.

26. The system of claim 18, further including a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

Meta Platforms, Inc. - Exhibit 1002
Page 45 of 686

27. The system of claim 26, wherein the portable handset includes at least one of the voice detection subsystem and the denoising subsystem.

28. The system of claim 18, further including a portable headset that includes the microphones along with at least one speaker device.

29. The system of claim 28, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

30. The system of claim 29, wherein the portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings.

31. The system of claim 29, wherein the communication device includes at least one of the voice detection subsystem and the denoising subsystem.

32. The system of claim 28, wherein the portable headset includes at least one of the voice detection subsystem and the denoising subsystem.

33. The system of claim 28, wherein the portable headset is a portable communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

34. A communications system, comprising:

at least one transceiver for use in a communications network;

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including a first microphone and a second microphone separated by a distance and having an angle between maximums of a spatial response curve of each microphone, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

35. The system of claim 34, wherein each of the first and second microphones is a unidirectional microphone, wherein the distance is approximately in the range of zero (0) to 15 centimeters and the angle is approximately in the range of zero (0) to 180 degrees.

36. The system of claim 34, wherein the first microphone is an omnidirectional microphone and the second microphone is a unidirectional microphone, wherein the first microphone is oriented to capture signals from at least one speech signal source and the second microphone is oriented to capture signals from at least one noise signal source, wherein an angle between the speech signal source and a maximum of a spatial response curve of the second microphone is approximately in the range of 45 to 180 degrees.

37. The system of claim 34, wherein the transceiver includes the first and second microphones.

[redacted]

38. The system of claim 34, wherein the transceiver couples information between the communications network and a user via a headset.

39. The system of claim 38, wherein the headset includes the first and second microphones.

[redacted]

Attorney Docket No. ALPH.P020

Microphone and Voice Activity Detection (VAD) Configurations For Use With Communication Systems

ABSTRACT

Communication systems are described, including both portable handset and headset devices, which use a number of microphone configurations to receive acoustic signals of an environment. The microphone configurations include, for example, a two-microphone array including two unidirectional microphones, and a two-microphone array including one unidirectional microphone and one omnidirectional microphone. The communication systems also include Voice Activity Detection (VAD) devices to provide information of human voicing activity. Components of the communications systems receive the acoustic signals and voice activity signals and, in response, automatically generate control signals from data of the voice activity signals. Components of the communication systems use the control signals to automatically select a denoising method appropriate to data of frequency subbands of the acoustic signals. The selected denoising method is applied to the acoustic signals to generate denoised acoustic signals when the acoustic signal includes speech and noise.

Meta Platforms, Inc. - Exhibit 1002
Page 49 of 686

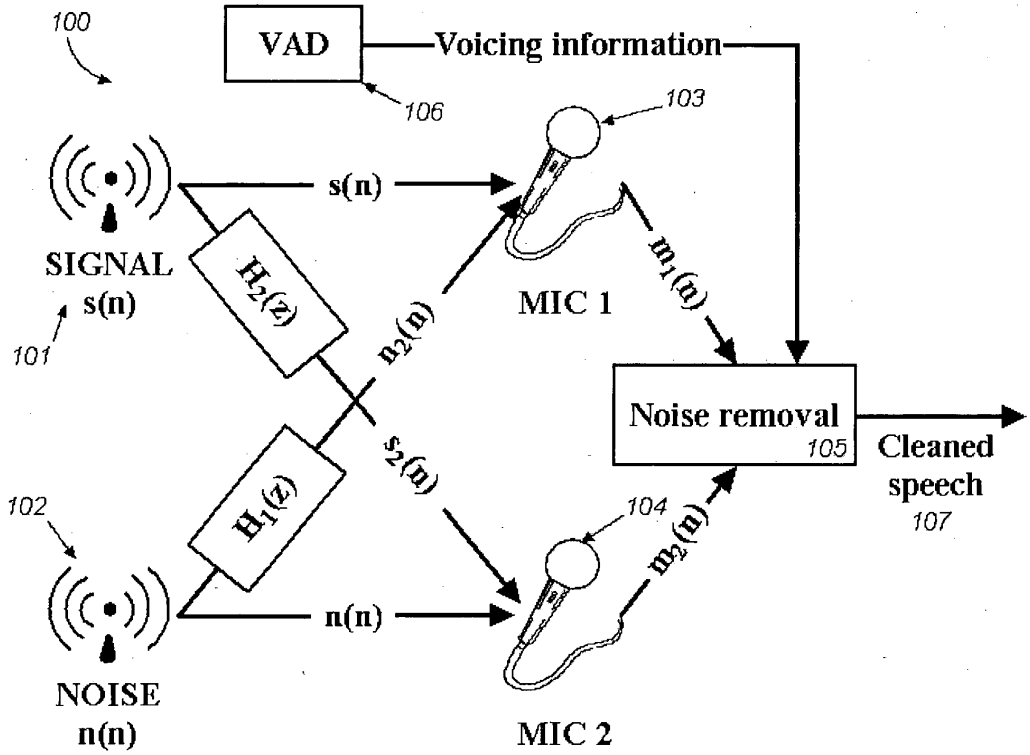


FIGURE 1

[redacted]

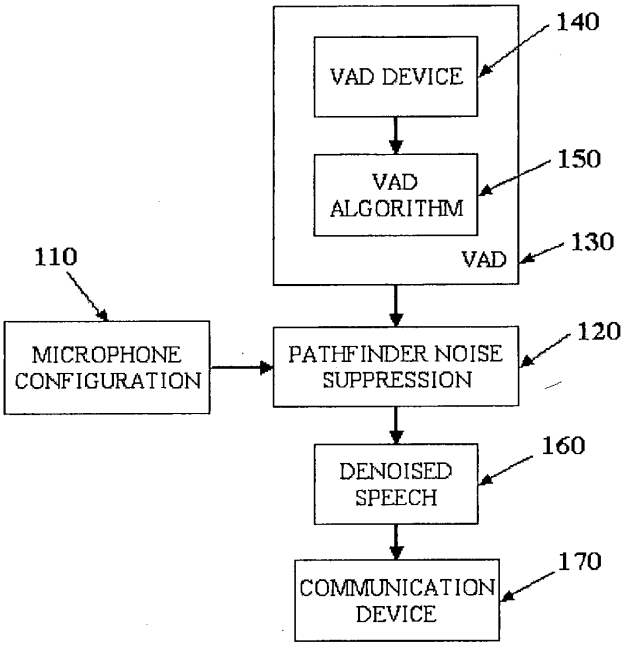


FIGURE 1A

[redacted]

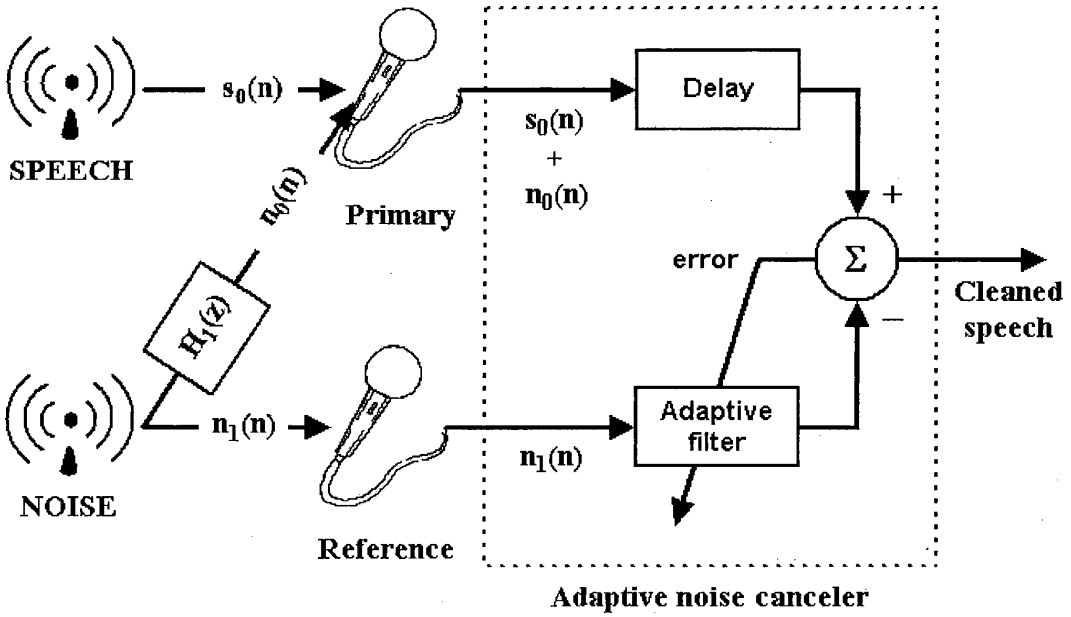


FIGURE 1B
(PRIOR ART)

UNIDIRECTIONAL

CHARACTERISTIC	OMNI-DIRECTIONAL	CARDIOID	SUPER-CARDIOID	HYPER-CARDIOID	BI-DIRECTIONAL
POLAR RESPONSE PATTERN					
COVERAGE ANGLE	360°	131°	115°	105°	90°
ANGLE OF MAXIMUM REJECTION (null angle)	—	180°	126°	110°	90°
REAR REJECTION (relative to front)	0	25 dB	12 dB	6 dB	0
AMBIENT SOUND SENSITIVITY (relative to omni)	100%	33%	27%	25%	33%
DISTANCE FACTOR (relative to omni)	1	1.7	1.9	2	1.7

FIGURE 2
(PRIOR ART)

[redacted]

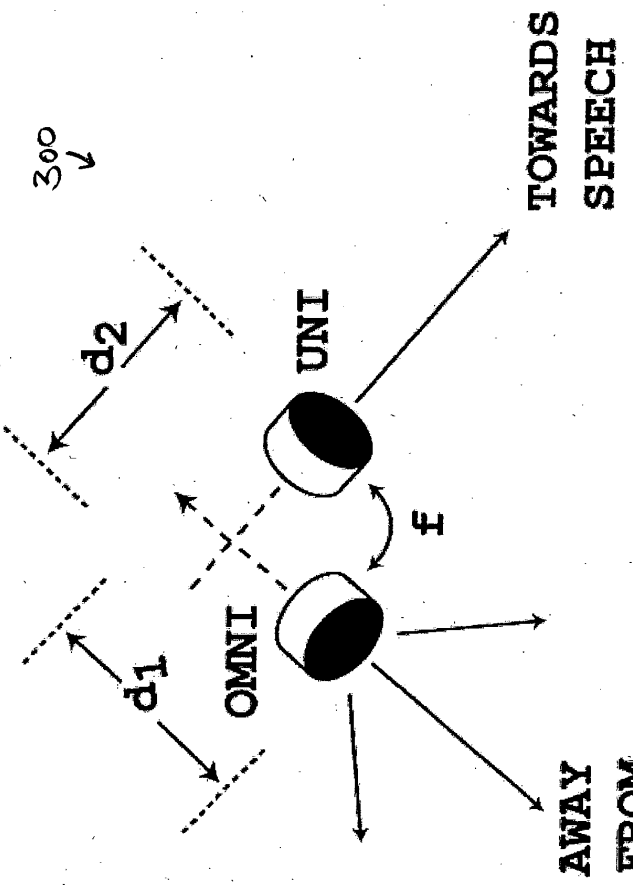


FIGURE 3A

310
SIDE
OMNI
UNI
TOWARDS SPEECH
END
UNI
OMNI
AWAY FROM SPEECH
TOWARDS SPEECH
END
UNI
d_1
OMNI
d_2
AWAY FROM SPEECH
SIDE
HANDSET

FIGURE 3B

320
FRONT
OMNI
UNI
TOWARDS
SPEECH
HEADSET
AWAY
FROM
SPEECH
OMNI
SIDE
UNI
d
TOWARDS
SPEECH

FIGURE 3C

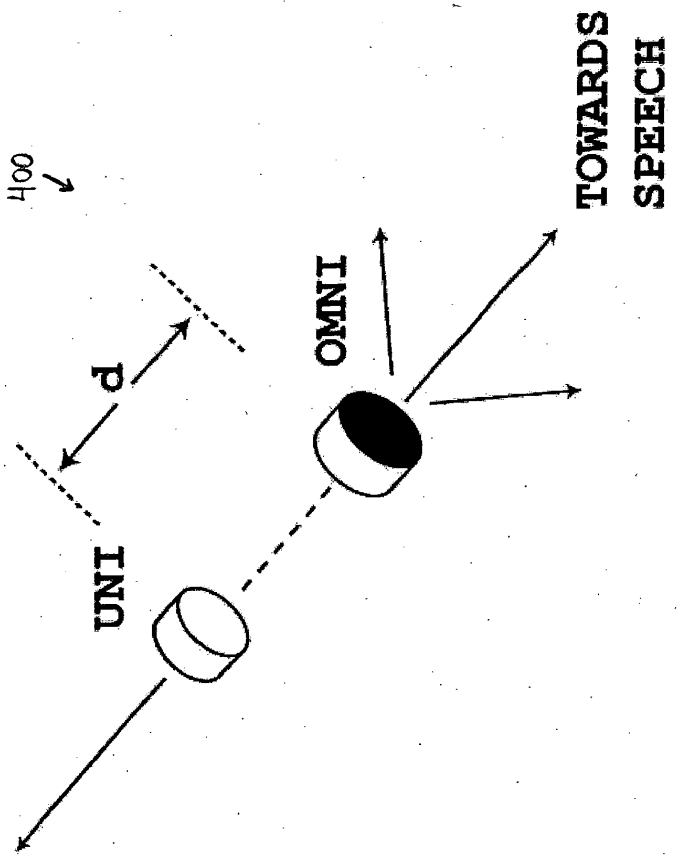


FIGURE 4A

410
UNI
SIDE
OMNI
TOWARDS SPEECH
END
OMNI
TOWARDS SPEECH
END
OMNI
d
UNI
SIDE
AWAY FROM SPEECH
HANDSET

FIGURE 4B

d
UNI
SIDE
OMNI
TOWARDS
SPEECH
420
AWAY
FROM
SPEECH
FRONT
UNI
OMNI
TOWARDS
SPEECH
HEADSET

FIGURE 4C

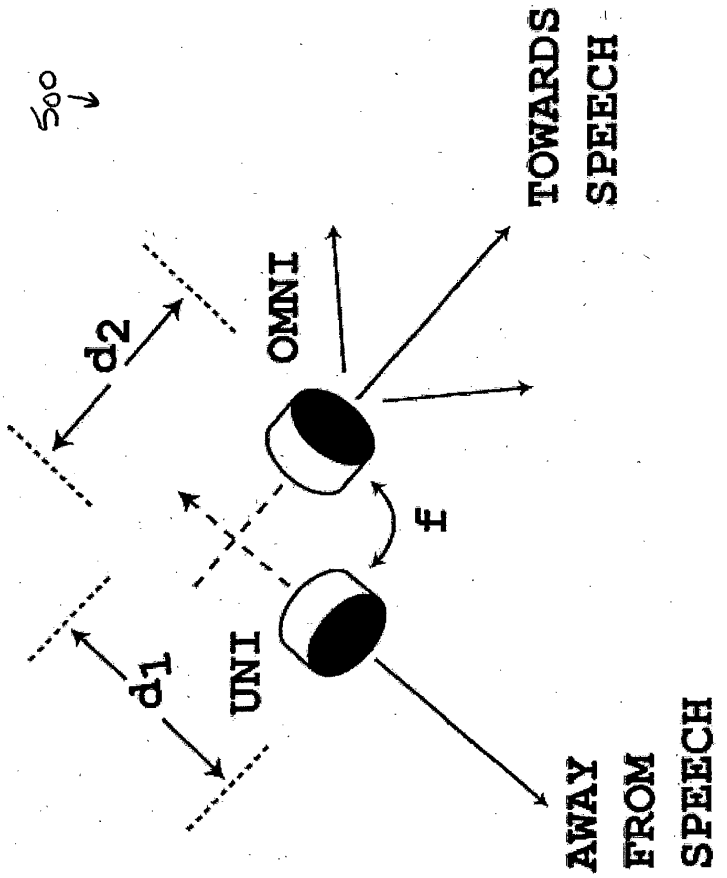


FIGURE 5A

SIDE
UNI
OMNI
TOWARDS SPEECH
END
OMNI
UNI
AWAY FROM HEAD
TOWARDS SPEECH
510
END
OMNI
d1
UNI
d2
AWAY FROM HEAD
SIDE
HANDSET

FIGURE 5B

520
FRONT
UNI
OMNI
TOWARDS
SPEECH
HEADSET
AWAY
FROM
HEAD
UNI
SIDE
OMNI
d
TOWARDS
SPEECH

FIGURE 5C

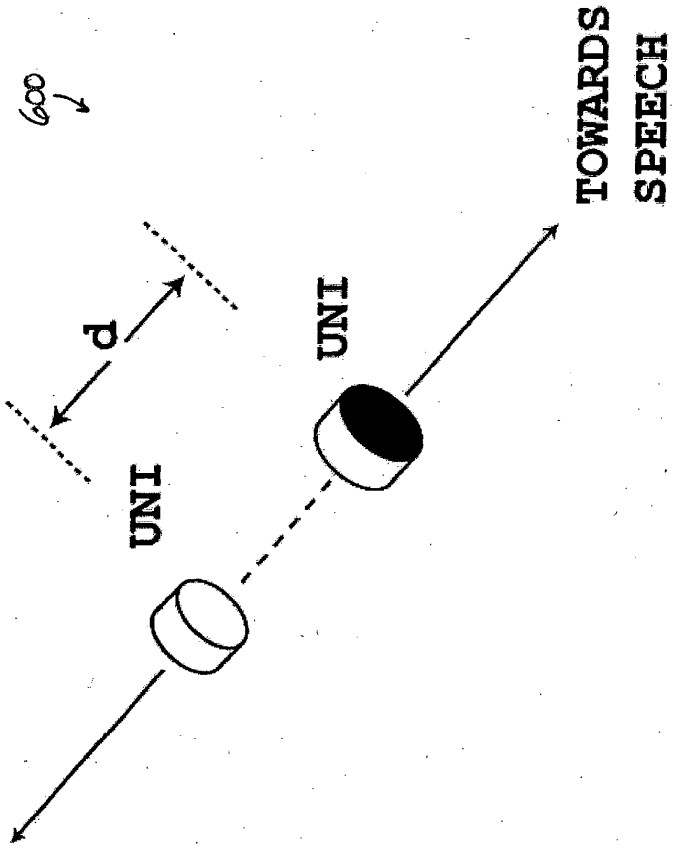


FIGURE 6A

UNI
SIDE
UNI
TOWARDS
SPEECH
END
UNI
TOWARDS
SPEECH
610
END
UNI
d
UNI
SIDE
AWAY
FROM
SPEECH
HANDSET

FIGURE 6B

d
UNI
SIDE
UNI
TOWARDS
SPEECH
620
FRONT
UNI
UNI
TOWARDS
SPEECH
AWAY
FROM
SPEECH
HEADSET

FIGURE 6C

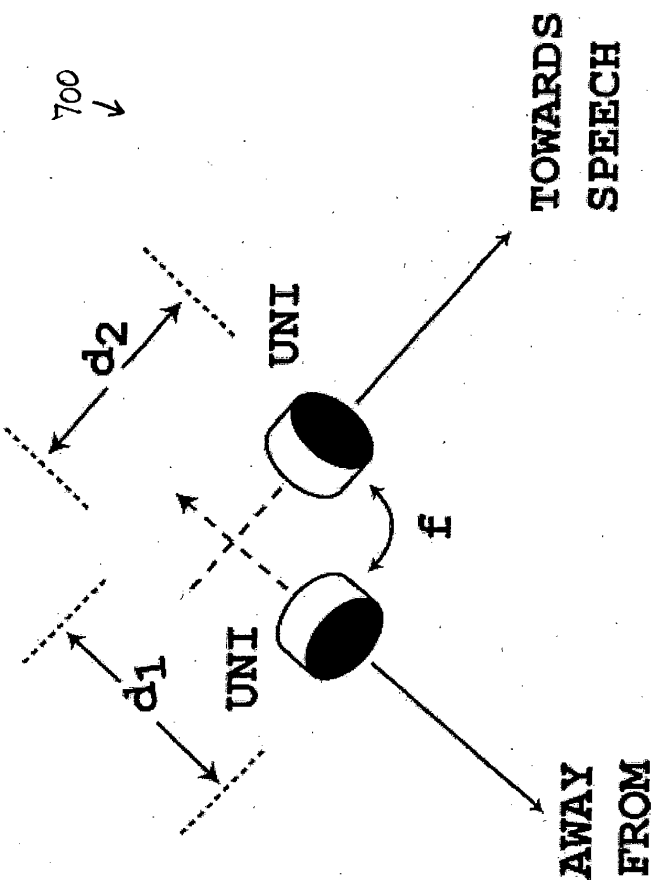


FIGURE 7A

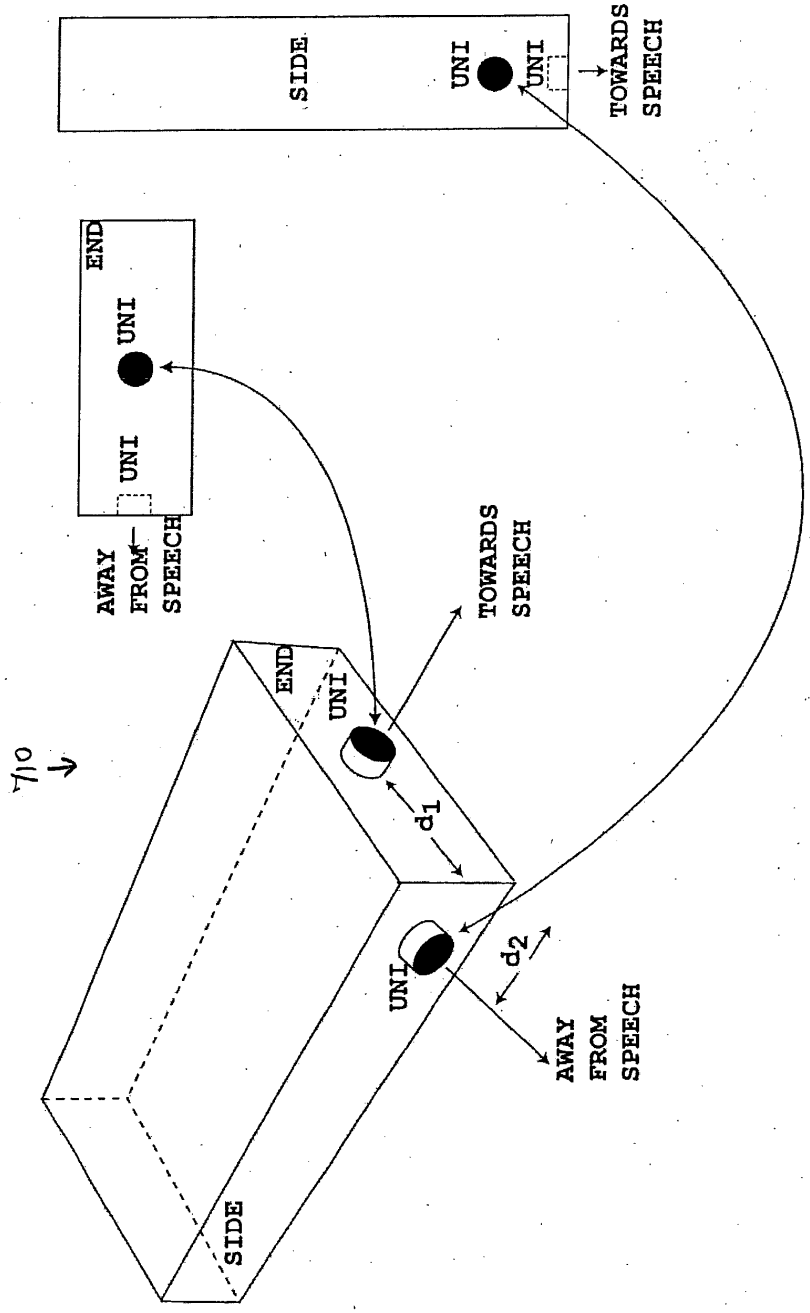

710
SIDE
UNI
UNI
TOWARDS SPEECH
END
UNI
UNI
AWAY FROM SPEECH
TOWARDS SPEECH
END
UNI
d_1
UNI
d_2
AWAY FROM SPEECH
SIDE
HANDSET

FIGURE 7B

720
HEADSET
FRONT
UNI
UNI
TOWARDS SPEECH
AWAY FROM SPEECH
UNI
SIDE
UNI
TOWARDS SPEECH

FIGURE 7C

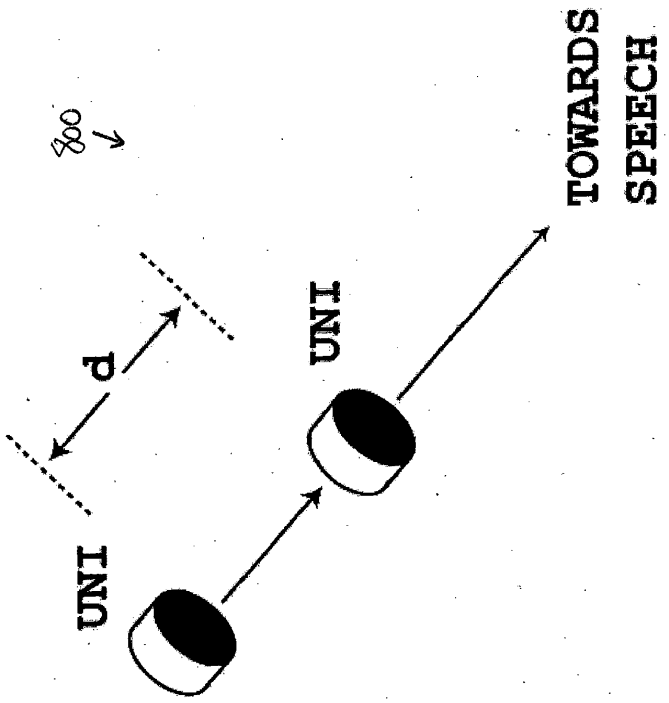


FIGURE 8A

SIDE
UNI
UNI
TOWARDS
SPEECH
END
UNI
TOWARDS
SPEECH
810
END
UNI
UNI
d
SIDE
HANDSET

FIGURE 8B

d
UNI
SIDE
UNI
TOWARDS
SPEECH
820
FRONT
UNI
UNI
TOWARDS
SPEECH
HEADSET

FIGURE 8C

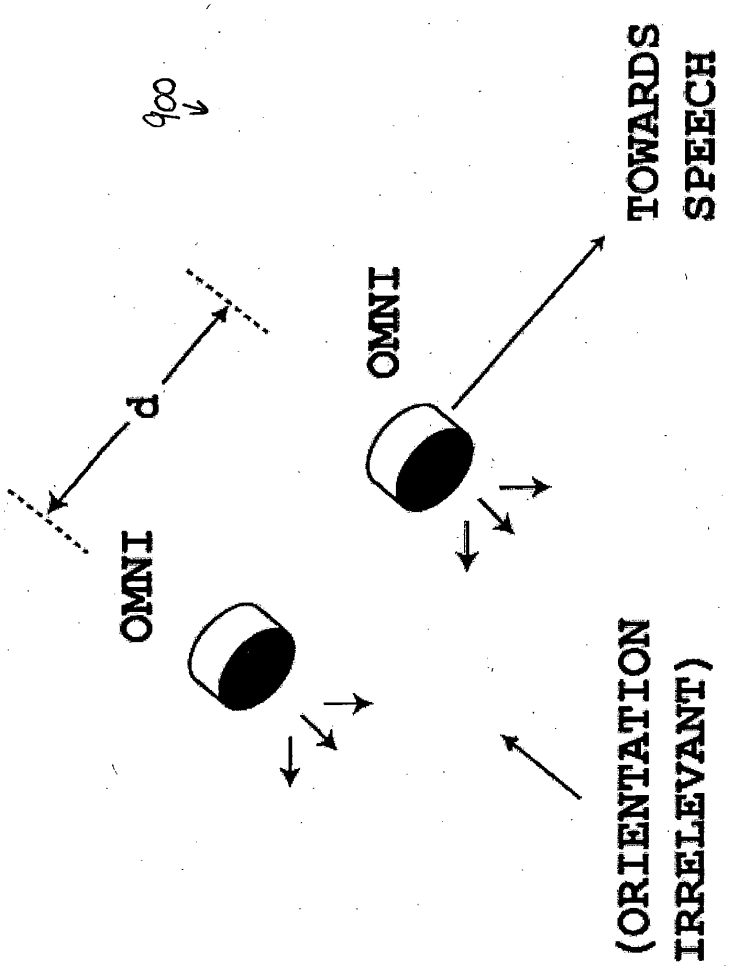


FIGURE 9A

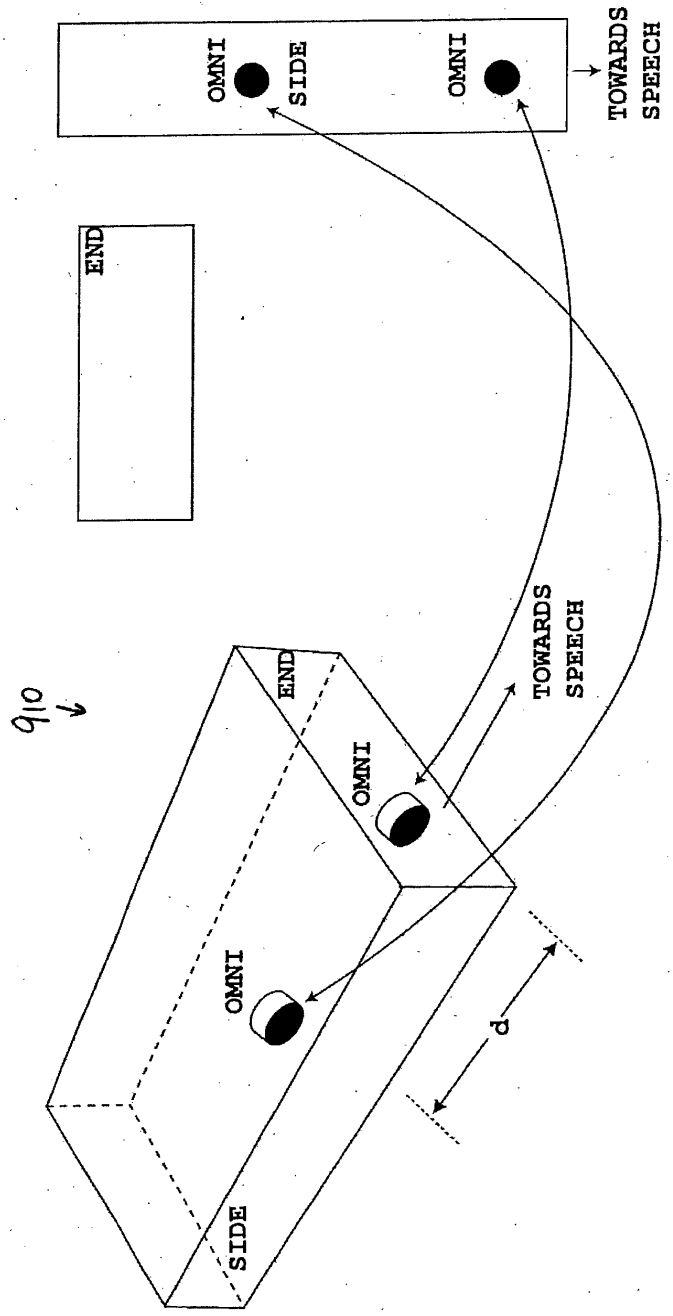

910
END
OMNI
SIDE
OMNI
TOWARDS
SPEECH
END
OMNI
TOWARDS
SPEECH
OMNI
d
SIDE
HANDSET

FIGURE 9B

d
OMNI
SIDE
OMNI
TOWARDS
SPEECH
120
FRONT
OMNI
OMNI
TOWARDS
SPEECH
HEADSET

FIGURE 9C

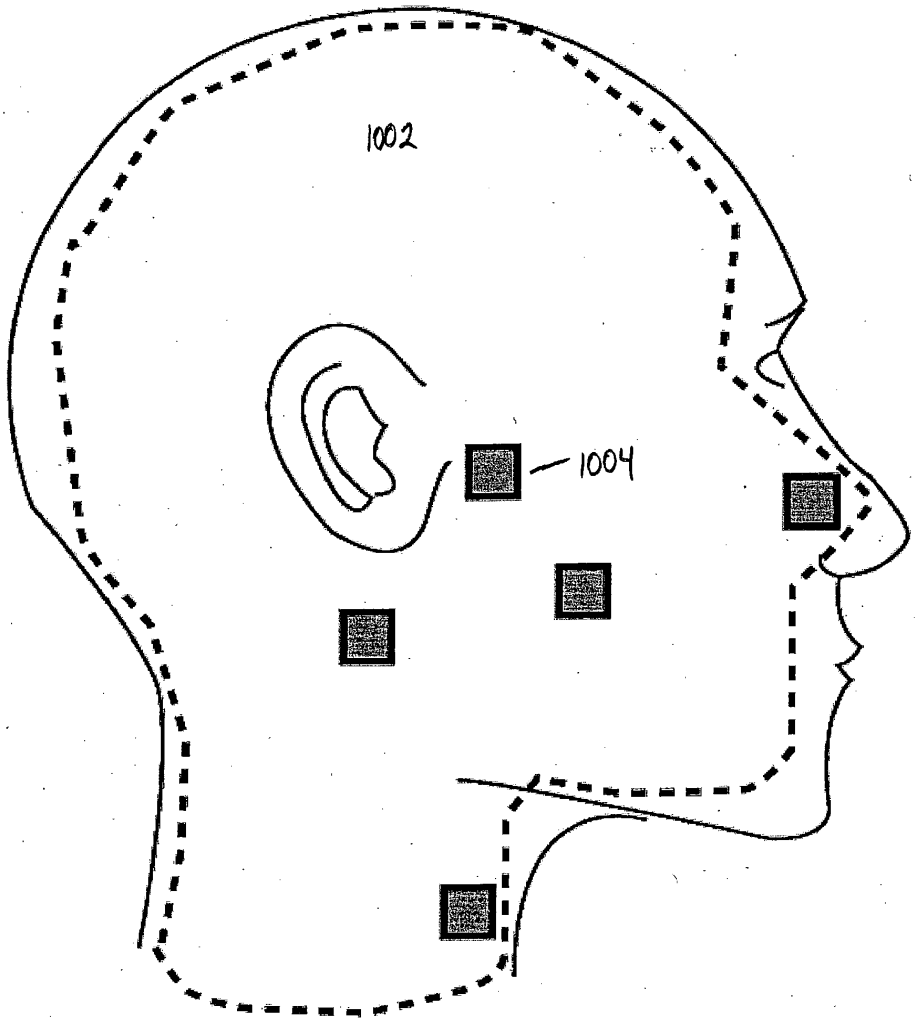


FIGURE 10A

[redacted]

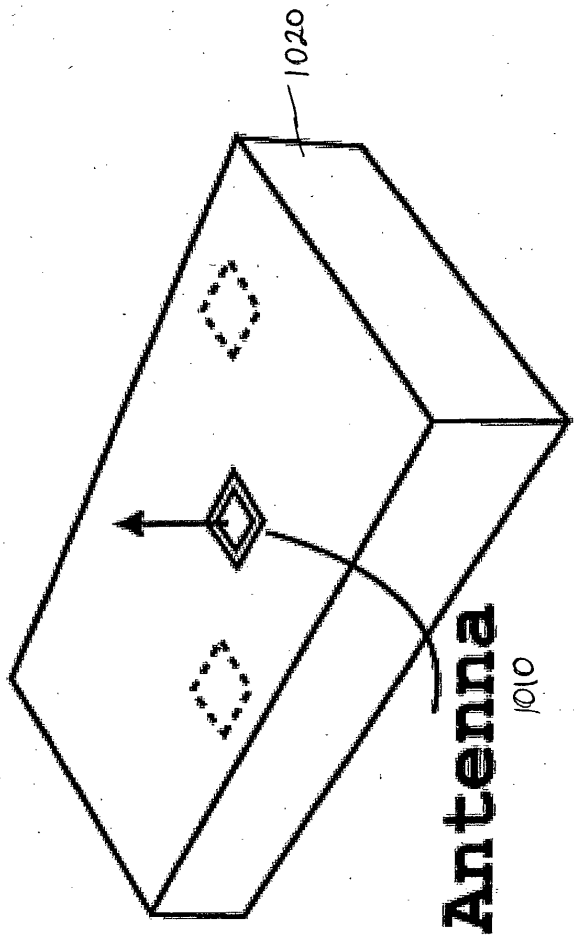


FIGURE 10B

A - Area Behind The Ear
B - Area Above The Ear
C - Mid Cheek Area
D - Area In Front of Ear Canal
E - Inside Ear Canal in Contact with Mastoid Bone Or Other Vibrating Tissue
F - Nose

FIGURE 11A

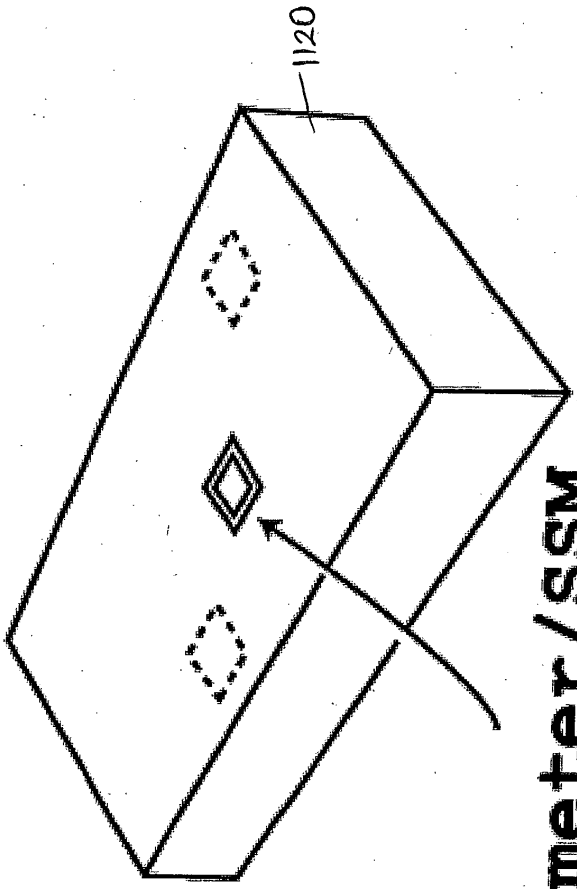


FIGURE 11b

Atty. Docket No.: ALPH.P020

PATENT

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	)	
	)	Examiner: Not Yet Assigned
Gregory C. Burnett et al.	)	
	)	Art Unit: Not Yet Assigned
Application No.: Not Yet Assigned	)	
	)	
Filed: HEREWITH	)	
	)	
For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS	)	

Assistant Commissioner for Patents
Washington, D.C. 20231

Power of Attorney by Assignee and Certification Under 37 CFR §3.73(b)

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

I, the undersigned, acting on behalf of the Assignee of the entire right, title and interest in the above-referenced patent applications, hereby revoke all prior powers of attorney for said applications and appoint the practitioners at Customer Number 30554, the Customer Number of Shemwell Gregory & Courtney LLP, as my/our attorney(s) or agent(s) to prosecute said applications, and to transact all business in the United States Patent and Trademark Office connected therewith. This appointment is to the exclusion of the inventor(s) and their attorney(s) and agent(s) in accordance with the provisions of 37 CFR 3.71.

Effective immediately, please direct all further communications in the above-identified patent application to the following address:

Shemwell Gregory & Courtney LLP
4880 Stevens Creek Blvd., Ste. 201
San Jose, CA 95129

Telephone: (408) 236-6640
Facsimile: (408) 236-6641
Customer No. 30554

[redacted]

In accordance with 37 CFR 3.73(b), I hereby certify that I am empowered to act on behalf of the Assignee. To the best of my knowledge and belief, title is in the Assignee, as evidenced by the duly executed assignment document enclosed herewith.

I further declare 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 Title 18, USC §1001 and that such willful false statements may jeopardize the validity of the this application or any patent resulting therefrom.

ASSIGNEE:	**AliphCom, Inc.**
Signature:	H.S. R
Typed Name:	Hosain Rahman
Title:	Vice President of Business Development; Founder
Date:	3/24/03
Address:	410 Jessie Street, Unit 601 San Francisco, California 94103

[redacted]

PTO/SB/01 (10-01)
Approved for use through 10/31/2002. OMB 0651-0032
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.

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.P020
First Named Inventor	Gregory C. Burnett
COMPLETE IF KNOWN	
Application Number	To be assigned
Filing Date	HEREWITH
Art Unit	To be assigned
Examiner Name	To be assigned

As the below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original and first inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled:

MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS

(Title of the Invention)

the specification of which

☑ is attached hereto

OR

☐ was filed on (MM/DD/YYYY) [ ] as United States Application Number or PCT International

Application Number [ ] 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:

Burden Hour Statement: This form is estimated to take 21 minutes 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.

[redacted]

PTO/SB/01 (10-01)
Approved for use through 10/31/2002. OMB 0651-0032
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.

DECLARATION — Utility or Design Patent Application

Direct all correspondence to: ☐ Customer Number or Bar Code Label [ ] OR ☑ Correspondence address below

SHEMWELL GREGORY & COURTNEY LLP
Name

4880 Stevens Creek Boulevard
Suite 201
Address

San Jose	California	95129
City	**State**	**ZIP**

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

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 G. B. **Date** 3-24-03

Livermore	California	US	US
Residence: City	**State**	**Country**	**Citizenship**

675 South H Street
Mailing Address

Livermore	California	94550	US
City	**State**	**ZIP**	**Country**

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

Given Name (first and middle [if any]) Nicolas J.	**Family Name or Surname** Petit

Inventor's Signature **Date** 3-24-03

San Francisco	California	US	BE
Residence: City	**State**	**Country**	**Citizenship**

3300 Scott Street #207
Mailing Address

San Francisco	California	94123	US
City	**State**	**ZIP**	**Country**

☑ Additional inventors are being named on the 1 supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto.

[redacted]

PTO/SB/02A (10-00)
Approved for use through 10/31/2002. OMB 0651-0032
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.

DECLARATION

ADDITIONAL INVENTOR(S)
Supplemental Sheet
Page 1 of 1

Name of Additional Joint Inventor, if any:	☐ A petition has been filed for this unsigned inventor		
Given Name: Alexander M.		Family Name or Surname: Asseily	
Inventor's Signature			Date: 3-24-03
San Francisco (Residence: City)	California (State)	US (Country)	UK (Citizenship)
2539 Post Street (Mailing Address)			
Mailing Address			
City: San Francisco	California (State)	94115 (ZIP)	US (Country)
Name of Additional Joint Inventor, if any:	☐ A petition has been filed for this unsigned inventor		
Given Name: Andrew E.		Family Name or Surname: Einaudi	
Inventor's Signature			Date: 3-24-03
San Francisco (Residence: City)	California (State)	US (Country)	US (Citizenship)
1570 Grove Street (Mailing Address)			
Mailing Address			
City: San Francisco	California (State)	94117 (ZIP)	US (Country)
Name of Additional Joint Inventor, if any:	☐ A petition has been filed for this unsigned inventor		
Given Name		Family Name or Surname	
Inventor's Signature			Date
Residence: City	State	Country	Citizenship
Mailing Address			
Mailing Address			
City	State	ZIP	Country

Burden Hour Statement: This form is estimated to take 21 minutes 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.

[redacted]

Atty. Docket No. ALPH.P020 *PATENT*

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	)	
	)	
Gregory C. Burnett et al.	)	Examiner: To be assigned
	)	
Application No. To be assigned	)	Art Unit: To be assigned
	)	
Filed: March 27, 2003 (HEREWITH)	)	
	)	
For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS	)	

Assistant Commissioner for Patents
Washington, D.C. 20231

ASSERTION OF SMALL ENTITY STATUS UNDER 37 CFR 1.27

Sir:

Applicants hereby state that small entity status is entitled to be asserted for the above-referenced patent application filed herewith.

Respectfully submitted,

SHEMWELL GREGORY & COURTNEY LLP

Dated: March 27, 2003

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

[redacted]

PATENT APPLICATION FEE DETERMINATION RECORD
Effective January 1, 2003

Application or Docket Number: 10400282

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	39	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	39 minus 20=	*
INDEPENDENT CLAIMS	3 minus 3 =	*
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	375.00	OR	BASIC FEE	750.00
X$ 9=		OR	XS18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL		OR	TOTAL	

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=	
X42=		OR	X84=	
+140=		OR	+280=	
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=	
X42=		OR	X84=	
+140=		OR	+280=	
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=	
X42=		OR	X84=	
+140=		OR	+280=	
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.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING/RECEIPT DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
10/400,282	03/27/2003	Gregory C. Burnett	ALPH.P020

CONFIRMATION NO. 1397

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

FORMALITIES LETTER

OC000000010155264

Date Mailed: 05/30/2003

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 $ **375** *to complete the basic filing fee for a small entity.*
- To avoid abandonment, a late filing fee or oath or declaration surcharge as set forth in 37 CFR 1.16(e) of $65 for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this letter.

Items Required To Avoid Processing Delays:

The item(s) indicated below are also required and should be submitted with any reply to this notice to avoid further processing delays.

- Additional claim fees of **$171** as a 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 **$611** for a Small Entity

- **$375** Statutory basic filing fee.
- **$65** Late oath or declaration Surcharge.
- Total additional claim fee(s) for this application is **$171**
  - **$171** for **19** total claims over 20 .

A copy of this notice <u>MUST</u> be returned with the reply.

Customer Service Center
Initial Patent Examination Division (703) 308-1202
PART 3 - OFFICE COPY



0120

Atty. Docket No. ALPH.P020 *PATENT*

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:

Gregory C. Burnett

Application No. 10/400,282

Filed: March 27, 2003

For: MICROPHONE AND VOICE ACTIVITY DETECTION(VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS

Examiner: To be assigned
Art Unit: To be assigned

FIRST CLASS MAIL CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service FIRST CLASS MAIL service with sufficient postage on the date indicated below and that the paper(s) and/or fee(s) have been addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Barbara B. Courtney
(Typed or printed name of person mailing paper(s) or fee(s))

(Signature of person mailing paper or fee)

September 4, 2003
(Date signed)

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 together with copies 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 3, 2003

Barbara B. Courtney
Registration No. 42,442

PATENT & TRADEMARK OFFICE SEP 08 2003

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

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.

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 2

Complet if Kn wn	
Application Number	10/400,282
Filing Date	March 27, 2003
First Named Inventor	Gregory C. Burnett
Group Art Unit	Unknown
Examiner Name	Unknown
Attorney Docket Number	ALPH.P020

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	
		5,406,662		Silverberg et al.	04-11-1995	
		5,517,435		Sugiyama	05-14-1996	

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.

SEP 08 2003

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

PTO/SB/08B (08-00)
Approved for use through 10/31/2002. 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.

Substitute for form 1449B/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 2 of 2

Complete if Known	
Application Number	10/400,282
Filing Date	March 27, 2003
First Named Inventor	Gregory C. Burnett
Group Art Unit	Unknown
Examiner Name	Unknown
Attorney Docket Number	ALPH.P020

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.	
		TODD J. GABLE 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 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] 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.

OIPE JC73
NOV 05 2004
PATENT & TRADEMARK OFFICE

2644
IFW

Atty Docket No. ALPH.P020 *PATENT*

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:

Gregory C. Burnett

Application No. 10/400,282

Filed: March 27, 2003

For: MICROPHONE AND VOICE ACTIVITY DETECTION(VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS

Examiner: To be assigned
Art Unit: 2644

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 0 5 2004
PATENT & TRADEMARK OFFICE

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. 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.

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	10/400,282
Filing Date	03/27/2003
First Named Inventor	Gregory C. Burnett
Art Unit	2644
Examiner Name	Not yet assigned
Attorney Docket Number	ALPH.P020

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- 5,473,702	12-05-1995	Yoshida et al.	
		US- 5,515,865	05-14-1996	Scanlon et al.	
		US- 5,649,055	07-15-1997	Gupta et al.	
		US- 5,684,460	11-04-1997	Scanlon et al.	
		US- 5,729,694	03-17-1998	Holzrichter et al.	
		US- 5,754,665	05-19-1998	Hosoi et al.	
		US- 5,853,005	12-29-1998	Scanlon	
		US- 6,069,963	05-30-2000	Martin et al.	
		US- 6,266,422	07-24-2001	Ikeda	
		US- 6,430,295	08-06-2002	Handel et al.	
		US- 5,097,515	03-17-2002	Baba	
		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.

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.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

IPE JC73
NOV 05 2004
PATENT & TRADEMARK OFFICE

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

I hereby certify that the following correspondence is being deposited with the United States Postal Service with sufficient postage and addressed to MS Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria VA 22313-1450 on the date below by:

Barbara B. Courtney
(Name of person transmitting correspondence)

November 4, 2004
Date

Serial/Patent No.: 10/400,282 Filing/Issue Date: March 27, 2003 Client: ALIPH, Inc.
Title: Voice Activity Detection (VAD) Configurations for use with Communication Systems

Atty. Docket No.: ALPH.P020 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)
- ☑ Itemized Postcard
- ☑ First Class Mail Certificate Of Mailing
- ☐ Express Mail No. _____
- ☐ Check No. ____ Amt $_____

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 637 187 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **93112064.6**

(51) Int. Cl.[6]: **H04R 1/10**

(22) Date of filing: **28.07.93**

(43) Date of publication of application:
01.02.95 Bulletin 95/05

(84) Designated Contracting States:
DE ES FR GB IT

(71) Applicant: **PAN COMMUNICATIONS, INC.**
Enokizaka Bldg. 4F,
1-12-12, Akasaka
Minato-ku,
Tokyo 107 (JP)

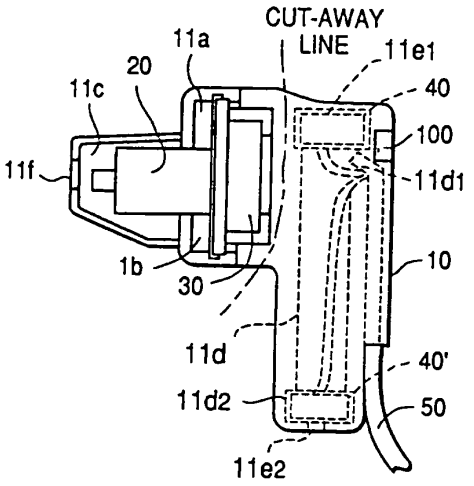
(72) Inventor: **Yamaguchi, Noboru**
11-15-203, Isogodai, Isogo-ku
Yokohama-shi,
Kanagawa-ken (JP)
Inventor: **Konomi, Masao**
3-14-12 Meguro
Meguro-ku,
Tokyo 153 (JP)

(74) Representative: **Patentanwälte Grünecker,**
Kinkeldey, Stockmair & Partner
Maximilianstrasse 58
D-80538 München (DE)

(54) Two-way communications earset.

(57) A one piece two way voice communications earset which is situated in or at the ear of the user and which includes either two unidirectional microphones having their outputs combined or a single bi-directional microphone.

FIG. 4



EP 0 637 187 A1

BEST AVAILABLE COPY

BACKGROUND OF THE INVENTION

The present invention relates to an earset for use in two-way voice communications which is worn in or at an ear canal of a user and which is operated hands-free. The earset of the present invention can transmit the user's voice and receive voice signals from another party simultaneously without causing feedback.

Modern wireless technologies have advanced to the extent that portable, wireless and mobile telephones have become small in size and are used widely. Such portable telephones typically include a handset requiring the use of at least one hand for communication.

A disadvantage of the handset type of telephone is that they are inconvenient to use in front of a computer or while driving a car. In such instances, the user must use a hand to hold the handset while typing at the keyboard, which is very difficult to do, or while holding the steering wheel of a car, which is dangerous. Alternatively, the user must hold the telephone handset to their ear with their shoulder, which is very uncomfortable.

In order to solve this drawback, hands-free telephones have been developed. A conventional two-way communications apparatus used with hands-free telephones comprises a headband including a speaker positioned in front of one ear and a boom attached to the headband with a small microphone at one end of the boom. With the boom connected to the headband, the microphone extends in front of the mouth of the user. However, this type of hands-free telephone is not convenient to use because it is cumbersome and because it disturbs the hair of the user.

Another conventional two-way communications system used with hands-free telephones includes a structure which hangs from the ear of the user. This type of communications system includes a speaker positioned in front of the user's ear and a boom having a microphone extending in front of the mouth of the user. Again, such a structure is not convenient for the user because it typically does not hang well at the ear and because it is bulky to carry owing to the boom.

Alternatively, as shown in Fig. 1, yet another conventional two-way communications system includes a receiver section 1 with a speaker 1a which is placed in the user's ear canal. Sound is transmitted to the user via an opening 1b in the back of the speaker 1a. The two way communications system also includes a transmitter section 3 which is located relatively close to the user's mouth. The transmitter section 3 includes a microphone 3a.

In the conventional two-way communications system shown in Fig. 1, however, the transmitter section 3 is attached to the receiver section 1 by a chord 2. The cord 2 also extends past the transmitter section 3 and is connected to a telephone terminal (not shown).

The two-way communications system shown in Fig. 1 does not require hands to operate. However, due to the connection of the transmitter section 3 by the cord 2, the microphone 3a dangles. With such a configuration, the microphone 3a must be omnidirectional causing noise when the microphone 3a rotates at the chord 2. Additionally, with the two-way communications system shown in Fig. 1, the sound intake of the microphone 3a may be blocked by the face or clothing of the user, causing a decrease in the quality of the transmitted voice signals. Moreover, contact between the transmitter section 3 and the clothing of the user tends to cause noise.

Conventional two-way communications systems, such as those shown in Fig. 2 and Fig. 3 attempt to overcome the deficiencies described above with the two-way communications system shown in Fig. 1.

The conventional two-way communications earsets shown in Figs. 2 and 3 integrate the speaker 1a and the microphone 3a into a single case 4. The L-shaped case 4 houses the speaker 1a in one leg and houses the microphone 3a in the other leg. In the embodiment shown in Fig. 2, the speaker 1a has a single opening 4a at a back portion thereof. Alternatively, as shown in Fig. 3, the speaker 1a may have a plurality of holes 4a'. The microphone 3a has an opening 4b through which signals are received. There is a chord 2 coming out from the lower part of the L-shaped case 4 which is connected to a telephone terminal (not shown).

By incorporating the speaker 1a and the microphone 3a in the case 4, conventional two-way communications earsets shown in Figs. 2 and 3 solve many of the problems discussed above related to the communications system shown in Fig. 1. However, the two-way communications earsets of Figs. 2 and 3 cause feedback because sound that leaks out from the opening 4a is fed into the microphone 3a though sound intake hole 4b. Therefore, in the communications earsets shown in Figs. 2 and 3, either the sound volume of the speaker 1a has to be controlled below a certain level or the sensitivity of the microphone 3a has to be kept below a certain level to reduce the effects of feedback.

However, if the sound volume is maintained at a low level, the user may find it difficult to hear voice signals due to the presence of ambient noise. In an effort to reduce the effects of ambient noise, the user may cover his ear with his hand. Unfortunately, this significantly increases the acoustic coupling between the speaker and microphone, causing even more feedback.

Meta Platforms, Inc. - Exhibit 1002
Page 95 of 686

In addition, with two-way communications earsets shown in Figs. 2 and 3, voice signals of the user are picked up at the ear, which is about 14 cm away from the user's mouth. Conventional telephone handsets are designed to pick up voice signals directly in front of the user's mouth which are approximately 2.5 cm away from the microphone. At this distance, the level of the voice signal is approximately 94dBSPL. Because the two-way communications earsets shown in Figs. 2 and 3 receive voice signals further away from the mouth than conventional handsets, the signals are approximately 14 dBSPL (sound pressure level) lower than those received by a conventional telephone handset. Because the voice signals are received from further away, they require greater amplification. As a result, the systems shown in Figs. 2 and 3 tend to pick up more ambient noise and room reverberation, both of which make the received voice signals less intelligible.

Accordingly, an object of the present invention is to provide an earset for use in two-way voice communications which is worn in or at an ear canal of the user and which is operated hands-free.

Another object of the present invention is to provide an earset which transmits the user's voice and receives voice signals from another party simultaneously without causing feedback caused by acoustic or mechanical coupling between the speaker and the microphone.

A further object of the present invention is to provide a two-way communications earset which delivers an adequate level of sound to the user without causing feedback, while also delivering an adequate level of sound to a receiver a the other end of the communication system.

A still further object of the present invention is to provide a two-way voice communications earset which is less sensitive to ambient noise at a level almost equal to a telephone handset and to room reverberation so that clear voice communications can be obtained.

Additional objects and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

SUMMARY OF THE INVENTION

To achieve the objects in accordance with the purposes of the present invention, as embodied and described herein, the earset of the present invention comprises a one piece two-way simultaneous voice transmitting and receiving device comprising a receiver for emitting sound primarily to the ear canal of a user and a transmitter, coupled to the receiver, and located outside the ear canal, comprising a first microphone adapted to be located at a first position relative to the mouth of the user and outputting a first signal, a second microphone spaced a distance away from the first microphone and adapted to be located at a second position relative to the mouth of the user further from the mouth of the user than the first position, and outputting a second signal and means for detecting the first and second signals.

The earset of the present invention further comprises a one piece two-way simultaneous voice transmitting and receiving device comprising a receiver, emitting sound primarily to the ear canal of a user, and a transmitter, coupled to the receiver and located outside the ear canal, comprising a microphone with bi-directional directivity having two sound receiving ends, a cavity housing the microphone substantially at a central portion thereof and directed toward the mouth of the user and sound absorbing materials placed with the cavity and abutting the sound receiving ends of the microphone.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate the presently preferred apparatus of the present invention and, together with the general description given above and the detailed description of the preferred embodiments given below serve to explain the principles of the invention. In the drawings:

Fig. 1 is a sectional view of a conventional earset with a microphone attached to a cord;

Fig. 2 is a side sectional view of a conventional one piece earset adapted to be worn in a user's ear;

Fig. 3 is a side sectional view of another conventional one piece earset adapted to be worn in a user's ear;

Fig. 4 is a sectional view of a two-way communications earset according to a first embodiment of the present invention;

Fig. 5 is a side view of a second embodiment of a two-way communications earset according to the present invention placed in an ear of a user;

Fig. 6 is a sectional view of a two-way communications system according to a third embodiment of the present invention;

Fig. 7 is a side view showing the relative positioning of a sound source relative to the earset shown in Fig. 4;

Fig. 8 is a side view showing the relative positioning of a mouth relative to the earset shown

Meta Platforms, Inc. - Exhibit 1002
Page 96 of 686

in Fig. 4;
Fig. 9 is a side view showing the relative positioning of a speaker output relative to the earset shown in Fig. 6;
Fig. 10 is a side view showing the relative positioning of a sound source with respect to an alternative embodiment of the two-piece microphone;
Fig. 11 is a circuit diagram of conventional circuit that produces an electret microphone output;
Fig. 12 is a circuit diagram of circuitry used in the earset of the present invention for subtracting the outputs of two microphones when the microphones are in phase;
Fig. 13 is a circuit diagram of circuitry used in the earset of the present invention for adding the outputs of two microphones when the microphone outputs are out of phase;
Fig. 14 is a circuit diagram of circuitry used in the earset of the present invention for adding the outputs of two microphones when the microphones are mutually out of phase;
Fig. 15 is a side view of a two-way communications earset according to a fourth embodiment of the present invention;
Fig. 16 is a side sectional view of the earset according to the fourth embodiment of the present invention hung on the user's ear;
Fig. 17 is a sectional view of a two-way communications earset according to the fifth embodiment of the present invention;
Fig. 18 is a side view of the earset according to the fifth embodiment inserted in a user's ear canal;
Fig. 19 is a side view of the earset according to the fifth embodiment with an alternative ear insertion shape;
Fig. 20 is a back view of a two-way communications earset according to the sixth embodiment of the present invention;
Fig. 21 is a side sectional view of the earset according to the sixth embodiment hung on an ear of a user;
Fig. 22 is a block diagram of a circuit used in the earset of the present invention for reducing the degree of amplification of sound to less than 70 dBSPL; and
Fig. 23 is a graphical representation of the input-output characteristics of the circuit shown in Fig. 22.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 4 is a sectional view of a two-way communications earset according to a first embodiment of the present invention. The embodiment shown in Fig. 4 comprises an earset 10 which has an L-shaped configuration. The earset 10 is preferably made of plastic and includes an enlarged portion 11a which is inserted in the ear of the user. The enlarged portion 11a includes an earset component portion 11b and an insertion portion 11c.

The enlarged portion 11a is placed in the user's ear auricle and the insertion portion 11c is inserted into the ear canal. The insertion portion 11c is preferably shaped so that the ear canal of the user will not be completely clogged by the earset 10 and so that the earset 10 will not be so loose as to cause feedback due to leaked sound.

A speaker 20 is housed in the earset component portion 11b and is supported by resilient material 30. The output of the speaker 20 is input to the insertion part 11c and is fed into the ear canal of the user through hole 11f. The speaker 20 can preferably be either a magnetic-type speaker or dynamic-type speaker. As shown in Fig. 1, the speaker 20 is situated in the earset component portion 11b. However, in accordance with the present invention, the speaker 20 can be placed in an alternate location, so long as the output from the speaker 20 is guided into the ear canal of the user.

The earset 10 also includes a cylindrical cavity 11d. At the ends of the cavity 11d are housing spaces 11d1 and 11d2. The housing spaces 11d1 and 11d2 are connected to the outside of the earset 10 through two respective holes 1e1 and 1e2. Two electret pieces 40 and 40' are respectively housed in the two housing spaces 11d1 and 11d2. Each of the electret pieces 40 and 40' is preferably a small and sensitive device.

Additionally, in a preferred embodiment of the present invention, the electret pieces 40 and 40' are preferably back-type electret so that they are immune to vibrations emanating from the earset 10 and from extraneous noise from the wires connecting the elements of the earset 10. Such wires may include the wire 50, which is substantially parallel to the cylindrical cavity 11d, and is led to the outside of the earset 10 and the wires coming from speaker 20 and electret pieces 40 and 40'.

The earset 10 shown in Fig. 4 also preferably includes a combination circuit 100 which combines the outputs of the electret pieces 40 and 40'. The combination circuit is explained in more detail below, but preferably is coupled to the output wires of the electret pieces 40 and 40' and has its output coupled to wire 50. As shown in Fig. 4, the combination circuit 100 is located within the cylindrical portion 11d. However, in accordance with the present invention, the combination circuit 100 may be located at any convenient place in the earset 10, so long as the outputs of the electret pieces 40 and 40' are input thereto.

Meta Platforms, Inc. - Exhibit 1002
Page 97 of 686

Fig. 5 shows an earset according to a second embodiment of the present invention. As shown in Fig. 5, the earset has a two-piece construction including a two-way wireless communication device 52 connected to an earset 51. The communication device 52 includes a transmitter/receiver at the front portion of the ear lobe. The communication device 52 also includes an integrated circuit (not shown) that transmits voice signals from electret pieces 40 and 40' to a station and receives voice signals from the station, and a combination circuit 100 that combines the outputs of electret pieces 40 and 40'.

The communication device 52 also includes a battery cell located at the back portion of the ear lobe. The battery cell and the transmitter/receiver remain connected to the ear lobe by a pinching mechanism located therebetween. The earset 51, shown in Fig. 5, is substantially the same as that shown in Fig. 4.

Fig. 6 is a side sectional view of an earset according to a third embodiment of the present invention. The earset 60 includes a cylindrical cavity 61d which preferably has a slightly folded cylindrical shape. With such a shape, the lower electret piece 40' is situated closer the user's mouth than the upper electret piece 40. With such a configuration, the lower microphone 40' picks up more of the user's voice signals that does the upper microphone 40 and therefore the users voice can be amplified to a greater extent than when the earset shown in Fig. 4 is used.

The operation of the earset according to any of the embodiments shown in Figs. 4-6 will be described below, specifically with respect to Fig. 4. The enlarged portion 11a of the earset 10 is inserted into the user's ear auricle and the insertion part 11c is inserted into the ear canal. The shape of the insertion part 11c is formed so that the insertion part 11c will not clog the ear canal. With such a shape, the user can hear sound coming from the outside and therefore finds the earset 10 safe to use.

Additionally, the shape of the insertion part 11c is formed so that the insertion part 11c will not leak much sound. As shown in Fig. 4, the speaker 20 is preferably situated in the earset component portion 11b. However, the speaker 20 can be located in other places within the earset 10 as long as the output of the speaker 20 is output to the user's ear canal.

With the earset 10 situated in the user's ear, the user can hear sound from the speaker 20 that is sent via the wire 50 from a duplex transmitting and receiving terminal (not shown). The output of the speaker 2 is led to the ear canal via a hole 11f of the insertion part 11c.

The voice signal from the user reaches the earset 10 via holes 11e1 and 11e2, and then respectively reaches the electret pieces 40 and 40'. The voice signals are converted into electrical signals by electret pieces 40 and 40' and are sent after being combined by the combination circuit 100 via the wire 50 to the duplex voice transmitting and receiving terminal (not shown).

The earsets according to the embodiments shown in Figs. 4-6 have a higher sensitivity to the voice signal of the user than to noise signals coming from places distant from to the user's mouth. This is because the lower electret piece 40' is located closer to the user's mouth than the upper electret piece 40. Thus, when the combination circuit 100 combines the outputs of the electret pieces 40 and 40', the voice signal of the user is output and noise signals from distant sources are nulled.

More specifically, if the output signals of the electret pieces 40 and 40' are in phase relative to the voice of the wearer, the combination circuit 100 preferably subtracts the output signals. If the output signals of the electret pieces are out of phase relative to the voice of the wearer, the circuit 100 preferably adds the outputs. However, regardless of whether the outputs are in phase or out of phase, in order to achieve an effective cancellation of noise, preferably the electret pieces 40 and 40' are identical in shape and electrical performance characteristics.

The noise cancellation which is achieved by the earset according to the present invention is illustrated with respect to Fig. 7. Fig. 7 is a side view showing the relative positioning of a sound source relative to the earset 10 shown in Fig. 4. This explanation assumes that the two electret pieces 40 and 40' have identical electrical performance characteristics and the circuit 100 subtracts the outputs of the electret pieces 40 and 40'.

Typically, a sound source, having sound pressure P, transmits sound through the air and a microphone a distance L from the sound source receives the sound, producing an electrical output of V volts. The relation of P, V and L is as follows:

$$V = k\,P/L \quad \text{(k is a constant related to a microphone)} \qquad (1)$$

In the earset according to the present invention including electret pieces 40 and 40', two voltages V and V' are produced. Additionally, the upper electret piece 40 is located a distance L1 from the sound source while the lower electret piece is located a distance L2 from the sound source P. According to equation (1) above, the difference between the outputs V and V' respectively from the electret pieces 40 and 40', the distances L1 and L2

Meta Platforms, Inc. - Exhibit 1002
Page 98 of 686

from the sound source P and the microphone constants k and k' have the following relationship:

$$Vo = V1 - V2 = (k1\ P/L1) - (k2\ P/L2) \quad (2)$$

Assuming the two electret pieces 40 and 40' are identical in electrical performance such that k1 = k2 = k, the formula (2) can be simplified as follows:

$$Vo = V1 - V2 = L1\ (1 - (L1/L2)) \quad (3)$$

If the distance between the electret pieces 40 and 40' is L3, and L1 and L2 are 10 times larger than L3, formula (3) shows that as L1 and L2 become almost equal, Vo becomes zero. In other words, as the distance to the noise source P increases, the difference between the outputs of the electret pieces 40 and 40' also approaches zero, so that no signal will be output from the earset 10 as a result of such a noise source P. Since L3 is designed to be around 5 cm, noise sources with a distance of 50 cm will not cause an produce an output from the earset.

Fig. 8 shows the distance relationship between the earset 10 and the mouth M of the user. Typically, the distance between the mouth and the entrance to an ear canal is approximately 14 cm. As shown in Fig. 8, the distance between the mouth M and the upper electret piece 40 is designated as L2, while the distance between the lower electret piece 40' and the user's mouth M is designated as L1. Because the distance L3 between electret pieces 40 and 40' is approximately 5 cm, the L1/l2 relationship becomes less than 1 in equation (3). As a result, a significant output is produced by the difference between the outputs of the electret pieces 40 and 40'. This output is primarily due to the voice signals of the user and is not due to ambient noise signals, which are effectively cancelled.

In the third embodiment of the present invention shown in Fig. 6, the lower electret piece 40' is preferably located closer to the user's mouth. With such a configuration, the ratio L1/L2 becomes even smaller because the distance between the user's mouth M and the lower electret piece 40' is decreased. As a result, the output signal Vo is greater than the output signal when using the first embodiment of the present invention shown in Fig. 4.

Using a combination of electret pieces 40 and 40', as shown in the first through third embodiments of the present invention, and the combination circuit 100 also helps to reduce feedback of the earset. As shown in Fig. 9, under this circumstance, the sound source P is the output of the speaker 20. As long as the distances between the speaker 20 and the electret pieces 40 and 40', shown in Fig. 9 as L1 and L2, respectively, are nearly equal, the output Vo, as evidenced from equation (3), becomes small, thus reducing feedback.

The electret pieces 40 and 40' used in the earset according to the present invention can be an omni-directional type, a unidirectional type or bi-directional type. Unidirectional type electret pieces produce more directionality toward the user's mouth than do omni-directional type electret pieces and therefore may be preferable to omni-directional type microphones.

Fig. 10 is a side sectional view of a dual microphone structure using two unidirectional microphones. As shown in Fig. 10, the lower electret piece 104' is directly opposite the upper electret piece 104 in the cylindrical cavity 101. The two electret pieces 104 and 104' are placed back to back at the ends of the cavity 101 so that directionality of the two electret pieces 40 and 40' is opposite. Therefore, when the earset with the unidirectional microphones shown in Fig. 10 is placed in a user's ear, the directionality of the lower electret piece 104' is toward the user's mouth while the directionality of the upper electret piece 104 is in a direction opposite to the mouth. More specifically, the directionality of the electret pieces 104 and 104' together form a figure eight, with a null point in the center.

In operation, the unidirectional electret pieces 104 and 104' require an input at the respective back surfaces 104a and 104a' of the electret pieces 104 and 104'. This input is provided by a hole 102 in the cylindrical cavity 101, Preferably, the hole 102 is placed at the null point of the directionality of the unidirectional microphones 104 and 104', that is, in the center of the cylindrical cavity 102. More specifically, the hole 102 should be placed such that the distances to the respective back surfaces 104a and 104a' of the unidirectional microphones 104 and 104' are equal. As shown in Fig. 10, the distances to the back surfaces 104a and 104a' are Lp1 and Lp2. The distance from the sound source P to the hole 102 is Lp. In a preferred embodiment of the present invention, the distances from the sound source P to the back surfaces 104a and 104a' are equal so that the combination circuit 100, not shown in Fig. 10, can effectively reduce noise.

As well as being an input for the unidirectional microphones 104 and 104', the hole 102 can preferably also be used as an outlet for wires connecting the electret pieces 104 and 104' and the wire 50, shown in Fig. 4.

The combination circuit 100, which combines the outputs from the electret pieces 4 and 4', shown in Figs. 4 and 7-9, 64 and 64', shown in Fig. 6 and 104 and 104', shown in Fig. 10, is explained

Meta Platforms, Inc. - Exhibit 1002
Page 99 of 686

below with respect to Figs. 11-14.

Fig. 11 is a circuit diagram of a conventional output circuit of a single electret microphone. As shown in Fig. 11, a positive direct voltage Vcc, a load resister RL and direct current cut-off capacitor C are connected to the microphone output terminal 111. An alternating voltage v appears as the output with respect to the microphone reference terminal 112. With the circuit of Fig. 11, only one output from a single microphone is produced.

However, in accordance with the present invention, the earset can have two microphones, the outputs of which must be combined. Fig. 12 shows a circuit diagram of a first combination circuit 100a to be used with the earset of the present invention. The combination circuit 100a, shown in Fig. 12 is similar to the circuit shown in Fig. 11 in that it includes direct voltage Vcc, load resistances RL1 and RL2, respectively of the microphones 40 and 40' and respective current cut-off capacitances C1 and C2.

The combination circuit 100a shown in Fig. 12 further includes a subtraction circuit S which outputs the difference between the outputs of the microphones 40 and 40', which are input, respectively at inputs 121 and 123. The combination circuit shown in Fig. 12 is used when the microphone elements are in phase. Reference voltages for the microphones 40 and 40' are provided at terminals 122 and 124. The two output signals of the microphones are respectively represented by v1 and v2.

The subtraction circuit S comprises an operational amplifier OP1 and resistors, RA1, RA2, RA3 and RA4. The operational amplifier and the resistors are configured such that the subtraction circuit S has no gain relative to the input signals. As a result, the output of the operational amplifier OP1 is Vo = v1 - v2.

In the combination circuit 100a shown in Fig. 12, the resistance of RA1 is preferably more than 20 times greater than the resistances of both RL1 and RL2. The capacitances of C1 and C2 are such that signals with frequencies higher than 50 Hz are passed. Moreover, if the outputs of the microphones which are input to the combination circuit 100a have equal sensitivities in their electrical performance, RL1 is preferably equal to RL2. However, if the microphones have different sensitivities, the values of the resistances RL1 and RL2 are preferably different so that such difference in the microphone sensitivities can be nulled.

Fig. 13 is a circuit diagram of a combination circuit to be used in an earset according to the present invention when the outputs of the microphones are out of phase. Like reference numerals in the combination circuit 100a shown in Fig. 12 are used in Fig. 13.

With the combination circuit 100b of Fig. 13, operational amplifiers OP2 and OP3 are used in combination with resistors RB1 through PRB5. The resistors are configured such that no gain is achieved with respect to the input signals. Thus, the addition circuit produces Vo = v1 + v2.

It is noted that using the combination circuits 100a and 100b, shown respectively in Figs. 12 and 13, differences in electrical performance of the microphones 40 and 40' can be compensated for by adjusting the values of the resistors. It is noted that in order to allow for continuous adjustments either one of the resistors RL1 and RL2 shown in Figs. 12 and 13 can be replaced by a variable resistor.

For a perfectly matched pair of microphones 40 and 40' that are perfectly in phase, the combination circuit 100c shown in Fig. 14 can be employed. The combination circuit 100c shown in Fig. 14 is an idealized version of that shown in Fig. 12, assuming that the microphone outputs appearing at terminals 121 and 123 are identical in electrical characteristics so that adjustments made via the subtraction circuit S are unnecessary. With the combination circuit 100c, no adjustments for differences in sensitivity of the microphones 40 and 40' can be made and the output Vo is simply the difference between the outputs of the microphones 40 and 40'. Using the combination circuit 100c shown Fig. 14 the number of wires coming out from the earset can be reduced.

Fig. 15 shows a back view of a two-way communications earset according to a fourth embodiment of the present invention. The earset 150, shown in Fig. 15, hangs at the ear of the user, instead of being inserted into the user's ear canal, as in the first through third embodiments of the present invention. The earset 150 includes an ear cover 157 having an arc shaped portion 157a that hangs at the base of the user's ear. Inside the ear cover 157 is a speaker 152, similar to the speaker 20 shown in Fig. 4.

Preferably, the ear cover 157 is constructed of an electrically-conductive plastic, which discharges static electricity that a user may pick up before inserting the earset 150 into their ear. If the ear cover is not constructed of such a material, the user may get a shock upon inserting the earset 150 into his ear.

Fig. 16 is a sectional view of the two-way communications earset according to the fifth embodiment of the present invention shown in Fig. 15 hung from a user's ear. As shown in Fig. 16, outside the ear cover 157 are the electret pieces 40 and 40' situated in cylindrical cavity 168, similar to those shown in Fig. 6. Additionally, there is a hole 168a in the cavity 168, which holds the electret pieces 40 and 40', which corresponds to the

Meta Platforms, Inc. - Exhibit 1002
Page 100 of 686

hole 102, shown in Fig. 10. The embodiment shown in Figs. 15 and 16 is easy to wear since it hangs at the ear of the user. Additionally, because the ear cover 157 shields sound from the speaker 152, there is little feedback between the microphones 40 and 40' and the speaker 152.

An earset according to the sixth embodiment of the present invention is shown in Figs. 17 and 18. In the earset shown in Figs, 17 and 18, the two microphones, shown in Figs. 4-10 and 15-16, are replaced by a small single electret microphone 179 with bi-directional directivity. The bi-directional microphone 179 is located in the middle of a cylindrical cavity 171d, which is preferably similar to one of the cylindrical cavities shown in Figs. 4 and 6. Between the sound intake holes 171e1 and 171e2 at either end of the cylindrical cavity 171d is sound absorbing materials 172. Preferably, the sound absorbing materials 172 are fibres or cotton filling which fill the spaces on both sides of the microphone 179.

Preferably, in the embodiment shown in Fig. 17, the total length of the cylindrical cavity 171d in which the microphone 179 is mounted should be less than 10 cm owing to the stability required for wearing the earset 170 in the user's ear. Accordingly, the microphone 179 is preferably mounted less than 5 cm from each end of the cylindrical cavity 171d.

It is noted, however, that the earset 170, shown in Fig. 17, can alternatively have the structure shown in Fig, 4, so long as the two electret microphones 40 and 40' are replaced by a single bi-directional microphone 179. Additionally, as with the embodiments shown in Fig. 4-6, the location of the speaker 20 in Fig. 17 can be changed so long as the output of the speaker 20 is input to the ear canal of the user. The remainder of the earset 170 is the same as that shown in Fig. 6 and like reference numerals identify like elements.

Fig. 18 is a side view of the embodiment shown in Fig. 17 inserted in an ear canal C. As shown in Fig. 18, the insertion part 61c fits snugly in the ear canal C, while the enlarged portion 61a abuts the ear auricle A. Alternatively, the earset 170 can have an ear insertion configuration such as that shown in Fig. 19. Fig. 19 shows a modification of the earset 170 which includes an ear insertion portion 191c and an enlarged portion 191a. The ear insertion portion 191c does not fit snugly in the ear canal, but rather is placed at the entrance of the ear canal C. Additionally, in the modification shown in Fig. 19, the enlarged portion 191a surrounds a portion of the ear auricle A and maintains the earset 170 at the user's ear.

It should also be noted that the earsets according to the first through third embodiments of the present invention can include two bi-directional microphones 179 similar to that shown and described with respect to Figs. 17-19. Using two bi-directional microphones in lieu of two unidirectional microphones 104 and 104' may be preferable because of the increased directivity achieved with bi-directional microphones.

An earset according to a sixth embodiment of the present invention is described with respect to Figs. 20 and 21. The earset 200, shown in Figs. 20 and 21 is shaped similar to the embodiment shown in Figs. 15 and 16, but includes a single bi-directional microphone, as shown in the embodiment shown and described with respect to Figs. 17-19. Like reference numerals from those figures are used in Figs 20 and 21.

As shown in Fig. 20, the earset 200 preferably includes a sound absorbing or shielding material 201 surrounding the speaker 152. Preferably, the sound absorbing or shielding material 201 is made of sponge and is ring-shaped surrounding the speaker 152. The sound absorbing or shielding material 201 prevents sound from leaking out of the space enclosed by the ear canal, the ear auricle and the ear cover 157.

Fig. 18 is a side sectional view of the earset 200 hung on the user's ear. As shown in Fig. 21, the bidirectional microphone 179 is placed within a cylindrical pipe 168. The cylindrical pipe 168 includes openings 202 and 202a which input signals to the bidirectional microphone 179 through the sound absorbing material 172. As with the embodiment shown in Fig. 16, signals are output through wire 50.

In the embodiments shown in Figs. 17-21, using a single bi-directional microphone 179, the leakage of the sound from the speaker 20 is prevented because such leaked sound, if any, travels to the bi-directional microphone 179 at a direction in which the microphone sensitivity is not high. This is because the axis of directionality of the bi-directional microphone 179 is perpendicular to the direction of any leaked sound from the speaker 20. As a result, feedback between the bidirectional microphone 179 and the speaker 20 is less likely to occur, as compared with conventional earsets.

Additionally, the earsets shown in the embodiments of the present invention have a cylindrical cavity 11d, 168, and 171d. Preferably, the length of the cylindrical cavity in each of the embodiments of the present invention is less than 10 cm. In the embodiments shown in Figs. 17-21, preferably the length of the cylindrical cavity below the bi-directional microphone 179 is less than 5 cm and is directed toward the user's mouth. Such a structure effectively shortens the distance from the mouth to the microphone 179, since the sound reaches the opening in the lower end of the cylindrical cavity pipe 1e2 without diffusion. Additionally, the sound

Meta Platforms, Inc. - Exhibit 1002
Page 101 of 686

absorbing material 172 within the cylindrical cavity 171d, shown in Figs. 17-19, or 168, shown in Fig. 21, limits feedback between the speaker 20 and the bi-directional microphone 179 because the sound absorbing material 171 absorbs higher frequency signals, which are the major cause of such feedback.

The earsets according to the embodiments shown in Figs. 17-21 are less sensitive to ambient noise, because ambient noise under normal circumstances tends to come from the horizontal plane. However, when placed in a user's ear, the bi-directional microphone 179 has its virtually on a vertical plane. So oriented, ambient noise impinges on the bi-directional microphone 179 from its least sensitive direction.

Additionally, as explained above with respect to the dual microphone embodiments, typically, sources of ambient noise tend to be more than 10 times the distance of that between the user's mouth and the bi-directional microphone 179. As explained in detail with respect to Fig. 7, the result of this distance is that the microphone will not output signals responsive to distant noise sources, but will primarily output voice signals of the user.

It is noted, however, that a small amount of ambient noise may still be heard using the earsets of the present invention. This is particularly true when the user stops talking and only ambient noise signals are picked up. In order to reduce such ambient noise, the circuitry shown in Fig. 22 can be used in combination with any of the earset embodiments of the present invention.

Fig. 22 is a block diagram of a circuit used in any one of the earsets of the present invention for reducing the degree of amplification of signals of less than 70 dBSPL. Typically, people use telephones at a noise level of less than 70 dBSPL while the sound level to be picked up at the ear is approximately 80 dBSPL. An ordinary telephone assumes 94 dBSPL at a distance of 2.5 cm in front of the user's mouth. The circuit shown in Fig. 22 amplifies signals with a sound level of less than 70 dBSPL much less than signals with a sound level of 70 dBSPL or greater. Accordingly, ambient noise signals which typically have a sound level of less than 70dBSPL will be amplified less than the voice signals of the user. Thus, ambient noise signals will be reduced.

The circuitry 220 shown in Fig. 22 includes a signal level detection circuit 2211 which receives an input signal at terminal 221. The input signal at terminal 221 is preferably either the output from one of the combination circuits shown in Figs. 12-14, when a dual microphone earset is used, or the output from the bidirectional microphone 179, when such an embodiment of the earset is used. It is noted that the circuitry 220 can be placed at any convenient location within the earsets of the present invention so long as the input terminal 221 is provided with the output of either the combination circuit or the bi-directional circuit 179 and the output of the circuit 220 is led to the output wire.

The circuitry 220 further includes a logarithmic amplifier 2212, which amplifies the input signal. A non-linear signal generating circuit 2213, is coupled between the signal level detection circuit 2211 and the logarithmic amplifier 2212 and generates a control signal, depending on output signal level from the signal level detection circuit 2211.

The logarithmic amplifier 2212 is coupled to a dividing circuit 2214, which is common in typical telephones and divides the output from the logarithmic amplifier 12. Specifically, the output from the logarithmic amplifier 2212 is output to an amplifier 2215, which feeds signals to the speaker 20. The dividing circuit 2214 also outputs the signal from the logarithmic amplifier 2212 to a line 2216 which is connected to a telephone exchange. It is noted that line 2216 shown in Fig. 22 may be incorporated in line 50 shown in the embodiments of the earset of the present invention.

The circuit shown in Fig. 22 operates such that input at terminal 221 is fed into the signal level detection circuit 2211. The signal level detection circuit 2211 produces a control signal equal to the level of the input sound, which is then fed to the control signal generating circuit 2213. The control signal generating circuit 2213 generates a lower control signal when the input signal is less than 70 dBSPL and generates a higher control signal when the input signal is higher than 70 dBSPL.

This output is shown in Fig. 23, which shows a logarithmic plot of the relationship between output signals of the signal level detection circuit 2211 and the output signals of the non-linear signal generating circuit 2213. In Fig. 23, the output of the signal level detection circuit 2211 is shown on the horizontal axis while the output of the non-linear signal generating circuit 2213 is shown on the vertical axis.

The graph of Fig. 23 shows that the output of the control signal generating circuit 2213 controls the degree of the amplification of the logarithmic amplifier 2212. As a result, when ambient noise is low, the amplification of the amplifier 2212 becomes low, so that a small amount of sound is transmitted through the dividing circuit 2214 to the outside line 2216.

Additionally, there is a small amount of sound leaked to the amplifier 2215, resulting in a small amount of sound being leaked to the speaker 20. A further benefit of the circuit shown in Fig. 22 is that room reverberation is diminished because of the lower amplification of reverberated sound.

Meta Platforms, Inc. - Exhibit 1002
Page 102 of 686

It is noted that the circuit shown in Fig. 22 can be applied to embodiments shown in Figs. 4, 5 and 15 as well as to the embodiments shown in Figs. 17-19. In any of the embodiments of the earset according to the present invention, the circuit shown in Fig. 22 preferably eliminates any weakness in the performance of the device owing to the distance between earset and the user's mouth. This is because by using the circuit shown in Fig. 22 in combination with the earset of the present invention, ambient noise is reduced and reverberated voice signals are eliminated.

The above described embodiments of the present invention implicitly refer to public wired telephone systems. However, it is to be understood that the embodiments of the present invention can be applied to any two-way simultaneous voice communication system such as wireless, portable, mobile and private systems.

Other embodiments of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with the true scope and spirit of the invention being indicated by the following claims.

Claims

1. A one piece two-way simultaneous voice transmitting and receiving device comprising:
   receiver means for emitting sound to the ear canal of a user;
   transmitter means, coupled to the receiver means, and located outside the ear canal, comprising:
   a first microphone for sound pickup adapted to be located at a first position relative to the mouth of the user and outputting a first signal; and
   a second microphone for sound pickup spaced a distance away from the first microphone and adapted to be located at a second position relative to the mouth of the user further from the mouth of the user than the first position, and outputting a second signal; and
   means for detecting the first and second signals.

2. The one piece two-way simultaneous voice transmitting and receiving device according to claim 1, wherein the first and second microphones are bi-directional microphones.

3. The one piece two-way simultaneous voice transmitting and receiving device according to claim 1, wherein the first and second microphones are unidirectional microphones.

4. The one piece two-way simultaneous voice transmitting and receiving device according to claim 1, wherein the means for detecting comprises a combination circuit for subtracting the first and second signals.

5. The one piece two-way simultaneous voice transmitting and receiving device according to claim 1, wherein the means for detecting comprises a combination circuit for adding the first and second signals.

6. The one piece two-way simultaneous voice transmitting and receiving device according to claim 1, wherein the device is adapted to fit within the ear canal of the user.

7. The one piece two-way simultaneous voice transmitting and receiving device according to claim 1, wherein the device is adapted to hang at the ear of the user.

8. A one piece two-way simultaneous voice transmitting and receiving device comprising:
   a receiver emitting sound to the ear canal of a user; and
   a transmitter, coupled to the receiver and located outside the ear canal, comprising:
   a microphone for sound pickup and bi-directional directivity having two sound receiving ends;
   a cavity housing the microphone substantially at a central portion thereof and directed toward the mouth of the user; and
   sound absorbing materials placed within the cavity and abutting the sound receiving ends of the microphone.

9. The one piece two-way simultaneous voice transmitting and receiving device according to claim 8, wherein the cavity comprises a sound pipe which extends less than 5 cm from each of the sound receiving ends of the microphone.

10. The one piece two-way simultaneous voice transmitting and receiving device according to claim 8, wherein the device is adapted to fit within the ear canal of the user.

11. The one piece two-way simultaneous voice transmitting and receiving device according to claim 8, wherein the device is adapted to fit hang at the ear of the user.

12. A one piece simultaneous voice transmitting and receiving device comprising:
   a receiver for emitting sound primarily to the ear canal of a user;

Meta Platforms, Inc. - Exhibit 1002
Page 103 of 686

a transmitter, coupled to the receiver, and adapted to be located outside the ear canal comprising:

a first microphone for sound pickup adapted to be located at a first position relative to the mouth of the user and outputting a first signal; and

a second microphone for sound pickup spaced from the first microphone and adapted to be located at a second position relative to the mouth of the user further from the mouth of the user than the first position and outputting a second signal;

subtracting means, coupled to the first and second microphones, for subtracting the first and second signals and for outputting a third signal with a degree of amplification; and

reducing means, coupled to the subtracting means, for reducing the degree of amplification of the third signal if a sound level in the area of the ear canal is less than 70 dBSPL to a greater extent than when the sound level is greater than 70 dBSPL.

13. The one piece simultaneous voice transmitting and receiving device according to claim 12, wherein the reducing means comprises:

a signal level detection circuit which receives the third signal from an input terminal and which detects the level of the third signal;

a signal generating circuit, coupled to the signal level detection circuit, for outputting a control signal based on the level detected by the signal level detection circuit;

a logarithmic amplifier, coupled to the signal generating circuit, which receives the third signal and amplifies the third signal based on the control signal output from the signal generating circuit;

a dividing circuit, coupled to the logarithmic amplifier, which divides the amplified third signal;

an amplifier, coupled to the dividing circuit, which amplifies a first output of the dividing circuit and outputs an amplified signal to the receiver; and

an output line, coupled to the dividing circuit, for outputting a second output of the dividing circuit to the transmitter.

14. A one piece two-way simultaneous voice transmitting and receiving device comprising:

a receiver section for emitting sound primarily to the ear canal of a user; and

a transmitter section, coupled to the receiver section, located outside the ear canal comprising:

a microphone for sound pickup with bi-directional directivity having two sound receiving ends and for outputting a signal; and

a cavity housing the microphone substantially at a central portion thereof and directed toward the mouth of the user;

sound absorbing materials placed within the cavity and abutting the sound receiving ends of the microphone; and

reducing means, coupled to the microphone, for reducing the degree of amplification of the signal if a sound level in the area of the ear canal is less than 70 dBSPL to a greater extent than when the sound level is greater than 70 dBSPL.

15. A two-way simultaneous voice transmitting and receiving device comprising:

an ear cover adapted to hang at the auricle of a user's ear;

a speaker attached to an inside portion of the ear cover and facing the entrance of the user's ear canal;

a transmitter attached to an outside portion of the ear cover and having a first microphone for sound pickup adapted to be located at a first position relative to the mouth of the user and outputting a first signal and a second microphone for sound pickup spaced from the first microphone and adapted to be located at a second position relative to the mouth of the user that is further away from the mouth of the user than the first position and outputting a second signal; and

a combination circuit, coupled to the transmitter, which subtracts the first and second signals.

16. A two-way simultaneous voice transmitting and receiving device comprising:

an ear cover adapted to hang at the auricle of a user's ear;

a speaker attached to an inside portion of the ear cover and facing the entrance of the user's ear canal;

a transmitter section adapted to be located outside the user's ear canal, comprising:

a microphone for sound pickup with bi-directional directivity having two sound receiving ends and for outputting a signal; and

a cavity housing the microphone substantially at a central portion thereof and directed toward the mouth of the user; and

sound absorbing materials placed within the cavity and abutting the sound receiving ends of the microphone.

17. A two-way simultaneous voice transmitting and receiving device comprising:

Meta Platforms, Inc. - Exhibit 1002
Page 104 of 686

an ear cover adapted to hang at the auricle of a user's ear;

a speaker attached to an inside portion of the ear cover and facing the entrance of the user's ear canal;

a transmitter, coupled to the receiver, and adapted to be located outside the ear canal comprising:

a first microphone for sound pickup adapted to be located at a first position relative to the mouth of the user and outputting a first signal; and

a second microphone for sound pickup spaced from the first microphone and adapted to be located at a second position relative to the mouth of the user further from the mouth of the user than the first position and outputting a second signal;

subtracting means, coupled to the first and second microphones, for subtracting the first and second signals and for outputting a third signal with a degree of amplification; and

reducing means, coupled to the subtracting means, for reducing the degree of amplification of the third signal if a sound level in the area of the ear canal is less than 70 dBSPL to a greater extent than when the sound level is greater than 70 dBSPL.

18. A two-way simultaneous voice transmitting and receiving system comprising:

an ear cover adapted to hang at the auricle of a user's ear;

a speaker attached to an inside portion of the ear cover and facing the entrance of the user's ear canal;

a transmitter section, coupled to the receiver section, located outside the ear canal comprising:

a microphone for sound pickup with bi-directional directivity having two sound receiving ends and for outputting a signal;

a cavity housing the microphone substantially at a central portion thereof and directed toward the mouth of the user; and

sound absorbing materials placed within the cavity and abutting the sound receiving ends of the microphone; and

reducing means, coupled to the microphone, for reducing the degree of amplification of the signal if a sound level in the area of the ear canal is less than 70 dBSPL to a greater extent than when the sound level is greater than 70 dBSPL.

Meta Platforms, Inc. - Exhibit 1002
Page 105 of 686

FIG. 1
PRIOR ART

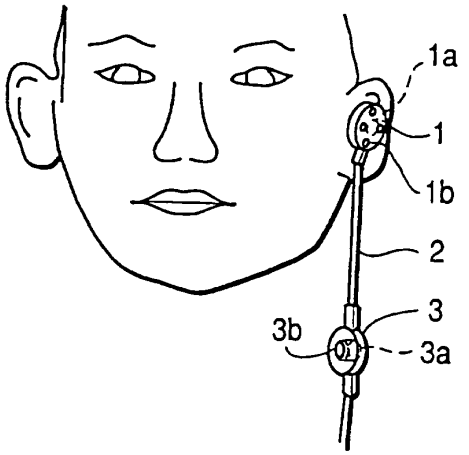


FIG. 2
PRIOR ART

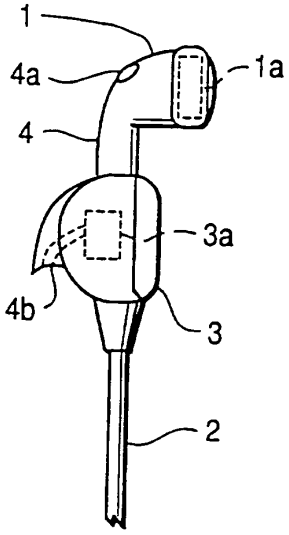
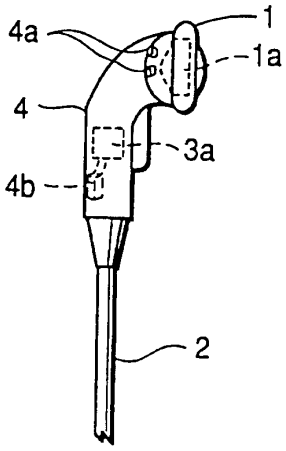


FIG. 3
PRIOR ART



Meta Platforms, Inc. - Exhibit 1002
Page 106 of 686

FIG. 4

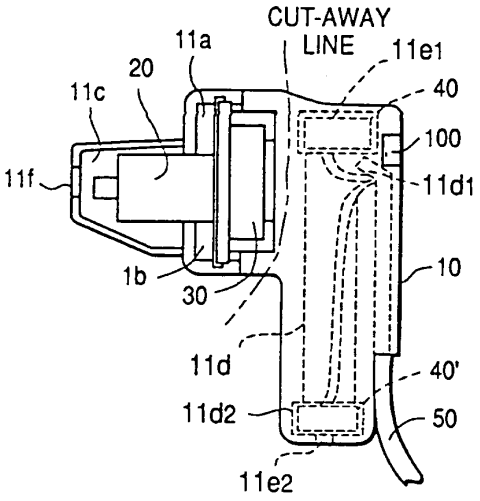


FIG. 5

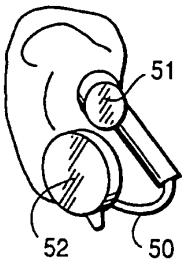


FIG. 6

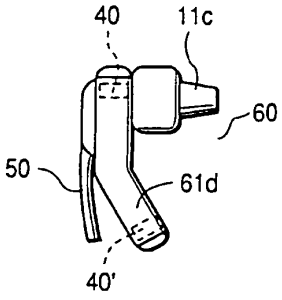
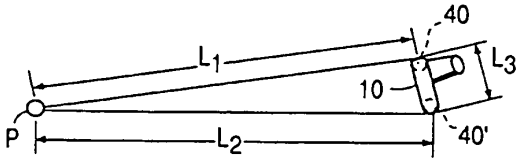


FIG. 7



Meta Platforms, Inc. - Exhibit 1002
Page 107 of 686

FIG. 8

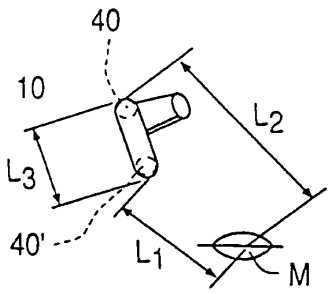


FIG. 9

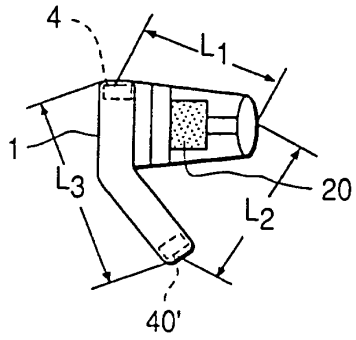
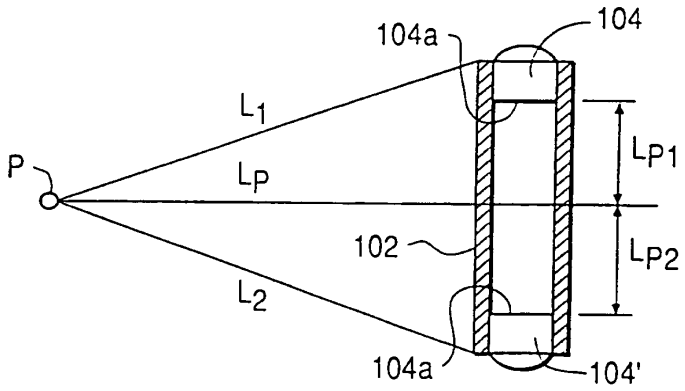


FIG. 10



Meta Platforms, Inc. - Exhibit 1002
Page 108 of 686

FIG. 11
PRIOR ART

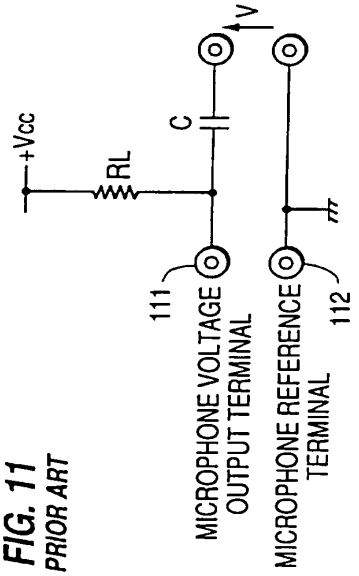
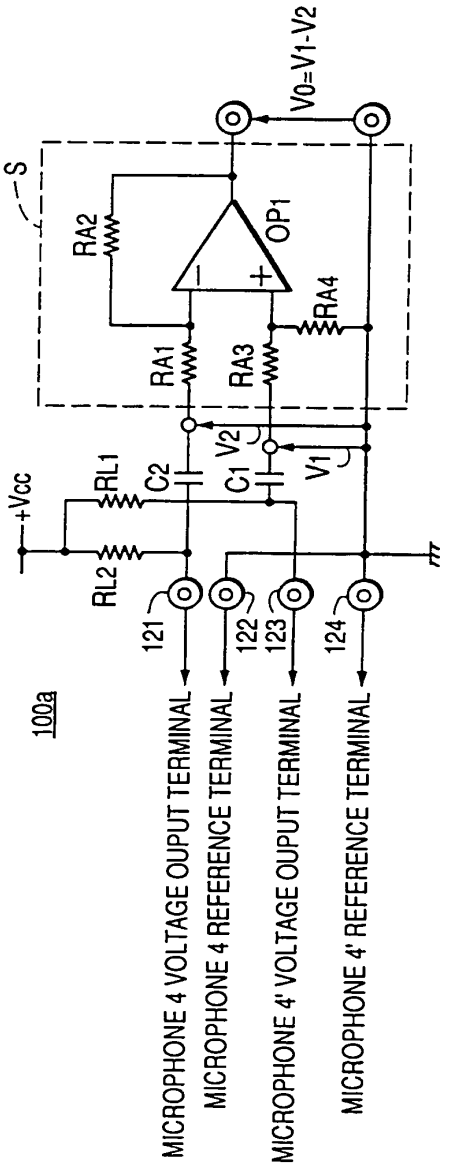
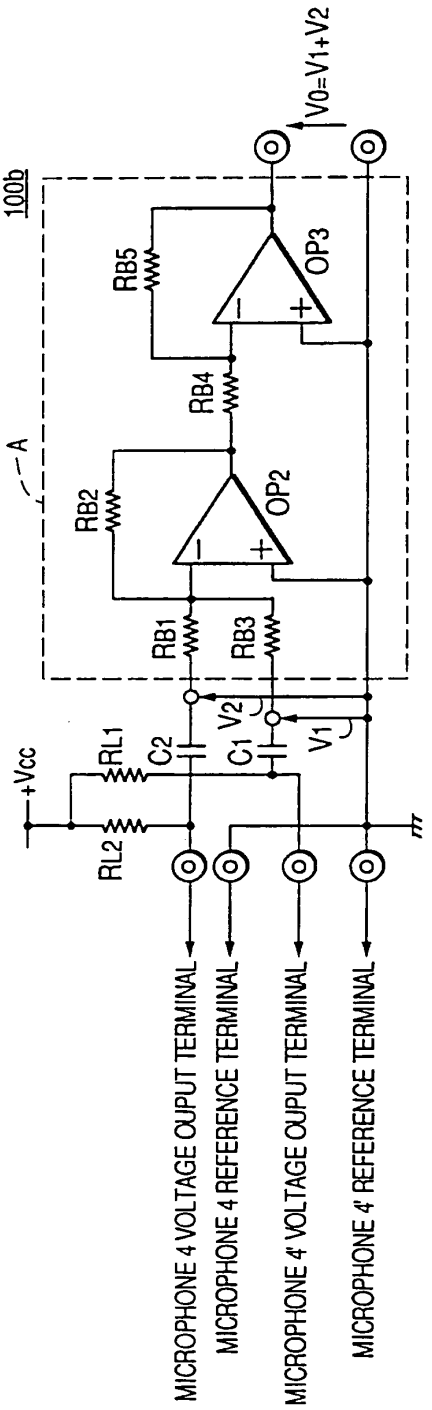


FIG. 12



Meta Platforms, Inc. - Exhibit 1002
Page 109 of 686

FIG. 13



Meta Platforms, Inc. - Exhibit 1002
Page 110 of 686

FIG. 14

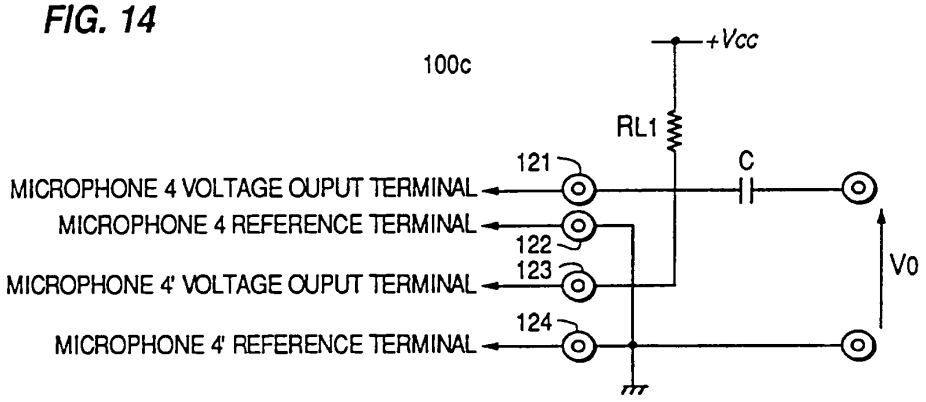


FIG. 15

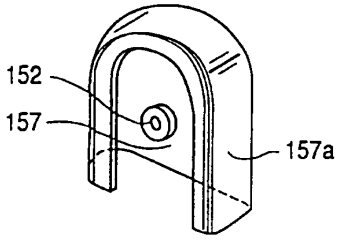
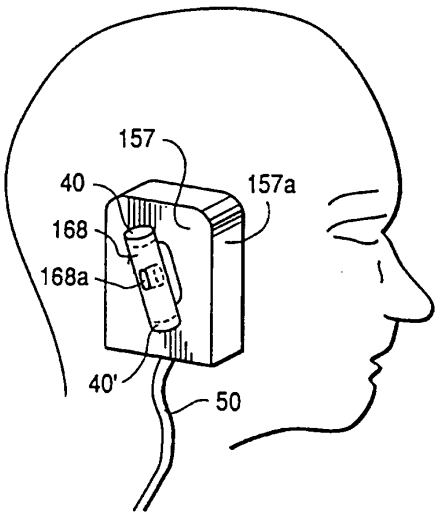


FIG. 16



Meta Platforms, Inc. - Exhibit 1002
Page 111 of 686

FIG. 17

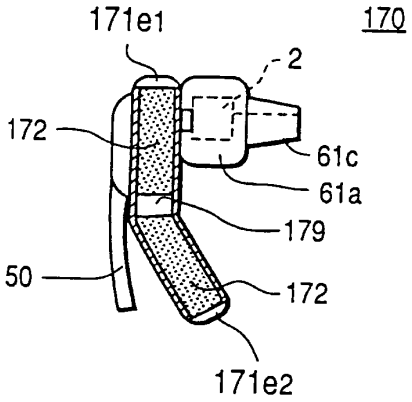


FIG. 18

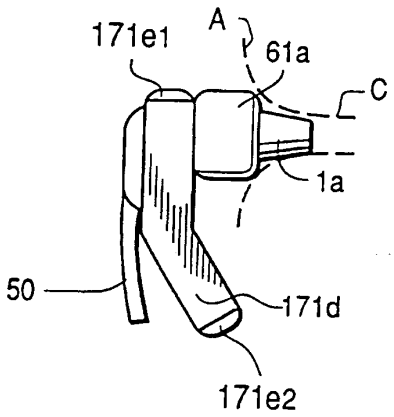
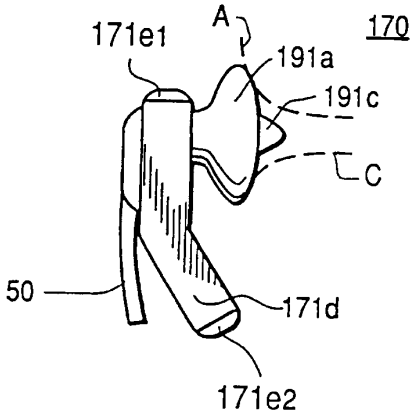


FIG. 19



Meta Platforms, Inc. - Exhibit 1002
Page 112 of 686

FIG. 21

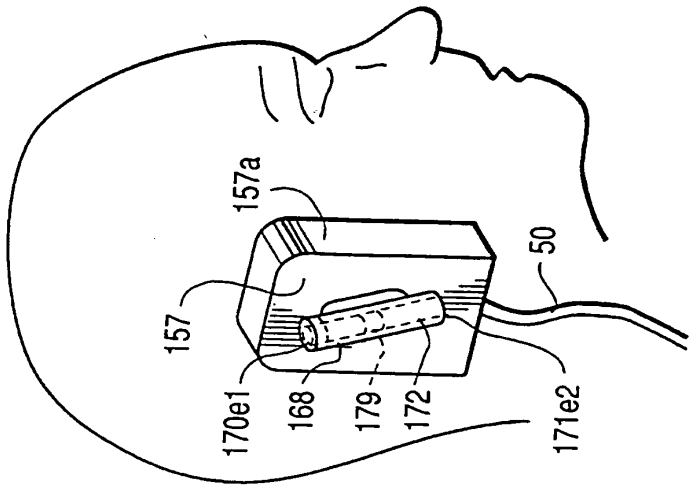
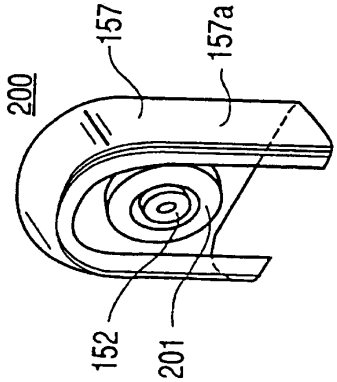


FIG. 20



Meta Platforms, Inc. - Exhibit 1002
Page 113 of 686

FIG. 22

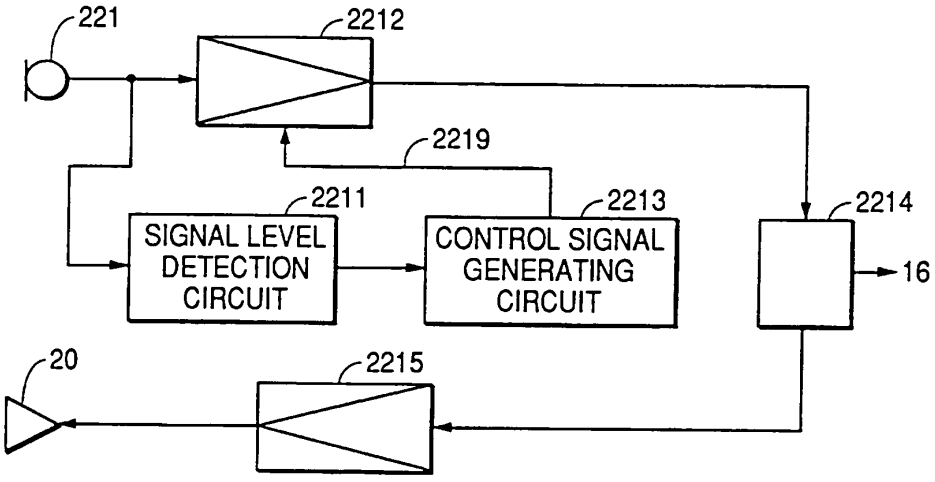
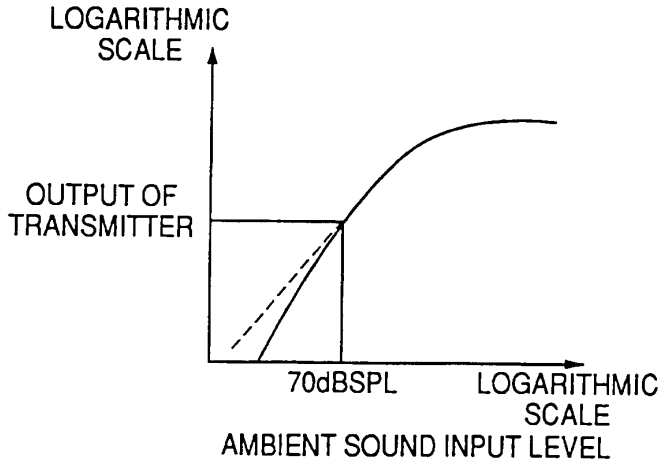


FIG. 23



Meta Platforms, Inc. - Exhibit 1002
Page 114 of 686

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 11 2064

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US-A-5 210 792 (KAJIHARA) * column 1, line 47-64 * * column 2, line 9-32 * * column 3, line 21 - column 5, line 30 * ---	1,6-8, 10-12, 14-18	H04R1/10
A	EP-A-0 414 264 (SONY) * page 2, line 7-10 * * page 2, line 44 - page 3, line 7 * * page 3, line 36 - page 4, line 17 * * page 5, line 45 - page 6, line 47 * ---	1-5,8,9, 12,14-18	
A	US-A-3 995 124 (GABR) * column 1, line 4-7 * * column 1, line 26-34 * * column 2, line 12 - column 4, line 17 * ---	1-3,8,9, 14,16,18	
A	US-A-5 046 103 (WARNAKA ET AL.) -----	12-14, 17,18	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H04R H04M A61F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 December 1993	Zanti, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

This Page is Inserted by IFW Indexing and Scanning Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☑ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.
As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 795 851 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.09.1997 Bulletin 1997/38

(51) Int. Cl.[6]: **G10L 3/00**

(21) Application number: **97104406.0**

(22) Date of filing: **14.03.1997**

(84) Designated Contracting States:
DE FR GB

(30) Priority: **15.03.1996 JP 59821/96**

(71) Applicant: **KABUSHIKI KAISHA TOSHIBA**
Kawasaki-shi, Kanagawa-ken 210 (JP)

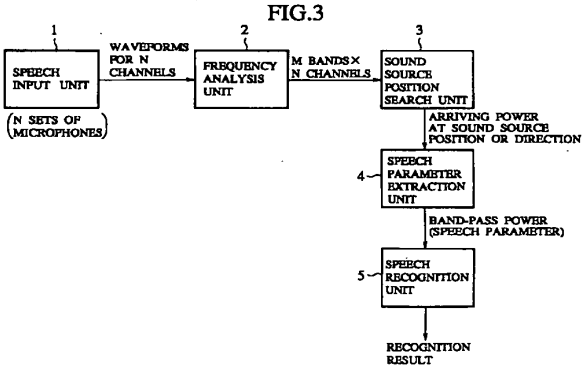
(72) Inventor: **Nagata, Yoshifumi**
Kobe-shi, Hyogo-ken (JP)

(74) Representative: **Zangs, Rainer E., Dipl.-Ing. et al**
Hoffmann Eitle,
Patent- und Rechtsanwälte,
Arabellastrasse 4
81925 München (DE)

(54) Method and system for microphone array input type speech recognition

(57) A microphone array input type speech recognition scheme capable of realizing a high precision sound source position or direction estimation by a small amount of calculations, and thereby realizing a high precision speech recognition. A band-pass waveform, which is a waveform for each frequency bandwidth, is obtained from input signals of the microphone array, and a band-pass power of the sound source is directly obtained from the band-pass waveform. Then, the obtained band-pass power is used as the speech parameter. It is also possible to realize the sound source estimation and the band-pass power estimation at high precision while further reducing an amount of calculations, by utilizing a sound source position search processing in which a low resolution position estimation and a high resolution position estimation are combined.

FIG.3



EP 0 795 851 A2

Printed by Rank Xerox (UK) Business Services
2.14.14/3.4

Description

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to a microphone array input type speech recognition scheme in which speeches uttered by a user are inputted through microphone array and recognized.

DESCRIPTION OF THE BACKGROUND ART

In the speech recognition, a surrounding environment under which the speech input is made can largely affect the recognition performance. In particular, background noises and reflected sounds of the user's speeches can degrade the recognition performance so that they are sources of a serious problem encountered in a use of a speech recognition system. For this reason, in general, a short range microphone designed for use near the mouth of the user such as a headset microphone or a hand microphone has been employed, but it is uncomfortable to wear the headset microphone on a head for any extended period of time, while the hand microphone can limit a freedom of the user as it occupies the user's hands, and there has been a demand for a speech input scheme that can allow more freedom to the user.

A microphone array has been studied as a potential candidate for a speech input scheme that can resolve the conventionally encountered inconvenience described above, and there are some recent reports of its application to the speech recognition system. The microphone array is a set of a plurality of microphones which are arranged at spatially different positions, where noises can be reduced by the synthetic processing of outputs of these microphones.

Fig. 1 shows a configuration of a conventional speech recognition system using a microphone array. This speech recognition system of Fig. 1 comprises a speech input unit 11 having a microphone array formed by a plurality (N sets) of microphones, a sound source direction estimation unit 12, a sound source waveform estimation unit 13, a speech detection unit 14, a speech analysis unit 15, a pattern matching unit 16, and a recognition dictionary 17.

In this configuration of Fig. 1, the speech entered at the microphone array is converted into digital signals for respective microphones by the speech input unit 11, and the speech waveforms of all channels are entered into the sound source direction estimation unit 12.

At the sound source direction estimation unit 12, a sound source position or direction is estimated from time differences among signals from different microphones, using the known delay sum array method or a method based on the cross-correlation function as disclosed in U. Bub, et al.: "Knowing Who to Listen to in Speech Recognition: Visually Guided Beamforming", ICASSP '95, pp. 848-851, 1995.

A case of estimating a direction of the sound source and a case of estimating a position of the sound source respectively correspond to a case in which the sound source is far distanced from the microphone array so that the incident sound waves can be considered as plane waves and a case in which the sound source is relatively close to the microphone array so that the sound waves can be considered as propagating in forms of spherical waves.

Next, the sound source waveform estimation unit 13 focuses the microphone array to the sound source position or direction obtained by the sound source direction estimation unit 12 by using the delay sum array method, and estimates the speech waveform of the target sound source.

Thereafter, similarly as in the usual speech recognition system, the speech analysis is carried out for the obtained speech waveform by the speech analysis unit 15, and the pattern matching using the recognition dictionary 17 is carried out for the obtained analysis parameter, so as to obtain the recognition result. For a method of pattern matching, there are several known methods including the HMM (Hidden Markov Model), the multiple similarity method, and the DP matching, as detailed in Rabiner et al.: "Fundamentals of Speech Recognition", Prentice Hall, for example.

Now, in the speech recognition system, it is custom to input the speech waveform. For this reason, even in the conventional speech recognition system using the microphone array as described above, the sound source position (or the sound source direction) and the speech waveform are obtained by processing the microphone array outputs according to the delay sum array method, due to a need to estimate the speech waveform by a small amount of calculations. The delay sum array method is often utilized because the speech waveform can be obtained by a relatively small amount of calculations, but the delay sum array method is also associated with a problem that the separation power is lowered when a plurality of sound sources are located close to each other.

On the other hand, as a method for estimating the sound source position (or direction), there is a parametric method based on a model as disclosed in S. V. Pillai: "Array Signal Processing", Springer-Verlag, New York, 1989, for example, which is presumably capable of estimating the sound source position at higher precision than the delay sum array method, and which is also capable of obtaining the power spectrum necessary for the speech recognition from the sound source position estimation processing at the same time.

Fig. 2 shows a processing configuration for this conventionally proposed parametric method. In the configuration of Fig. 2, signals from a plurality of microphones are entered at a speech input unit 21, and the frequency analysis based

Meta Platforms, Inc. - Exhibit 1002
Page 118 of 686

on the FFT (Fast Fourier Transform) is carried out at a frequency analysis unit 22. Then, the sound source position estimation processing is carried out for each frequency component at a power estimation unit 23, and the final sound source position estimation result is obtained by synthesizing the estimation results for all the frequencies at a sound source direction judgement unit 24.

Here, the sound source position estimation processing is a processing for estimating a power at each direction or position while minutely changing a direction or position over a range in which the sound source can possibly be located, so that a very large amount of calculations are required. In particular, in a case of assuming the propagation of sound waves in forms of spherical waves, it is going to estimate a position of the sound source rather than an arriving direction of the sound waves, so that two- or three-dimensional scanning is necessary and consequently an enormous amount of calculations are required.

Moreover, in the conventionally proposed parametric method described above, it is necessary to carry out this scanning processing for each frequency component obtained by the fast Fourier transform of the speech, so that it is difficult to reduce a required amount of calculations.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a method and a system for microphone array input type speech recognition capable of realizing a high precision sound source position or direction estimation by a small amount of calculations, and thereby realizing a high precision speech recognition. This object is achieved by obtaining a band-pass waveform, which is a waveform for each frequency bandwidth, from input signals of the microphone array, and directly obtaining a band-pass power of the sound source from the band-pass waveform. Then, the obtained band-pass power can be used as the speech parameter.

It is another object of the present invention to provide a method and a system for microphone array input type speech recognition capable of realizing the sound source estimation and the band-pass power estimation at high precision while further reducing an amount of calculations. This object is achieved by utilizing a sound source position search processing in which a low resolution position estimation and a high resolution position estimation are combined.

According to one aspect of the present invention there is provided a microphone array input type speech recognition system, comprising: a speech input unit for inputting speeches in a plurality of channels using a microphone array formed by a plurality of microphones; a frequency analysis unit for analyzing an input speech of each channel inputted by the speech input unit, and obtaining band-pass waveforms for each channel, each band-pass waveform being a waveform for each frequency bandwidth; a sound source position search unit for calculating a band-pass power distribution for each frequency bandwidth from the band-pass waveforms for each frequency bandwidth obtained by the frequency analysis unit, synthesizing calculated band-pass power distributions for a plurality of frequency bandwidths, and estimating a sound source position or direction from a synthesized band-pass power distribution; a speech parameter extraction unit for extracting a speech parameter for speech recognition, from the band-pass power distribution for each frequency bandwidth calculated by the sound source position search unit, according to the sound source position or direction estimated by the sound source position search unit; and a speech recognition unit for obtaining a speech recognition result by matching the speech parameter extracted by the speech parameter extraction unit with a recognition dictionary.

According to another aspect of the present invention there is provided a microphone array input type speech analysis system, comprising: a speech input unit for inputting speeches in a plurality of channels using a microphone array formed by a plurality of microphones; a frequency analysis unit for analyzing an input speech of each channel inputted by the speech input unit, and obtaining band-pass waveforms for each channel, each band-pass waveform being a waveform for each frequency bandwidth; a sound source position search unit for calculating a band-pass power distribution for each frequency bandwidth from the band-pass waveforms for each frequency bandwidth obtained by the frequency analysis unit, synthesizing calculated band-pass power distributions for a plurality of frequency bandwidths, and estimating a sound source position or direction from a synthesized band-pass power distribution; and a speech parameter extraction unit for extracting a speech parameter from the band-pass power distribution for each frequency bandwidth estimated by the sound source position search unit, according to the sound source position or direction estimated by the sound source position search unit.

According to another aspect of the present invention there is provided a microphone array input type speech analysis system, comprising: a speech input unit for inputting speeches in a plurality of channels using a microphone array formed by a plurality of microphones; a frequency analysis unit for analyzing an input speech of each channel inputted by the speech input unit, and obtaining band-pass waveforms for each channel, each band-pass waveform being a waveform for each frequency bandwidth; and a sound source position search unit for calculating a band-pass power distribution for each frequency bandwidth from the band-pass waveforms for each frequency bandwidth obtained by the frequency analysis unit, synthesizing calculated band-pass power distributions for a plurality of frequency bandwidths, and estimating a sound source position or direction from a synthesized band-pass power distribution.

According to another aspect of the present invention there is provided a microphone array input type speech rec-

Meta Platforms, Inc. - Exhibit 1002
Page 119 of 686

ognition method, comprising the steps of: inputting speeches in a plurality of channels using a microphone array formed by a plurality of microphones; analyzing an input speech of each channel inputted by the inputting step, and obtaining band-pass waveforms for each channel, each band-pass waveform being a waveform for each frequency bandwidth; calculating a band-pass power distribution for each frequency bandwidth from the band-pass waveforms for each frequency bandwidth obtained by the analyzing step, synthesizing calculated band-pass power distributions for a plurality of frequency bandwidths, and estimating a sound source position or direction from a synthesized band-pass power distribution; extracting a speech parameter for speech recognition, from the band-pass power distribution for each frequency bandwidth calculated by the calculating step, according to the sound source position or direction estimated by the calculating step; and obtaining a speech recognition result by matching the speech parameter extracted by the extracting step with a recognition dictionary.

According to another aspect of the present invention there is provided a microphone array input type speech analysis method, comprising the steps of: inputting speeches in a plurality of channels using a microphone array formed by a plurality of microphones; analyzing an input speech of each channel inputted by the inputting step, and obtaining band-pass waveforms for each channel, each band-pass waveform being a waveform for each frequency bandwidth; calculating a band-pass power distribution for each frequency bandwidth from the band-pass waveforms for each frequency bandwidth obtained by the analyzing step, synthesizing calculated band-pass power distributions for a plurality of frequency bandwidths, and estimating a sound source position or direction from a synthesized band-pass power distribution; and extracting a speech parameter from the band-pass power distribution for each frequency bandwidth calculated by the calculating step, according to the sound source position or direction estimated by the calculating step.

According to another aspect of the present invention there is provided a microphone array input type speech analysis method, comprising the steps of: inputting speeches in a plurality of channels using a microphone array formed by a plurality of microphones; analyzing an input speech of each channel inputted by the inputting step, and obtaining band-pass waveforms for each channel, each band-pass waveform being a waveform for each frequency bandwidth; and calculating a band-pass power distribution for each frequency bandwidth from the band-pass waveforms for each frequency bandwidth obtained by the analyzing step, synthesizing calculated band-pass power distributions for a plurality of frequency bandwidths, and estimating a sound source position or direction from a synthesized band-pass power distribution.

Other features and advantages of the present invention will become apparent from the following description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of a conventional microphone array input type speech recognition system.

Fig. 2 is a block diagram of a processing configuration for a conventionally proposed parametric method for estimating the sound source position or direction.

Fig. 3 is a block diagram of a microphone array input type speech recognition system according to the first embodiment of the present invention.

Fig. 4 is a diagram of a filter function to be used in a sound source position search unit in the system of Fig. 3.

Figs. 5A and 5B are diagrams showing a relationship between a sound source position and microphone positions in the system of Fig. 3, for a case of direction estimation and for a case of position estimation, respectively.

Fig. 6 is a diagram for explaining a peak detection from a sound source power distribution after the synthesizing processing in the system of Fig. 3.

Fig. 7 is a block diagram of one exemplary configuration for a speech recognition unit in the system of Fig. 3.

Fig. 8 is a block diagram of another exemplary configuration for a speech recognition unit in the system of Fig. 3.

Fig. 9 is a flow chart for the overall processing in the system of Fig. 3.

Fig. 10 is a diagram for explaining a read out waveform data for one frame used in a calculation of a correlation matrix at a sound source position search unit in the system of Fig. 3.

Figs. 11A and 11B are diagrams showing a relationship between a resolution and an increment value for search in a sound source position estimation in the system of Fig. 3.

Fig. 12 is a block diagram of a sound source position search unit in the system of Fig. 3 according to the second embodiment of the present invention.

Fig. 13 is a flow chart for the processing of the sound source position search unit of Fig. 12.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to Fig. 3 to Fig. 10, the first embodiment of a method and a system for microphone array input type speech recognition according to the present invention will be described in detail.

Fig. 3 shows a basic configuration of a microphone array input type speech recognition system in this first embodiment. This speech recognition system of Fig. 1 comprises a speech input unit 1, a frequency analysis unit 2, a sound

Meta Platforms, Inc. - Exhibit 1002
Page 120 of 686

source position search unit 3, a speech parameter extraction unit 4, and a speech recognition unit 5.

The speech input unit 1 has a microphone array (not shown) formed by N sets (8 sets, for example) of microphones, and converts speeches entered from the microphone array into digital signals.

The frequency analysis unit 2 analyzes the input speech for each microphone (channel) entered at the speech input unit 1 by a band-pass filter bank (a group of band-pass filters), and obtains a band-pass waveform which is a waveform for each frequency bandwidth.

The sound source position search unit 3 estimates a power arriving from each position or direction for each bandwidth according to the band-pass waveform for each frequency bandwidth obtained for each channel by the frequency analysis unit 2, as a sound source position judgement information, and identifies a sound source direction or position by synthesizing the obtained sound source position judgement information for a plurality of frequency bandwidths.

The speech parameter extraction unit 4 extracts the band-pass power of the speech signals arrived from the sound source direction or position identified by the sound source position search unit 3, as a speech parameter, according to the sound source position judgement information obtained at the sound source position search unit 3.

The speech recognition unit 5 carries out the speech recognition by matching the speech parameter extracted by the speech parameter extraction unit 4 with a recognition dictionary.

Now, the outline of the overall operation in the speech recognition system of Fig. 3 will be described.

First, the speeches entered at N (=8) sets of microphones are AD converted at the sampling frequency such as 12 KHz for example, microphone channel by microphone channel, at the speech input unit 1. Then, the frequency analysis is carried out at the frequency analysis unit 2, to obtain band-pass waveforms for a plurality of bands (bandwidths) corresponding to microphones. Here, a number M of bands used in the analysis is assumed to be equal to 16. The transmission bandwidths of the band-pass filters are to be determined as those required at the speech recognition unit 5. A manner of constructing the band-pass filters is well known and can be found in Rabiner et al.: "Fundamentals of Speech Recognition", Prentice Hall, for example.

Next, at the sound source position search unit 3, an arriving power in each bandwidth is estimated for each position or direction, according to the band-pass waveforms for N (=8) channels in each bandwidth outputted by the frequency analysis unit 2, as the sound source position judgement information. This processing is repeated for M (=16) times. This calculation of the sound source position judgement information is a calculation of an arriving power while sequentially displacing an assumed sound source position or direction, so as to obtain a distribution of arriving powers over a range in which the sound source can be located.

Thereafter, the sound wave arriving direction or the sound source position is estimated by synthesizing the above described power distribution obtained for each of M frequency bandwidths. Here, a position or direction with a large value in the power distribution is to be estimated as that of the source source.

In addition, at the speech parameter extraction unit 4, the sound source power (band-pass power) at the sound wave arriving direction or the sound source position is extracted, from the sound source position judgement information estimated for each bandwidth at the sound source position search unit 3, as the speech parameter. This speech parameter is then given to the speech recognition unit 5, where the speech recognition result is obtained and outputted.

As described, in this first embodiment, the sound source position is determined according to the estimated power distribution for each frequency bandwidth to be used in the speech recognition, and the speech parameter is obtained according to the determined sound source position, so that even when the sound source position is unknown, it is possible to realize the speech recognition by directly obtaining the speech parameter at high precision with a small amount of calculations.

Note that, when the sound source position is known, it suffices to obtain the arriving power value by limiting a power distribution calculation range to a single known sound source position or direction, and the configuration of Fig. 3 is also applicable to this case without any change. This simplified operation is effective when it is possible to assume that a user makes a speech input by approaching to a specific location.

Next, the detailed operation for obtaining the power distribution from a plurality of band-pass waveforms at the sound source position search unit 3 will be described.

At the sound source position search unit 3, in order to obtain a power at each direction or position from a plurality (M sets) of band-pass waveforms, the calculation of the minimum variance method is carried out. The minimum variance method is well known and described in Haykin: "Adaptive Filter Theory", Prentice Hall, for example.

In this first embodiment, at a time of the sound source power estimation by the minimum variance method, in order to deal with signals having a certain bandwidth which is not a narrow bandwidth, a filter function as indicated in Fig. 4 is realized by calculation, where the band-pass waveforms of the same frequency bandwidth obtained for N sets of microphones (i = 1 to N) by the frequency analysis unit 2 are added by an adder 32 after passing through transversal filters 31-1 to 31-N with multiple delay line taps corresponding to N sets of microphones (i = 1 to N). Here, the filter coefficients w_{11} to w_{1J}, $\cdots\cdots\cdots$, w_{N1} to w_{NJ} of the filters 31-1 to 31-N are switchably set up for each bandwidth, so as to realize the filter function for all bandwidths.

In the configuration of Fig. 2, a number of taps in the filter is denoted as J, and a filter coefficient of the i-th microphone (microphone No. i) is denoted as w_{ij} ($1 \leq i$ d N, $1 \leq j \leq J$). Here, J is equal to 10, for example, but this setting may

Meta Platforms, Inc. - Exhibit 1002
Page 121 of 686

be be changed depending on a width of the bandwidth.

The filter output y in this configuration of Fig. 2 can be expressed as follows.

First, by denoting the band-pass waveform of the k-th frequency bandwidth ($1 \leqq k \leqq M$) obtained from the waveform for the i-th microphone as $x_{ik}(n)$, and by arranging band-pass waveform sample sequences: $x_{ik} = (x_{ik}(n\text{-}J+1), x_{ik}(n\text{-}J+2), \cdots\cdots\cdots, x_{ik}(n\text{-}1), x_{ik}(n))$ from J samples past of a certain time n up to this time n, for all N sets of microphones, it is possible to obtain a vector given by the following equation (1).

$$x_k = (x_{1k}, x_{2k}, \cdots\cdots\cdots, x_{Nk})^T \tag{1}$$

Also, by arranging the filter coefficients w_{ij}, it is possible to obtain a vector given by the following equation (2).

$$w_k = (w_{11}, w_{12}, \cdots\cdots\cdots, w_{1J}, w_{21}, w_{22}, \cdots\cdots\cdots, w_{2J}, \cdots\cdots\cdots, w_{N1}, w_{N2}, \cdots\cdots\cdots, w_{NJ})^T \tag{2}$$

Using the above equations (1) and (2), the filter output y can be expressed as:

$$y = w_k^* x_k \tag{3}$$

where * denotes a complex conjugate of a vector. In this expression, x_k is usually called a snap-shot.

Now, denoting the expectation value as E[ ], the expectation value of the filter output power y^2 is expressed as :

$$E[y^2] = E[w_k^* x_k x_k^* w_k] = w_k^* R_k w_k \tag{4}$$

where $R_k = E[x_k x_k^*]$ is a correlation matrix of x. Then, the estimation vector according to the minimum variance method is obtained by minimizing this expectation value $E[y^2]$ under the constraint conditions that a response of the microphone array for a target direction or position is to be maintained constant.

These constraint conditions can be expressed as:

$$w_k^* A = g \tag{5}$$

where g is a column vector with constant values in a size equal to a number L of constraint conditions. For example, this g can be [1, 1, ·····, 1]. Also, A is a matrix formed by direction control vectors a_m for different frequencies as column vectors. This matrix A can be expressed as:

$$A = [a_1, a_2, \cdots\cdots\cdots, a_L] \tag{6}$$

and each direction control vector a_m (m = 1, 2, ·····, L) can be expressed as:

$$a_m = (1, a_2 e^{-j\omega m\tau 2}, \cdots\cdots\cdots, a_N e^{-j\omega m\tau N}) \tag{7}$$

where $\tau_2, \cdots\cdots\cdots, \tau_N$ are propagation time differences of the incident sound wave for the second to N-th microphones with reference to the first microphone, respectively. Note that the propagation time difference τ_1 of the incident sound wave for the first microphone is set equal to zero. Also, ω_m is an angular frequency, and $a_2, \cdots\cdots\cdots, a_N$ are amplitude ratio of the incident sound wave for the second to N-th microphone with reference to the first microphone, respectively. Here, L is set equal to 10, for example, and ω_m is set to be $\omega_m = ((\omega_a\text{-}\omega_b)/(L\text{-}1)) \cdot m + \omega_b$, where ω_a is an upper limit angular frequency of the bandwidth and ω_b is a lower limit angular frequency of the bandwidth.

When the problem of minimization under the constraints given by the equations (4) and (5) is solved by the Lagrange's method of indeterminate coefficients, the filter coefficient w_k for minimizing the arriving power from any direction or position other than the sound source direction θ or the sound source position θ can be given by the following equation (8).

$$w_k = R_k^{-1} A (A^* R_k^{-1} A)^{-1} g \tag{8}$$

Using this filter coefficient w_k, the arriving power (arriving band-pass power, sound source power) $P_k(\theta)$ for the k-th bandwidth from the sound source θ can be calculated as the following equation (9).

$$P_k(\theta) = g^* (A^* R_k^{-1} A)^{-1} g \tag{9}$$

Meta Platforms, Inc. - Exhibit 1002
Page 122 of 686

In a case of the sound source position estimation, θ is taken as a vector for expressing the coordinates.

Now, with reference to Figs. 5A and 5B, a manner of obtaining the propagation time difference and the amplitude for each microphone will be described. Here, the explanation is given on two-dimensional plane for the sake of simplicity, but the extension to the three-dimensional space should be obvious.

First, as shown in Fig. 5A, the coordinates of the first microphone (No. 1) are denoted as (x_1, y_1) and the coordinates of the i-th microphone (No. i) are denoted as (x_i, y_i). Then, for a case of the plane waves, when the sound waves are incident from a direction θ, the propagation time difference τ_i of the incident sound waves at the i-th microphone and the first microphone is given by:

$$\tau_i(\theta) = ((x_i - x_1)^2 + (y_i - y_1)^2)^{1/2} \cos(\theta - \tan^{-1}((y_i - y_1)/(x_i - x_1))) \quad (10)$$

and the amplitude can be assumed as:

$$a_1 = a_2 = \cdots\cdots\cdots = a_N = 1 \quad (11)$$

On the other hand, in a case of a point sound source, as shown in Fig. 5B, when an assumed sound source position θ is located at (x_s, y_s), the propagation time difference τ_i and the amplitude a_i can be given by:

$$\tau_i = (((x_i - x_s)^2 + (y_i - y_s)^2)^{1/2} - ((x_i - x_s)^2 + (y_i - y_s)^2)^{1/2})/c \quad (12)$$

and

$$a_i = ((x_i - x_s)^2 + (y_i - y_s)^2)^{1/2} / ((x_i - x_s)^2 + (y_i - y_s)^2)^{1/2} \quad (13)$$

where c is the speed of sound.

$P_k(\theta)$ given by the above equation (9) becomes large when θ coincides with the arriving direction or the sound source position, or small when they do not coincide. For this reason, by calculating $P_k(\theta)$ for each direction or position, the arriving direction or the sound source position can be estimated as a position of the peak.

To this end, in a case of obtaining the sound source direction, the sound source position search unit 3 calculates $P_k(\theta)$ while sequentially changing θ gradually, 1° by 1° for example. Also, in a case of obtaining the sound source position, the sound source position search unit 3 calculates $P_k(\theta)$ for lattice points at 2 cm interval for example, within the search range. The increment value for θ may be changed to any appropriate value depending on factors such as a wavelength and a distance to an assumed sound source position.

Next, at the sound source position search unit 3, $P_k(\theta)$ of the equation (9) obtained for all bandwidths are synthesized to estimate the sound source position or the sound source direction.

Here, the synthesizing can be realized by multiplying a weight W_k to the arriving power distribution $P_k(\theta)$ for each bandwidth, and taking a sum for all the frequency bandwidths from k = 1 to k = M, that is:

$$P(\theta)_{total} = \Sigma W_k P_k(\theta) \quad (14)$$

and estimating the sound source from a peak on the distribution after this synthesizing processing (the total sound source power distribution).

Here, all the weights W_k may be set equal to 1, or the weight for the frequency of a noise source with a known frequency characteristic such as a power source frequency may be set small so as to reduce the influence of the noise.

The detection of the sound source is carried out according to a size of a peak in $P(\theta)_{total}$ as described above, and a single largest peak can be detected as the sound source. Alternatively, as shown in Fig. 6, by setting a prescribed threshold with reference to an average value of portions other than peak portions on the synthesized (total) sound source power distribution, such as 5 dB, and all peaks above this threshold may be detected as the sound sources, while not detecting any sound source at all when there is no peak above this threshold.

In this manner, the arriving power distribution $P_k(\theta)$ for each bandwidth given by the equation (9) is used in Judging whether the sound source exists at an assumed sound source position which is set to be each direction or position determined with reference to positions of a plurality of microphones, so that this arriving power distribution $P_k(\theta)$ will be referred to as the sound source position judgement information.

Next, the speech parameter extraction unit 4 can extract the power of the k-th frequency bandwidth of the sound source, from the already obtained arriving power distribution $P_k(\theta)$ for each bandwidth, according to the sound source direction or position obtained by the sound source position search unit 3. Consequently, by extracting the power for all the bandwidths from k = 1 to k = M, it is possible to obtain the band-pass power to be used as the speech parameter.

The band-pass power of the sound source obtained in this manner is sent from the speech parameter extraction unit 4 to the speech recognition unit 5, and used in the speech recognition processing.

Meta Platforms, Inc. - Exhibit 1002
Page 123 of 686

As shown in Fig. 7, the speech recognition unit 5 comprises a speech power calculation unit 501, a speech detection unit 502, a pattern matching unit 503, and a recognition dictionary 504.

In this speech recognition unit 5, the speech power is calculated from the speech parameter (band-pass power) extracted by the speech parameter extraction unit 4, and a speech section is detection by the speech detection unit 502 according to the calculated speech power. Then, for the speech parameter in the detected speech section, the pattern matching with the recognition dictionary 504 is carried out by the pattern matching unit 503.

Note that, as shown in Fig. 8, the speech recognition unit 5 may be formed by a pattern matching unit 511, a recognition dictionary 512, and a speech detection unit 513, so as to carry out the word spotting scheme in which the continuous pattern matching for the speech parameter is carried out and a section with the largest matching score is determined as a speech section.

The total speech power can be obtained by summing powers for all the bandwidths extracted by the speech parameter extraction unit 4, so that it is possible to use the known speech section detection method based on the speech power as disclosed in L. F. Lamel et al.: "An Improved Endpoint Detector for Isolated Word Recognition", IEEE Transactions on Acoustics, Speech, and Signal Processing, Vol.ASSP-29, No. 4, pp. 777-785, August 1981. The above processing is to be carried out for each frame of the input speech waveform data so as to recognize the speech continuously.

In this first embodiment, using the configuration of the microphone array input type speech recognition system as described above, the speech recognition is realized by directly obtaining the band-pass power which is the speech parameter. Consequently, it is possible to use the minimum variance method which is a sound source direction or sound source position estimation method with a high precision and a small amount of calculations.

Now, the flow of processing as described above will be summarized with reference to the flow chart of Fig. 9.

First, prior to the start of the processing, the initial setting is made for factors such as whether a direction estimation is to be used or a position estimation is to be used, a range of sound source search to be used, and an increment value to be used in the search (step S1). In an example of Fig. 9, a direction estimation is to be used, a searching range is from -90° to +90°, and an increment value for search is 1°.

Next, the speeches entered at N sets of microphones are A/D converted at the sampling frequency of 12 KHz for example, for all N channels in parallel, by the speech input unit 1. The obtained waveform data are then stored in a buffer (not shown) of the speech input unit 1 (step S2). Normally, this step S2 is carried out continuously in real time, regardless of the other processing.

Next, the waveform data for each channel is read out from the buffer for one frame size, 256 points for example, and applied to the band-pass filter bank at the frequency analysis unit 2, so as to extract the band-pass waveform for each frequency bandwidth k ($k = 1$ to M), where $M = 16$ in this example (step S3). Here, the calculations for the band-pass filters may be carried out independently for each microphone in parallel, or sequentially for each microphone serially.

Next, at the source source position search unit 3, using the band-pass waveform data for N channels obtained by the frequency analysis unit 2 at the step S3, the correlation matrix R_k for each frequency bandwidth k is obtained (step S4). Here, as shown in Fig. 10, the calculation of the correlation matrix R_k is realized by obtaining the correlation matrix R_k as a time average of the auto-correlation matrices of samples for 20 frames taken at an interval of 2 samples from a frame data of 256 samples (points) for example.

In addition, at the step S4, using this correlation matrix R_k, the arriving power distribution $Pk(\theta) = g^* (A^* R_k^{-1} A)^{-1} g$ is obtained as the sound source position judgement information for each assumed position or direction. This calculation is carried out over the entire space to be searched through, so as to obtain the spatial distribution of the arriving powers. As for the bandwidths, when $M = 16$, the calculation is carried out from $k = 1$ to $k = 16$.

Next, at the sound source position search unit 3, the arriving power distributions $P_k(\theta)$ for different frequency bandwidths are summed over the entire frequency bandwidths, for each θ, so as to obtain the total sound source power distribution $P(\theta)_{total}$. Then, the largest peak is extracted from this $P(\theta)_{total}$ and identified as the sound source position θ_ϕ (step S5).

Next, at the speech parameter extraction unit 4, a value on the arriving power distribution (sound source position judgement information distribution) $P_k(\theta)$ for each frequency bandwidth obtained by the sound source position search unit 3 at the sound source position θ_ϕ is extracted, and this is repeated for all the frequency bandwidths for each sound source, so as to obtain the speech parameter $P_k(\theta_\phi)$ (step S6).

In addition, at the step S6, the powers for different bandwidths k of the speech parameter $P_k(\theta)$ are summed to obtain the power for the entire speech bandwidth at the speech power calculation unit 501 of the speech recognition unit 5.

Next, using the power for the entire speech bandwidth obtained at the step S6, the speech section is detected by the speech detection unit 502 of the speech recognition unit 5 (step S7).

Then, whether the end of the speech section is detected by the speech detection unit 502 or not is judged (step S8), and if not, the processing returns to the step S2 to carry out the frequency analysis for the next waveform data frame.

Meta Platforms, Inc. - Exhibit 1002
Page 124 of 686

On the other hand, when the end of the speech section is detected, a matching of the speech parameter in the detected speech section with the recognition dictionary 504 is carried out, and the obtained recognition result is outputted (step S9). Then, the processing returns to the step S2 to carry out the frequency analysis for the next waveform data frame.

Thereafter, the above processing is repeated so as to carry out the speech parameter estimation and the speech recognition continuously.

Note that the processing described above can be carried out at high speed by adopting the pipeline processing using a plurality of processors (as many processors as a number of microphones, for example) which are operated in parallel.

Referring now to Fig. 11A to Fig. 13, the second embodiment of a method and a system for microphone array input type speech recognition according to the present invention will be described in detail.

This second embodiment is directed to a scheme for further reducing an amount of calculations in the sound source position estimation, by changing the constraint conditions used in the spectrum estimation so as to control the resolution, and changing the search density according to the resolution so as to reduce an amount of calculation in the sound source search. In this second embodiment, the basic configuration of the speech recognition system is the same as that of the first embodiment, so that Fig. 3 will be also referred in the following description.

In the first embodiment described above, the constraint conditions used in the spectrum estimation based on the minimum variance method are that a response of the microphone array for one direction or position is to be maintained constant. In this case, the resolution of the estimation is sufficiently high, so that the peak is found by the dense search in which the arriving power is obtained while changing θ 1° by 1° for example within the sound source search range.

When the resolution is so high as in this case, as shown in Fig. 11A, there is a possibility for failing to detect an accurate apex of the peak when the search is carried out not so densely, so that an amount of calculations for the search cannot be reduced easily.

In contrast, when the resolution of the sound source position estimation processing can be lowered, as shown in Fig. 11B, a possibility for overlooking the peak position can be made low even when the search is carried out coarsely, so that an amount of calculations can be reduced. In this case, however, it may not be possible to separate the closely located sound sources, or the estimation precision may be lowered, as much as the resolution is lowered.

For this reason, this second embodiment adopts a scheme in which the lower resolution search is carried out first and then the high resolution search is carried out only in a vicinity of the peak, so as to realize the high precision sound source position estimation with a small amount of calculations. This scheme will now be described in detail.

The resolution at a time of the sound source position estimation can be controlled by requiring that responses of the microphone array for a plurality of directions or positions are to be simultaneously maintained constant, instead of just requiring a response of the microphone array for one direction or position to be maintained constant as in the constraint conditions of the equation (5).

For example, using two time delays $\tau_1(\theta_1)$ and $\tau_2(\theta_2)$ for two angles θ_1 and θ_2 (according to the equation (10)), it is possible to use two direction control vectors $a_m(\theta_1)$ and $a_m(\theta_2)$ (m = 1, 2, · · · · · · · · ·, L) given by the following equations (15) and (16).

$$a_m(\theta_1) = (1, a_2 e^{-j\omega m\tau 2(\theta 1)}, \cdots\cdots\cdots, a_N e^{-j\omega m\tau N(\theta 1)}) \quad (15)$$

$$a_m(\theta_2) = (1, a_2 e^{-j\omega m\tau 2(\theta 2)}, \cdots\cdots\cdots, a_N e^{-j\omega m\tau (\theta 2)}) \quad (16)$$

Then, using these two direction control vectors $a_m(\theta_1)$ and $a_m(\theta_2)$, it is possible to set:

$$A = [a_1(\theta_1), a_2(\theta_1), \cdots\cdots\cdots, a_L(\theta_1), a_1(\theta_2), a_2(\theta_2), \cdots\cdots\cdots, a_L(\theta_2)] \quad (17)$$

so as to make responses of the microphone array to two directions simultaneously.

Here, when θ_1 and θ_2 are set to close values, such as $\theta_2 = \theta_1 + 1°$ for example, it is equivalent to a case of making a response of the microphone array for a single direction with a width between θ_1 and θ_2, so that it is equivalent to the lowering of the resolution. Note here that a number of directions for which the responses of the microphone array are to be made simultaneously is not necessarily limited to two.

When the resolution is lowered, the search can be coarser compared with a case of high resolution, so that an amount of calculations can be reduced.

Then, after the search using the low resolution sound source position estimation processing described above, the high resolution search as described in the first embodiment can be carried out only in a vicinity of the peak detected by the first search, so that the high precision sound source position estimation can be realized with a reduced amount of calculations overall.

Fig. 12 shows a configuration of the sound source position search unit 3 in this second embodiment for realizing the above described sound source position estimation processing.

Meta Platforms, Inc. - Exhibit 1002
Page 125 of 686

In this configuration of Fig. 12, the sound source position search unit 3 comprises a low resolution sound source position search unit 301 and a high resolution sound source position search unit 302. The low resolution sound source position search unit 301 coarsely estimates the arriving power distribution in terms of positions or directions by using the low resolution spectrum estimation. The high resolution sound source position search unit 302 densely estimates the arriving power distribution by using the high resolution spectrum estimation only in a vicinity of the position or direction obtained by the low resolution sound source position search unit 301.

Now, the flow of processing in this sound source position search unit 3 in the configuration of Fig. 12 will be described with reference to the flow chart of Fig. 13.

First, using the inputs of the band-pass waveforms corresponding to the microphone, the correlation matrix R_k is calculated (step S11). Here, a method for obtaining this correlation matrix R_k is the same as in the first embodiment.

Next, using the obtained correlation matrix R_k, the low resolution sound source position search is carried out (step S12). At this point, the increment value θ_d for search is set to be a relatively large value, such as 5° for example, so as to carry out the search coarsely over the entire search range. Also, in order to lower the resolution, a matrix as expressed by the equation (17) which has two direction control vectors $a_m(\theta_1)$ and $a_m(\theta_2)$ for two directions or positions as expressed by the equations (15) and (16) as column vectors is used instead of a matrix A in the equation (9). In Fig. 13, this matrix is denoted as B in order to distinguish it from a matrix A of the equation (6). The search is carried out for each bandwidth.

Next, the low resolution arriving power distributions for different bandwidths are synthesized, and the sound source position $\theta_\emptyset$ is obtained from a peak therein (step S13).

Next, in a vicinity of the sound source position obtained at the step S13, the high resolution sound source position search is carried out. Here, the setting of the search range is set to be ±10° of the sound source position obtained at the step S13, for example. At this point, the equation to be used for the arriving power estimation (arriving power distribution) is the same as the equation (9), and the increment value is set to a smaller value such as 1° for example (step S14).

Next, the high resolution arriving power distributions for different bandwidths obtained at the step S14 are synthesized, and the sound source position $\theta_\emptyset'$ is obtained from a peak therein (step S15).

At the speech parameter extraction unit 4, the power (speech parameter) of the sound source is extracted from the arriving power distribution obtained by the high resolution sound source position search at the high resolution sound source position search unit 302 of the sound source position search unit 3.

As described, in this second embodiment, by using the sound source position search processing in which the low resolution sound source position estimation and the high resolution sound source position estimation are combined, it is possible to estimate the sound source position and its band-pass power while reducing an amount of calculations considerably.

As described, according to the present invention, a band-pass waveform which is a waveform for each frequency bandwidth is obtained from input signals of the microphone array, and a band-pass power of the sound source is directly obtained from the band-pass waveform, so that it is possible to realize a high precision sound source position or direction estimation by a small amount of calculations. Moreover, the obtained band-pass power can be used as the speech parameter so that it is possible to realize a high precision speech recognition.

In the speech recognition system of the present invention, the input signals of the microphone array entered by the speech input unit are frequency analyzed by the frequency analysis unit, so as to obtain the band-pass waveform which is a waveform for each frequency bandwidth. This band-pass waveform is obtained by using the band-pass filter band (a group of band-pass filters), instead of using the frequency analysis based on FFT as in the conventional speech recognition system. Then, the band-pass power of the sound source is directly obtained from the obtained band-pass waveform by the sound source position search unit.

Here, in order to handle signals within some bandwidth collectively, a filter configuration (filter function) having a plurality of delay line taps for each microphone channel is used and the sound source power is obtained as a sum of the filter outputs for all channels, while using the minimum variance method which is a known high precision spectrum estimation method.

The sound source power estimation processing using the minimum variance method is also used in the conventionally proposed parametric method described above, but a use of only one delay line tap has been assumed conventionally, so that it has been impossible to obtain the bandwidth power collectively.

In contrast, in the speech recognition system of the present invention, a filter configuration with a plurality of delay line taps is used so that the power in each direction or position is obtained for each frequency bandwidth necessary for the speech recognition, rather than obtaining the power in each direction or position for each frequency, and therefore the obtained power can be directly used for the speech recognition while a required amount of calculations can be reduced.

For example, in a case of using the conventional FFT with 512 points, it has been necessary to repeatedly obtain the power in each direction for each of 256 components, but in the present invention, when a number of bands in the band-pass filter bank is set to 16 for example, it suffices to estimate the power in each direction for 16 times. In addition,

Meta Platforms, Inc. - Exhibit 1002
Page 126 of 686

this power (band-pass power) can be estimated at higher precision compared with the conventional case of using the delay sum array processing, so that it is possible to realize the high precision speech recognition.

In the sound source position search unit, the synthesizing of the band-pass power distributions for a plurality of frequency bandwidths can be realized by multiplying respective weights to the band-pass power distributions of different bandwidths, and taking a sum of the weighted band-pass power distributions for all the frequency bandwidths. Here, all the weights may be set equal to 1, or the weight for the frequency of a noise source with a known frequency characteristic such as a power source frequency may be set small so as to reduce the influence of the noise.

Also, in the sound source position search unit, the estimation of the sound source position or direction from the synthesized power distribution for each position or direction can be realized by detecting a peak in the synthesized power distribution and setting a position or direction corresponding to the detected peak as the sound osurce position or direction.

Furthermore, according to the present invention, by using a sound source position search processing in which a low resolution position estimation and a high resolution position estimation are combined, it is possible to realize the sound source estimation and the band-pass power estimation at high precision while further reducing an amount of calculations.

In this case, the coarse search carried out by the sound source position search unit for the purpose of reducing an amount of calculations is the low resolution search so that it is possible to malke it highly unlikely to overlook the sound source position or direction (a peak position in the power distribution).

Although there is a possibility for being unable to separate closely located sound sources or lowering the estimation precision by the low resolution search alone, the high resolution search is also carried out only in a vicinity of the sound source position or direction obtained by the low resolution search (in a vicinity of the detected peak), so that it is possible to realize the high precision sound source position estimation with a further reduced amount of calculations.

It is to be noted that, in the above description, the speech recognition system having a speech recognition unit has been described, but the speech parameter extraction technique according to the present invention can be utilized separately from the speech recognition device.

Namely, it is also possible to provide a microphone array input type speech analysis system for analyzing the input signals of the microphone array and extracting the speech parameter, which is formed by the speech input unit, the frequency analysis unit, the sound source position search unit, and the speech parameter extraction unit substantially as described above, in which the band-pass waveform which is a waveform for each frequency bandwidth is obtained from input signals of the microphone array, a band-pass power of the sound source is directly obtained from the band-pass waveform, and the obtained band-pass power is used as the speech parameter.

Similarly, it is also possible to provide a microphone array input type speech analysis system for analyzing the input signals of the microphone array and estimating the sound source position or direction, which is formed by the speech input unit, the frequency analysis unit, and the sound source position search unit substantially as described above, in which the band-pass waveform which is a waveform for each frequency bandwidth is obtained from input signals of the microphone array, a band-pass power of the sound source is directly obtained from the band-pass waveform, and the sound source position or direction is estimated according to a synthesized band-pass power distribution.

Such a microphone array input type speech analysis system according to the present invention is utilizable not only in the speech recognition but also in the other speech related processing such as a speaker recognition.

It is also to be noted that, besides those already mentioned above, many modifications and variations of the above embodiments may be made without departing from the novel and advantageous features of the present invention. Accordingly, all such modifications and variations are intended to be included within the scope of the appended claims.

Claims

1. A microphone array input type speech recognition system, comprising:

   a speech input unit for inputting speeches in a plurality of channels using a microphone array formed by a plurality of microphones;

   a frequency analysis unit for analyzing an input speech of each channel inputted by the speech input unit, and obtaining band-pass waveforms for each channel, each band-pass waveform being a waveform for each frequency bandwidth;

   a sound source position search unit for calculating a band-pass power distribution for each frequency bandwidth from the band-pass waveforms for each frequency bandwidth obtained by the frequency analysis unit, synthesizing calculated band-pass power distributions for a plurality of frequency bandwidths, and estimating a sound source position or direction from a synthesized band-pass power distribution;

   a speech parameter extraction unit for extracting a speech parameter for speech recognition, from the band-pass power distribution for each frequency bandwidth calculated by the sound source position search unit, according to the sound source position or direction estimated by the sound source position search unit; and

Meta Platforms, Inc. - Exhibit 1002
Page 127 of 686

a speech recognition unit for obtaining a speech recognition result by matching the speech parameter extracted by the speech parameter extraction unit with a recognition dictionary.

2. The system of claim 1, wherein the sound source position search unit includes:

a low resolution sound source position estimation unit for estimating a rough sound source position or direction, by minimizing an output power of the microphone array under constraints that responses of the microphone array for a plurality of directions or positions are to be maintained constant; and
a high resolution sound source position estimation unit for estimating an accurate sound source position or direction in a vicinity of the rough sound source position or direction estimated by the low resolution sound source position estimation unit, by minimizing the output power of the microphone array under constraints that a response of the microphone array for one direction or position is to be maintained constant, wherein the speech parameter extraction unit extracts the speech parameter for speech recognition according to the accurate sound source position or direction.

3. The system of claim 1, wherein the frequency analysis unit obtains the band-pass waveforms for each channel by using a band-pass filter bank.

4. The system of claim 1, wherein the sound source position search unit calculates the band-pass power distribution for each frequency bandwidth, by calculating a band-pass power for each frequency bandwidth, in each one of a plurality of assumed sound source positions or directions within a prescribed search range.

5. The system of claim 1, wherein the sound source position search unit calculates the band-pass power distribution for each frequency bandwidth by using a filter function configuration having a plurality of delay line taps for each channel.

6. The system of claim 1, wherein the sound source position search unit calculates the band-pass power distribution for each frequency bandwidth by using a minimum variance method for minimizing an output power of the microphone array under constraints that a response of the microphone array for one direction or position is to be maintained constant.

7. The system of claim 1, wherein the speech parameter extraction unit extracts the band-pass power distribution for each frequency bandwidth calculated by the sound source position search unit for the sound source position or direction estimated by the sound source position search unit directly as the speech parameter.

8. The system of claim 1, wherein the sound source position search unit synthesizes the calculated band-pass power distributions for a plurality of frequency bandwidths by weighting the calculated band-pass power distributions with respective weights, and summing weighted band-pass power distributions.

9. The system of claim 1, wherein the sound source position search unit estimates the sound source position or direction by detecting a peak in the synthesized band-pass power distribution and setting a position or direction corresponding to a detected peak as the sound source position or direction.

10. A microphone array input type speech analysis system, comprising:

a speech input unit for inputting speeches in a plurality of channels using a microphone array formed by a plurality of microphones;
a frequency analysis unit for analyzing an input speech of each channel inputted by the speech input unit, and obtaining band-pass waveforms for each channel, each band-pass waveform being a waveform for each frequency bandwidth;
a sound source position search unit for calculating a band-pass power distribution for each frequency bandwidth from the band-pass waveforms for each frequency bandwidth obtained by the frequency analysis unit, synthesizing calculated band-pass power distributions for a plurality of frequency bandwidths, and estimating a sound source position or direction from a synthesized band-pass power distribution; and
a speech parameter extraction unit for extracting a speech parameter from the band-pass power distribution for each frequency bandwidth estimated by the sound source position search unit, according to the sound source position or direction estimated by the sound source position search unit.

11. The system of claim 10, wherein the sound source position search unit includes:

Meta Platforms, Inc. - Exhibit 1002
Page 128 of 686

a low resolution sound source position estimation unit for estimating a rough sound source position or direction, by minimizing an output power of the microphone array under constraints that responses of the microphone array for a plurality of directions or positions are to be maintained constant; and

a high resolution sound source position estimation unit for estimating an accurate sound source position or direction in a vicinity of the rough sound source position or direction estimated by the low resolution sound source position estimation unit, by minimizing the output power of the microphone array under constraints that a response of the microphone array for one direction or position is to be maintained constant, wherein the speech parameter extraction unit extracts the speech parameter according to the accurate sound source position or direction.

12. A microphone array input type speech analysis system, comprising:

a speech input unit for inputting speeches in a plurality of channels using a microphone array formed by a plurality of microphones;

a frequency analysis unit for analyzing an input speech of each channel inputted by the speech input unit, and obtaining band-pass waveforms for each channel, each band-pass waveform being a waveform for each frequency bandwidth; and

a sound source position search unit for calculating a band-pass power distribution for each frequency bandwidth from the band-pass waveforms for each frequency bandwidth obtained by the frequency analysis unit, synthesizing calculated band-pass power distributions for a plurality of frequency bandwidths, and estimating a sound source position or direction from a synthesized band-pass power distribution.

13. The system of claim 12, wherein the sound source position search unit includes:

a low resolution sound source position estimation unit for estimating a rough sound source position or direction, by minimizing an output power of the microphone array under constraints that responses of the microphone array for a plurality of directions or positions are to be maintained constant; and

a high resolution sound source position estimation unit for estimating an accurate sound source position or direction in a vicinity of the rough sound source position or direction estimated by the low resolution sound source position estimation unit, by minimizing the output power of the microphone array under constraints that a response of the microphone array for one direction or position is to be maintained constant.

14. A microphone array input type speech recognition method, comprising the steps of:

inputting speeches in a plurality of channels using a microphone array formed by a plurality of microphones:

analyzing an input speech of each channel inputted by the inputting step, and obtaining band-pass waveforms for each channel, each band-pass waveform being a waveform for each frequency bandwidth;

calculating a band-pass power distribution for each frequency bandwidth from the band-pass waveforms for each frequency bandwidth obtained by the analyzing step, synthesizing calculated band-pass power distributions for a plurality of frequency bandwidths, and estimating a sound source position or direction from a synthesized band-pass power distribution;

extracting a speech parameter for speech recognition, from the band-pass power distribution for each frequency bandwidth calculated by the calculating step, according to the sound source position or direction estimated by the calculating step; and

obtaining a speech recognition result by matching the speech parameter extracted by the extracting step with a recognition dictionary.

15. The method of claim 14, wherein the calculating step includes the steps of:

a low resolution sound source position estimation step for estimating a rough sound source position or direction, by minimizing an output power of the microphone array under constraints that responses of the microphone array for a plurality of directions or positions are to be maintained constant; and

a high resolution sound source position estimation step for estimating an accurate sound source position or direction in a vicinity of the rough sound source position or direction estimated by the low resolution sound source position estimation step, by minimizing the output power of the microphone array under constraints that a response of the microphone array for one direction or position is to be maintained constant, wherein the extracting step extracts the speech parameter for speech recognition according to the accurate sound source position or direction.

Meta Platforms, Inc. - Exhibit 1002
Page 129 of 686

16. The method of claim 14, wherein the analyzing step obtains the band-pass waveforms for each channel by using a band-pass filter bank.

17. The method of claim 14, wherein the calculating step calculates the band-pass power distribution for each frequency bandwidth, by calculating a band-pass power for each frequency bandwidth, in each one of a plurality of assumed sound source positions or directions within a prescribed search range.

18. The method of claim 14, wherein the calculating step calculates the band-pass power distribution for each frequency bandwidth by using a filter function configuration having a plurality of delay line taps for each channel.

19. The method of claim 14, wherein the calculating step calculates the band-pass power distribution for each frequency bandwidth by using a minimum variance method for minimizing an output power of the microphone array under constraints that a response of the microphone array for one direction or position is to be maintained constant.

20. The method of claim 14, wherein the extracting step extracts the band-pass power distribution for each frequency bandwidth calculated by the calculating step for the sound source position or direction estimated by the calculating step directly as the speech parameter.

21. The method of claim 14, wherein the calculating step synthesizes the calculated band-pass power distributions for a plurality of frequency bandwidths by weighting the calculated band-pass power distributions with respective weights, and summing weighted band-pass power distributions.

22. The method of claim 14, wherein the calculating step estimates the sound source position or direction by detecting a peak in the synthesized band-pass power distribution and setting a position or direction corresponding to a detected peak as the sound source position or direction.

23. A microphone array input type speech analysis method, comprising the steps of:

inputting speeches in a plurality of channels using a microphone array formed by a plurality of microphones;
analyzing an input speech of each channel inputted by the inputting step, and obtaining band-pass waveforms for each channel, each band-pass waveform being a waveform for each frequency bandwidth;
calculating a band-pass power distribution for each frequency bandwidth from the band-pass waveforms for each frequency bandwidth obtained by the analyzing step, synthesizing calculated band-pass power distributions for a plurality of frequency bandwidths, and estimating a sound source position or direction from a synthesized band-pass power distribution; and
extracting a speech parameter from the band-pass power distribution for each frequency bandwidth calculated by the calculating step, according to the sound source position or direction estimated by the calculating step.

24. The method of claim 23, wherein the calculating step includes the steps of:

a low resolution sound source position estimation step for estimating a rough sound source position or direction, by minimizing an output power of the microphone array under constraints that responses of the microphone array for a plurality of directions or positions are to be maintained constant; and
a high resolution sound source position estimation step for estimating an accurate sound source position or direction in a vicinity of the rough sound source position or direction estimated by the low resolution sound source position estimation step, by minimizing the output power of the microphone array under constraints that a response of the microphone array for one direction or position is to be maintained constant, wherein the extracting step extracts the speech parameter according to the accurate sound source position or direction.

25. A microphone array input type speech analysis method, comprising the steps of:

inputting speeches in a plurality of channels using a microphone array formed by a plurality of microphones;
analyzing an input speech of each channel inputted by the inputting step, and obtaining band-pass waveforms for each channel, each band-pass waveform being a waveform for each frequency bandwidth; and
calculating a band-pass power distribution for each frequency bandwidth from the band-pass waveforms for each frequency bandwidth obtained by the analyzing step, synthesizing calculated band-pass power distributions for a plurality of frequency bandwidths, and estimating a sound source position or direction from a synthesized band-pass power distribution.

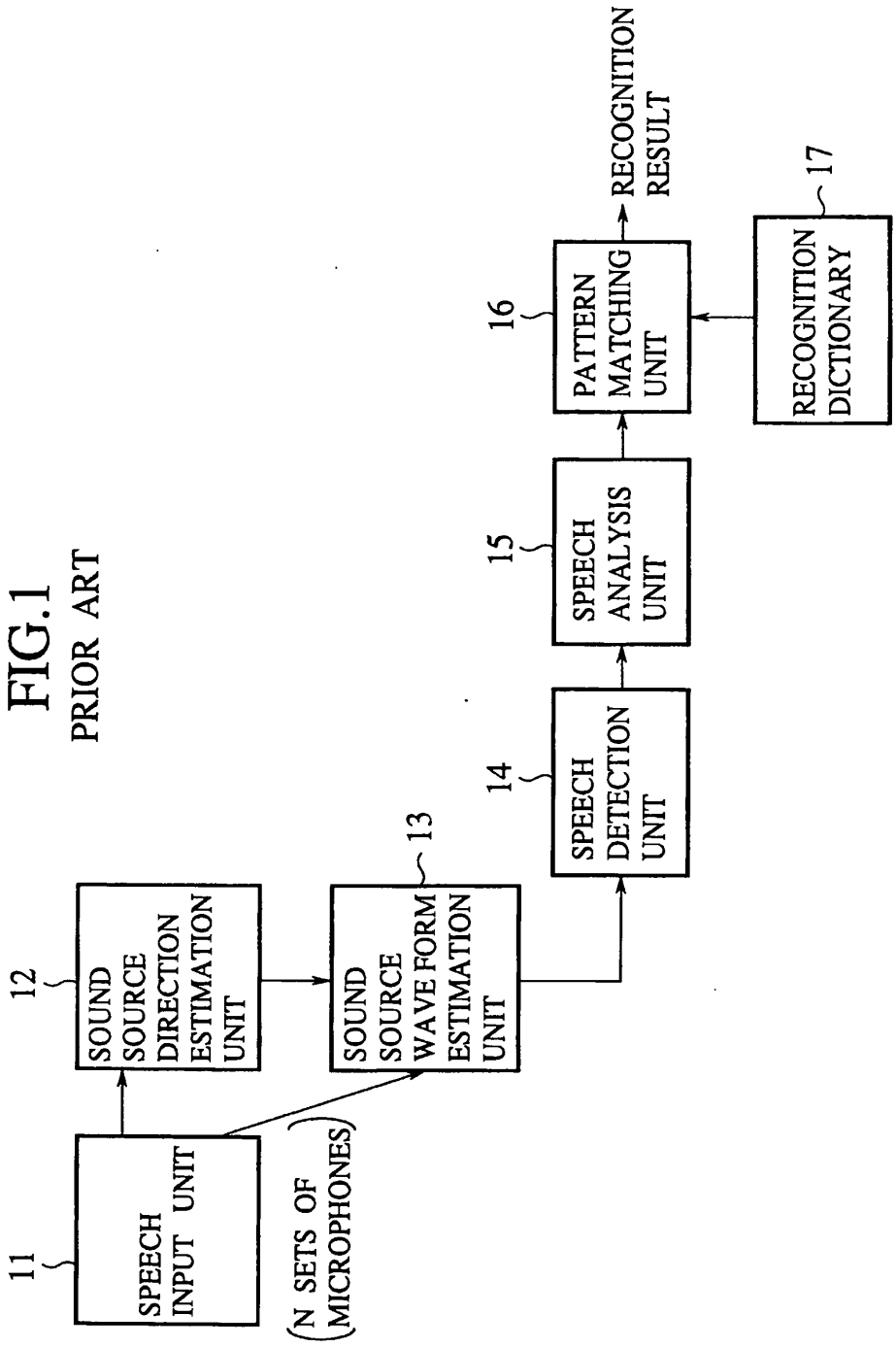
Meta Platforms, Inc. - Exhibit 1002
Page 130 of 686

26. The method of claim 25, wherein the calculating step includes the steps of:

a low resolution sound source position estimation step for estimating a rough sound source position or direction, by minimizing an output power of the microphone array under constraints that responses of the microphone array for a plurality of directions or positions are to be maintained constant; and
a high resolution sound source position estimation step for estimating an accurate sound source position or direction in a vicinity of the rough sound source position or direction estimated by the low resolution sound source position estimation step, by minimizing the output power of the microphone array under constraints that a response of the microphone array for one direction or position is to be maintained constant.

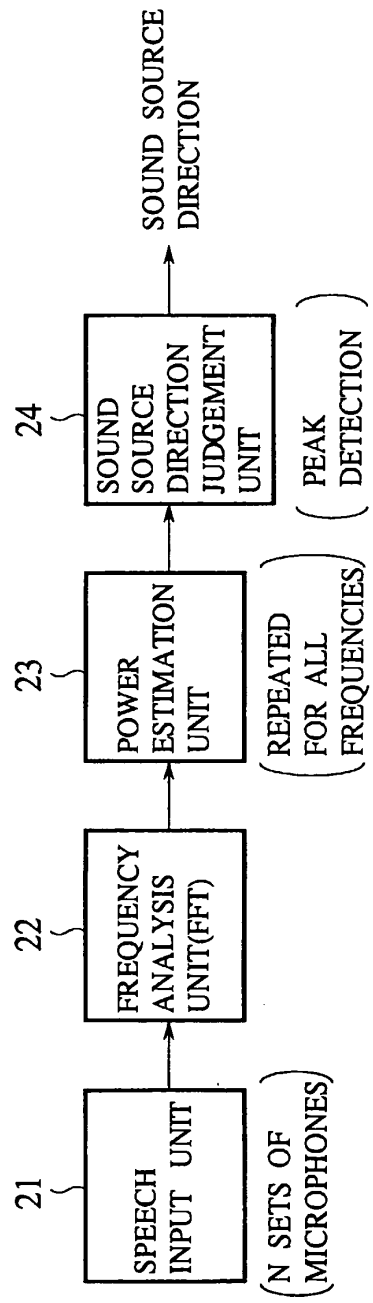
Meta Platforms, Inc. - Exhibit 1002
Page 131 of 686

FIG.1
PRIOR ART



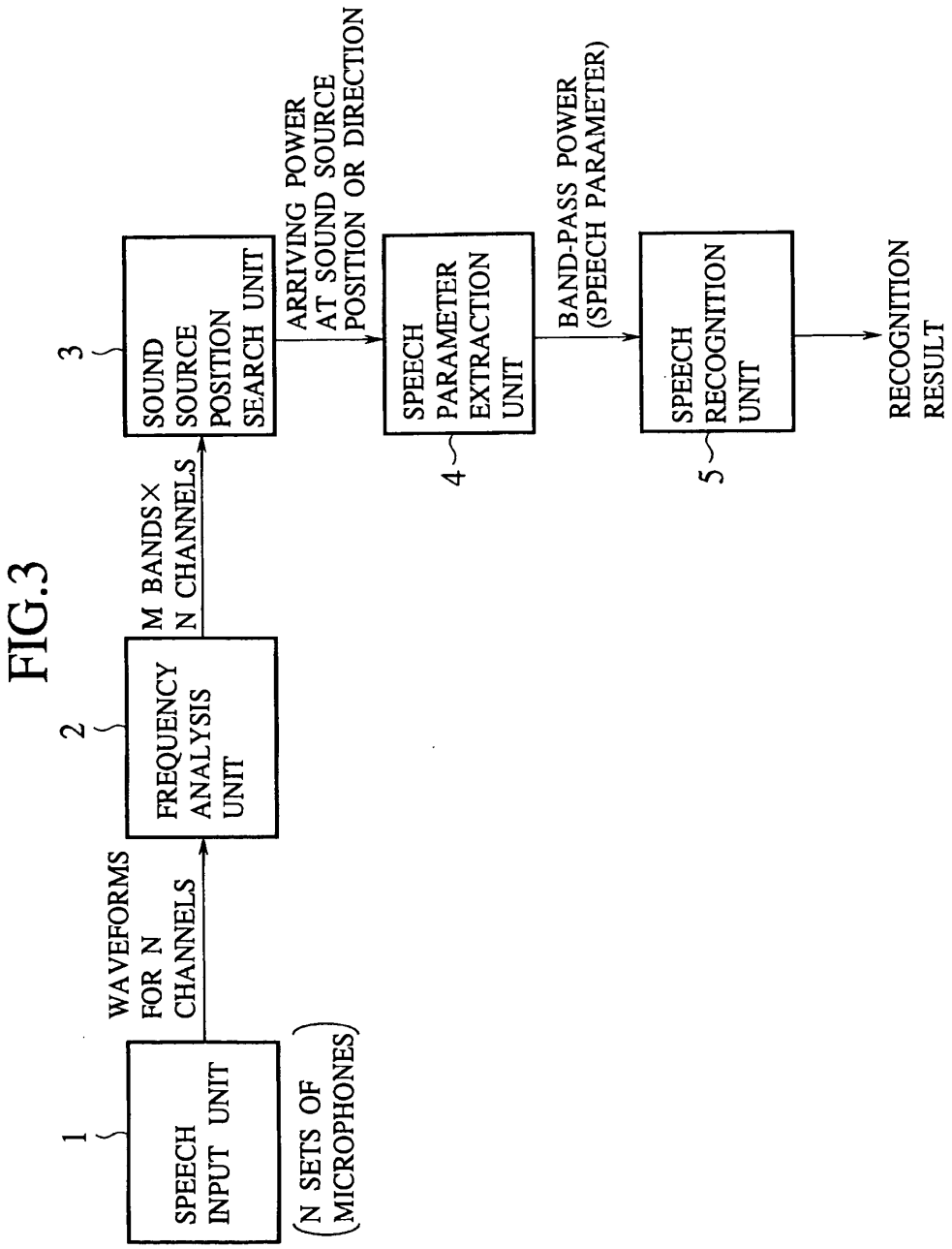
Meta Platforms, Inc. - Exhibit 1002
Page 132 of 686

FIG.2
PRIOR ART



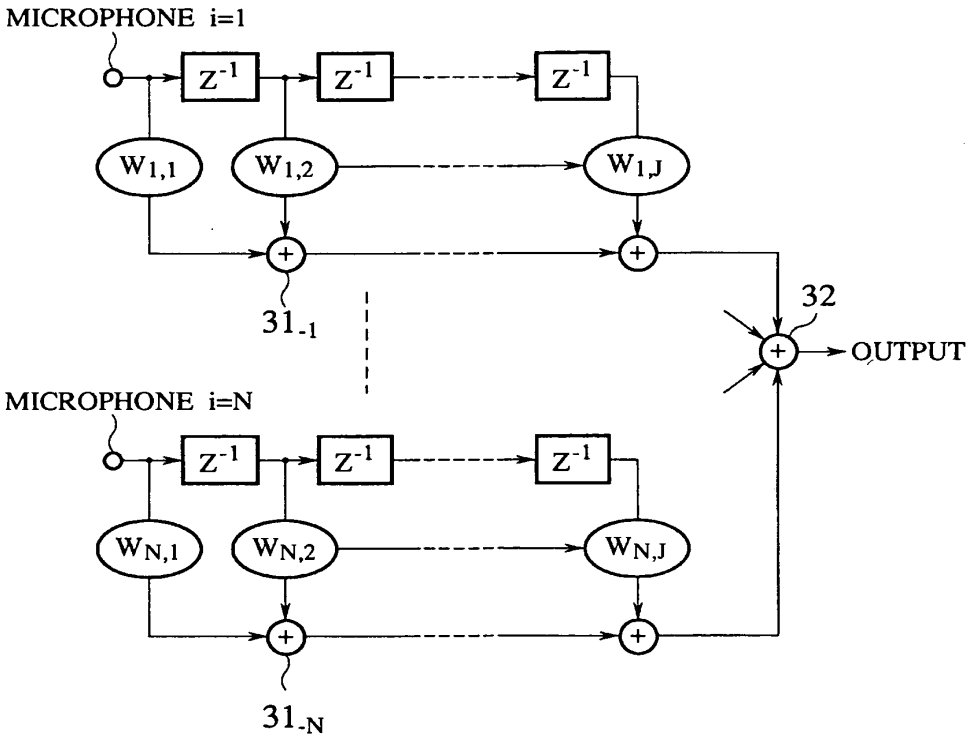
Meta Platforms, Inc. - Exhibit 1002
Page 133 of 686

FIG.3



Meta Platforms, Inc. - Exhibit 1002
Page 134 of 686

FIG.4



Meta Platforms, Inc. - Exhibit 1002
Page 135 of 686

FIG.5A

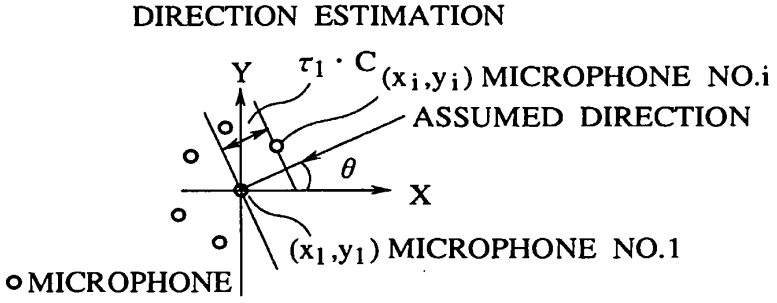


FIG.5B

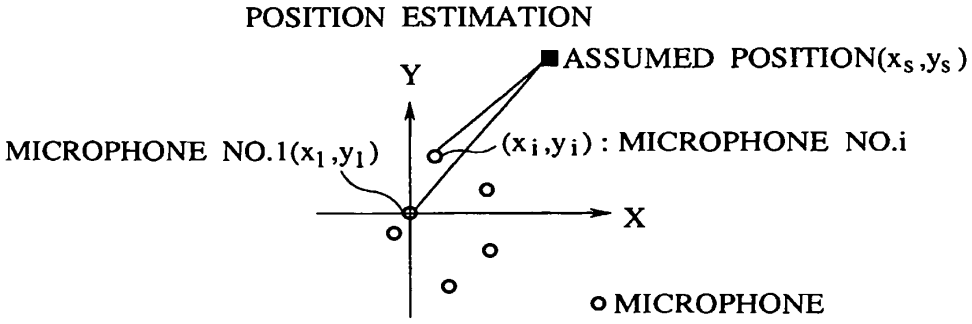
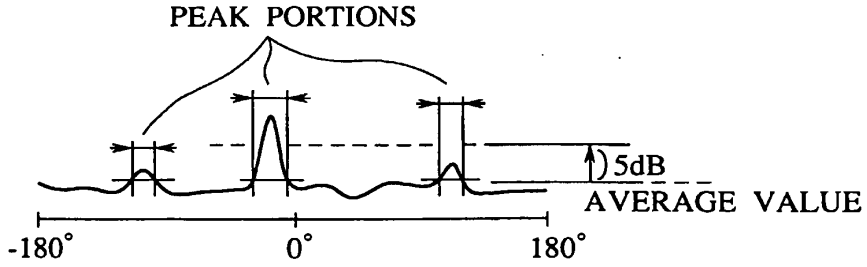
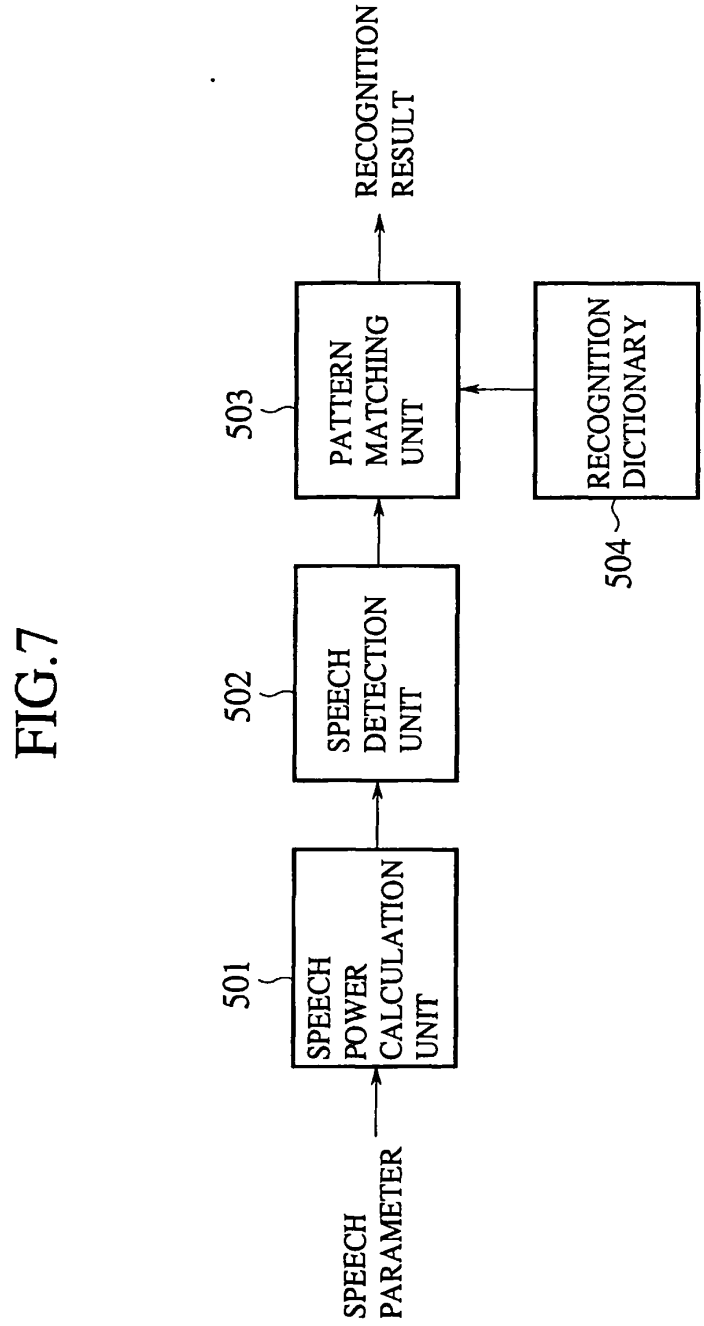


FIG.6



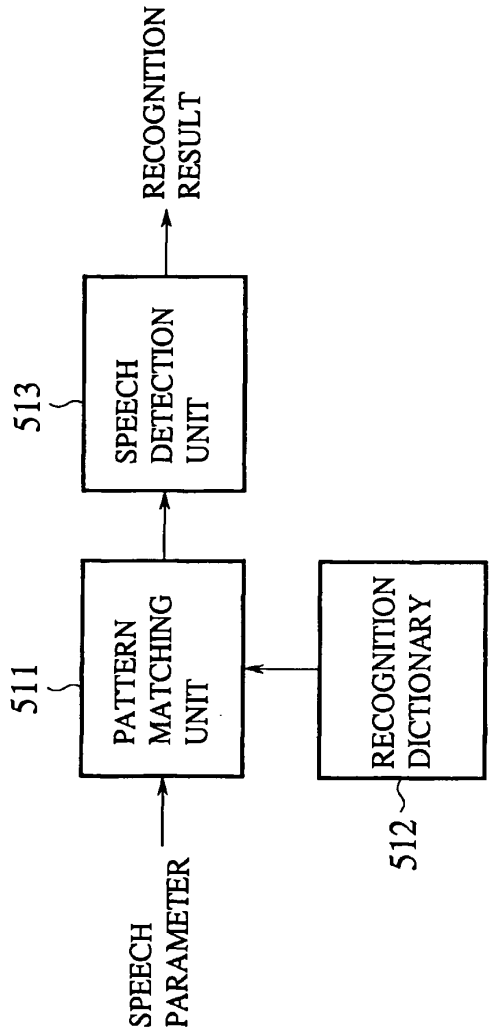
Meta Platforms, Inc. - Exhibit 1002
Page 136 of 686

FIG.7



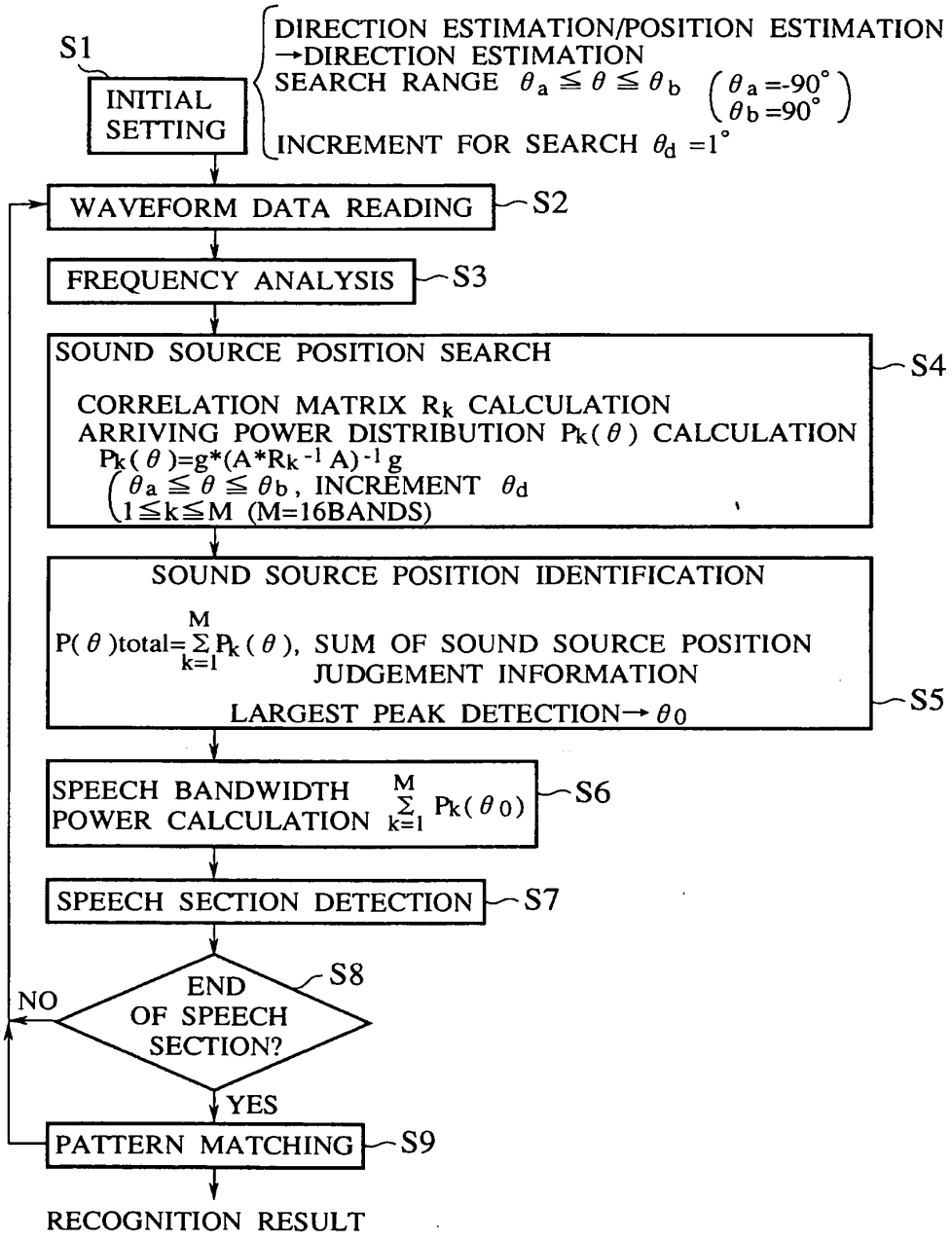
Meta Platforms, Inc. - Exhibit 1002
Page 137 of 686

FIG.8



Meta Platforms, Inc. - Exhibit 1002
Page 138 of 686

FIG.9



Meta Platforms, Inc. - Exhibit 1002
Page 139 of 686

FIG.10

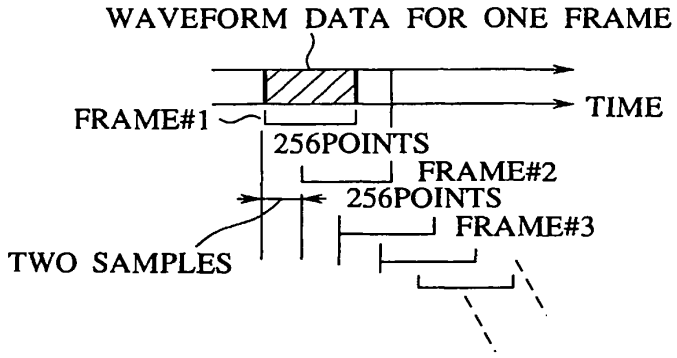


FIG.11A

HIGH RESOLUTION, COARSE SEARCH

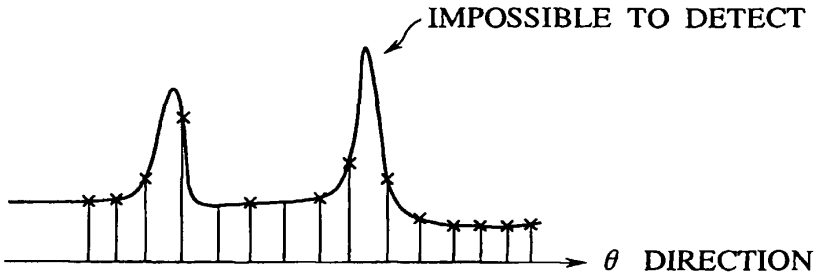
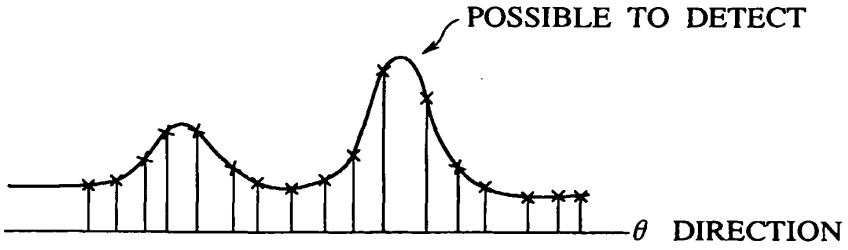


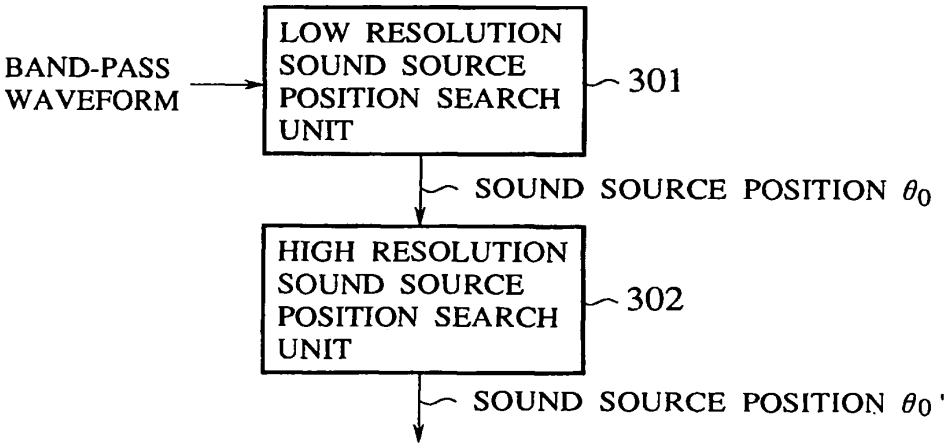
FIG.11B

LOW RESOLUTION, COARSE SEARCH



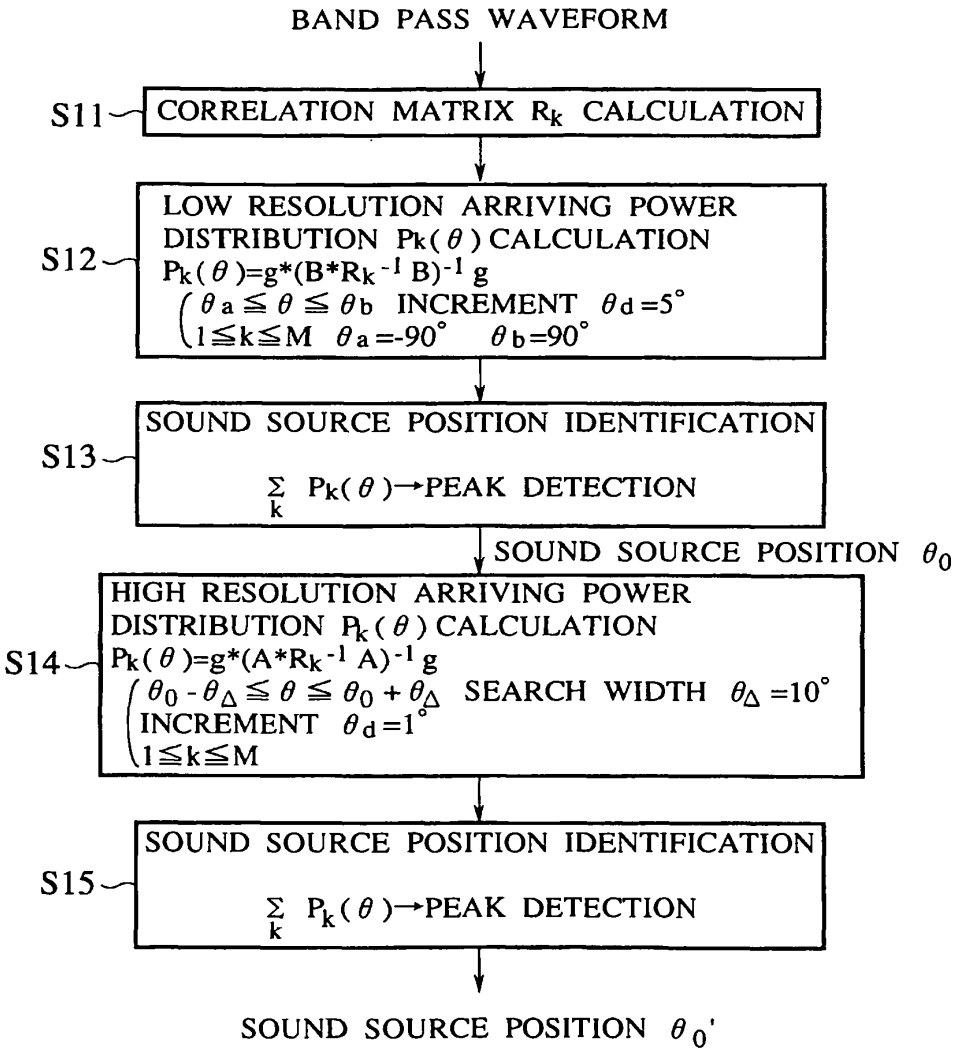
Meta Platforms, Inc. - Exhibit 1002
Page 140 of 686

FIG.12



Meta Platforms, Inc. - Exhibit 1002
Page 141 of 686

FIG.13



Meta Platforms, Inc. - Exhibit 1002
Page 142 of 686

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 984 660 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.03.2000 Bulletin 2000/10

(51) Int. Cl.[7]: **H04R 1/10**, H04R 1/46

(21) Application number: **99123289.3**

(22) Date of filing: **16.05.1995**

(84) Designated Contracting States:
DE FR GB

(30) Priority: **18.05.1994 JP 10376694**
29.08.1994 JP 20397794

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
95107430.1 / 0 683 621

(71) Applicant:
Nippon Telegraph and Telephone Corporation
Tokyo 100-8116 (JP)

(72) Inventors:
- **Aoki, Shigeaki**
  Yokosuka-shi, Kanagawa (JP)
- **Mitsuhashi, Kazumasa**
  Zushi-shi, Kanagawa (JP)
- **Nishino, Yutaka**
  Miura-shi, Kanagawa (JP)
- **Matsumoto, Kohichi**
  Yokosuka-shi, Kanagawa (JP)
- **Yuse, Chikara**
  Yokosuka-shi, Kanagawa (JP)
- **Matsui, Hiroyuki**
  Yokohama-shi, Kanagawa (JP)

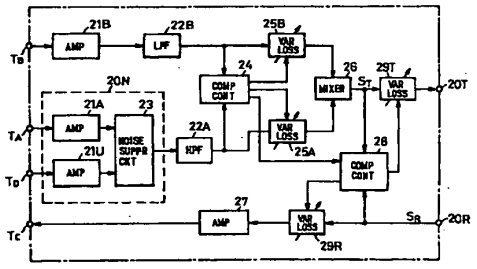
(74) Representative:
Hoffmann, Eckart, Dipl.-Ing.
Patentanwalt,
Bahnhofstrasse 103
82166 Gräfelfing (DE)

Remarks:
This application was filed on 30 - 11 - 1999 as a divisional application to the application mentioned under INID code 62.

(54) Transmitter-receiver having ear-piece type acoustic transducer part

(57) A transmitter-receiver comprising: acoustic transducing means composed of a bone-conducted sound pickup microphone (14) for picking up a bone-conducted sound, a directional microphone (15) for picking up an air-conducted sound, an omnidirectional microphone (16) for detecting noise, and a receiver (17) for transducing a received speech signal to a received speech sound; a low-pass filter (22B) which permits the passage therethrough of those low-frequency components in the output from said bone-conducted sound pickup microphone which are lower than a predetermined cutoff frequency; a noise suppressing part (20N) which combines the outputs from said directional microphone (15) and said omnidirectional microphone (16) to suppress a noise component; a high-pass filter (22A) which permits the passage therethrough of those high-frequency components in the output from said noise suppressing part which are higher than said cutoff frequency; a combining circuit (26) which combines the outputs from said low-pass filter and said high-pass filter and outputs a speech sending signal; and means (27) for supplying said received speech signal to said receiver.

FIG. 2



EP 0 984 660 A2

Printed by Xerox (UK) Business Services
2.16.7/3.6

BEST AVAILABLE COPY

Description

TECHNICAL FIELD

[0001] The present invention relates to a transmitter-receiver which comprises an ear-piece type acoustic transducing part having a microphone and a receiver formed as a unitary structure and a transmitting-receiving circuit connected to the acoustic transducing part and which permits hands-free communications. More particularly, the invention pertains to a transmitter-receiver which has an air-conducted sound pickup microphone and a bone-conducted sound pickup.

BACKGROUND OF THE INVENTION

[0002] Conventionally, this kind of transmitter-receiver employs, as its ear-piece or ear-set type acoustic transducing part, means which picks up vibrations of the skull caused from talking sound by an acceleration pickup set in the auditory canal (which means will hereinafter be referred to also as a bone-conducted sound pickup microphone and the speech sending signal picked up by this means will hereinafter be referred to as a "bone-conducted sound signal"), or (2) means which guides a speech or talking sound as vibrations of air by a sound pickup tube extending to the vicinity of the mouth and picks up the sound by a microphone set on an ear (which means will hereinafter be referred to also as an air-conducted sound pickup microphone and the speech sending signal picked up by this means will hereinafter be referred to as an "air-conducted sound signal").

[0003] Such a conventional transmitter-receiver of the type which sends speech through utilization of bone conduction is advantageous in that it can be used even in a high-noise environment and permits hands-free communications. However, this transmitter-receiver is not suited to ordinary communications because of its disadvantages that the clarity of articulation of the transmitted speech is so low that the listener cannot easily identify the talker, that the clarity of articulation of the transmitted speech greatly varies from person to person or according to the way of setting the acoustic transducing part on an ear, and that an abnormal sound as by the friction of cords is also picked up. On the other hand, the transmitter-receiver of the type utilizing air conduction is more excellent in clarity than the above but has defects that it is inconvenient to handle when the sound pickup tube is long and that the speech sending signal is readily affected by ambient noise when the tube is short.

[0004] The air-conducted sound pickup microphone picks up sounds having propagated through the air, and hence has a feature that the tone quality of the picked-up speech signals is relatively good but is easily affected by ambient noise. The bone-conducted sound pickup microphone picks up a talker's vocal sound transmitted through the skull into the ear set, and hence has a feature that the tone quality of the picked-up speech signal is relatively low because of large attenuation of components above 1 to 2 kHz but that the speech signal is relatively free from the influence of ambient noise. As a transmitter-receiver assembly for sending excellent speech (acoustic) signals through utilization of the merits of such air-conducted sound pickup microphone and bone-conducted sound pickup microphone, there is disclosed in Japanese Utility Model Registration Application Laid-Open No. 206393/89 a device according to the prior art portion of claim 1 that mixes the speech signal picked up by the air-conducted sound pickup microphone and the speech signal picked up by the bone-conducted sound pickup microphone.

[0005] According to this device, the speech signals from the bone conduction type microphone and the air conduction type microphone are both applied to a low-pass filter and a high-pass filter which have a cutoff frequency of 1 to 2 kHz, then fed to variable attenuators and combined by a mixer into a speech sending signal. With this configuration, low-frequency noises in the output from the air conduction type microphone which are lower than the cutoff frequency are removed, and it is possible to remove or cancel components higher than the cutoff frequency in the noise which the bone conduction type microphone is likely to pick up, such as frictional noise by the friction between a cord extending from the ear set and the human body or clothing, or wind noise by the wind blowing against the ear set. Moreover, in a high-noise environment, the SN ratio of the speech sending signal can be improved by decreasing the attenuation of the bone-conducted sound signal from the low-pass filter and increasing the attenuation of the air-conducted sound signal from the high-pass filter through manual control.

[0006] With this configuration, however, when the level of noise from the air-conducted sound pickup microphone is high, the frequency components higher than the cutoff frequency need to be appreciably attenuated for the purpose of attenuating the noise, and consequently, the speech sending signal is substantially composed only of the bone-conducted sound signal components, and hence is extremely low in tone quality. Moreover, the attenuation control by the variable attenuator is manually effected by an ear set user and the user does not monitor the speech sending signal; hence, it is almost impossible to set the attenuation to the optimum value under circumstances where the amount of noise varies. Furthermore, it is cumbersome to manually control the ratio of combining the speech signal from the air-conducted sound pickup microphone and the speech signal from the bone-conducted sound pickup microphone.

Meta Platforms, Inc. - Exhibit 1002
Page 144 of 686

SUMMARY OF THE INVENTION

[0007] It is therefore an object of the present invention to provide a transmitter-receiver which automatically processes the speech sending signal in accordance with use environments (such as the tone quality and the amount of sound) to send speech of the best tone quality.

[0008] This object is achieved with transmitter-receiver as claimed in claim 1. Preferred embodiments are subject-matter of the dependent claims.

[0009] According to the present invention, it is possible to efficiently cancel the noise component in the air-conducted sound by the noise component from the omnidirectionnal microphone and to effectively prevent howling which results from the coupling the speech sending signal and the received speech signal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Fig. 1 is a sectional view illustrating the configuration of an acoustic transducing part for use in a first embodiment of the present invention;

Fig. 2 is a block diagram illustrating the construction of a transmitting-receiving circuit connected to the acoustic transducing part in Fig. 1;

Fig. 3 is a diagram for explaining the characteristics of a directional microphone and an omnidirectional microphone;

Fig. 4 is a table for explaining control operations of a comparison/control circuit 24 shown in Fig. 2;

Fig. 5 is a block diagram illustrating a transmitter-receiver according to a second embodiment of the present invention;

Fig. 6 is a graph showing the relationship between the tone quality of an air-conducted sound signal and the ambient noise level, and the relationship between the tone quality of a bone-conducted sound signal and the ambient noise level;

Fig. 7 is a graph showing the relationship of the ambient noise level to the level ratio between the bone-conducted sound signal and the air-conducted sound signal in the listening or silent state;

Fig. 8 is a graph showing the relationship of the ambient noise level to the level ratio between the bone-conducted sound signal and the air-conducted sound signal in the talking or double-talking state;

Fig. 9 is a table for explaining operating states of the Fig. 5 embodiment;

Fig. 10A is a blocked diagram showing the construction of a signal mixing circuit which is used as a substitute for each of signal select circuits 33_1 to 33_n in the Fig. 5 embodiment;

Fig. 10B is a graph showing the mixing operation of the circuit shown in Fig. 10A;

Fig. 11 is a block diagram illustrating a modified form of the Fig. 5 embodiment; and

Fig. 12 is a block diagram showing the comparison/control circuit 32 in Fig. 5 or 11 constructed as an analog circuit.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] In Fig. 1 there is schematically illustrated the configuration of an ear-piece type acoustic transducing part 10 for use in an embodiment of the present invention. Reference numeral 11 denotes a case of the ear-piece type acoustic transducing part 10 wherein various acoustic transducers described later are housed, 12 a lug or protrusion for insertion into the auditory canal 50, and 13 a sound pickup tube for picking up air-conducted sounds. The sound pickup tube 13 is designed so that it faces the user's mouth when the lug 12 is put in the auditory canal 50; that is, it is adapted to pick up sounds only in a particular direction. The lug 12 and the sound pickup tube 13 are formed as a unitary structure with the case 11.

[0012] Reference numeral 14 denotes an acceleration pickup (hereinafter also referred to as a bone-conducted sound microphone) for picking up bone-conducted sounds, and 15 a directional microphone for picking up air-conducted sounds (i.e. an air-conducted sound pickup microphone), which has such directional characteristics that its sensitivity is high in the direction of the user's mouth (i.e. in the direction of the sound pickup tube 13). The directional microphone 15 has its directivity defined by the combining of sound pressure levels of a sound picked up from the front of the microphone 15 and a sound picked up from behind through a guide hole 11. Accordingly, the directivity could also be obtained even if the sound pickup tube 13 is removed to expose the front of the directional microphone 15 in the surface of the case 11.

[0013] Reference numeral 16 denotes an omnidirectional microphone for detecting noise, which has a sound pickup aperture or opening in the direction opposite to the directional microphone 15. Reference numeral 17 denotes an elec-

Meta Platforms, Inc. - Exhibit 1002
Page 145 of 686

tro-acoustic transducer (hereinafter referred to as a receiver) for transducing a received speech signal into a sound, and 18 lead wires for interconnecting the acoustic transducing part 10 and a transmitting-receiving circuit 20 described later; the transmitting-receiving circuit 20 has its terminals T_A, T_B, T_C and T_D connected via the lead wires 18 to the directional microphone 15, the bone-conducted pickup sound microphone 14, the receiver 17 and the omnidirectional microphone 16, respectively.

[0014] In Fig. 2 there is shown in block form the configuration of the transmitting-receiving circuit 20 which is connected to the acoustic transducing part 10 exemplified in Fig. 1. In Fig. 2 terminals T_A, T_B, T_C and T_D are connected to those T_A, T_B, T_C and T_D in Fig. 1, respectively.

[0015] Reference numeral 21B denotes an amplifier for amplifying a bone-conducted sound signal from the microphone 14, and 21A an amplifier for amplifying an air-conducted sound signal from the directional, microphone 15. The gains of the amplifiers 21B and 21A are preset so that their output speech signal levels during a no-noise period are of about the same order at the inputs of a comparison/control circuit 24 described later. Reference numeral 21U denotes an amplifier which amplifies a noise signal from the noise detecting omnidirectional microphone 16 and whose gain is preset so that its noise output during a silent period becomes substantially the same as the noise output level of the amplifier 21A in a noise suppressor circuit 23 described later. The amplifiers 21A and 21B and the noise suppressor circuits 23 constitute a noise suppressing part 20N. The noise suppressor circuit 23 substantially cancels the noise signal by adding together the outputs from the amplifiers 21A and 21U after putting them 180° out of phase to each other.

[0016] Reference numeral 22B denotes a low-pass filter (LPF), which may preferably be one that approximates characteristics inverse to the frequency characteristics of the microphone 14 used; but it may be a simple low-pass filter of a characteristic such that it cuts the high-frequency components of the output signal from the amplifier 21B but passes therethrough the low-frequency components, and its cutoff frequency is selected within the range of 1 to 2 kHz. Reference numeral 22A denotes a high-pass filter (HPF), which may preferably be one that approximates characteristics inverse to the frequency characteristics of the directional microphone 15; but it may be a simple high-pass filter of a characteristic such that it cuts the low-frequency components of the output signal from the noise suppressor circuit 23 and passes therethrough the high-frequency components, and its cutoff frequency is selected within the range of 1 to 2 kHz.

[0017] The directional microphone 15 and the omnidirectional microphone 16 bear such a relationship of sensitivity characteristic that the former has a high sensitivity within a narrow azimuth angle but the latter substantially the same in all directions as indicated by ideal sensitivity characteristics 15S and 16S in Fig. 3, respectively. Then, assuming that the ambient noise level is the same in any directions and at any positions, and letting the total amount of noise energy per unit time applied to the omnidirectional microphone 16 from all directions be represented by the surface area N_U of a sphere with a radius r, the noise energy per unit time applied to the directional microphone 15 is represented by an area N_A defined by the spreading angle of its directional characteristic on the surface of the sphere. Hence, their energy ratio N_A/N_U takes a value sufficiently smaller than one. Now, assume that the amounts of speech energy S_A and S_U applied to the directional microphone 15 and the omnidirectional microphone 16 take the same value S, and let the gains of the amplifiers 21A and 21U be represented by G_A and G_U, respectively. By setting that a value G_AN_A is nearly equal to a value G_UN_U, noise is substantially canceled by the noise suppressor circuit 23 but the speech signal level at the output of the noise suppressor circuit 23 becomes $G_AS\text{-}G_US=G_AS(1\text{-}N_A/N_U)$, since the energy ratio N_A/N_U is sufficiently smaller than one, the speech level is nearly equal to G_AS--this indicates that a speech signal in the air-conducted sound signal can effectively extracted therefrom ideally. The noise suppressing effect that could be achieved by the directional microphone 15, the omnidirectional microphone 16 and the noise suppressing part 20N actually used was typically in the range of 3 to 10 dB.

[0018] In Fig. 2 the bone-conducted sound signal and the air-conducted sound signal, which have their frequency characteristics equalized by the low-pass filter 22B and the high-pass filter 22A, respectively, are applied to the comparison/control circuit 24, wherein their levels V_B and V_A are compared with predetermined reference levels V_{RB} and V_{RA}, respectively. Based on the results of comparison, the comparison/control circuit 24 controls losses L_B and L_A of variable loss circuits 25B and 25A, thereby controlling the levels of the bone- and air-conducted sound signals. A mixer circuit 26 mixes the bone-conducted sound signal and the air-conducted sound signal having passed through the variable loss circuits 25B and 25A. The thus mixed signal is provided as a speech sending signal S_T to a speech sending signal output terminal 20T via a variable loss circuit 29T. A comparison/control circuit 28 compares the level of a speech receiving signal S_R and the level of the speech sending signal S_T with predetermined reference levels V_{RR} and V_{RT}, respectively, and, based on the results of comparison, controls the losses of variable loss circuits 29T and 29R, thereby controlling the levels of the speech sending signal and the speech receiving signal to suppress an echo or howling. The speech receiving signal from the variable loss circuit 29R is amplified by an amplifier 27 to an appropriate level and then applied to the receiver 17 via the terminal T_C.

[0019] Fig. 4 is a table for explaining the control operations of the comparison/control circuit 24 in Fig. 2. The comparison/control circuit 24 compares the output level V_B of the low-pass filter 226 and the output level V_A of the high-pass filter 22A with the predetermined reference levels V_{RB} and V_{RA}, respectively, and determines if the bone- and air-con-

Meta Platforms, Inc. - Exhibit 1002
Page 146 of 686

ducted sound signals are present (white circles) or absent (crosses), depending upon whether the output levels are higher or lower than the reference levels. In Fig. 4, state 1 indicates a state in which the bone-conducted sound signal (the output from the low-pass filter 23B) and the air-conducted sound signal (the output from the high-pass filter 23A), both frequency-equalized, are present at the same time, that is, a speech sending or talking state. State 2 indicates a state in which the bone-conducted sound signal is present but the air-conducted sound signal is absent, that is, a state in which the microphone 14 is picking up abnormal sounds such as wind noise of the case 11 and frictional sounds by the lead wires 18 and the human body or clothing. State 3 indicates a state in which the air-conducted sound signal is present but the bone-conducted sound signal is absent, that is, a state in which no speech signal is being sent and the noise component of the ambient sound picked up by the directional microphone 15 which has not been canceled by the noise suppressor circuit 23 is being outputted. State 4 indicates a state in which neither of the bone-and air-conducted sound signals is present, that is, a state in which no speech signal is being sent and no noise is present. The control operations described in the right-hand columns of the Fig. 4 table show the operations which the comparison/control circuit 24 performs with respect to the variable loss circuits 25B and 25A in accordance with the above-mentioned states 1 to 4, respectively.

[0020] Next, a description will be given of the operation of this embodiment of the above construction. When a user of this transmitter-receiver utters a vocal sound with the ear-piece type acoustic transducing part 10 of Fig. 1 put on his or her ear, the vibration of the skull as well as aerial vibration are created by the vibration of the vocal chords. The vibration of the skull is picked up as a bone-conducted sound signal by the microphone 14, from which the signal is provided via the terminal T_B to the amplifier 21B. The aerial vibration of the speech is picked up by the directional microphone 15, from which the signal is provided as an air-conducted sound signal to the amplifier 21A via the terminal T_A.

[0021] In general, as compared with the air-conducted sound, the bone-conducted sound has many low-frequency components, makes less contribution to articulation and contains, in smaller quantity, high-frequency components which are important for the expression of consonants. On the other hand, abnormal sounds such as wind noise by the wind blowing against the case 11 and frictional sound between the cords (lead wires) 18 and the human body or clothing are present in lower and higher frequency bands than the cutoff frequencies of the filters 22A and 22B. Such wind noise and frictional sounds constitute contributing factors to the lack of articulation of the speech sending sound by the bone conduction and the formation of abnormal sounds. On the other hand, "speech" passes through the sound pickup tube 13 and is picked up as an air-conducted sound signal by the directional microphone 15, from which it is applied to the amplifier 21A via the terminal T_A. The air-conducted sound by a talker's speech is a human voice itself, and hence contains frequency components spanning low and high frequency bands.

[0022] In this embodiment, as described in the afore-mentioned Japanese Utility Model Registration Application Laid-Open Gazette, the high-frequency components of the bone-conducted sound from the amplifier 21B are removed by the low-pass filter 228 to extract the low-frequency components alone and this bone-conducted sound signal having the high-frequency components thus cut out therefrom is mixed with an air-conducted sound signal having cut out therefrom the low-frequency components by the high-pass filter 22A. By this, a speech sending signal is generated which has compensated for the degradation of the articulation which would be caused by the lack of the high-frequency components when the speech sending signal is composed only of the bone-conducted sound signal. Besides, according to the present invention, the processing for the generation of such a speech sending signal is automatically controlled to be optimal in accordance with each of the states shown in Fig. 4, by which it is possible to generate a speech sending signal of the best tone quality on the basis of time-varying ambient noise and the speech transmitting-receiving state.

[0023] The noise levels at the directional microphone 15 and the omnidirectional microphone 16 can be regarded as about the same level as referred to previously; but, because of a difference in their directional sensitivity characteristic, the directional microphone 15 picks up a smaller amount of noise energy than does the omnidirectional microphone 16, and hence provides a higher SN ratio. Since the gains G_A and G_U of the amplifiers 21A and 21U are predetermined so that their output noise levels become nearly equal to each other as mentioned previously, the gain G_A of the amplifier 21A is kept sufficiently larger than the gain G_U of the amplifier 21U. Hence, the user's speech signal is amplified by the amplifier 21A with the large gain G_A and takes a level higher than the noise signal level.

[0024] The comparison/control circuit 24 compares, at regular time intervals (1 sec, for instance), the outputs from the low-pass filter 22B (for the bone-conducted sound) and the high-pass filter 22A (for the air-conducted sound) with the reference levels V_{RB} and V_{RA}, respectively, to perform such control operations as shown in Fig. 4. At first, the characteristic of the transmitter-receiver of the present invention immediately after its assembling is adjusted (or initialized) by setting the losses L_B and L_A of the variable loss circuits 25B and 25A to initial values L_{BO} and L_{AO} so that the level of the air-conducted sound signal to be input into the mixer 26 is higher than the level of the bone-conducted sound signal by 3 to 10 dB when no noise is present (State 4 in Fig. 4). The reason for this is that it is preferable in terms of articulation that the air-conducted sound be larger than the bone-conducted one under circumstances where no noise is present.

[0025] Next, a description will be given of the actual state of use in which the levels of the bone-and air-conducted sound signals vary every moment.

Meta Platforms, Inc. - Exhibit 1002
Page 147 of 686

(a) When the output (the bone-conducted sound signal) from the low-pass filter 22B is not present (State 3 or 4 in Fig. 4):

The comparison/control circuit 24 compares the output level V_A of the high-pass filter 22A with the reference level V_{RA}. When the output from the high-pass filter 22A is smaller than the reference level V_{RA} (State 4), the comparison/control circuit 24 decides that noise is not present or small and that no talks are being carried out and sets the losses of the variable loss circuits 25B and 25A to the afore-mentioned initial values L_{BO} and L_{AO}, respectively. When this state changes to the talking state (State 1), a mixture of the bone-conducted sound signal composed of law-frequency components and the air-conducted sound signal composed of high-frequency components is provided as the speech sending signal S_T at the output of the mixer circuit 26.

Next, when the output level V_B of the low-pass filter 22B is smaller than the reference level V_{RB} and the output level V_A of the high-pass filter 22A is larger than the reference level V_{RA} (State 3), the comparison/control circuit 24 decides that no talks are being carried out and that ambient noise is large. In this instance, the comparison/control circuit 24 applies a control signal C_A to the variable loss circuit 25A to set its loss L_A to a value larger than the initial value L_{AO} in proportion to the difference between the output level V_A of the high-pass filter 22A and the reference level value V_{RA} as expressed by such an equation as follows:

$$L_A = \lceil (V_A - V_{RA}) / V_M \rceil K + L_{AO} \quad (1)$$

where K is a predetermined constant and the notation $\lceil x \rceil$ represents the smallest integer greater than x. Alternatively, it is possible to increase the loss L_A by a constant K on a stepwise basis each time the level difference (V_A-V_{RA}) increases by a constant V_M, as expressed by the following equation.

$$L_A = K (V_A - V_{RA}) + L_{AO} \quad (2)$$

When the output from the low-pass filter 22B becomes larger than the reference level V_{RB}, that is, when this State 3 changes to the talking state (State 1), the losses of the variable loss circuits 25A and 25B are not changed but are kept at the values set in the immediately preceding State 3. By this, the bone-conducted sound signal composed of low-frequency components and the air-conducted sound signal of the same level as or lower than the level of the bone-conducted sound signal and composed of high-frequency components are mixed by the mixer circuit 26 into the speech sending signal S_T. In this case, it is also possible to hold the loss of the variable loss circuit 25A unchanged and control the loss of the variable loss circuit 25B so that the mixed output level of the mixer circuit 26 takes a predetermined value.

(b) When the output (the bone-conducted sound signal) level V_B of the low-pass filter 22B is larger than the reference level V_{RB} (State 1 or 2 in Fig. 4):

The comparison/control circuit 24 checks the output level V_A of the high-pass filter 22A and, if it is smaller than the reference level V_{RA} (State 2), determines that no talks are being carried out and that the microphone 14 is picking up abnormal sounds. In such an instance, the comparison/control circuit 24 applies a control signal C_B to the variable loss circuit 25B to set its loss L_B to a value greater than the initial value L_{BO} in proportion to the difference between the output level V_B of the low-pass filter 22B and the reference level V_{RA}, as expressed by the following equation.

$$L_B = K (V_B - V_{RB}) + L_{BO} \quad (3)$$

Alternatively, as is the case with the above, the loss L_B may be controlled as expressed by the following equation.

$$L_B = \lceil (V_B - V_{RB}) / V_M \rceil K + L_{BO} \quad (4)$$

When the output level V_A of the high-pass filter 22A becomes larger than the reference level V_{RA}, that is, when this State 2 changes to the talking state (State 1), the losses of the variable loss circuits 25A and 25B are held unchanged, and hence are kept at the values set in the immediately preceding State 2. An air-conducted sound signal composed of high-frequency components and a bone-conducted sound signal of a level set in accordance with the output level V_B of the low-pass filter 22B and composed of low-frequency components are mixed together by the mixer circuit 26. In this instance, it is also possible to hold the loss of the variable loss circuit 25B unchanged and control the loss of the variable loss circuit 25A so that the output level of the mixer circuit 26 may assume the

Meta Platforms, Inc. - Exhibit 1002
Page 148 of 686

afore-mentioned predetermined fixed value.

[0026] Next, when the output level V_A of the high-pass filter 22A is larger than the reference level V_{RA} (State 1), the comparison/control circuit 24 decides that the state is the talking state, and causes the variable loss circuits 25B and 25A to hold losses set in the state immediately preceding State 1. As a result, bone- and air-conducted sound signals of levels controlled in accordance with the losses held unchanged are mixed by the mixer circuit 26, which provides the speech sending signal S_T.

[0027] Incidentally, the variable loss circuits 29T and 29R and the comparison/control circuit 28 are provided to suppress the generation of an echo and howling which result from the coupling of the speech sending system and the speech receiving system. The ear-piece type acoustic transducing part 10 has the following two primary contributing factors to the coupling which leads to the generation of howling. First, when the transmitter-receiver assembly is applied to a telephone set, a two-wire/four-wire junction at a telephone station allows the speech sending signal to sneak as an electrical echo into the speech receiving system from the two-wire/four-wire junction, providing the coupling (sidetone) between the two systems. Second, a speech receiving signal is picked up by the bone-conducted sound pickup microphone 14 or directional microphone 15 as a mechanical vibration from the receiver 17 via the case 11--this also provides the coupling between the two systems. Such phenomena also occur in a loudspeaking telephone system which allows its user to communicate through a microphone and a loudspeaker without the need of holding a handset. In this instance, however, the cause of the sneaking of the received sound into the speech sending system is not the mechanical vibration but the acoustic coupling between the microphone and the speaker through the air.

[0028] This problem could be solved by known techniques such as a method for the suppression of howling in the loudspeaking telephone system. The configuration by the comparison/control circuit 28 and the variable loss circuits 29T and 29R is an example of such a prior art. The comparison/control circuit 28 monitors the output level V_T of the mixer circuit 26 and the signal level V_R at a received speech input terminal 20R and, when the speech receiving signal level V_R is larger than a predetermined level V_{RR} and the output level V_T of the mixer circuit 26 is smaller than a predetermined level V_{RT}, the circuit 28 decides that the transmitter-receiver is in the speech receiving state, and sets a predetermined loss L_T in the variable loss circuit 29T, reducing the coupling of the speech receiving signal to the speech sending system. When the output level V_T of the mixer circuit 26 is larger than the predetermined level V_{RT} and the input level V_R at the speech receiving signal input terminal 20R is lower than the predetermined level V_{RR}, the comparison/control circuit 28 decides that the transmitter-receiver is in the talking state, and sets a predetermined loss L_R in the variable loss circuit 29R, suppressing the sidetone from the speech receiving system. When the output level V_T of the mixer circuit 26 and the input level V_R at the speech receiving signal input terminal 20R are higher than the predetermined levels V_{RT} and V_{RR}, respectively, the comparison/control circuit 28 decides that the transmitter-receiver is in a double-talk state, and sets in the variable loss circuits 29T and 29R losses one-half those of the above-mentioned predetermined values L_T and L_R, respectively. In this way, speech with great clarity can be sent to the other party in accordance with the severity of ambient noise and the presence or absence of abnormal noise.

[0029] According to the first embodiment described above, a mixture of the bone-conducted sound signal composed principally of low-frequency components and the air-conducted sound signal composed principally of high-frequency components is used as the speech signal that is sent to the other party. Moreover, the ratio of mixture of the two signals is automatically varied with the magnitude of ambient noise and the abnormal sound picked up by the microphone 14. This permits the implementation of a transmitter-receiver which can be used in a high-noise environment, obviates such defects of the prior art as low clarity or articulation and discomfort by abnormal sound, and allows hands-free communications.

[0030] In the embodiment depicted in Figs. 1 and 2, the comparison/control circuit 24 and the variable loss circuits 25A and 25B may be dispensed with, and even in such a case, the noise level can be appreciably suppressed by the operations of the directional microphone 15, the omnidirectional microphone 16 and the amplifiers 21A and 21B and the noise suppressor circuit 23 which form the noise suppressing part 20N; hence, it is possible to obtain a transmitter-receiver of higher speech quality than in the past. Alternatively, the omnidirectional microphone 16, the amplifier 21U and the noise suppressor circuit 23 may be omitted, and in this case, too, the processing for the generation of the optimum speech sending signal can automatically be performed by the operations of the comparison/control circuit 24, the variable loss circuits 25A and 25B and the mixer circuits 26 in accordance with the states of signals involved.

[0031] Next, a detailed description will be given, with reference to Figs. 5 through 9, of a second embodiment of the transmitter-receiver according to the present invention.

[0032] Fig. 5 illustrates in block form the transmitter-receiver according to the second embodiment of the invention. The bone-conducted sound pickup microphone 14, the directional microphone 15 and the receiver 17 are provided in such an ear-piece type acoustic transducing part 10 as depicted in Fig. 1. In this embodiment, the air-conducted sound signal from the directional microphone (the air-conducted sound pickup microphone 15 and the bone-conducted sound signal from the bone-conducted sound pickup microphone 14 are fed to an air-conducted sound dividing circuit 31A and a bone-conducted sound dividing circuit 31B via the amplifiers 21A and 21B of the transmitting-receiving circuit 20,

Meta Platforms, Inc. - Exhibit 1002
Page 149 of 686

respectively. As is the case with Fig. 2, the gains of the amplifiers 21A and 21B are preset so that input air-and bone-conducted sound signals of a vocal sound uttered in a no-noise environment may have about the same level. The air-conducted sound dividing circuit 31A divides the air-conducted sound signal from the directional microphone 15 into first through n-th frequency bands and applies the divided signals to a comparison/control circuit 32 and signal select circuits 33_1 through 33_n. The bone-conducted sound dividing circuit 31B divides the bone-conducted sound signal from the bone-conducted sound pickup microphone 14 into first through n-th frequency bands and applies the divided signals to the comparison/control circuit 32 and the signal select circuits 33_1 through 33_n. In the present invention, the air- and bone-conducted sound signals need not always be divided (i.e. n = 1), but when divided into frequency bands, they are divided, for example, every one or one-third octave, or into high and low bands, or high, intermediate and low bands.

[0033] A received signal dividing circuit 31R divides the received signal S_R from an external line circuit via the input terminal 20R into first through n-th frequency bands and applies the divided signal to the comparison/control circuit 32. In this embodiment, the comparison/control circuit 32 is such one that converts each input signal into a digital signal by an A/D converter (not shown), and performs such comparison and control operations by a CPU (not shown) as described below. That is, the comparison/control circuit 32 calculates an estimated value of the ambient noise level for each frequency band on the basis of the air-conducted sound signals of the respective bands from the air-conducted sound dividing circuit 31A, the bone-conducted sound signals of the respective bands from the bone-conducted sound dividing circuit 31B and the received signals of the respective bands from the received signal dividing circuit 31R. The comparison/control circuit 32 compares the estimated values of the ambient noise levels with a predetermined threshold value (i.e. a reference value for selection) N_{th} and generates control signals C1 to Cn for the respective bands on the basis of the results of comparison. The control signals C1 to Cn thus produced are applied to the signal select circuits 33_1 to 33_n, respectively. The signal select circuits 33_1 to 33_n respond to the control signals C1 to Cn to select the air-conducted sound signals input from the air-conducted sound dividing circuit 31A or the bone-conducted sound signals from the bone-conducted sound signal dividing circuit 31B, which are provided to a signal combining circuit 34. The signal combining circuit 34 combines the input speech signals of the respective frequency bands, taking into account the balance between the respective frequency bands, and provides the combines signal to the speech transmitting output terminal 20T. The output terminal 20T is a terminal which is connected to an external line circuit.

[0034] Fig. 6 is a graph showing, by the solid lines 3A and 3B, a standard or normal relationship between the tone quality (evaluated in terms of the SN ratio or subjective evaluation) of the air-conducted sound signal picked up by the directional microphone 15 and the ambient noise level and a standard or normal relationship between the tone quality of the bone-conducted sound signal picked up by the bone-conducted sound pickup microphone and the ambient noise level. The ordinate represents the tone quality of the sound signals (the SN ratio in the circuit, for instance) and the abscissa the noise level. As indicated by the solid line 3A, the tone quality of the air-conducted sound signal picked up by the directional microphone 15 is greatly affected by the ambient noise level; the tone quality is seriously degraded when the ambient noise level is high. On the other hand, as indicated by the solid line 3B, the tone quality of the bone-conducted sound signal picked up by the bone-conducted sound pickup microphone 14 is relatively free from the influence of the ambient noise level; degradation of the tone quality by the high noise level is relatively small. Hence, the speech sending signal S_T of good tone quality can be generated by setting the noise level at the intersection of the two solid lines 3A and 3B as the threshold value N_{th} and by selecting either one of the air-conducted sound signal picked up by the directional microphone 15 and the bone-conducted sound signal picked up by the bone-conducted sound pickup microphone, depending upon whether the ambient noise level is higher or lower than the threshold value N_{th}. It was experimentally found that the threshold value N_{th} is substantially in the range of 60 to 80 dBA. The characteristics indicated by the solid lines 3A and 3B in Fig. 6 are standard; the characteristics vary within the ranges defined by the broken lines 3A' and 3B' in dependence upon the characteristics of the microphones 14 and 15, the preset gains of the amplifiers 21A and 21B and the frequency characteristics of the input speech signals, but they remain in parallel to the solid lines 3A and 3B, respectively. The solid lines 3A and 3B are substantially straight.

[0035] The relationship between the tone quality of the air-conducted sound signal by the directional micropohone 15 and the ambient noise level and the relationship between the tone quality of the bone-conducted sound signal by the bone-conducted sound pickup microphone 14 and the ambient noise level differ with the respective frequency bands. For this reason, according to this embodiment, the sound signals are each divided into respective frequency bands and either one of the air- and bone-conducted sound signals is selected depending upon whether the measured ambient noise level is higher or lower than a threshold value set for each frequency band--this provides improved tone quality of the speech sending signal.

[0036] To switch between the air- and bone-conducted sound signals in accordance with the ambient noise level, it is necessary to calculate an estimated value of the ambient noise level. Fig. 7 is a graph showing, by the solid line 4BA, a standard relationship of the ambient noise level (on the abscissa) to the level ratio (on the ordinate) between an ambient noise signal picked up by the directional microphone 15 and an ambient noise signal by the bone-conducted sound pickup microphone 14 in the listening or speech receiving or silent duration. Fig. 8 is a graph showing, by the solid line 5BA, a standard relationship of the ambient noise level to the level ratio between a signal (the air-conducted sound sig-

Meta Platforms, Inc. - Exhibit 1002
Page 150 of 686

nal plus the ambient noise signal) picked up by the directional microphone 15 and a signal (the bone-conducted sound signal plus the ambient noise signal) by the bane-conducted sound pickup microphone 15 in the talking or double-talking duration. As shown in Figs. 7 and 8, the characteristic in the listening or silent duration and the characteristic in the talking or double-talking duration differ from each other. Hence, the level V_A of the air-conducted sound signal from the directional microphone 15, the level V_B of the bone-conducted sound signal from the bone-conducted sound pickup microphone 15 and the level V_R of the received signal from the amplifier 27 are compared with the reference level values V_{RA}, V_{RB} and V_{RR}, respectively, to determine if the transmitter-receiver is in the listening (or silent) state or in the talking (or double-talking) state. Next, the level ratio V_B/V_A between the bone-conducted sound signal and the air-conducted sound signals picked up by the microphones 14 and 15 in the listening or silent state is calculated, and the noise level at that time is estimated from the level ratio through utilization of the straight line 4BA in Fig. 7. Depending upon whether the estimated noise level is higher or lower than the threshold value N_{th} in Fig. 6, the signal select circuits 33_1 to 33_n each select the bone-conducted sound signal or air-conducted sound signal. Similarly, the level ratio V_B/V_A between the bone-conducted sound signal and the air-conducted sound signal in the talking or double-talking duration is calculated, then the noise level at that time is estimated from the straight line 5BA in Fig. 8, and the bone-conducted sound signal or air-conducted sound signal is similarly selected depending upon whether the estimated noise level is above or below the threshold value N_{th}.

[0037] Next, the operation of the transmitter-receiver will be described. Incidentally, let is be assumed that there are prestored in a memory 32M of the comparison/control circuit 32 the reference level values V_{RA}, V_{RB} and V_{RR}, the threshold value N_{th} and the level ratio vs. noise level relationships shown in Figs.7 and 8. Since the speech signals and the received signals divided into the first through n-th frequency bands are subjected to exactly the same processing until they are input into the signal combining circuit 34, the processing in only one frequency band will be described using reference numerals with no suffixes indicating the band.

[0038] The comparison/control circuit 32 compares, at regular time intervals (of one second, for example), the levels V_A, V_B and V_R of the air-conducted sound signal, the bone-conducted sound signal and the received signal input from the air-conducted sound dividing circuit 31A, the bone-conducted sound dividing circuit 31B and the received signal dividing circuit 31R with the predetermined reference level values V_{RA}, V_{RB} and V_{RR}, respectively. When the level V_R of the received signal S_R is higher than the predetermined value V_{RR} and the level V_A of the air-conducted sound signal picked up by the directional microphone 15 and the level V_B of the bone-conducted sound signal by the bone-conducted sound pickup microphone 14 are smaller than the predetermined values V_{RA} and V_{RB}, respectively, the comparison/control circuit 32 determines that this state is the listening state shown in the table of Fig. 9. When the level V_R of the received signal level V_R is smaller than the predetermined value V_{RR} and the levels V_A and V_B of the air-conducted sound signal and the bone-conducted sound signal are both smaller than the predetermined values V_{RA} and V_{RB}, the circuit 32 determines that this state is the silent state. In these two states the comparison/control circuit 32 calculates the level ratio V_B/V_A between the air-conducted sound signal from the air-conducted sound dividing circuit 31A and the bone-conducted sound signal from the bone-conducted sound dividing circuit 31B. Based on the value of this level ration, the comparison/control circuit 32 refers to the relationship of Fig. 7 stored in the memory 32M to obtain an estimated value of the corresponding ambient noise level. When the estimated value of the ambient noise level is smaller than the threshold value N_{th} shown in Fig. 6, the comparison/control circuit 32 supplies the signal select circuit 33 with a control signal C instructing it to select and output the air-conducted sound signal input from the air-conducted sound dividing circuit 31A. When the estimated value of the ambient noise level is greater than the threshold value N_{th}, the comparison/control circuit 32 applied th control signal C to the signal select circuit 33 to instruct it to select and output the bone-conducted sound signal input from the bone-conducted sound dividing circuit 31B.

[0039] On the other hand, when the received signal level V_R is smaller than the reference level value V_{RR} and the levels V_A and V_B of the air-conducted sound signal by the directional microphone 15 and the bone-conducted sound signal by the bone-conducted sound pickup microphone 14 are larger then the predetermined reference level values V_{RA} and V_{RB}, the comparison/control circuit 32 determines that this state is the talking state shown in the table of Fig. 9. When the received signal level V_R is larger than the reference level value V_{RR} and the levels V_A and V_B of the air-conducted sound signal and the bone-conducted sound signal are larger than the predetermined reference level values V_{RA} and V_{RB}, the comparison/control circuit 32 determines that this state is the double-talking state. In these two states the comparison/control circuit 32 calculates the level ratio V_B/V_A between the bone-conducted sound signal and the air-conducted sound signal and estimates the ambient noise level N through utilization of the relationship of Fig. 8 stored in the memory 32M.

[0040] When the thus estimated value of the ambient noise level N is smaller than the threshold value N_{th} shown in Fig. 6, the comparison/control circuit 32 applies the control signal C to the signal select circuit 33 to cause it to select and output the air-conducted sound signal input from the air-conducted sound dividing circuit 31A. When the estimated value N of the ambient noise level is greater than the threshold value N_{th}, the circuit 32 applies the control signal C to the signal select circuit 33 to cause it to select and output the bone-conducted sound signal input from the bone-conducted sound dividing circuit 31B.

Meta Platforms, Inc. - Exhibit 1002
Page 151 of 686

[0041] The comparison/control circuit 32 has, in the memory 32M for each of the first through n-th frequency bands, the predetermined threshold value N_{th} shown in Fig. 6 and the level ratio vs. noise level relationships representing the straight characteristic lines 4BA and 5BA shown in Figs. 7 and 8. The comparison/control circuit 32 performs the same processing as mentioned above and applies the resulting control signals C1 to Cn to the signal select circuits 33_1 to 33_n. The signal combining circuit 34 combines the speech signals from the signal select circuits 33_1 to 33_n, taking into account the balance between the respective frequency bands.

[0042] While in the above the embodiments have been described to estimate and compare the noise level with the threshold value and control the signal select circuits 33_1 to 33_n accordingly in any state described in the table of Fig. 9, it is also possible to employ a scheme that estimates the noise level only in the silent or listening state and uses the thus estimated noise level to effect control in the talking state and the double-taking state. In such an instance, the characteristic data of Fig. 8 need not be stored in the memory 32M. In contrast to this, the estimation of the noise level may be made only in the talking or double-talking state, in which case the estimated noise level is used for control in the talking or double-talking state. In this instance, the characteristic data of Fig. 7 is not needed.

[0043] Incidentally, the double-talking duration and the silent duration are shorter than the talking or listening duration. Advantage may also be taken of this to effect control in the double-talking state and in the silent state by use of the ambient noise level estimated prior to these states.

[0044] When the level of the bone-conducted sound signal picked up by the bone-conducted sound pickup microphone 14 is abnormally high, it can be considered that noise is made by the friction of cords or the like; hence, it is effective to select the air-conducted sound signal picked up by the directional microphone 15.

[0045] In the case where the estimated noise level N is compared with the threshold value N_{th} for each frequency band and the air-conducted sound signal picked up by the directional microphone 15 is switched to the bone-conducted sound signal by the bone-conducted sound pickup microphone 14 on the basis of the result of comparison as described previously with reference to the Fig. 5 embodiment, the timbre of the speech being sent may sometimes undergo an abrupt change, making the speech unnatural. To solve this problem, an area N_W of a fixed width as indicated by N^- and N^+ is provided about the threshold value N_{th} of the ambient noise level shown in Fig. 6; when the estimated noise level N is within the area N_W, the air-conducted sound signal from the directional microphone 15 and the bone-conducted sound signal from the bone-conducted sound pickup microphone 14 are mixed in a ratio corresponding to the noise level, and when the estimated noise level N is larger than the area N_W, the bone-conducted sound signal is selected, and when the estimated noise level is smaller than the area N_W, the air-conducted sound signal is selected. By this, it is possible to reduce the abrupt change in the timbre prior to or subsequent to the switching operation.

[0046] The modification of the Fig. 5 embodiment for such signal processing can be effected by using, for example, a signal mixer circuit 33 depicted in Fig. 10A in place of each of the signal select circuits 33_1 to 33_n. In this example, the corresponding air-conducted sound signal and bone-conducted sound signal of each frequency band are applied to variable loss circuits 33A and 33B, respectively, wherein they are given losses L_A and L_B set by control signals C_A and C_B from the comparison/control circuit 32. The both signals are mixed in a mixer 33C and the mixed signal is applied to the signal combining circuit 34 in Fig. 5.

[0047] The losses L_A and L_B for the air-conducted sound signal and the bone-conducted sound signal in the area N_W need only to be determined as shown in Fig. 10B, for instance. For the brevity's sake, setting $N_{th} = (N^+ + N^-)/2$, the area width to $D = N^+ - N^-$, the minimum values L_{AO} and L_{BO} of the losses L_A and L_B to 0 dB, respectively, and their maximum values L_{AMAX} and L_{BMAX} to the same L_{MAX} dB, the loss L_A in the area N_W can be expressed, for example, by the following equation.

$$L_A = \frac{1}{2}(L_{AMAX} - L_{AO}) + \frac{L_{AMAX} - L_{AO}}{N^+ - N^-}(N + N_{th}) + L_{AO} \quad (5)$$
$$= L_{MAX}\left\{\frac{1}{2} + \frac{N - N_{th}}{D}\right\}$$

[0048] Similarly, the loss L_B can be expressed by the following equation.

$$L_B = L_{MAX}\left\{\frac{1}{2} + \frac{N - N_{th}}{D}\right\} \quad (6)$$

[0049] The value of the maximum loss L_{MAX} is selected in the range of between 20 and 40 dB, and the width D of the area N_W is set to about 20 dB, for instance. When the estimated noise level N is larger than the area N_W, the bone-con-

Meta Platforms, Inc. - Exhibit 1002
Page 152 of 686

ducted sound signal is given any loss (L_B = 0) and is applied intact to the mixer 33C. On the other hand, the air-conducted sound signal is not given the loss L_{MAX} but instead the variable loss circuit 33A is opened to cut off the signal. Similarly, when the estimated noise level N is smaller than the area N_W, the air-conducted sound signal is not given any loss (L_A = 0) and is fed intact to the mixer 33C, whereas the bone-conducted sound signal is cut off by opening the variable loss circuit 33B. The comparison/control circuit 32 determines the losses L_A and L_B for each band as described and sets the losses in the variable loss circuits 33A and 33B by the control signals C_A and C_B.

[0050] With such signal processing as described above, it is possible to provide smooth timbre variations of the speech being sent when the air-conducted sound signal is switched to the bone-conducted sound signal or vice versa. Moreover, if the levels of the air-conducted sound signal and the bone-conducted sound signal input into the variable loss circuits 33A and 33B are nearly equal to each other, the output level of the mixer 33C is held substantially constant before and after the switching between the air- and bone-conducted sound signals and the output level in the area N_W is also held substantially constant, ensuring smooth signal switching. Incidentally, the signal select processing by the signal select circuits 33_1 to 33_n, in Fig. 5 corresponds to the case where the width D of the area N_W is set to zero in the processing in the modified embodiment depicted in Figs. 10A and 10B. Hence, it can be said, in a broad sense, that the signal select circuits 33_1 to 33_n, also contribute to the mixing of signals on the basis of the estimated noise level.

[0051] In the above, when the estimation of the ambient noise level may be rough, it can be estimated by using average values of the characteristics shown in Figs. 7 and 8. In this instance, the received signal dividing circuit 31R can be dispensed with. When the estimation of the ambient noise level may be rough, it can also be estimated by using only the speech signal from the directional microphone 14.

[0052] Fig. 11 illustrates in block form a modified form of the Fig. 5 embodiment, in which as is the case with the first embodiment of Figs. 1 and 2, the omnidirectional microphone 16, the amplifier 21U and the noise suppressing circuit 23 are provided in association with the direction microphone 15 and the output from the noise suppressing circuit 23 is fed as an air-conducted sound signal to the air-conducted sound dividing circuit 31A. This embodiment is identical in construction with the Fig. 5 embodiment except the above. In this embodiment, when the transmitter-receiver is in the silent or listening state, a switch 35 is opened and only the air-conducted sound signal provided via the amplifier 21U from the omnidirectional microphone 16 is applied to the noise suppressing circuit 23, from which it is fed intact to the air-conducted sound dividing circuit 31A, and the air-conducted sound signals divided into respective frequency bands are applied to the comparison/control circuit 32. As in the Fig. 5 embodiment, the comparison/control circuit 32 estimates the ambient noise levels through utilization of the relationships shown in Fig. 7 and, based on the estimated levels, generate the control signals C1 to Cn for signal selection (or mixing use in the case of using the Fig. 10A circuit configuration), which are applied to the signal select circuits 33_1 to 33_n (or the signal mixing circuit 36). After this, the switch 35 is turned ON to pass therethrough the air-conducted sound signal from the directional microphone 15 to the noise suppressing circuit 23, in which its noise components are suppressed, and then the air-conducted sound signal is fed to the air-conducted sound dividing circuit 31A. This is followed by the speech sending signal processing by the same signal selection or mixing as described previously with respect to Fig. 5.

[0053] Although in the embodiments of Figs. 5 and 11 the comparison/control circuit 32 has been described to convert the signals input thereto to digital signals and generate the control signals C1 to Cn on the basis of the level ratio-noise level relationships stored in the memory 32M, the comparison/control circuit 32 may also be formed as an analog circuit, for example, as depicted in Fig. 12. In Fig. 12 there is shown in block form only a circuit portion corresponding to one of the divided subbands. A pair of corresponding subband signals from the air-conducted sound signal dividing circuit 31A and the bone-conducted sound signal dividing circuit 31B are both applied to a level ratio circuit 32A and a comparison/logic state circuit 32E. The level ratio circuit 32A calculates the level ratio L_B/L_A between the bone- and air-conducted sound signals in an analog fashion and supplies level converter circuits 32B and 32C with a signal of a level corresponding to the calculated level ratio.

[0054] The level converter circuit 32B performs a level conversion based on the relationship shown in Fig. 7. That is, when supplied with the level ratio V_B/V_A, the level converter circuit 32B outputs an estimated noise level N corresponding thereto and provides it to a select circuit 32D. Similarly, the level converter circuit 32C performs a level conversion based on the relationship shown in Fig. 8. That is, when supplied with the level ratio V_B/V_A, the level converter circuit 32C outputs an estimated noise level corresponding thereto and provides it to the select circuit 32D. On the other hand, the comparison/state logic circuit 32E compares the levels of the corresponding air- and bone-conducted sound signals of the same subband and the level of the received speech signal with the reference levels V_{RA}, V_{RB} and V_{RR}, respectively, to make a check to see if these signals are present. Based on the results of these checks, the comparison/state logic circuit 32E applies a select control signal to the select circuit 32D to cause it to select the output from the level converter circuit 32B in the case of State 1 or 2 shown in the table of Fig. 9 and the output from the level converter circuit 32C in the case of State 3 or 4.

[0055] The select circuit 32D supplies a comparator circuit 32F with the estimated noise level N selected in response to the select control signal. The comparator circuit 32F compares the estimated noise level N with the threshold level N_{th} and provides the result of the comparison, as a control signal C for the subband concerned, to the corresponding

Meta Platforms, Inc. - Exhibit 1002
Page 153 of 686

one of the signal select circuits 311 to 31n in Fig. 5 or 11. In this instance, it is also possible to make a check to determine if the estimated noise level N is within the area N_W or high or lower than it as described previously with respect to Fig. 10B, instead of comparing the estimated noise level N with the threshold value N_{th}; if the estimated noise level N is within the area N_W, the control signals C_A and C_B corresponding to the difference between the estimated noise level N and the threshold level N_{th}, as is the case with Eqs. (5) and (6), are applied to the signal mixing circuit of the Fig. 10A configuration to cause it to mix the air-conducted sound signal and the bone-conducted sound signal; when the estimated noise level N is higher than the area N_W, the bone-conducted sound signal is selected and when the estimated noise level N is lower than the area N_W, the air-conducted sound signal is selected.

[0056] As described above, according to the transmitter-receiver of the embodiment shown in each of Figs. 5 and 11 the air-conducted sound signal picked up by the directional microphone and the bone-conducted sound signal by the bone-conducted sound pickup microphone are used to estimate the ambient noise level and, on the basis of the magnitude of the estimated noise level, either one of the air-conducted sound signal and the bone-conducted sound signal is selected or both of the signals are mixed together, whereby a speech sending signal of the best tone quality can be generated. Thus, the communication device of the present invention is able to transmit speech sending signals of excellent tone quality, precisely reflecting the severity and amount of ambient noise regardless of whether the device is in the talking or listening state.

[0057] While in the first and second embodiments the transmitting-receiving circuit 20 is described to be provided outside the case 11 of the ear-piece type acoustic transducing part 10 and connected thereto via the cord 18, it is evident that the transmitting-receiving circuit 20 may be provided in the case 11 of the acoustic transducing part 10.

[0058] It will be apparent that many modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

Claims

1. A transmitter-receiver comprising:

   acoustic transducing means composed of a bone-conducted sound pickup microphone (14) for picking up a bone-conducted sound, a directional microphone (15) for picking up an air-conducted sound, an omnidirectional microphone (16) for detecting noise, and a receiver (17) for transducing a received speech signal to a received speech sound;
   a low-pass filter (22B) which permits the passage therethrough of those low-frequency components in the output from said bone-conducted sound pickup microphone which are lower than a predetermined cutoff frequency;
   a high-pass filter (22A) which permits the passage therethrough of those high-frequency components in the outputs from said directional microphone (15) and said omnidirectional microphone (16) which are higher than said cutoff frequency;
   a combining circuit (26) which combines the outputs from said low-pass filter and said high-pass filter and outputs a speech sending signal; and
   means (27) for supplying said received speech signal to said receiver;
   characterized in that
   a noise suppressing part (20N) which combines the outputs from said directional microphone (15) and said omnidirectional microphone (16) to suppress a noise component, wherein said high-pass filter (22A) passes the high-frequency components in the output from said noise suppressing part to said combining circuit (26).

2. The transmitter-receiver of claim 1 , which further comprises: first and second variable loss circuits (29T, 29R) connected to the output side of said combining circuit and the input side of said received speech signal supplying means, for controlling the levels of said speech sending signal and said received speech signal, respectively; and a comparison/control circuit (28) which compares the level of said speech sending signal fed to said first variable loss circuit (29T) and the level of said received speech signal fed to said second variable loss circuit (29R) with predetermined first and second reference levels, respectively, and on the basis of the results of comparison, controls the losses that are set in said first and second variable loss circuits (29T, 29R).

3. The transmitter-receiver of claim 1 or 2, wherein said noise suppressing part (20N) comprises: a first amplifier (21A) for amplifying said air-conducted sound signal; a second amplifier (21U) for amplifying said noise components detected by said omnidirectional microphone (16); and a noise suppressor circuit (23) which adds together the outputs from said first and second amplifiers in a 180° out-of-phase relation to each other to generate an air-conducted sound signal with said noise components suppressed and applies it to said high-pass filter (22A).

Meta Platforms, Inc. - Exhibit 1002
Page 154 of 686

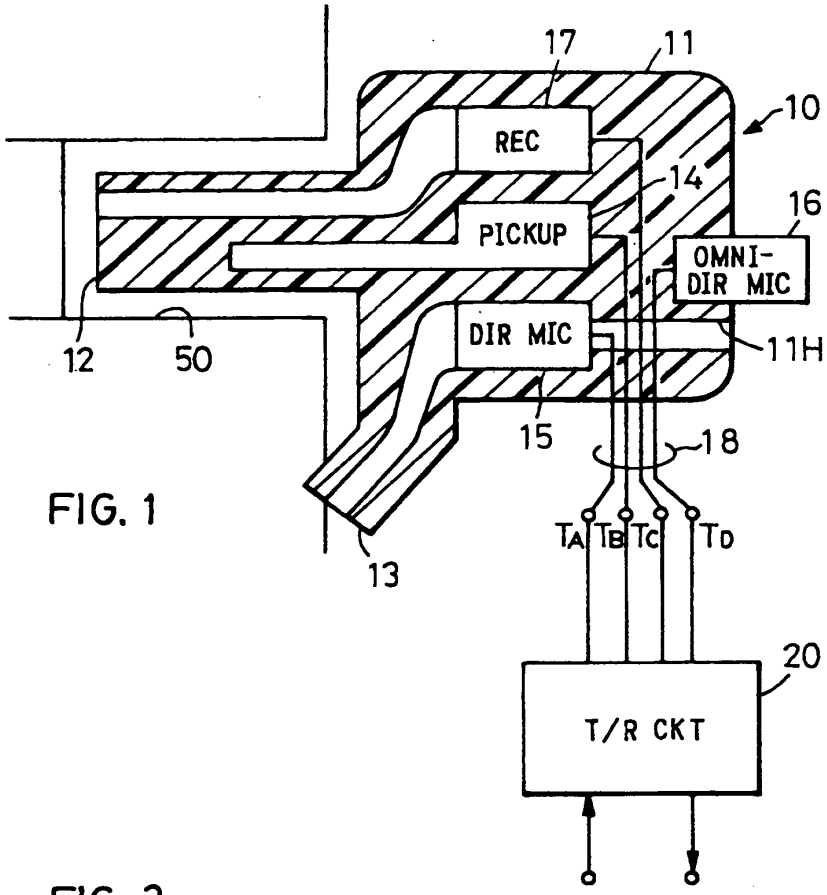
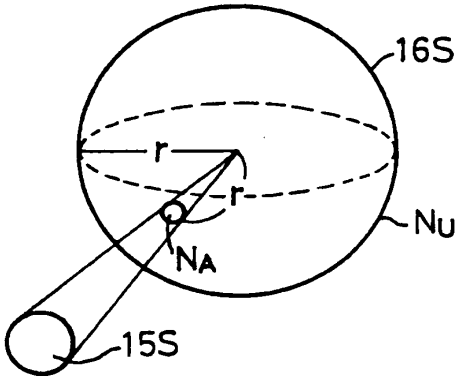


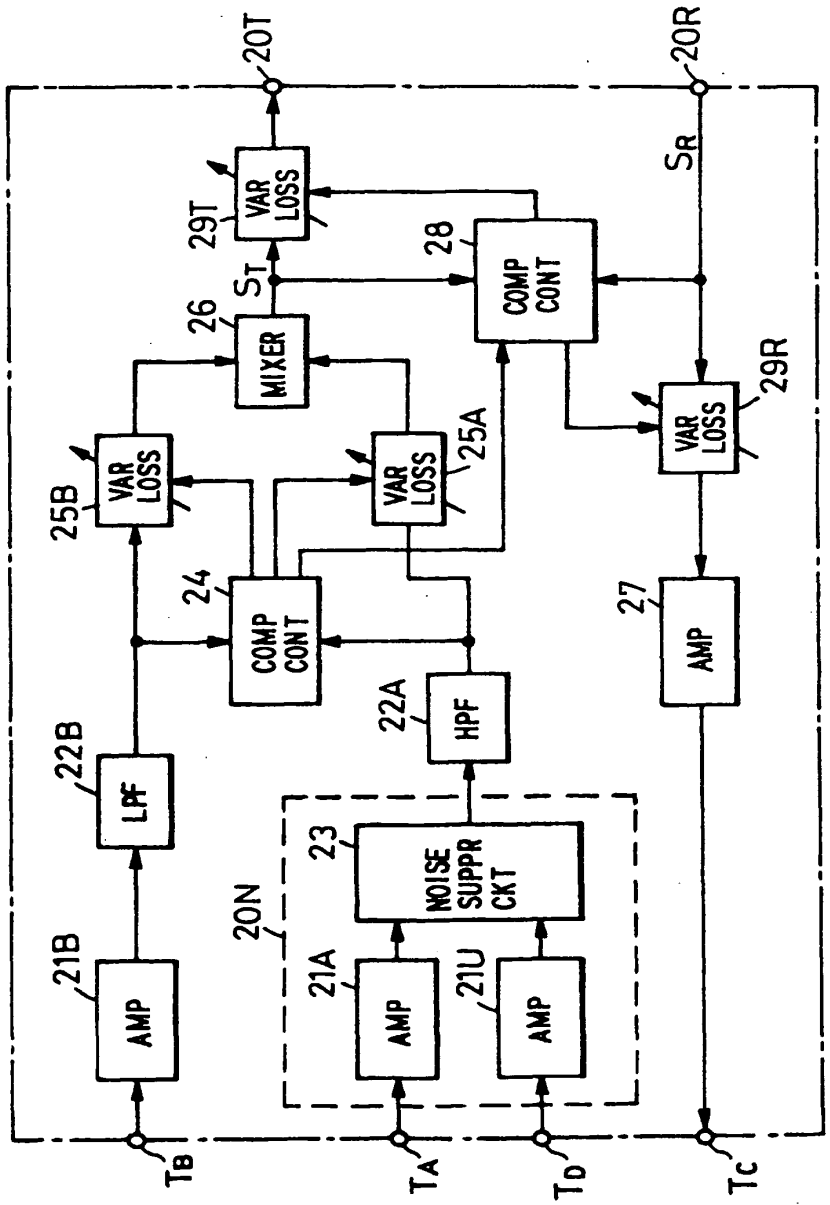
FIG. 1

FIG. 3



Meta Platforms, Inc. - Exhibit 1002
Page 155 of 686

FIG. 2



Meta Platforms, Inc. - Exhibit 1002
Page 156 of 686

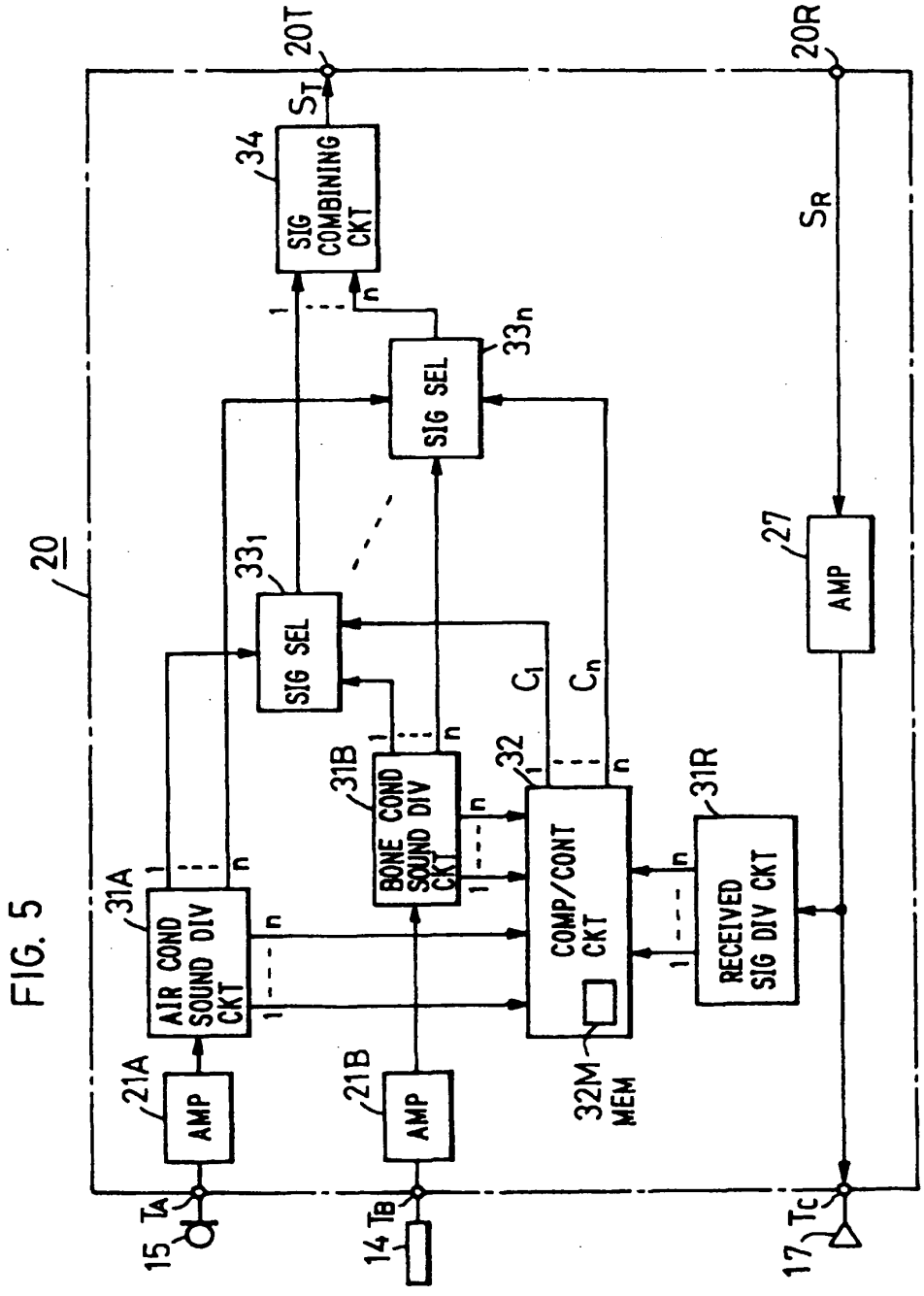
FIG. 4

STATE	PRESENCE OR ABSENCE OF SIGNAL		CONTROL OPERATIONS	
	LPF OUTPUT	HPF OUTPUT	LOSS BY 25B	LOSS BY 25A
1	O	O	MAINTAIN SET VALUE OF THE PRECEDING STATE	MAINTAIN SET VALUE OF THE PRECEDING STATE
2	O	×	INCREASE LOSS L_B FROM L_{BO} ACCORDING TO V_B	SET INITIAL VALUE L_{AO}
3	×	O	SET INITIAL VALUE L_{BO}	INCREASE LOSS L_A FROM L_{AO} ACCORDING TO V_A
4	×	×	SET INITIAL VALUE L_{BO}	SET INITIAL VALUE L_{AO}

O: PRESENCE ×: ABSENCE

Meta Platforms, Inc. - Exhibit 1002
Page 157 of 686

FIG. 5



Meta Platforms, Inc. - Exhibit 1002
Page 158 of 686

FIG. 6

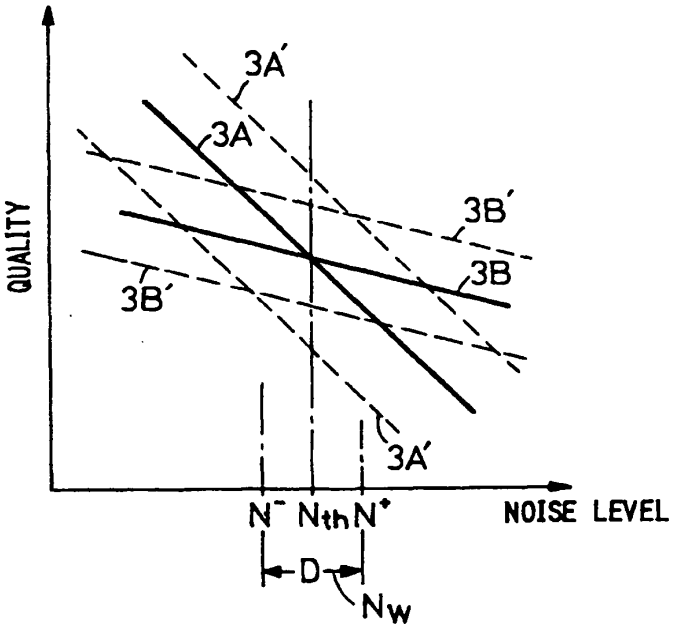
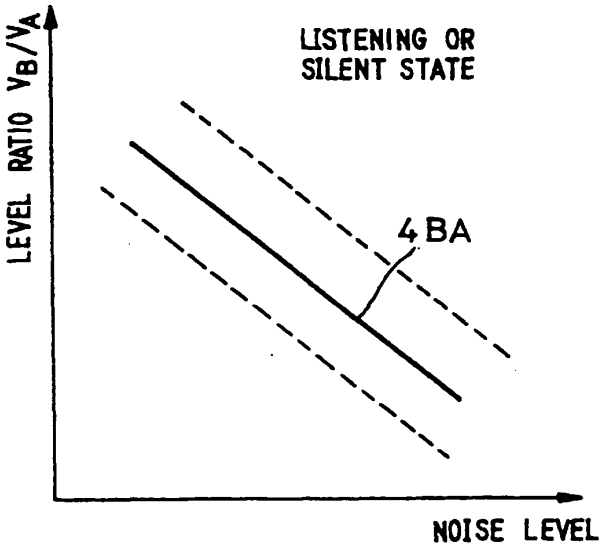


FIG. 7



Meta Platforms, Inc. - Exhibit 1002
Page 159 of 686

FIG. 8

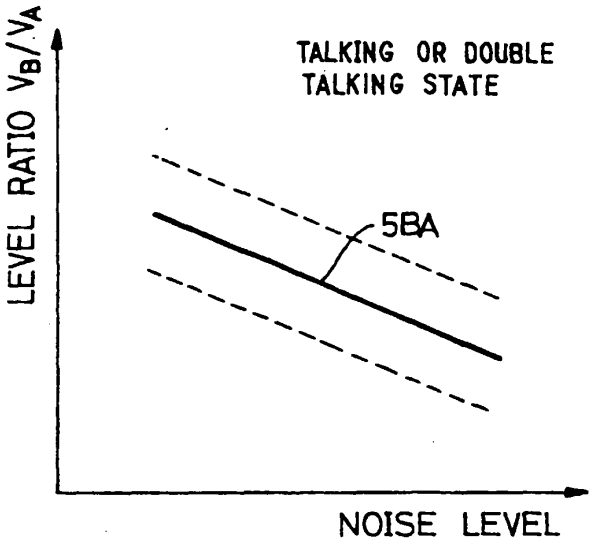


FIG. 9

	RECEIVING SIG	AIR COND SOUND	BONE COND SOUND	
1 LISTENING STATE	○	×	×	USE FIG.7
2 SILENT STATE	×	×	×	
3 TALKING STATE	×	○	○	USE FIG.8
4 DOUBLE-TALK STATE	○	○	○	

× : ABSENCE ○ : PRESENCE

Meta Platforms, Inc. - Exhibit 1002
Page 160 of 686

FIG. 10A

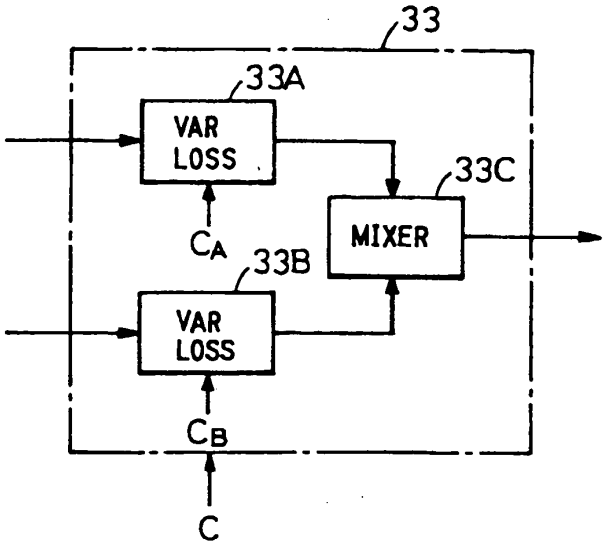
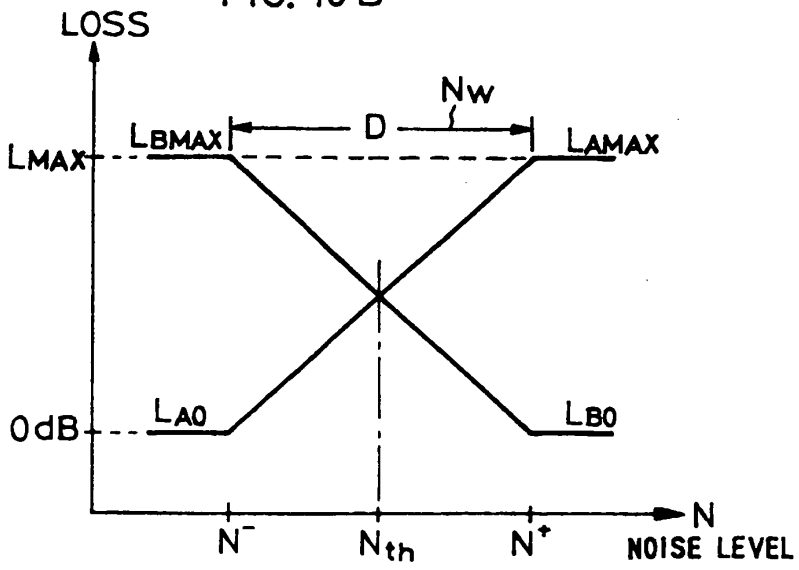
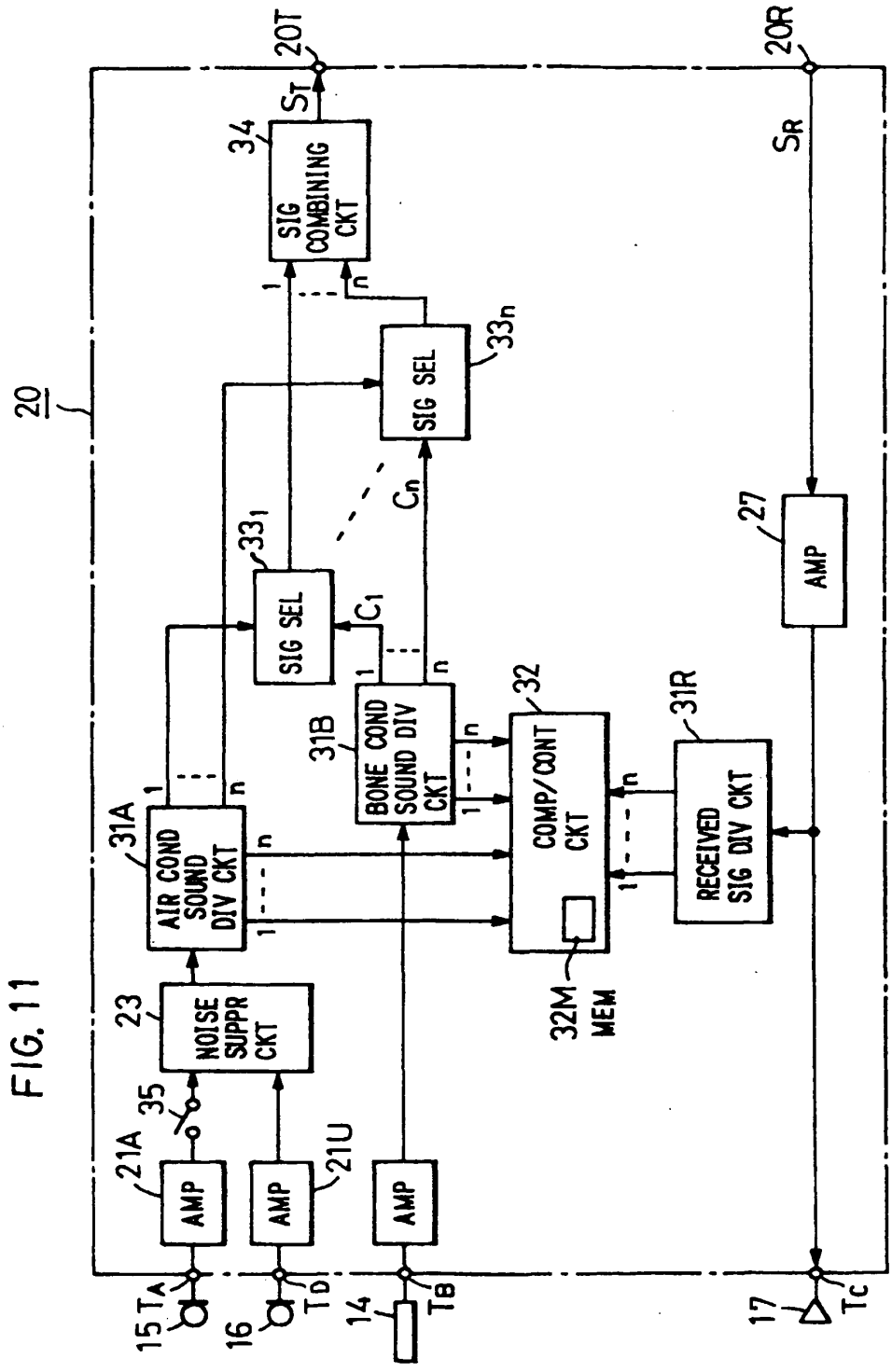


FIG. 10B



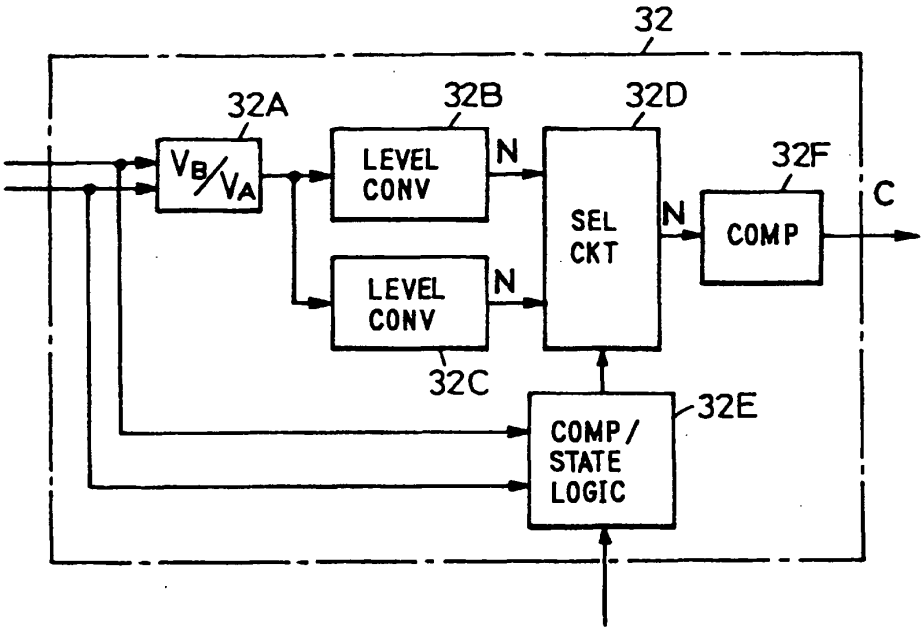
Meta Platforms, Inc. - Exhibit 1002
Page 161 of 686

FIG. 11



Meta Platforms, Inc. - Exhibit 1002
Page 162 of 686

FIG. 12



Meta Platforms, Inc. - Exhibit 1002
Page 163 of 686

This Page is Inserted by IFW Indexing and Scanning Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☑ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.
As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.

EUROPEAN PATENT OFFICE

Patent Abstracts of Japan

PUBLICATION NUMBER : 2000312395
PUBLICATION DATE : 07-11-00

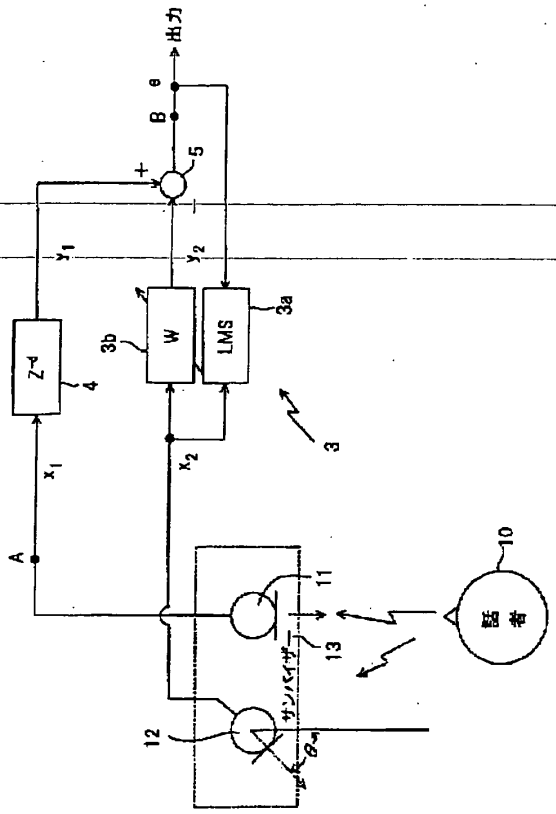
APPLICATION DATE : 28-04-99
APPLICATION NUMBER : 11121517

APPLICANT : ALPINE ELECTRONICS INC;

INVENTOR : KIUCHI SHINGO;

INT.CL. : H04R 1/40 B60R 11/02 G10L 15/00
G10L 21/02 H04R 3/00

TITLE : MICROPHONE SYSTEM



ABSTRACT : PROBLEM TO BE SOLVED: To enhance the S/N of a voice signal in a noise reduction system where two microphones are in use.

SOLUTION: In the microphone system that uses output signals of two microphones to output a talker voice signal with the enhanced S/N through adaptive signal processing, the two microphones 11, 12 with directivity are closely arranged and an angle between the directivity of the microphone and a voice utterance direction of a talker differs between the microphones. For example, each of the microphones 11, 12 is mounted on a sunvisor 13 of a vehicle while differentiating the directivity or mounted on a driver's assistant seat or a ceiling at a driver's seat of the vehicle.

COPYRIGHT: (C)2000,JPO

BEST AVAILABLE COPY

(19)日本国特許庁（ＪＰ）　(12)**公開特許公報**（Ａ）　(11)特許出願公開番号
特開2000－312395
（P2000－312395A）
(43)公開日　平成12年11月７日(2000.11.7)

(51)Int.Cl.⁷	識別記号	ＦＩ		テーマコード（参考）
Ｈ０４Ｒ　1/40	３２０	Ｈ０４Ｒ　1/40	３２０Ｚ	３Ｄ０２０
Ｂ６０Ｒ　11/02		Ｂ６０Ｒ　11/02	Ｍ	５Ｄ０１５
Ｇ１０Ｌ　15/00		Ｇ１０Ｌ　3/00	５５１Ｊ	５Ｄ０２０
21/02		3/02	３０１Ｅ	９Ａ００１
Ｈ０４Ｒ　3/00	３２０	Ｈ０４Ｒ　3/00	３２０	

審査請求　未請求　請求項の数３　ＯＬ　（全９頁）

(21)出願番号　特願平11－121517

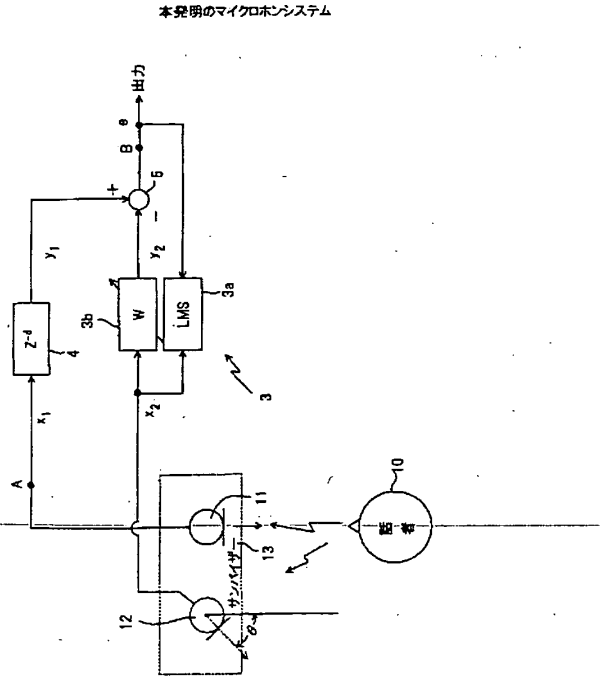
(22)出願日　平成11年４月28日(1999.4.28)

(71)出願人　000101732
アルパイン株式会社
東京都品川区西五反田１丁目１番８号
(72)発明者　中田　孝一
東京都品川区西五反田１丁目１番８号　アルパイン株式会社内
(72)発明者　斉藤　望
東京都品川区西五反田１丁目１番８号　アルパイン株式会社内
(74)代理人　100084711
弁理士　斉藤　千幹

最終頁に続く

(54)【発明の名称】　マイクロホンシステム

(57)【要約】
【課題】　マイクロホンを２つ使用するノイズリダクションシステムにおいて音声信号のSN比を改善する。
【解決手段】　２つマイクロホンの出力信号を用いて適応信号処理を行いSN比を改善した話者音声信号を出力するマイクロホンシステムにおいて、指向特性を有する２つのマイクロホン１１，１２を接近して配置すると共に、マイクロホンの指向方向と話者の発声方向がなす角度をマイクロホン毎に異ならせる。例えば、各マイクロホン１１，１２の指向方向を異ならせてを車両のサンバイザー１３に取り付け、あるいは、車両の助手席あるいは運転席側天井に取り付ける。



Meta Platforms, Inc. - Exhibit 1002
Page 166 of 686

【特許請求の範囲】

【請求項１】　２つマイクロホンの出力信号を用いて適応信号処理を行いSN比を改善した話者音声信号を出力するマイクロホンシステムにおいて、
指向特性を有する２つのマイクロホンを接近して配置すると共に、マイクロホンの指向方向と話者の発声方向がなす角度をマイクロホン毎に異ならせることを特徴とするマイクロホンシステム。

【請求項２】　前記各マイクロホンを車両のサンバイザーに取り付けたことを特徴とする請求項１記載のマイクロホンシステム。

【請求項３】　前記各マイクロホンを車両の運転席あるいは助手席側天井に取り付けたことを特徴とする請求項１記載のマイクロホンシステム。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明はマイクロホンシステムに係わり、特に、受音感度について指向特性を有する２つマイクロホンから出力する信号を用いて適応信号処理を行い、SN比を改善した話者音声信号を出力するマイクロホンシステムに関する。

【０００２】

【従来の技術】現在の音声認識システムは、15dB以上のSN比（S：音声／N：ノイズ）が確保されている場合、約95%の認識率を実現できるくらいの技術レベルにまで達している。しかし、周囲に存在するノイズによりSN比が低下すると、それに伴って認識率が急激に低下する性質も有している。図９はSN比と認識性能との関係をいくつかの種類のマイクロホン（無指向性、単一指向性、狭指向性、AMNOR(AdaptiveMicrophone-array for Noise Reduction)）について評価したもので、SN比と認識率がおおむねＳ字特性100を示す帯の中に包含されている。この図９から明らかなように、認識率はSN比の低下により急激に低下し、SN比が0dBの環境下において約50%にまで低下してしまう。

【０００３】そのため、自動車が発生するノイズ（エンジン音・ロードノイズ・パターンノイズ・風切り音など）が存在する自動車車室内において、上記のような認識性能の劣化は避けられず、音声認識システムを車載化する上で大きな問題の一つとなっている。前記したような事情から、周囲に存在するノイズの影響を少なくし、高いSN比で音声を受音するための方式が種々提案されており、複数のマイクロホンとディジタル信号処理を用いた高SN比受音システムはその一例である。かかる高SN比受音システムの中で最も簡単な構成のものは２つのマイクロホンを使用した図１０のようなシステムであるが、他にも、Griffith-Jim型アレイやAMNORといった、より高度なシステムが提案されている。

【０００４】図１０において、１，２は第１、第２のマイクロホン、３は適応信号処理部であり、誤差信号ｅが入力されると共にマイクロホン２の出力信号x_2が参照信号として入力され、誤差信号ｅのパワーが最小となるようにLMS(Least MeanSquare)アルゴリズムに基づいて適応信号処理を行う。適応信号処理部３において、３ａはLMS演算部、３ｂは例えばFIR型デジタルフィルタ構成の適応フィルタである。LMS演算部３ａは適応信号処理により誤差信号ｅのパワーが最小となるように適応フィルタ３ｂの係数を決定する。

【０００５】４はマイクロホン１から出力する信号を目標信号として入力される目標応答設定部であり、因果性を満たすためのものである。適応フィルタ３ｂのタップ長の半分の信号遅延時間をｄとするとき、目標応答設定部４は該時間ｄの遅延特性を有し、オーディオ周波数帯域でフラットな特性（ゲイン１の特性）を有する。すなわち、目標応答設定部４は、図１１（ａ）に示すようにゲイン１のフラットな周波数特性を備え、図１１（ｂ）に示すように遅延時間ｄを有するインパルス応答特性を有している。５は減算部であり、目標応答設定部４から出力する目標応答より適応フィルタ３ｂの出力信号を減算して誤差信号ｅを出力する。

【０００６】非音声認識時、マイクロホン１、２にはノイズのみが入力し、適応信号処理部３は適応信号処理により誤差信号ｅのパワー、すなわち、ノイズ出力が最小となるようにフィルタ係数Wを決定する。一方、音声認識時には、適応信号処理部３はフィルタ係数の更新をせず、前記非音声認識時に決定したフィルタ係数Wを適応フィルタ３ｂに設定して音声信号を出力する。図１０に示すシステムに本来求められている理想的な性能は、音声認識時に出力信号として音声信号Xs(z)のみ(ノイズ出力は0)を出力することである。すなわち、ノイズ出力En(z)に関して、

$$En(z)=Xn_1(z)z^{-d}-Xn_2(z)W(z) \qquad (1)$$

とするとき、誤差信号ｅのパワーが最小となるよう調整可能なパラメータ(適応フィルタ３ｂの係数)Wを決定することである。ここで

$$Es(z)=Xs_1(z)z^{-d}-Xs_2(z)\cdot W(z)\fallingdotseq Xs(z) \qquad (2)$$

となることが理想である。ただし、$Xn_1(z)$，$Xn_2(z)$はマイクロホン１、２の出力信号に含まれるノイズであり、ノイズ源(ノイズ＝xn)から第１、第２のマイクロホン１，２までの伝搬特性をCN1，CN2とすれば、

$$Xn_1(z)=CN1\cdot xn$$

$$Xn_2(z)=CN2\cdot xn$$

であり、(1)式は

$$En(z)=(CN1\cdot z^{-d}-CN2\cdot W(z))\,xn \qquad (1)'$$

となる。又、$Xs_1(z)$，$Xs_2(z)$はマイクロホン１、２の出力信号に含まれる音声信号であり、話者口元(話者音声＝xs)から第１、第２マイクロホン１，２までの伝搬特性をCS1，CS2とすれば、

$Xs_1(z) = CS1 \cdot xs$
$Xs_2(z) = CS2 \cdot xs$
であり、（２）式は
$Es(z) = (CS1 \cdot z^{-d} - CS2 \cdot W(z))xs$ (2)'
となる。
【０００７】
【発明が解決しようとする課題】自動車には騒音源が多数存在するため、マイクロホン１，２が拾う自動車車室内ノイズのコヒーレンスは、マイクロホン１，２を遠ざけるにしたがって低下する傾向を有している。このため、２つのマイクロホン１，２を遠ざける程、(1)式が大きくなってしまう問題が生じ、マイクロホン１，２はできるだけ近い位置に配置する必要がある。ところが、２つのマイクロホン１，２をできるだけ近い位置に配置すると、２つのマイクロホンにほぼ同様の音声とノイズがそれぞれ入射する可能性が高くなり、ノイズの除去に最適に決定された適応フィルタ係数Wでノイズを消去すると、音声までもが消去されてしまう。一方、逆に(2)式を満たすように適応フィルタ係数Wを決定すると、音声は損傷を受けないかわりにノイズもほとんど消えず、SN比もほとんど改善されなくなってしまうという問題が発生する。
【０００８】以上より、ノイズを最大限抑圧するためには２つのマイクロホンが接近していることが望ましく、一方、音声の損傷を最小限にするためには、２つのマイクロホンが互いに離れている方が望ましく、両者を同時に満足することができない。このため、従来のマイクロホンシステムでは音声信号のSN比を十分に改善できない問題がある。以上から本発明の目的は、マイクロホンを２つ使用するマイクロホンシステム（ノイズリダクションシステム）において、音声信号のSN比を改善できるようにすることである。
【０００９】
【課題を解決するための手段】上記課題は本発明によれば、２つマイクロホンの出力信号を用いて適応信号処理を行いSN比を改善した話者音声信号を出力するマイクロホンシステムにおいて、指向特性を有する２つのマイクロホンを接近して配置すると共に、マイクロホンの指向方向と話者の発声方向がなす角度をマイクロホン毎に異ならせることにより達成される。このようにすれば、２つのマイクロホンを接近して配置するにもかかわらず、1つのマイクロホンは高いSN比で話者音声を拾い、もう一方のマイクロホンは低いSN比で話者音声を拾うようにできる。一方、ノイズはマイクの向きを異ならせることによるコヒーレンスの低下が大きくはないため、各マイクロホンによる受信ノイズの相関を大きく、かつ、各マイクロホンの音声に対する受信感度の差を大きくでき、音声信号のSN比を改善することができる。マイクロホンの配置例としては、車両のサンバイザーあるいは車両の助手席あるいは運転席側天井に、２つのマイクロホンを接近して、かつ、各マイクロホンの指向方向と話者発声方向とのなす角度を異ならせて取り付ける。
【００１０】
【発明の実施の形態】（ａ）本発明の原理
２つのマイクロホンを使用するノイズリダクションシステムにおいて、各マイクロホンによる受信ノイズの相関を大きくし、かつ、各マイクロホンの音声に対する受信感度の差を大きくすることが理想である。しかし、２つのマイクロホンのこれら“受信ノイズの相関”と“音声に対する受信感度の差”にはトレードオフが存在し、距離を調整して一方を満たせば他方が満たされなくなる。例えば、マイクロホン間距離が近い程、２つのマイクロホンの受信ノイズの相関が大きくなるが、音声に対する受信感度の差がなくなり音声を同じように受信してしまう。このため、適応信号処理を行った場合、ノイズを抑圧できるが、音声も同時に抑圧してしまう事になり、結果としてSN比の改善は望めなくなる。
【００１１】そこで、本発明では、指向特性を有する２つのマイクロホンを接近して配置すると共に、マイクロホンの指向方向と話者の発声方向がなす角度をマイクロホン毎に異ならせる。このようにすれば、２つのマイクロホンを接近して配置するにもかかわらず、1つのマイクロホンは高いSN比で話者音声を拾い、もう一方のマイクロホンは低いSN比で話者音声を拾うようにできる。このため、２つのマイクロホンの接近配置により受信ノイズ間の相関を高くでき、かつ、各マイクロホンの音声に対する受信感度の差を大きくでき、音声信号のSN比を改善することができる。
【００１２】（ｂ）マイクロホンシステムの構成
図１は本発明のマイクロホンシステムの構成図であり、図１０のシステムと同一部分には同一符号を付している。図中、１０は話者であり、例えば自動車の運転手、１１，１２は受音感度について指向特性を有する第１、第２のマイクロホンである。マイクロホンの指向特性は、例えば図２に示す単一指向性の感度特性を有している。すなわち、指向方向を$\theta = 0^0$、該指向方向の感度をE_0するとき、任意の角度θ方向の感度は次式
$E(\theta) = E_0 (1 + \cos\theta) / 2$
により表現され、指向方向からずれるにしたがって感度が低下する。
【００１３】第１、第２のマイクロホン１１，１２は一例として運転席側サンバイザー１３にたとえば１０cmの間隔で取り付けられている。第１のマイクロホン１１の指向方向は話者発声方向(話者口が向いている方向)と一致して設けられ、第２のマイクロホン１２の指向方向は助手席方向を向いており、話者発声方向と所定の角度θを形成している。したがって、図２の指向特性より、第１のマイクロホン１１の方が話者音声に対して感度が良く、高いSN比で話者音声を拾い、第２のマイクロホン１２は話者音声に対して感度が悪く、低いSN比で話者音声

Meta Platforms, Inc. - Exhibit 1002
Page 168 of 686

を拾う。

【００１４】３は適応信号処理部で、誤差信号ｅが入力されると共にマイクロホン１２の出力信号x_2が参照信号として入力され、誤差信号ｅのパワーが最小となるようにLMSアルゴリズムに基づいて適応信号処理を行う。適応信号処理部３において、３ａはLMS演算部、３ｂはFIR型デジタルフィルタ構成の適応フィルタである。LMS演算部３ａは適応信号処理により誤差信号ｅのパワーが最小となるように適応フィルタ３ｂの係数を決定する。適応信号処理部３は、非音声認識時においてのみ適応信号処理により適応フィルタ３ｂのフィルタ係数Wを決定し、音声認識時にはフィルタ係数の更新をせず、前記非音声認識時に決定したフィルタ係数Wを適応フィルタ３ｂに設定する。

【００１５】４はマイクロホン１１から出力する信号を目標信号として入力される目標応答設定部で、時間ｄの遅延特性を有し、かつ、オーディオ周波数帯域でフラットな特性（ゲイン１の特性）を有している。５は減算部で、目標応答設定部４から出力する目標応答より適応フィルタ３ｂの出力信号を減算して誤差信号ｅを出力する。図１のマイクロホン配置によれば、第１、第２のマイクロホン１１、１２の話者音声に対する感度の相違に加えて、人間の音声放射特性（人間の口を音源としたときの音圧が話者の正面に対して偏向するほど低くなる特性）により、近接配置したにも係らず２つのマイクロホン１１，１２で受音する音声パワーを異ならせることができ、しかも、近接配置により、２つのマイクロホン１１，１２で受音するノイズの相関も高く保つことができる。

【００１６】（ｃ）動作

マイクロホン１１、１２にノイズのみが入力する非音声認識時において、適応信号処理部３は適応信号処理により誤差信号ｅのパワーが最小となるように適応フィルタ３ｂのフィルタ係数Wを決定する。理想的には、フィルタ係数W(Z)は、

$$W(z)=CN1\cdot z^{-d}/CN2 \quad (3)$$

となる。

【００１７】一方、音声認識時、適応信号処理部３はフィルタ係数の更新をせず、前記非音声認識時に決定したフィルタ係数W(Z)を適応フィルタ３ｂに設定して音声信号を出力する。この結果、(2)´及び(3)式より音声信号は次式

$$Es(z)=(CS1\cdot z^{-d}-CS2\cdot W(z))\,xs$$
$$=(CS1-CS2\cdot CN1/CN2)\cdot z^{-d}\cdot xs \quad (4)$$

となる。マイクロホンの接近配置によりCN1≒CN2が成立するとすれば、(4)式の音声信号Es(z)は次式

$$Es(z)=(CS1-CS2)\cdot z^{-d}\cdot xs \quad (4)'$$

で与えられる。マイクロホン１、２の感度差及び音声放射特性によりCS1≒CS2であるため、音声信号Es(z)は0となることはない。すなわち、ノイズ入力時の誤差信号ｅのパワーが最小となるように適応フィルタ係数W(Z)を決定しても、(4)式の音声出力Es(z)は零とならず、音声信号のSN比を改善することができる。又、CN1≒CN2が成り立てば音声信号Es(z)の大きさは、(CS1-CS2)の差、すなわち、マイクロホン１１，１２の感度の差に主に依存する。

【００１８】（ｄ）マイクロホン配置とSN比改善量の検討

以上により、SN比を改善するためには、なるべく相関のあるノイズを２つのマイクロホンで受信しながら、音声はなるべく一方のマイクロホンでのみ受信することが基本である。この基本原理に基づき、最適なマイクロホンレイアウトの検討を行った。マイクロホン配設場所として、(1) 車両のサンバイザーと(2) 車両の助手席側天井を選定した。

【００１９】(d-1) マイクロホンのレイアウト

図３（ａ）はサンバイザーにマイクロホンを設置する場合のレイアウト説明図であり、第１、第２のマイクロホン１１、１２を話者１０前方のサンバイザー（図示せず）に距離ｄの間隔で配置し、かつ、第１のマイクロホン１１の指向方向と発声方向を一致するように固定し、第２のマイクロホン１２の指向方向と話者発声方向の角度をθとした。話者口元から各マイクロホンまでの垂直距離H及びサンバイザーまでの距離Dは一定で共に約30cmである。SN比の改善量の検討に際しては、(1) 第１、第２のマイクロホン１１，１２の位置を固定し、第２のマイクロホン１２の指向方向を可変した（図４参照）、(2) 第１、第２のマイクロホン１１，１２の指向方向を固定し、第２のマイクロホン１２の位置を移動してマイク間距離ｄを可変した（図５参照）。

【００２０】図３（ｂ）は助手席側天井にマイクロホン１１、１２を設置する場合のレイアウト説明図であり、第１、第２のマイクロホン１１、１２を助手席側天井に距離ｄの間隔で前後に配置し、かつ、第１、第２のマイクロホン１１、１２の指向方向を話者発声方向と直角あるいは所定角度θを形成するように配置した。話者口元から各マイクロホンまでの垂直距離H及び水平距離Dは一定で共に約30cmである。SN比の改善量の検討に際しては、(3) 第１、第２のマイクロホン１１，１２をその指向方向が発声方向と直角となるようにし、第２のマイクロホン１２の位置を可変した（図６参照）、(4) 第１のマイクロホン１１の指向方向を発声方向に直角な方向と角度θを形成するように固定し（話者の口元方向に向け設置し）、一方、第２のマイクロホン１２の指向方向を発声方向と直角となるようにし、該第２のマイクロホン位置を可変した（図７参照）。

【００２１】(d-2) 検討結果

図４～図７は上記(1)～(4)において、SN比の改善量が最大になった場合の説明図である。各図において、「Ps」は音声パワー、「Pn」はノイズパワー、「SNR」はSN比、

「改善量」はSN比改善量(dB)、「NR量」はノイズリダクション量(dB)を意味している。又、「NR前」はノイズリダクション制御をしない場合の値(図1のA点におけるPs，Pn)、「NR後」はノイズリダクション制御を行った場合の値(図1のB点におけるPs，Pn)である。又、検討に際しては、「八戸」、「気仙沼」、「行橋」、「札幌」、「北見」の5つの地名の発声を行った場合について、NR前、NR後のPs，Pn、SNRを求め、NR前後のSNRよりSN比改善量を求め、それぞれのSN比改善量の平均値を計算した。

【0022】(1) 図4は、サンバイザーにおいて第1、第2のマイクロホン11，12の位置を固定し、右側の第2のマイクロホン12の指向方向と話者発声方向のなす角度θを可変した場合の検討結果である。θ=15⁰，30⁰，45⁰，60⁰，90⁰，120⁰，180⁰について検討した結果、θ=45⁰において最大の平均SN比改善量4.3dBが得られた。

【0023】(2) 図5は、サンバイザーにおいて第1のマイクロホン11の指向方向を話者発声方向に固定し、第2のマイクロホン12の指向方向を話者発声方向と60⁰の角度をなすように固定し、第2のマイクロホン12の位置を移動してマイク間距離dを可変した場合の検討結果である。d=3cm，6cm，9cm，12cm，15cm，18cmについて検討した結果、d=9cmにおいて最大の平均 SN比改善量4.7dBが得られた。

【0024】(3) 図6は、助手席側天井において第1、第2のマイクロホン11，12の指向方向を話者発声方向と直角となるようにし、第2のマイクロホン12の位置を移動してマイク間距離dを可変した場合の検討結果である。d=2.5cm，5cm，7.5cmについて検討した結果、d=7.5cmにおいて最大の平均 SN比改善量4.5dBが得られた。

【0025】(4) 図7は、助手席側天井において第1のマイクロホン11の指向方向を話者発声方向に直角な方向と角度θを形成するように固定し、又、第2のマイクロホン12の指向方向を話者発声方向と直角となるようにし、該第2のマイクロホン位置を移動してマイク間距離dを可変した場合の検討結果である。d=2cm，4cm,6cmについて検討した結果、d=2cmにおいて最大の平均 SN比改善量4.5dBが得られた。以上のようにマイクロホンを(1)～(4)のようにレイアウトすることにより4～5dBのSN比の改善ができる。このSN比改善により認識率を大幅に改善することが可能になる。以上図6、図7では助手席側天井にマイクロホン11、12を設けた例を示したが、運転席側天井の同様位置にマイクロホンを設けることもできる。

【0026】(e) 別のマイクロホンシステムの構成図
図8は本発明を適用できるマイクロホンシステムの別の構成図であり、図1と同一部分には同一符号を付している。異なる点は、図1の目標応答設定部4を適応信号処理部4′で構成している点である。図1のマイクロホンシステムでは、誤差信号eのパワーが最小となるように適応信号処理部3でのみ適応信号処理を行うが、図8のマイクロホンシステムでは、適応信号処理部3と適応信号処理部4′が誤差信号eのパワーが最小となるように適応信号処理を行う。以上、本発明を実施例により説明したが、本発明は請求の範囲に記載した本発明の主旨に従い種々の変形が可能であり、本発明はこれらを排除するものではない。

【0027】

【発明の効果】以上本発明によれば、指向特性を有する2つのマイクロホンを接近して配置すると共に、マイクロホンの指向方向と話者の発声方向がなす角度をマイクロホン毎に異ならせるようにしたから、一方のマイクロホンから出力する音声信号のSN比を高くし、他方のマイクロホンから出力する音声信号のSN比を低くするようにでき、この結果、ノイズ出力が最小となるように適応フィルタ係数を決定しても、音声出力は零とならず、音声信号のSN比を改善することができる。又、本発明によれば、各マイクロホンを車両のサンバイザーあるいは車両の助手席あるいは運転席側天井に取り付け、それぞれの指向方向を異ならせるだけの簡単な構成で、各マイクロホンを比較的近距離に配置しているにも拘らず、1つのマイクロホンにおいてできるだけ高いSN比で音声を拾い、もう一方のマイクロホンにおいて、できるだけ低いSN比で音声を拾うようにでき、SN比を改善することができる。

【図面の簡単な説明】

【図1】本発明のマイクロホンシステムである。

【図2】指向特性説明図である。

【図3】マイクロホンのレイアウト説明図である。

【図4】サンバイザーに取り付けた右側のマイクロホンの指向方向と話者発声方向のなす角度θを可変した場合のSN比改善量説明図表である。

【図5】サンバイザーにマイクロホンを取り付け、60⁰の角度を付けた右側のマイクロホンを移動した場合のSN比改善量説明図表である。

【図6】助手席側天井に指向方向が話者発声方向と直角となるように各マイクロホンを取り付け、一方のマイクロホンの位置を移動してマイク間距離を可変した場合のSN比改善量説明図表である。

【図7】助手席側天井前方にマイクロホンを取り付け、マイクロホン間距離を可変した場合のSN比改善量説明図表である。

【図8】別のマイクロホンシステムの構成図である。

【図9】SN比と認識率の関係図である。

【図10】従来のマイクロホンを2つ使用した場合の高SN比受音システムである。

【図11】目標応答設定部の特性図である。

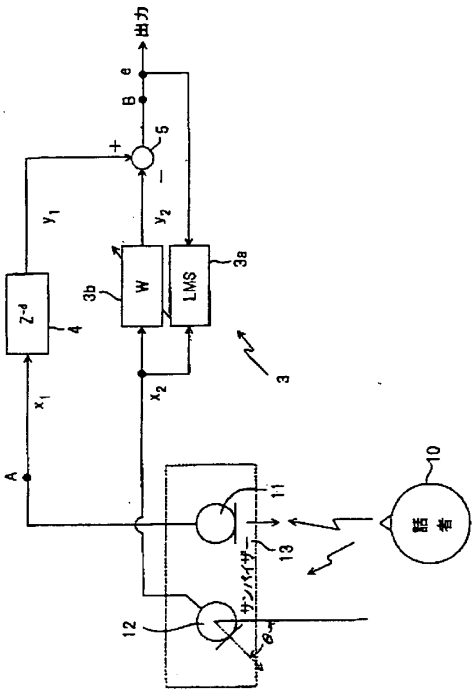
【符号の説明】

Meta Platforms, Inc. - Exhibit 1002
Page 170 of 686

11，12・・第1、第2のマイクロホン
13・・サンバイザー
3・・適応信号処理部
3a・・LMS演算部
3b・・適応フィルタ
4・・目標応答設定部
5・・減算部

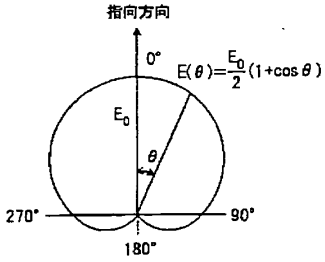
【図1】

本発明のマイクロホンシステム



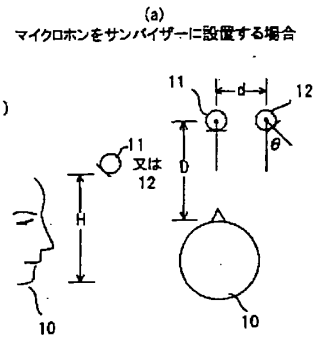
【図2】

指向特性説明図



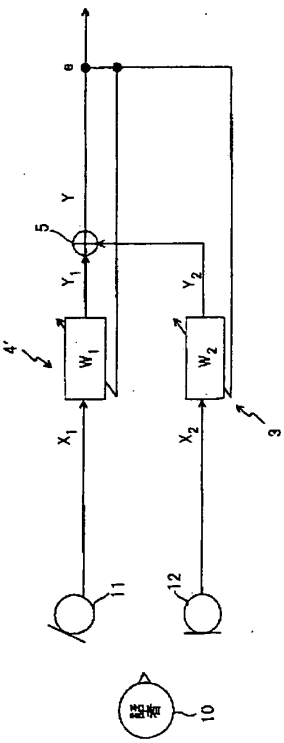
【図3】

マイクロホンレイアウト説明図



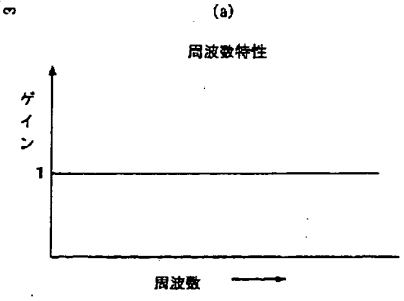
【図8】

別のマイクロホンシステムの構成



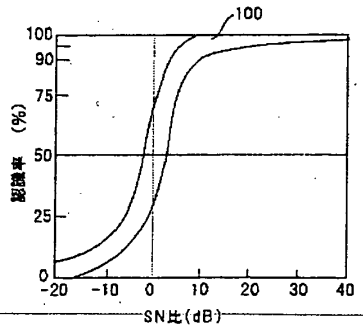
【図11】

目標応答設定部の特性



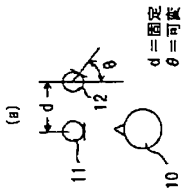
【図9】

SN比と認識率の関係



【図4】

サンバイザー取付け右側のマイクロホンの指向方向を変えた場合のSN改善量説明図表



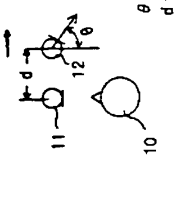
(b)

NR前 NR後

条件		八戸		気仙沼		行橋		札幌		北見		改善量平均
サンバイザー R 45°	Ps	-11.3	-12.0	-14.2	-14.7	-16.2	-16.9	-10.8	-10.3	-11.5	-11.9	NR量:5.83 ○
	Pn	-17.0	-21.7	-17.0	-21.7	-17.0	-21.7	-17.0	-21.7	-17.0	-21.7	
	SNR	5.6	9.7	2.7	7.0	-0.7	5.0	6.3	11.4	5.4	9.8	
	改善量	4.1		4.2		4.1		5.1		4.3		4.3

【図5】

サンバイザーにマイクロホンを取付け、60° の角度をつけた右側のマイクロホンを移動した場合のSN改善量説明図表



(b)

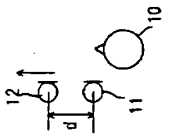
NR前 NR後

条件		八戸		気仙沼		行橋		札幌		北見		改善量平均
サンバイザー R 9cm-60°	Ps	-14.8	-13.6	-13.5	-11.6	-15.8	-13.7	-12.3	-9.5	-10.3	-6.7	NR量:4.51 ○
	Pn	-17.6	-20.0	-17.6	-20.0	-17.8	-20.0	-17.6	-20.0	-17.6	-20.0	
	SNR	3.0	6.4	4.1	8.4	2.0	5.3	5.3	10.5	7.3	13.3	
	改善量	3.5		4.3		4.4		5.2		6.0		4.7

【図6】

助手席側天井に各マイクロホンを話者発声方向と直角に取付け、一方のマイクロホン位置を移動した場合のSN改善量説明図

(a)



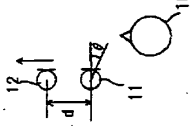
(b)

条件		八戸		気仙沼		行橋		札幌		北見		改善量平均
横天 距離 7.5cm	Ps	-12.2	-16.1	-12.6	-17.1	-13.5	-17.1	-12.3	-18.0	-8.8	-11.1	NR量:3.90
	Pn	-12.8	-20.8	-12.9	-20.8	-12.9	-20.8	-12.8	-20.8	-12.8	-20.8	○
	SNR	0.7	4.6	0.2	3.7	-0.6	3.8	0.6	5.8	4.0	0.6	
	改善量	4.0		3.8		4.3		5.2		5.6		4.5

【図7】

助手席側天井前方にマイクを取付け、マイク間距離を可変した場合のSN改善量説明図表

(a)



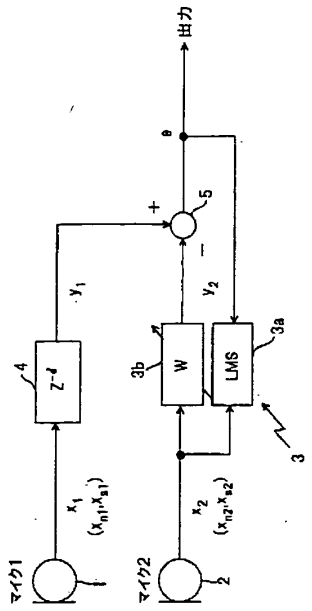
(b)

NR前 NR後

条件		八戸		気仙沼		行橋		札幌		北見		改善量平均
横天 F 平行−2cm	Ps	-14.3	-14.0	-13.0	-13.7	-15.9	-15.6	-11.2	-11.7	-10.4	-11.0	NR量:6.77
	Pn	-20.2	-24.7	-20.2	-24.7	-20.2	-24.7	-20.2	-24.7	-20.2	-24.7	○
	SNR	6.0	10.7	8.5	11.0	4.7	9.2	8.5	13.0	9.3	13.8	
	改善量	4.7		4.5		4.5		4.5		4.5		4.5

【図10】

従来のマイクロホンを2つ使用した場合の高SN比受音システム



フロントページの続き

(72)発明者　木内　真吾
東京都品川区西五反田１丁目１番８号　アルパイン株式会社内

Ｆターム(参考)　3D020 BA11 BC02 BC04 BE04
5D015 EE05 KK01
5D020 BB04 BB07
9A001 HH17 KK31

This Page is Inserted by IFW Indexing and Scanning Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☑ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☑ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.
As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2001－189987
（P2001－189987A）
(43)公開日　平成13年７月10日(2001.7.10)

(51)Int.Cl.'		識別記号	FI		テーマコード'(参考)
H04R	3/00	320	H04R	3/00	320　5D018
	1/40	320		1/40	320B　5D020

審査請求　未請求　請求項の数１　ＯＬ　（全４頁）

(21)出願番号　特願平11－374820

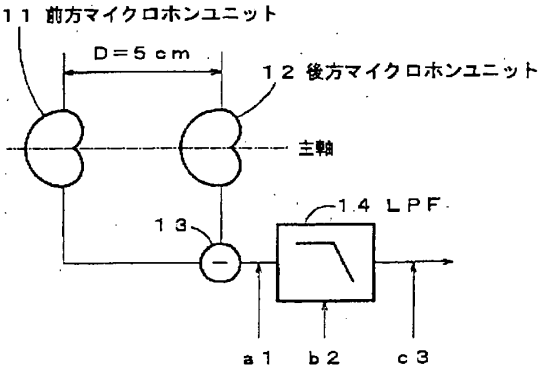
(22)出願日　平成11年12月28日(1999.12.28)

(71)出願人　000005016
パイオニア株式会社
東京都目黒区目黒１丁目４番１号
(71)出願人　000221926
東北パイオニア株式会社
山形県天童市大字久野本字日光1105番地
(72)発明者　佐藤　光一
山形県天童市大字久野本日光1105番地　東北パイオニア株式会社内
(74)代理人　100060690
弁理士　瀧野　秀雄

Ｆターム(参考)　5D018 BB23
5D020 BB04 BB07

(54)【発明の名称】　狭指向性マイクロホンユニット

(57)【要約】
【課題】　全音声帯域で狭指向性を得、人の声の明瞭度を高めるとともに、走行ノイズや振動ノイズを拾いにくくする。
【解決手段】　２個の単一指向性マイクロホン１１、１２を同一軸上に所定間隔で配列し、この２個のマイクロホン出力を演算器１３で減算出力し、ローパスフィルタ１４で高周波成分を除去する。例えば、マイクロホンの設置間隔を５０ｍｍ（電話音声帯域の上限の半波長相当）に設定することにより、正面特性が電話の音声帯域の上限である３ｋＨｚからマイクロホンに生じる位相差で６ｄＢ／ｏｃｔの特性が実現され、カットオフ周波数５００Ｈｚ、６ｄＢ／ｏｃｔのローパスフィルタ１４を組み込むことにより、マイクロホン出力が５００Ｈｚから３．４ｋＨｚまでのバンドパスフィルタを通した特性になる。



BEST AVAILABLE COPY

【特許請求の範囲】
【請求項１】　所定の間隔を隔て同一軸上に配置された２個の単一指向性マイクロホンユニットと、
前記単一指向性マイクロホンユニットの一方の出力信号と他方の出力信号の差を演算する演算器と、
前記演算器出力の高周波成分を除去するローパスフィルタと、を備えたことを特徴とする狭指向性マイクロホン。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、特に、車載用ハンズフリー通話システム及び音声認識システムに用いて好適な、狭指向性マイクロホンに関する。
【０００２】
【従来の技術】図３、図４に従来の狭指向性マイクロホンの基本構成が示されている。図３に示されるように従来の狭指向性マイクロホンは、主軸方向に正面方向を向けた２つの単一指向性マイクロホンユニット３１、３２と、遅延回路網３３、そして減算器３４で構成されるか、あるいは図４に示されるように、主軸方向に正面方向を向けた２つの単一指向性マイクロホンユニット４１、４２と、ハイパスフィルタ４３、そして減算器４４で構成される。
【０００３】狭指向性マイクロホンは、二次音圧傾度型（１つの無指向性マイクロホンユニットの指向性をｆ（θ）＝１としたとき、単一指向性マイクロホンユニット２個を使用した場合の指向性ｆ（θ）＝（１＋ｃｏｓθ）^{2}で示される）が一般的であるが、正面特性の均一性をはかるため、図３、図４に示すように２つのマイクロホンユニット３１（４１）、３２（４２）のうち、、一方のマイクロホンユニットの出力を遅延回路網３３で遅延させるか、あるいはハイパスフィルタ４３を介して高周波成分を除去した後、減算器３４（４３）で減算していた。
【０００４】
【発明が解決しようとする課題】上述した従来技術によれば、全音声帯域、特に低域での狭指向性が得られないため、走行ノイズや振動ノイズを拾いやすく、かつ、音声の明瞭度が低い。従って、ハンズフリー通話システム等車内での実使用に耐えない。
【０００５】本発明は上記事情に鑑みてなされたものであり、２個の単一指向性マイクロホンユニットを同一軸上に電話音声帯域の半波長相当間隔を置いて配置し、前記２個のマイクロホンユニット出力を減算して高周成分を除去することで、低域から高域に至る全音声帯域で狭指向性を得ることのできる、特に車内での使用に適した狭指向性マイクロホンを提供することを目的とする。
【０００６】
【課題を解決するための手段】上記した課題を解決するために請求項１に記載の狭指向性マイクロホンは、所定の間隔を隔て同一軸上に配置された２個の単一指向性マイクロホンユニットと、前記単一指向性マイクロホンユニットの一方の出力信号と他方の出力信号の差を演算する演算器と、前記演算器出力の高周波成分を除去するローパスフィルタとを備えたことを特徴とする。
【０００７】このことにより、マイクロホンユニットの設置間隔を例えば５０ｍｍ（電話音声帯域の上限の半波長相当）に設定することにより、正面特性が電話の音声帯域の上限である３．４ｋＨｚからマイクロホンユニットに生じる位相差で６ｄＢ／ｏｃｔの特性が実現され、例えば、カットオフ周波数５００Ｈｚ、６ｄＢ／ｏｃｔのローパスフィルタを組み込むことにより、マイクロホン出力が５００Ｈｚから３．４ｋＨｚまでのバンドパスフィルタを通した特性となり、全音声帯域に渡り狭指向性を実現でき、人の声の明瞭度が高まると共に、低周波成分の感度が低くなるためにロードノイズを拾いにくくなり、従って、車内でのハンズフリー通話での実用に耐えることができる。
【０００８】
【発明の実施の形態】図１は本発明の狭指向性マイクロホンの実施形態を示す図である。図２は本発明実施形態の動作を説明するために引用した図であり、図１における各ポイントａ、ｂ、ｃにおける信号の周波数特性を示した図である。
【０００９】図１において、１１、１２は、単一指向性マイクロホンユニットであり、５ｃｍの間隔を隔て同一軸上に設置されるものである。ここでは、設置位置の関係上、正面に近いところから、前方マイクロホンユニット１１、後方マイクロホンユニット１２と称する。なお、５ｃｍの間隔は、電話音声帯域の上限３．４ｋＨｚの半波長に相当する。１３は演算器である。演算器１３は、前方マイクロホンユニット１１の出力から後方マイクロホンユニット１２の出力を減算することにより、図２（ａ）に示す周波数特性を持つ出力信号を生成するものである。すなわち、２つのマイクロホンユニット１１、１２出力を減算することにより、正面特性は、位相差によって位相が反転する周波数（マイクロホンユニット１１、１２の設置間隔Ｄが５ｃｍのとき３．４ＭＨｚ）まで、６ｄＢ／ｏｃｔで上昇する。なお、側面から拾われる音は、全ての周波数において同相入力となるため、減算されて出力は０になる。
【００１０】１４はローパスフィルタである。ローパスフィルタ１４は、図２（ｂ）に示す周波数特性を持つものを使用する。すなわち、カットオフ周波数５００Ｈｚ、６ｄＢ／ｏｃｔのローパスフィルタを用い、演算器１３出力の高周波成分を除去する。このことにより、図２（ｃ）に示す特性を持つ出力が生成される。従って、マイクロホンの出力が５００Ｈｚから３．４ｋＨｚまでバンドパスフィルタを通した特性となり、人の声の明瞭度を高めると共に、走行ノイズ等低周波成分を押さえる

BEST AVAILABLE COPY

ことができる。

【0011】このように、図2（a）に示す特性を持ったマイクロホン出力（減算器13出力）に、図2（b）に示す特性を持つローパスフィルタ14を通すことにより、正面特性が所望のバンドパスフィルタを通した、すなわち、図2（c）に示す特性を得ることができる。

【0012】図2（a）の特性を得るマイクロホンは、2つの単一指向性マイクロホンユニットを同一軸上に配列し、前方マイクロホンユニット11から後方マイクロホンユニット12の出力を演算器13で減算することによって得ることができる。これらマイクロホンユニット11、12において、設置間隔を50mmに設定することにより、マイクロホンの正面特性が電話の音声帯域の上限である3．4MHzからマイクロホンユニット11（12）に生じる位相差で6dB／octの特性を実現し、このことにより、低周波の感度が低くなり、従ってロードノイズを拾いにくくなる。また、マイクロホンユニット11、12の側面から拾われる音は、2つのマイクロホンユニット11、12に同相で入力されるため、減算することによって相殺され、結果として正面のみの音が出力され、全音声帯域での狭指向性が実現される。

【0013】

【発明の効果】以上説明のように本発明は、2個の単一指向性マイクロホンユニットを同一軸上に所定間隔で配列し、この2個のマイクロホンユニット出力を演算器で減算出力して高周波成分を除去したものである。このことにより、マイクロホンの設置間隔を例えば50mm（電話音声帯域の上限の半波長相当）に設定することにより、正面特性が電話の音声帯域の上限である3．4kHzからマイクロホンユニットに生じる位相差で6dB／octの特性が実現され、例えば、カットオフ周波数500Hz、6dB／octのローパスフィルタを組み込むことにより、マイクロホン出力が500Hzから3．4kHzまでのバンドパスフィルタを通した特性となる。従って、全音声帯域に渡り狭指向性を実現でき、人の声の明瞭度が高まると共に、低周波成分の感度が低くなるためにロードノイズを拾いにくくなり、従って、車内でのハンズフリー通話での実用に耐えることができる。

【図面の簡単な説明】

【図1】本発明の狭指向性マイクロホンの一実施形態を示す図である。

【図2】本発明実施形態の動作を説明するために引用した図であり、図1の各ポイントにおける信号の周波数特性を示す図である。

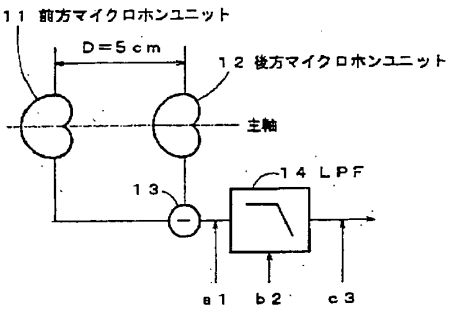
【図3】従来における狭指向性マイロホンの一構成例を示す図である。

【図4】従来における狭指向性マイロホンの他の構成例を示す図である。

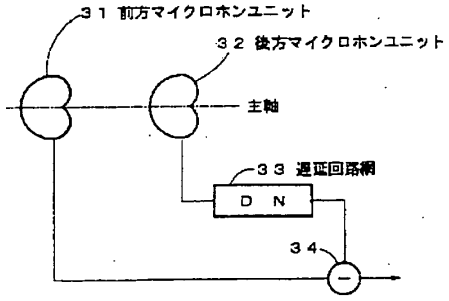
【符号の説明】

11　前方マイクロホンユニット
12　後方マイクロホンユニット
13　演算器
14　ローパスフィルタ

【図1】

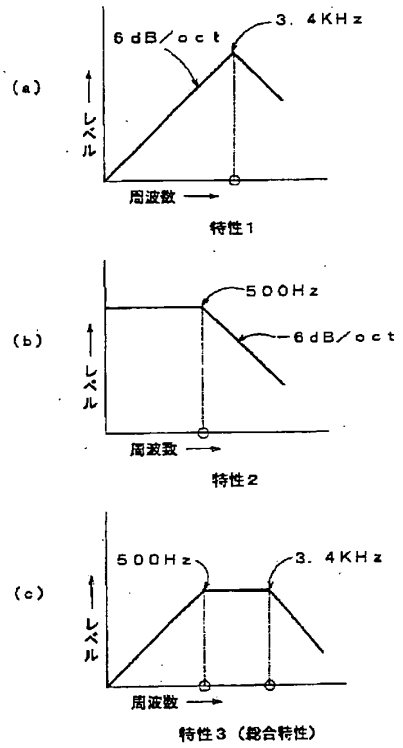


【図3】

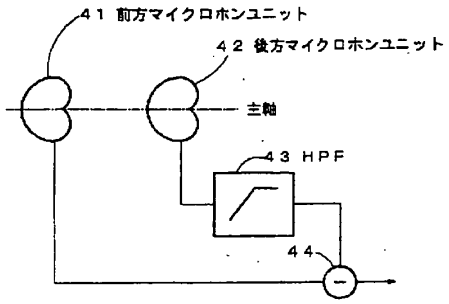


BEST AVAILABLE COPY

【図2】



【図4】



BEST AVAILABLE COPY

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
24 January 2002 (24.01.2002)

PCT

(10) International Publication Number
WO 02/07151 A2

(51) International Patent Classification[7]: G10L 21/00

(21) International Application Number: PCT/US01/22490

(22) International Filing Date: 17 July 2001 (17.07.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/219,297	19 July 2000 (19.07.2000)	US
09/905,361	12 July 2001 (12.07.2001)	US

(63) Related by continuation (CON) or continuation-in-part (CIP) to earlier applications:

US	60/219,297 (CIP)
Filed on	19 July 2000 (19.07.2000)
US	09/905,361 (CIP)
Filed on	12 July 2001 (12.07.2001)

(71) Applicant *(for all designated States except US)*: **ALIPHCOM** [US/US]; 2nd floor, 54 Mint Street, San Francisco, CA 94103 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **BURNETT, Gregory, C.** [US/US]; 637 South H Street, Livermore, CA 94550 (US). **BREITFELLER, Eric, F.** [US/US]; 11526 Streambed Place, Dublin, CA 94568-2294 (US).

(74) Agent: **PERKINS COIE, LLP**; P.O. Box 2168, Menlo Park, CA 94026 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 02/07151 A2

(54) Title: METHOD AND APPARATUS FOR REMOVING NOISE FROM ELECTRONIC SIGNALS

(57) Abstract: A method and system are provided for acoustic noise removal from human speech, wherein noise is removed without respect to noise type, amplitude, or orientation. The system includes microphones and a voice activity detection (VAD) data stream coupled among a processor. The microphones receive acoustic signals and the VAD produces a signal including a binary one when speech (voiced and unvoiced) is occurring and a binary zero in the absence of speech. The processor includes denoising algorithms that generate transfer functions. The transfer functions include a transfer function generated in response to a determination that voicing information is absent from the received acoustic signal during a specified time period. The transfer functions also include transfer functions generated in response to a determination that voicing information is present in the acoustic signal during a specified time period. At least one denoised acoustic data stream is generated using the transfer functions.

BEST AVAILABLE COPY

METHOD AND APPARATUS FOR REMOVING NOISE FROM ELECTRONIC SIGNALS

FIELD OF THE INVENTION

The invention is in the field of mathematical methods and electronic systems for removing or suppressing undesired acoustical noise from acoustic transmissions or recordings.

BACKGROUND

In a typical acoustic application, speech from a human user is recorded or stored and transmitted to a receiver in a different location. In the environment of the user, there may exist one or more noise sources that pollute the signal of interest (the user's speech) with unwanted acoustic noise. This makes it difficult or impossible for the receiver, whether human or machine, to understand the user's speech. This is especially problematic now with the proliferation of portable communication devices like cellular telephones and personal digital assistants. There are existing methods for suppressing these noise additions, but they either require far too much computing time or cumbersome hardware, distort the signal of interest too much, or lack in performance to be useful. Many of these methods are described in textbooks such as "Advanced Digital Signal Processing and Noise Reduction" by Vaseghi, ISBN 0-471-62692-9. Consequently, there is a need for noise removal and reduction methods that address the shortcomings of typical systems and offer new techniques for cleaning acoustic signals of interest without distortion.

Meta Platforms, Inc. - Exhibit 1002
Page 181 of 686

SUMMARY

A method and system are provided for acoustic noise removal from human speech, wherein the noise can be removed and the signal restored without respect to noise type, amplitude, or orientation. The system includes microphones and sensors coupled with a processor. The microphones receive acoustic signals including both noise and speech signals from human signal sources. The sensors yield a binary Voice Activity Detection (VAD) signal that provides a signal that is a binary "1" when speech (both voiced and unvoiced) is occurring and a binary "0" when no speech is occurring. The VAD signal can be obtained in numerous ways, for example, using acoustic gain, accelerometers, and radio frequency (RF) sensors.

The processor system and method includes denoising algorithms that calculate the transfer function among the noise sources and the microphones as well as the transfer function among the human user and the microphones. The transfer functions are used to remove noise from the received acoustic signal to produce at least one denoised acoustic data stream.

Meta Platforms, Inc. - Exhibit 1002
Page 182 of 686

BRIEF DESCRIPTION OF THE DRAWINGS

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

Figure 2 is a block diagram of a noise removal algorithm of an embodiment, assuming a single noise source and a direct path to the microphones.

Figure 3 is a block diagram of a front end 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 of a front end of a noise removal algorithm of an embodiment in the most general case where there are *n* distinct noise sources and signal reflections.

Figure 5 is a flow diagram of a denoising method of 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.

Meta Platforms, Inc. - Exhibit 1002
Page 183 of 686

DETAILED DESCRIPTION

Figure 1 is a block diagram of a denoising system of an embodiment that uses knowledge of when speech is occurring derived from physiological information on voicing activity. The system includes microphones 10 and sensors 20 that provide signals to at least one processor 30. The processor includes a denoising subsystem or algorithm.

Figure 2 is a block diagram of a noise removal system/algorithm of an embodiment, assuming a single noise source and a direct path to the microphones. The noise removal system diagram includes a graphic description of the process of an embodiment, with a single signal source (100) and a single noise source (101). This algorithm uses two microphones, a "signal" microphone (MIC 1, 102) and a "noise" microphone (MIC 2, 103), but is not so limited. MIC 1 is assumed to capture mostly signal with some noise, while MIC 2 captures mostly noise with some signal. This is the common configuration with conventional advanced acoustic systems. The data from the signal to MIC 1 is denoted by s(n), from the signal to MIC 2 by $s_2(n)$, from the noise to MIC 2 by n(n), and from the noise to MIC 1 by $n_2(n)$. Similarly, the data from MIC 1 is denoted by $m_1(n)$, and the data from MIC 2 $m_2(n)$, where s(n) denotes a discrete sample of the analog signal from the source.

The transfer functions from the signal to MIC 1 and from the noise to MIC 2 are assumed to be unity, but the transfer function from the signal to MIC 2 is denoted by $H_2(z)$ and from the noise to MIC 1 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 noise removal systems, the information from MIC 2 is used to attempt to remove noise from MIC 1. However, an unspoken assumption is that the Voice Activity Detection (VAD) 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 is assumed to be perfect and is equal to zero when there is no speech being produced by the user,

Meta Platforms, Inc. - Exhibit 1002
Page 184 of 686

and one when speech is produced, a substantial improvement in the noise removal can be made.

In analyzing the single noise source and direct path to the microphones, with reference to **Figure 2**, the acoustic information coming into MIC 1 is denoted by $m_1(n)$. The 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 the VAD signal 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

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

Meta Platforms, Inc. - Exhibit 1002
Page 185 of 686

$H_1(z)$ 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 $H_1(z)$ and $H_2(z)$ do not change substantially while the other is being calculated.

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

Meta Platforms, Inc. - Exhibit 1002
Page 186 of 686

characteristics of the noise. The only assumptions made are a perfect VAD, sufficiently accurate $H_1(z)$ and $H_2(z)$, and that $H_1(z)$ and $H_2(z)$ do not change substantially when the other is being calculated. 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 of a front end 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:

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

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

$$M_{1n} = N_1H_1 + N_2H_2 + \ldots N_nH_n$$
$$M_{2n} = N_1G_1 + N_2G_2 + \ldots N_nG_n \quad \text{Eq. 5}$$

A new transfer function can now be defined, analogous to $H_1(z)$ above:

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

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 that there is no 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

Meta Platforms, Inc. - Exhibit 1002
Page 187 of 686

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

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

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

Solving for S yields,

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

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 of a front end of a noise removal algorithm of an embodiment in the most general case where there are *n* distinct noise sources and signal reflections. Here, reflections of the signal enter both microphones. This is the most general case, as reflections of the noise source into the microphones can be modeled accurately as simple additional noise sources. For clarity, the direct path from the signal to MIC 2 has changed from $H_0(z)$ to $H_{00}(z)$, and the reflected paths to Microphones 1 and 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 the z's again)

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

Meta Platforms, Inc. - Exhibit 1002
Page 188 of 686

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 $\tilde{H}_2$:

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

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

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

Some algebraic manipulation yields

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

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 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 Microphone 2, which act as noise sources.

Figure 5 is a flow diagram of a denoising method of an embodiment. In operation, the acoustic signals are received 502. Further, physiological

Meta Platforms, Inc. - Exhibit 1002
Page 189 of 686

information associated with human voicing activity is received 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 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 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 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 they do 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

Meta Platforms, Inc. - Exhibit 1002
Page 190 of 686

simplicity an all-zero Finite Impulse Response (FIR) filter is used. With enough taps (around 60) the approximation to the actual $H_I(z)$ is very good.

Regarding subband selection, 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, with the lowest frequency at 50 Hz and the highest at 3700. The denoising algorithm was then applied to each subband in turn, and 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 has been found to work as well.

The amplitude of the noise was constrained in an embodiment so that the microphones used did not saturate (i.e. operate outside a linear response region). It is important that the microphones operate linearly to ensure the best performance. Even with this restriction, very high signal-to-noise ratios (SNR) can be tested (down to about –10 dB).

The calculation of $H_I(z)$ was 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 Stearns, published by Prentice-Hall, ISBN 0-13-004029-0.

The VAD for an embodiment was 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) interferometer to detect tissue motion associated with human speech production, but is not so limited. It is therefore completely acoustic-noise free, and is able to function in any acoustic noise environment. A simple energy measurement can be used to determine if voiced speech is occurring. Unvoiced speech can be determined using conventional frequency-based methods, by proximity to voiced sections, or through a combination of the above. Since there is much less energy in unvoiced speech, its activation accuracy is not as critical as 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

Meta Platforms, Inc. - Exhibit 1002
Page 191 of 686

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 results of a noise suppression algorithm of an embodiment for an American English speaking female in the presence of airport terminal noise that 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 data 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, to name a few. 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

Meta Platforms, Inc. - Exhibit 1002
Page 192 of 686

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.

Various embodiments are described herein with reference to the figures, but the detailed description and the figures are not intended to be limiting. Various combinations of the elements described have not been shown, but are within the scope of the invention which is defined by the following claims.

Meta Platforms, Inc. - Exhibit 1002
Page 193 of 686

CLAIMS

What is claimed is:

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

receiving a plurality of acoustic signals;

receiving physiological information 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;

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;

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.

2. 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.

3. The method of claim 1, wherein receiving physiological information comprises receiving physiological data associated with human voicing using at least one detector selected from a group consisting of radio frequency devices, electroglottographs, ultrasound devices, acoustic throat microphones, and airflow detectors.

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

Meta Platforms, Inc. - Exhibit 1002
Page 194 of 686

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

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

detecting an absence of voiced information during at least one period;

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.

10. The method of claim 9, wherein the at least one noise source signal includes at least one reflection of at least one associated noise source signal.

Meta Platforms, Inc. - Exhibit 1002
Page 195 of 686

11. The method of claim 9, wherein the at least one composite signal includes at least one reflection of at least one associated composite signal.

12. The method of claim 9, wherein detecting comprises collecting physiological data associated with human voicing using at least one detector selected from a group consisting of radio frequency devices, electroglottographs, ultrasound devices, acoustic throat microphones, and airflow detectors.

13. The method of claim 9, wherein receiving includes receiving the at least one noise source signal using at least one microphone.

14. The method of claim 13, wherein the at least one microphone includes a plurality of independently located microphones.

15. The method of claim 9, 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.

16. The method of claim 9, wherein generating at least one transfer function comprises recalculating the at least one transfer function during at least one prespecified interval.

17. The method of claim 9, 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 techniques.

18. A method for removing noise from electronic signals, comprising:
determining at least one unvoicing period during which voiced information is absent;

Meta Platforms, Inc. - Exhibit 1002
Page 196 of 686

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;

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;

receiving at least one composite signal comprising acoustic and noise signals; 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 at least one denoised acoustic data stream.

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

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

at least one sensor that receives physiological 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 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.

Meta Platforms, Inc. - Exhibit 1002
Page 197 of 686

20. The system of claim 19, wherein the at least one sensor includes at least one radio frequency (RF) interferometer that detects tissue motion associated with human speech production.

21. The system of claim 19, wherein the at least one sensor includes at least one sensor selected from a group consisting of radio frequency devices, electroglottographs, ultrasound devices, acoustic throat microphones, and airflow detectors.

22. The system of claim 19, 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 combination of the at least one first transfer function and the at least one second 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.

23. The system of claim 19, wherein the at least one receiver includes a plurality of independently located microphones.

24. 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 collects physiological data 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

Meta Platforms, Inc. - Exhibit 1002
Page 198 of 686

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

25. 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 is coupled to receive physiological information 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 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.

26. The signal processing system of claim 25, wherein the at least one electronic device includes at least one device selected from a group consisting of cellular telephones, personal digital assistants, portable communication devices, computers, video cameras, digital cameras, and telematics systems.

27. 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;

Meta Platforms, Inc. - Exhibit 1002
Page 199 of 686

receiving physiological 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;

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;

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.

28. 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 physiological 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;

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;

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.

Meta Platforms, Inc. - Exhibit 1002
Page 200 of 686

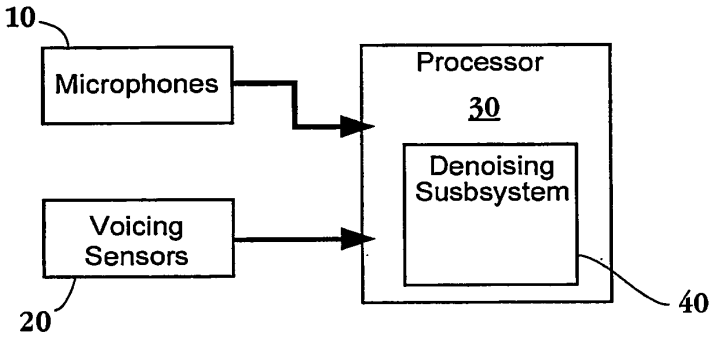

10
Microphones
Voicing Sensors
20
Processor
30
Denoising Susbsystem
40

Fig. 1

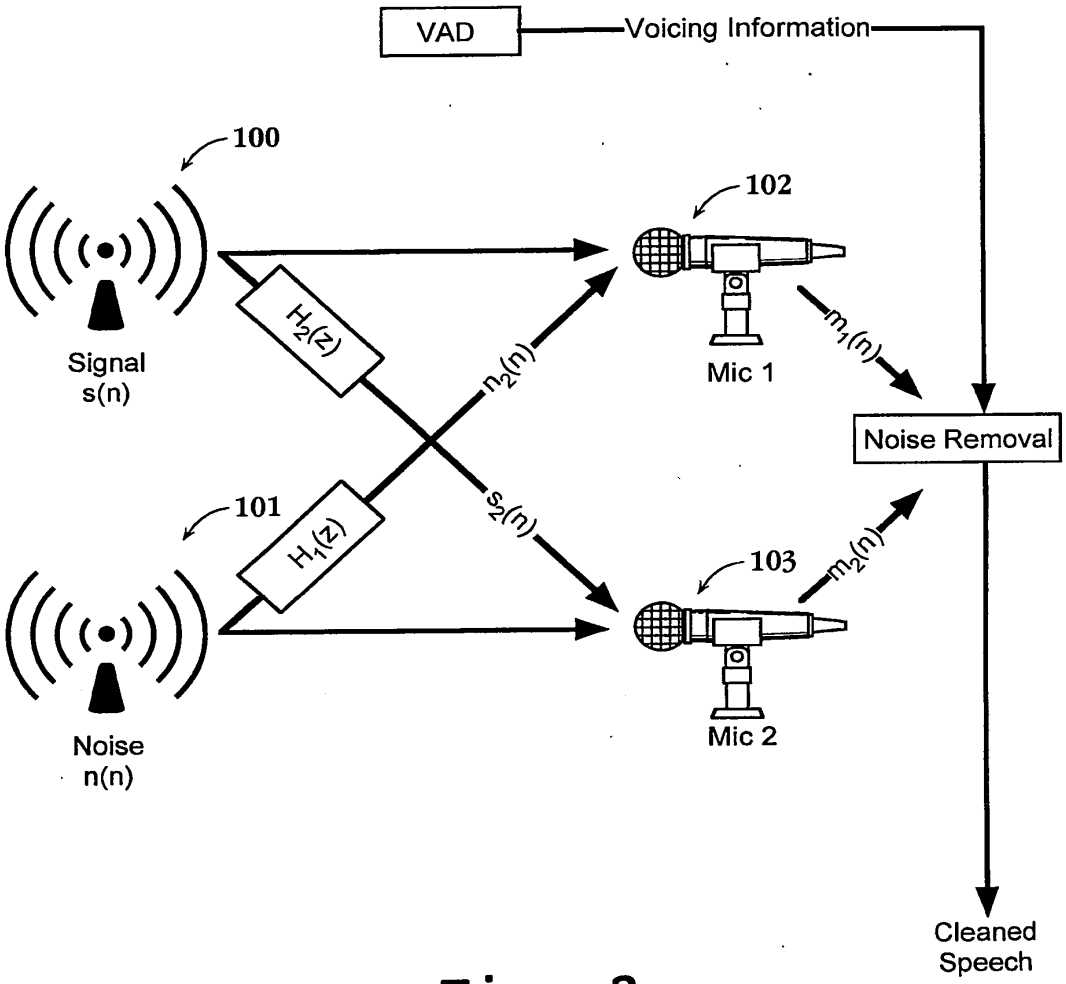

VAD
Voicing Information
100
Signal
s(n)
102
Mic 1
$H_2(z)$
$n_2(n)$
$m_1(n)$
Noise Removal
101
$H_1(z)$
$s_2(n)$
103
$m_2(n)$
Noise
n(n)
Mic 2
Cleaned
Speech

Fig. 2

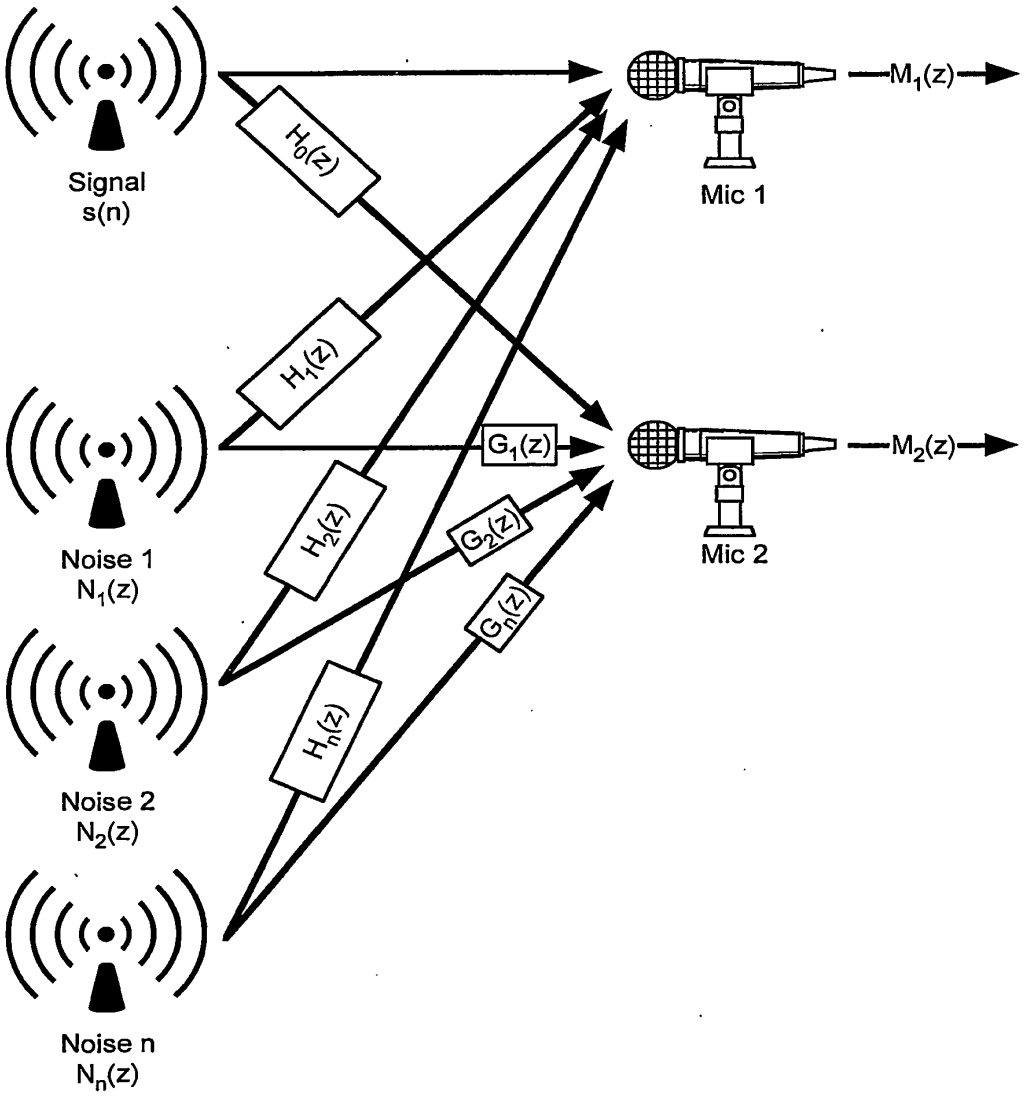

Signal
s(n)
Noise 1
$N_1(z)$
Noise 2
$N_2(z)$
Noise n
$N_n(z)$
$H_0(z)$
$H_1(z)$
$H_2(z)$
$H_n(z)$
$G_1(z)$
$G_2(z)$
$G_n(z)$
Mic 1
Mic 2
$M_1(z)$
$M_2(z)$

Fig. 3

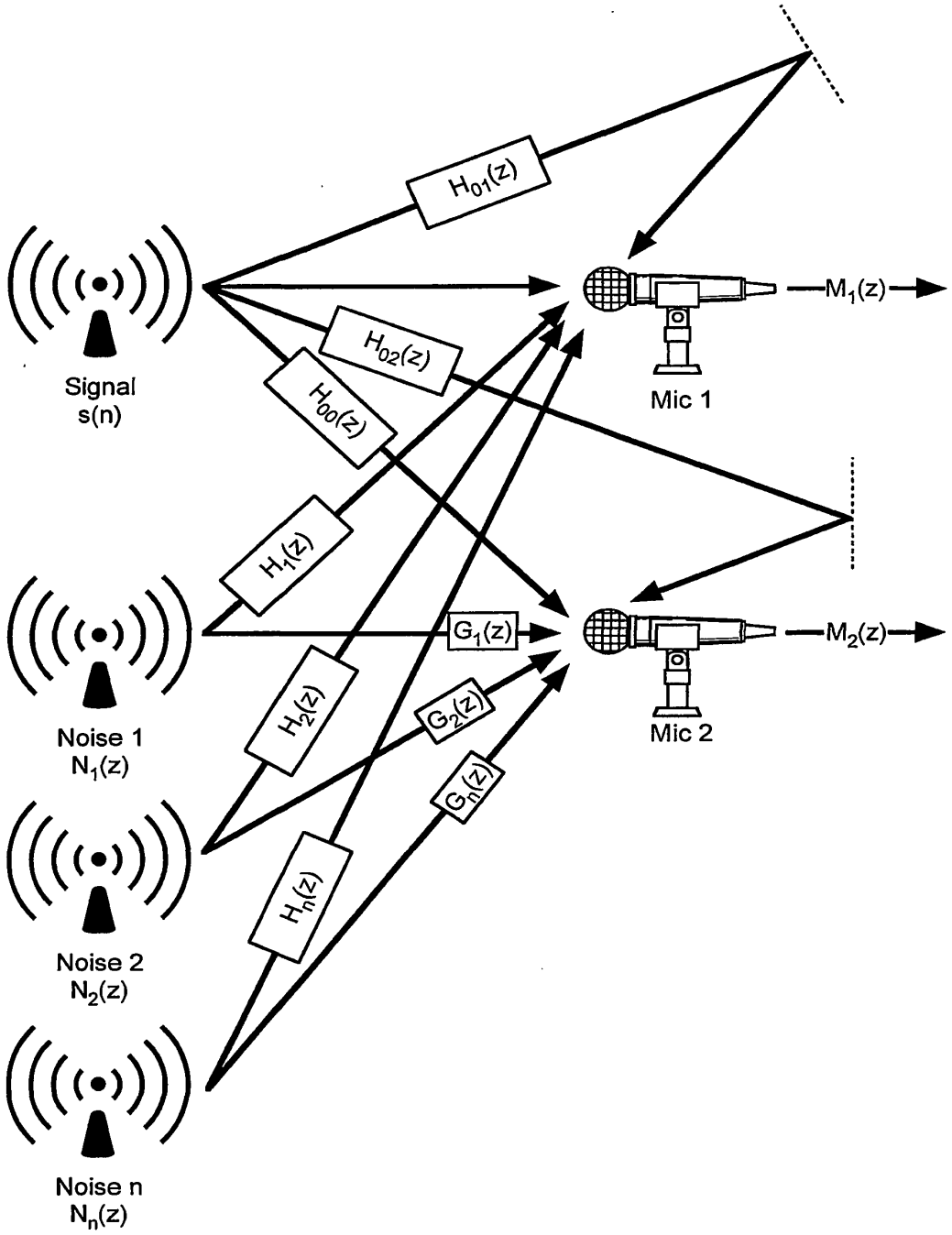

$H_{01}(z)$
$H_{02}(z)$
$H_{00}(z)$
$H_1(z)$
$H_2(z)$
$H_n(z)$
$G_1(z)$
$G_2(z)$
$G_n(z)$
$M_1(z)$
$M_2(z)$
Signal
s(n)
Noise 1
$N_1(z)$
Noise 2
$N_2(z)$
Noise n
$N_n(z)$
Mic 1
Mic 2

Fig. 4

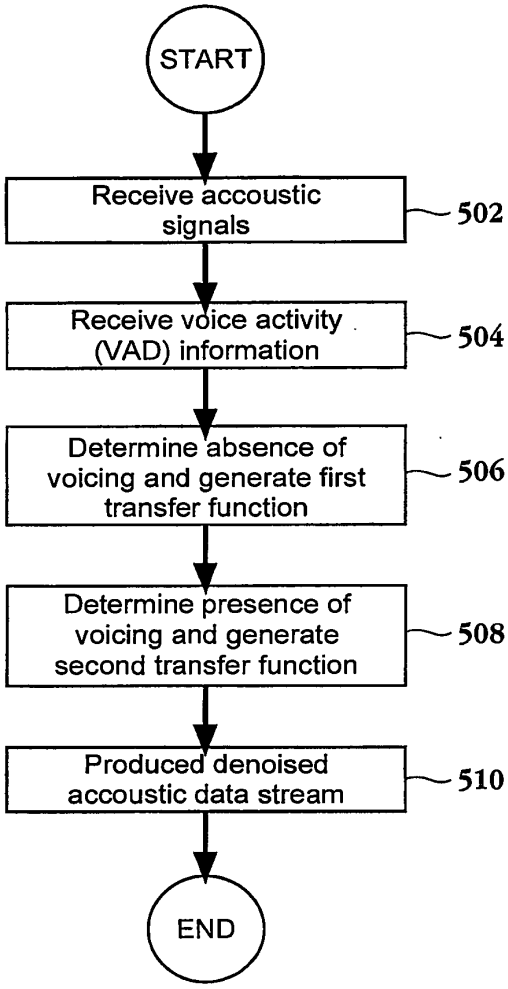

START
Receive accoustic signals
502
Receive voice activity (VAD) information
504
Determine absence of voicing and generate first transfer function
506
Determine presence of voicing and generate second transfer function
508
Produced denoised accoustic data stream
510
END

Fig. 5

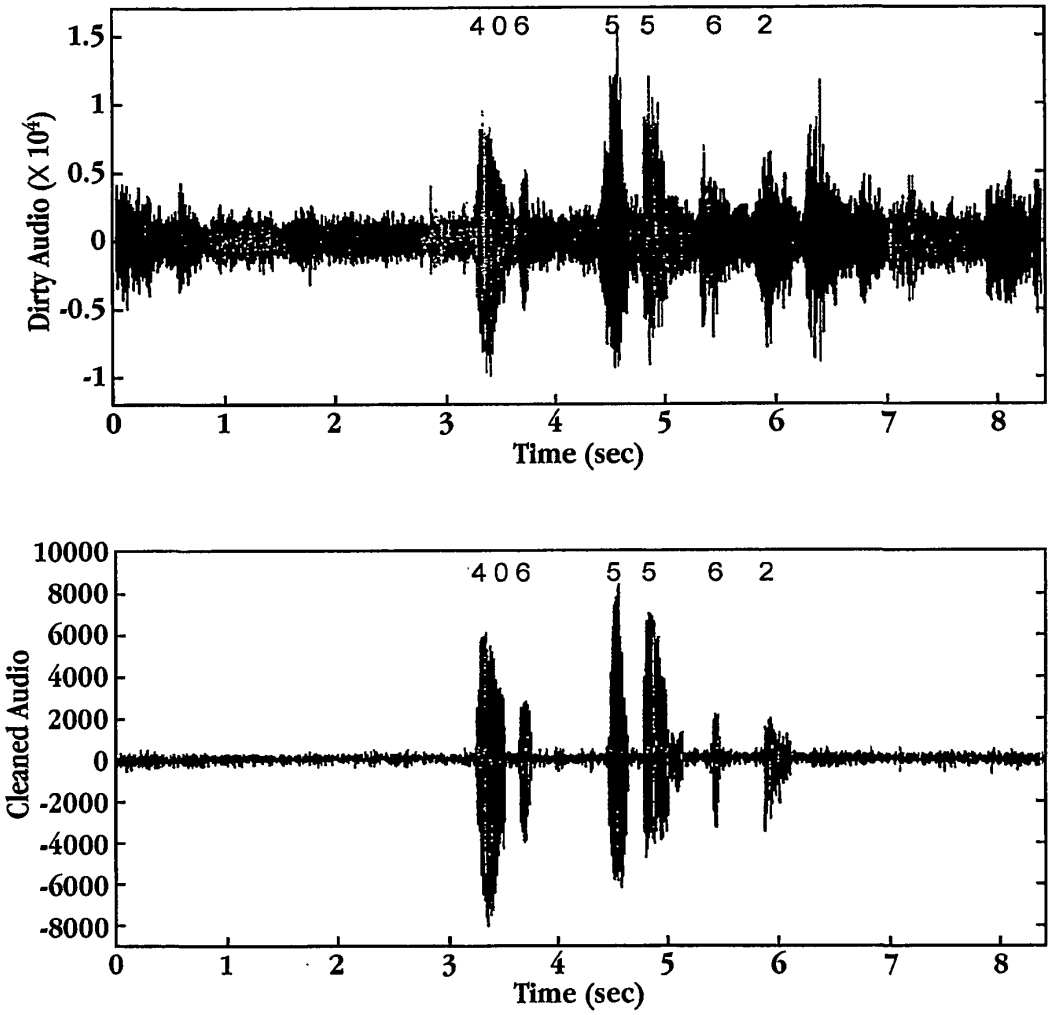

406 55 62
Dirty Audio (X 10⁴)
1.5
1
0.5
0
-0.5
-1
0 1 2 3 4 5 6 7 8
Time (sec)
406 55 62
Cleaned Audio
10000
8000
6000
4000
2000
0
-2000
-4000
-6000
-8000
0 1 2 3 4 5 6 7 8
Time (sec)

Fig. 6

This Page is Inserted by IFW Indexing and Scanning Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☑ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.
As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.

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
10/400,282		2654	0500

Correspondence Address / Fee Address Change

The following fields have been set to Customer Number 53186 on 08/26/2005

- Correspondence Address
- Maintenance Fee Address

The address of record for Customer Number 53186 is:
COURTNEY STANIFORD & GREGORY LLP
P.O. BOX 9686
SAN JOSE,CA 95157

PLUS Search Results for S/N 10400282, Searched Thu Aug 24 15:15:36 EDT 2006

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.

5732143 65
5751822 47
5825897 65
6061456 65
6061456 65
5463694 58
5289544 55
6108415 55
7092882 55
20020069054 55
5940499 53
6266410 53
4600077 52
4966252 52
4965775 52
5742693 52
6122389 52
7020290 52
20060120537 52
5471538 51
5548652 50
5594803 50
4453043 50
5363444 50
5373555 50
5812659 50
4796287 50
5359448 50
4599580 50
5721771 50
6173059 49
4340787 49
5598466 49
5737407 49
5844994 49
20030198359 49
5689615 48
5774849 48
6081732 48
6188981 48
6223154 48
6223154 48
20030179888 48
20030228023 48
20040133421 48
20050207583 48
5563952 47
5673325 47
5937070 47
5848172 47

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	344	381/92.ccls. and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/22 12:36
S2	8751	(voice near3 detect$3)	US-PGPUB; USPAT	ADJ	ON	2007/01/22 12:36
S3	23	S1 and S2	US-PGPUB; USPAT	ADJ	ON	2007/01/19 12:08
S4	3	("2003/0044025").URPN.	USPAT	ADJ	ON	2007/01/19 11:43
S5	911	704/226,233.ccls. and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/22 17:18
S6	279	S5 and S2	US-PGPUB; USPAT	ADJ	ON	2007/01/19 12:25
S7	1834	microphone near5 array	US-PGPUB; USPAT	ADJ	ON	2007/01/19 12:25
S8	12	S5 and S2 and S7	US-PGPUB; USPAT	ADJ	ON	2007/01/19 12:32
S9	458	381/94.1,94.2,94.3.ccls. and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/23 07:58
S10	25	S9 and S7	US-PGPUB; USPAT	ADJ	ON	2007/01/19 12:33
S11	3	S9 and S7 and S2	US-PGPUB; USPAT	ADJ	ON	2007/01/19 12:33
S12	6048	(speech near3 detect$3)	US-PGPUB; USPAT	ADJ	ON	2007/01/19 12:34
S13	496	(S1 or S5 or S9) and S12	US-PGPUB; USPAT	ADJ	ON	2007/01/19 12:34
S14	42	(S1 or S5 or S9) and S12 and S7	US-PGPUB; USPAT	ADJ	ON	2007/01/19 13:39
S15	1256	(omni-directional or omnidirectional) and (uni-directional or unidirectional)	US-PGPUB; USPAT	ADJ	ON	2007/01/19 12:45
S17	13	S7 and (S2 or S12) and S15 and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/19 13:29
S18	698	pathfinder	US-PGPUB; USPAT	ADJ	ON	2007/01/19 13:29
S19	2	S18 and S7 and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/19 13:31
S20	8	("20010028713"|"20020165711"|"5205285"|"5406622"|"5463694"|"5625684"|"6668062"|"6766292").PN.	US-PGPUB; USPAT	ADJ	ON	2007/01/22 16:46
S21	8877	(subtract$3 near10 noise)	US-PGPUB; USPAT	ADJ	ON	2007/01/19 13:39
S22	90	(S1 or S5 or S9) and S21 and S2	US-PGPUB; USPAT	ADJ	ON	2007/01/22 12:32
S23	207014	noise near5 (estimat$3 or signal)	US-PGPUB; USPAT	ADJ	ON	2007/01/22 12:36
S24	287374	subtract$3	US-PGPUB; USPAT	ADJ	ON	2007/01/22 12:36
S25	4868	S23 near10 S24	US-PGPUB; USPAT	ADJ	ON	2007/01/22 12:36
S26	432	381/92,94.7.ccls. and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/22 12:36

EAST Search History

S27	91	S25 and S26	US-PGPUB; USPAT	ADJ	ON	2007/01/22 12:36
S28	13063	(voice or speech) near3 detect$3	US-PGPUB; USPAT	ADJ	ON	2007/01/22 12:37
S29	29	S25 and S26 and S28	US-PGPUB; USPAT	ADJ	ON	2007/01/22 12:37
S30	8	glottal electromagnetic micropower sensor	US-PGPUB; USPAT	ADJ	ON	2007/01/22 16:44
S31	8	glottal electromagnetic micropower	US-PGPUB; USPAT	ADJ	ON	2007/01/22 16:44
S32	25909	accelerometer	US-PGPUB; USPAT	ADJ	ON	2007/01/22 16:46
S33	11	S26 and S32	US-PGPUB; USPAT	ADJ	ON	2007/01/22 17:18
S34	204	skin near5 microphone	US-PGPUB; USPAT	ADJ	ON	2007/01/22 17:19
S35	458	381/94.1,94.2,94.3.ccls. and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:39
S36	911	704/226,233.ccls. and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:39
S37	1	(S26 or S35 or S36) and S34	US-PGPUB; USPAT	ADJ	ON	2007/01/22 17:19
S38	339	skin near15 microphone	US-PGPUB; USPAT	ADJ	ON	2007/01/22 17:22
S39	2	(S26 or S35 or S36) and S38	US-PGPUB; USPAT	ADJ	ON	2007/01/22 17:21
S40	236	throat near15 microphone	US-PGPUB; USPAT	ADJ	ON	2007/01/22 17:21
S41	4	(S26 or S35 or S36) and S40	US-PGPUB; USPAT	ADJ	ON	2007/01/22 17:21
S42	20	glottal near15 microphone	US-PGPUB; USPAT	ADJ	ON	2007/01/23 07:58
S43	7205	electromagnetic near2 sensor	US-PGPUB; USPAT	ADJ	ON	2007/01/23 07:58
S44	13074	(speech or voice) near3 detect$3	US-PGPUB; USPAT	ADJ	ON	2007/01/23 09:44
S46	52	S43 and S44 and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:03
S47	30	(skin near5 surface) near5 microphone	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:03
S48	297	skin near10 microphone	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:03
S49	13	S48 and S44 and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:04
S50	30	381/364.ccls. and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:31
S51	176501	(portable handset) or ((cellular or portable or satellite or internet or wireless) (telephone or phone)) or pda	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:31
S52	432	381/92,94.7.ccls. and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:31
S53	38	S51 and S52	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:39

EAST Search History

S54	47972	bluetooth or earpiece or earphone or headset	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:39
S55	46	S54 and S52	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:57
S56	912	704/226,233.ccls. and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:39
S57	458	381/94.1,94.2,94.3.ccls. and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:39
S58	106	S54 and (S56 or S57)	US-PGPUB; USPAT	ADJ	ON	2007/01/23 08:59
S59	8758	voice near3 detect$3	US-PGPUB; USPAT	ADJ	ON	2007/01/23 09:44
S60	861468	manual or manually	US-PGPUB; USPAT	ADJ	ON	2007/01/23 09:44
S61	42	S59 near10 S60	US-PGPUB; USPAT	ADJ	ON	2007/01/23 10:13
S62	225574	(manual or user) near3 control$5	US-PGPUB; USPAT	ADJ	ON	2007/01/23 10:16
S63	304	S62 same S44	US-PGPUB; USPAT	ADJ	ON	2007/01/23 10:14
S64	209	S62 same S59	US-PGPUB; USPAT	ADJ	ON	2007/01/23 10:14
S65	1	(S62 same S44) and (S52 or S56 or S57)	US-PGPUB; USPAT	ADJ	ON	2007/01/23 10:15
S66	62473	manually near3 control$5	US-PGPUB; USPAT	ADJ	ON	2007/01/23 10:15
S67	0	(S66 same S44) and (S52 or S56 or S57)	US-PGPUB; USPAT	ADJ	ON	2007/01/23 10:15
S68	60157	(manual$2 or user) near3 activat$3	US-PGPUB; USPAT	ADJ	ON	2007/01/23 10:15
S69	0	(S68 same S44) and (S52 or S56 or S57)	US-PGPUB; USPAT	ADJ	ON	2007/01/23 10:16
S70	265902	(manual$2 or user) near3 control$5	US-PGPUB; USPAT	ADJ	ON	2007/01/23 10:16
S71	1	(S70 same S44) and (S52 or S56 or S57)	US-PGPUB; USPAT	ADJ	ON	2007/01/23 10:16
S72	3765	(S70 or S68) and S44	US-PGPUB; USPAT	ADJ	ON	2007/01/23 10:16
S74	116	(S70 or S68) and S44 and "381"/.clas. and (@ad<"20020327" or @rlad<"20020327")	US-PGPUB; USPAT	ADJ	ON	2007/01/23 10:17

Meta Platforms, Inc. - Exhibit 1002
Page 212 of 686

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.
10/400,282	03/27/2003	Gregory C. Burnett	ALPH.P020	1397

53186 7590 02/09/2007
COURTNEY STANIFORD & GREGORY LLP
P.O. BOX 9686
SAN JOSE, CA 95157

EXAMINER	
PENDLETON, BRIAN T	
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)	
	10/400,282	BURNETT ET AL.	
	Examiner	Art Unit	
	Brian T. Pendleton	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 *27 March 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) *1-38* 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) *1-7,10-14,16-23,26-30,32-37* is/are rejected.

7)☒ Claim(s) *8, 9, 15, 24, 25, 31, 38 and 39* 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 *3/27/03* 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

Claim Rejections - 35 USC § 103

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.

Claims 1-4, 6, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al, US Patent 5,473,702 in view of Oh et al, US Patent 5,353,376. Yoshida discloses a communications system comprising a voice detection subsystem 300, denoising subsystem 20, microphones 1 and 2, whereby the voice detection subsystem 300 is used to select a denoising method which subtracts a noise waveform from an acoustic signal generated from microphone 1. Yoshida does not disclose that the microphones are unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone. Oh et al teach a system for improved speech acquisition for a hands-free system in a noise environment comprising microphone array 10 and generalized sidelobe canceller 14 (denoising system). As proposed in column 7 lines 14-25, the use of unidirectional microphones improved performance of the speech acquisition. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Yoshida et al by substituting unidirectional microphones, as taught by Oh, for the microphones 1 and 2 for the purpose of improving the performance of the noise cancellation system. Claims 1 and 7 are rejected. Regarding claims 2, 3, and 8, one of ordinary skill in the art would have realized the claimed distance and angle between the microphones without undue experimentation. As to claims 4 and

6, Examiner takes Official Notice that it was well known in the art at the time of invention to use glottal electromagnetic sensors and skin microphones to generate voice signals. It would have been obvious to one of ordinary skill in the art at the time of invention to modify the combination of Yoshida et al and Oh et al to use such sensors in the place of microphone 1 for the purpose of improving the voice detection performance.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al in view of Oh et al, as applied to claim 1 above, and further in view of Park et al. The combination of Yoshida and Oh et al do not disclose that the voice detection subsystem comprises an accelerometer sensor in contact with the skin of the user and a voice activity detector for processing the accelerometer sensor voice activity signals. Park et al teach a speech processing system comprising accelerometer 34 and noise microphone 31. It would have been obvious to one of ordinary skill in the art at the time of invention to modify the combination of Yoshida et al and Oh et al to have an accelerometer coupled to the power monitoring circuit 300 (voice activity detector), for the purpose of generating voice activity signals directly from the source.

Claims 10-14, 16, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al in view of Oh et al as applied to claim 1 above, and further in view of Housni, US Patent 6,795,713. The combination of Yoshida et al and Oh et al does not disclose that the system includes a portable handset that includes the microphones. It was well known to use a two microphone system as taught by Yoshida et al in a portable handset as demonstrated by Housni who discloses a portable handset 1 which includes microphones 3 and 12 for wireless communication. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to implement the circuitry of Yoshida et al and Oh et al in a portable handset

for the purpose of improving wireless speech communication. Claim 10 is rejected. Regarding claim 11, the modified Yoshida et al and Oh et al combination provides a voice detection subsystem and denoising subsystem in the anti-noise circuitry of the portable handset. As to claim 12, the portable handset 1 of Housni includes a speaker 4. Per claims 13 and 14, the portable handset of Housni inherently couples to another wireless phone via wireless couplings. Regarding claims 16 and 17, the combination meets the limitations.

Claims 18-21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al, in view of Ouyang et al, US Patent Application Publication 2003/0044025. Yoshida discloses a communications system comprising a voice detection subsystem 300, denoising subsystem 20, microphones 1 and 2, whereby the voice detection subsystem 300 is used to select a denoising method which subtracts a noise waveform from an acoustic signal generated from microphone 1. Yoshida does not disclose one omnidirectional microphone and one unidirectional microphone, the microphones separated by a distance. Ouyang et al teach a microphone system for a speakerphone comprising omnidirectional microphone 20 and unidirectional microphone 12 and noise suppression circuit 11 (denoising system). The system advantageously determines the source of noise and suppresses it using the unidirectional microphone as a reference. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Yoshida et al by substituting the microphone configuration of Ouyang et al, for the microphones 1 and 2 for the purpose of improving the performance of the noise cancellation system. Claim 18 is rejected. Regarding claims 19 and 20, one of ordinary skill in the art would have realized the claimed distance and angle between the microphones without undue experimentation. As to claims 21 and 23, Examiner takes Official Notice that it

was well known in the art at the time of invention to use glottal electromagnetic sensors and skin microphones to generate voice signals. It would have been obvious to one of ordinary skill in the art at the time of invention to modify the combination of Yoshida et al and Ouyang et al to use such sensors in the place of microphone 1 for the purpose of improving the voice detection performance.

Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al in view of Ouyang et al, as applied to claim 18 above, and further in view of Park et al. The combination of Yoshida and Ouyang et al do not disclose that the voice detection subsystem comprises an accelerometer sensor in contact with the skin of the user and a voice activity detector for processing the accelerometer sensor voice activity signals. Park et al teach a speech processing system comprising accelerometer 34 and noise microphone 31. It would have been obvious to one of ordinary skill in the art at the time of invention to modify the combination of Yoshida et al and Ouyang et al to have an accelerometer coupled to the power monitoring circuit 300 (voice activity detector), for the purpose of generating voice activity signals directly from the source.

Claims 26-30, 32, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al in view of Ouyang et al as applied to claim 18 above, and further in view of Housni. The combination of Yoshida et al and Oh et al does not disclose that the system includes a portable handset that includes the microphones. It was well known to use a two microphone system as taught by Yoshida et al in a portable handset as demonstrated by Housni who discloses a portable handset 1 which includes microphones 3 and 12 for wireless communication. Therefore, it would have been obvious to one of ordinary skill in the art at the

time of invention to implement the circuitry of Yoshida et al and Oh et al in a portable handset for the purpose of improving wireless speech communication. Claim 26 is rejected. Regarding claim 27, the modified Yoshida et al and Ouyang et al combination provides a voice detection subsystem and denoising subsystem in the anti-noise circuitry of the portable handset. As to claim 28, the portable handset 1 of Housni includes a speaker 4. Per claims 29 and 30, the portable handset of Housni inherently couples to another wireless phone via wireless couplings. Regarding claims 32 and 33, the combination meets the limitations.

Claims 34 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al, in view of Housni. Yoshida discloses a communications system comprising a voice detection subsystem 300, denoising subsystem 20, microphones 1 and 2, whereby the voice detection subsystem 300 is used to select a denoising method which subtracts a noise waveform from an acoustic signal generated from microphone 1. Yoshida does not disclose at least one transceiver for use in a communications network. Housni discloses a portable transceiver having microphones 3 and 12 and an anti-noise circuit. It would have been obvious to one of ordinary skill in the art at the time of invention to implement the circuitry of Yoshida et al in a transceiver, as taught by Housni, for the purpose of providing noise cancellation in wireless applications. Claims 34 and 37 are rejected.

Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al in view of Housni, as applied to claim 34 above, and further in view of Oh et al. The combination of Yoshida et al and Housni does not disclose that the first and second microphones are unidirectional with the claimed distance and angle. Oh et al teach a system for improved speech acquisition for a hands-free system in a noise environment comprising microphone array 10 and

generalized sidelobe canceller 14 (denoising system). As proposed in column 7 lines 14-25, the use of unidirectional microphones improved performance of the speech acquisition. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Yoshida et al and Housni by substituting unidirectional microphones, as taught by Oh, for the microphones 1 and 2 for the purpose of improving the performance of the noise cancellation system. An artisan would have realized the claimed distance and angle between the microphones without undue experimentation.

Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al in view of Housni, as applied to claim 34 above, and further in view of Ouyang et al. The combination of Yoshida et al and Housni does not disclose that the first and second microphones are omnidirectional and unidirectional, respectively, with the claimed distance and angle. Ouyang et al teach a microphone system for a speakerphone comprising omnidirectional microphone 20, unidirectional microphone 12 and noise suppression circuit 11 (denoising system). The system advantageously determines the source of noise and suppresses it using the unidirectional microphone as a reference. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Yoshida et al and Housni by substituting the microphone configuration of Ouyang et al, for the microphones 1 and 2 for the purpose of improving the performance of the noise cancellation system.

Allowable Subject Matter

Claims 8, 9, 15, 24, 25, 31, 38 and 39 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian T. Pendleton whose telephone number is (571) 272-7527. The examiner can normally be reached on M-F 7-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on (571) 272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Brian T. Pendleton
Primary Examiner
Art Unit 2615

btp

OIPE JC73
NOV 0 5 2004
PATENT & TRADEMARK OFFICE

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. 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.

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	10/400,282
Filing Date	03/27/2003
First Named Inventor	Gregory C. Burnett
Art Unit	2644
Examiner Name	Not yet assigned
Attorney Docket Number	ALPH.P020

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
BTP		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- 5,473,702	12-05-1995	Yoshida et al.	
		US- 5,515,865	05-14-1996	Scanlon et al.	
		US- 5,649,055	07-15-1997	Gupta et al.	
		US- 5,684,460	11-04-1997	Scanlon et al.	
		US- 5,729,694	03-17-1998	Holzrichter et al.	
		US- 5,754,665	05-19-1998	Hosoi et al.	
		US- 5,853,005	12-29-1998	Scanlon	
		US- 6,069,963	05-30-2000	Martin et al.	
		US- 6,266,422	07-24-2001	Ikeda	
		US- 6,430,295	08-06-2002	Handel et al.	
BTP		US- 5,097,515	03-17-2002	Baba	
		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]
BTP		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		
BTP		WO 02 07151	01-24-2002	ALIPHCOM, Inc.		

Examiner Signature		Date Considered	2/23/07

*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.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

SEP 08 2003

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
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.

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 2

Complet if Kn wn	
Application Number	10/400,282
Filing Date	March 27, 2003
First Named Inventor	Gregory C. Burnett
Group Art Unit	Unknown
Examiner Name	Unknown
Attorney Docket Number	ALPH.P020

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
BTP		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	
		5,406,662		Silverberg et al.	04-11-1995	
BTP		5,517,435		Sugiyama	05-14-1996	

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	1/23/07

*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.

SEP 0 8 2003

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

PTO/SB/08B (08-00)
Approved for use through 10/31/2002. 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.

Substitute for form 1449B/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 2 of 2

Complete If Known	
Application Number	10/400,282
Filing Date	March 27, 2003
First Named Inventor	Gregory C. Burnett
Group Art Unit	Unknown
Examiner Name	Unknown
Attorney Docket Number	ALPH.P020

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]
BTP		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.	
		TODD J. GABLE et al.: "Speaker Verification Using Combined Acoustic and EM Sensor Signal Processing", ICASSP-2001, Salt Lake City, USA.	
BTP		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 Considered	1/23/07

*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.

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.

Notice of References Cited	Application/Control No. 10/400,282	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner Brian T. Pendleton	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-5,353,376 A	10-1994	Oh et al.	704/233
*	B	US-5,473,702 A	12-1995	Yoshida et al.	381/94.7
*	C	US-5,590,241 A	12-1996	Park et al.	704/227
*	D	US-2003/0044025 A1	03-2003	Ouyang et al.	381/92
*	E	US-6,795,713 B2	09-2004	Housni, Jamal	455/550.1
	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
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	Pendleton, Brian T	2615

SEARCHED			
Class	Subclass	Date	Examiner
381	94.1,94.2,94.3,94.7,92	1/22/07	BTP
704	226,233	1/22/07	BTP

SEARCH NOTES		
Search Notes	Date	Examiner
East Word Search	1/22/07	BTP

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	Pendleton, Brian T	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	01/23/2007								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	O								
	9	O								
	10	✓								
	11	✓								
	12	✓								
	13	✓								
	14	✓								
	15	O								
	16	✓								
	17	✓								
	18	✓								
	19	✓								
	20	✓								
	21	✓								
	22	✓								
	23	✓								
	24	O								
	25	O								
	26	✓								
	27	✓								
	28	✓								
	29	✓								
	30	✓								
	31	O								
	32	✓								
	33	✓								
	34	✓								
	35	✓								
	36	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	Pendleton, Brian T	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	01/23/2007								
	37	✓								
	38	O								
	39	O								

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

Bib Data Sheet

CONFIRMATION NO. 1397

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/400,282	03/27/2003 RULE	381	2615	ALPH.P020

APPLICANTS

Gregory C. Burnett, Livermore, CA;
Nicolas J. Petit, San Francisco, CA;
Alexander M. Asseily, San Francisco, CA;
Andrew E. Einaudi, San Francisco, CA;

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

This appln claims benefit of 60/368,209 03/27/2002 Yes BTP

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

None BTP

IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** SMALL ENTITY **
** 05/30/2003

Foreign Priority claimed	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ yes ☒ no	CA	29	39	3
35 USC 119 (a-d) conditions met ☐ yes ☐ no ☐ Met after Allowance				
Verified and Acknowledged: Examiner's Signature / Initials: BTP				

ADDRESS
53186

TITLE

Microphone and Voice Activity Detection (VAD) configurations for use with communication systems

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
611	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

Courtney Staniford & Gregory LLP

Intellectual Property Attorneys

Tel: 408-342-1900
Fax: 408-342-1909

10001 N. De Anza Blvd., Suite 300
Cupertino, California 95014

P.O. Box 9686
San Jose, California 95157
www.csgip.com

RECEIVED
CENTRAL FAX CENTER
JUN 04 2007

Fax

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: 17 including cover

Phone: 571-272-7527 Date: June 4, 2007

Re: **Application Serial No. 10/400,282**
Art Unit 2615
Examiner Brian T. Pendleton

CC:

Atty Docket No. ALPH.P020

☑ Urgent ☑ For Review ☑ Please Comment ☑ Please Acknowledge

Attorney Docket No. ALPH.P020 Patent

Transmittal of Office Action Response

Certification of Transmission Under 37 C.F.R. §1.8

Transmitted to USPTO Central Facsimile No. **June 4, 2007**
Date of Transmission

571-273-8300

I hereby certify that this document, and any other accompanying documents referred to herein are being transmitted via facsimile to the United States Patent Office to the facsimile number and on the date indicated above under 37 CFR 1.8.

Barbara B. Courtney
(Print Name of Person Transmitting Facsimile)

(Signature of Person Transmitting Facsimile)

1. Response to the Final Office Action mailed February 2, 2007
2. Petition for one month Extension of Time; and
3. Authorization to charge Credit Card.

Confidentiality Note

This facsimile transmission contains information which is confidential. If you are not the intended recipient named on this cover page, be aware that any disclosure, copying, distribution or use of this faxed information is prohibited. If you have received this facsimile in error, please notify us by telephone immediately so that we can arrange for the retrieval of the original documents at no cost to you.

RECEIVED
CENTRAL FAX CENTER
JUN 04 2007

Attorney Docket No. ALPH.P020

Attorney Docket No. ALPH.P020	Patent

Transmittal of Office Action Response

Certification of Transmission Under 37 C.F.R. §1.8

Transmitted to USPTO Central Facsimile No.

571-273-8300

June 4, 2007
Date of Transmission

I hereby certify that this document, and any other accompanying documents referred to herein are being transmitted via facsimile to the United States Patent Office to the facsimile number and on the date indicated above.

Barbara B. Courtney
(Print Name of Person Transmitting Facsimile)

(Signature of Person Transmitting Facsimile)

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:

Gregory C. Burnett et al.

Application No. 10/400,282

Filed: March 27, 2003

For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS

Examiner: Brian T. Pendleton

Art Unit: 2615

CENTRAL FAX NUMBER **571-273-8300**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT AND REPONSE UNDER 37 C.F.R. § 1.111

Sir:

Response under 37 C.F.R. § 1.111

This is a response to the Office action mailed February 9, 2007. Applicants respectfully request entry of the following amendments and consideration of the Remarks.

PAGE 2/17 * RCVD AT 6/4/2007 1:55:10 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/7 * DNIS:2738300 * CSID:14083421909 * DURATION (mm-ss):05-22

Attorney Docket No. ALPH.P020

RECEIVED
CENTRAL FAX CENTER
JUN 04 2007

IN THE CLAIMS

1. (Currently amended) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals, the voice detection subsystem comprising,

two unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone, wherein the distance is approximately in the range of zero (0) to 15 centimeters and wherein the angle is approximately in the range of zero (0) to 180 degrees; and

at least one voice activity detector (VAD) algorithm for processing the voice activity signals and generating the control signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including two unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

2. (Original) The system of claim 1, wherein the distance is approximately in the range of zero (0) to 15 centimeters.

3. (Original) The system of claim 1, wherein the angle is approximately in the range of zero (0) to 180 degrees.

PAGE 3/17 * RCVD AT 6/4/2007 1:55:10 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/7 * DNIS:2738300 * CSID:14083421909 * DURATION (mm-ss):05-22

4. (Original) The system of claim 1, wherein the voice detection subsystem further comprises: at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.

5. (Original) The system of claim 1, wherein the voice detection subsystem further comprises: at least one accelerometer sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.

6. (Original) The system of claim 1, wherein the voice detection subsystem further comprises: at least one skin-surface microphone sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.

7. (Original) The system of claim 1, wherein the voice detection subsystem receives voice activity signals via couplings with the microphones.

Claim 8 (Canceled).

9. (Original) The system of claim 1, wherein the voice detection subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals.

10. (Original) The system of claim 1, further including a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet

PAGE 4/17 * RCVD AT 6/4/2007 1:55:10 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/7 * DNIS:2738300 * CSID:14083421909 * DURATION (mm-ss):05-22

telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

11. (Original) The system of claim 10, wherein the portable handset includes at least one of the voice detection subsystem and the denoising subsystem.

12. (Original) The system of claim 1, further including a portable headset that includes the microphones along with at least one speaker device.

13. (Original) The system of claim 12, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

14. (Original) The system of claim 13, wherein the portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings.

15. (Original) The system of claim 13, wherein the communication device includes at least one of the voice detection subsystem and the denoising subsystem.

16. (Original) The system of claim 12, wherein the portable headset includes at least one of the voice detection subsystem and the denoising subsystem.

17. (Original) The system of claim 12, wherein the portable headset is a portable communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

PAGE 5/17 * RCVD AT 6/4/2007 1:55:10 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/7 * DNIS:2738300 * CSID:14083421909 * DURATION (mm-ss):05-22

18. (Currently amended) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals, wherein the voice detection subsystem further comprises,

two unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone, wherein the distance is approximately in the range of zero (0) to 15 centimeters and wherein the angle is approximately in the range of zero (0) to 180 degrees; and

at least one voice activity detector (VAD) algorithm for processing the voice activity signals and generating the control signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including an omnidirectional microphone and a unidirectional microphone separated by a distance, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

19. (Original) The system of claim 18, wherein the distance is approximately in the range of zero (0) to 15 centimeters.

20. (Original) The system of claim 18, wherein the omnidirectional microphone is oriented to capture signals from at least one speech signal source and the unidirectional microphone is oriented to capture signals from at least one noise signal source, wherein

PAGE 6/17 * RCVD AT 6/4/2007 1:55:10 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/7 * DNIS:2738300 * CSID:14083421909 * DURATION (mm-ss):05-22

an angle between the speech signal source and a maximum of a spatial response curve of the unidirectional microphone is approximately in the range of 45 to 180 degrees.

21. (Original) The system of claim 18, wherein the voice detection subsystem further comprises: at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.

22. (Original) The system of claim 18, wherein the voice detection subsystem further comprises: at least one accelerometer sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.

23. (Original) The system of claim 18, wherein the voice detection subsystem further comprises: at least one skin-surface microphone sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.

Claim 24 (Canceled).

25. (Original) The system of claim 18, wherein the voice detection subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals.

26. (Original) The system of claim 18, further including a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet

PAGE 7/17 * RCVD AT 6/4/2007 1:55:10 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/7 * DNIS:2738300 * CSID:14083421909 * DURATION (mm-ss):05-22

telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

27. (Original) The system of claim 26, wherein the portable handset includes at least one of the voice detection subsystem and the denoising subsystem.

28. (Original) The system of claim 18, further including a portable headset that includes the microphones along with at least one speaker device.

29. (Original) The system of claim 28, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

30. (Original) The system of claim 29, wherein the portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings.

31. (Original) The system of claim 29, wherein the communication device includes at least one of the voice detection subsystem and the denoising subsystem.

32. (Original) The system of claim 28, wherein the portable headset includes at least one of the voice detection subsystem and the denoising subsystem.

33. (Original) The system of claim 28, wherein the portable headset is a portable communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

PAGE 8/17 * RCVD AT 6/4/2007 1:55:10 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/7 * DNIS:2738300 * CSID:14083421909 * DURATION (mm-ss):05-22

34. (Currently amended) A communications system, comprising:

at least one transceiver for use in a communications network;

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including a first microphone and a second microphone separated by a distance and having an angle between maximums of a spatial response curve of each microphone, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise, wherein the transceiver couples information between the communications network and a user via a headset.

35. (Original) The system of claim 34, wherein each of the first and second microphones is a unidirectional microphone, wherein the distance is approximately in the range of zero (0) to 15 centimeters and the angle is approximately in the range of zero (0) to 180 degrees.

36. (Original) The system of claim 34, wherein the first microphone is an omnidirectional microphone and the second microphone is a unidirectional microphone, wherein the first microphone is oriented to capture signals from at least one speech signal source and the second microphone is oriented to capture signals from at least one noise signal source, wherein an angle between the speech signal source and a maximum of a

PAGE 9/17 * RCVD AT 6/4/2007 1:55:10 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/7 * DNIS:2738300 * CSID:14083421909 * DURATION (mm-ss):05-22

spatial response curve of the second microphone is approximately in the range of 45 to 180 degrees.

37. (Original) The system of claim 34, wherein the transceiver includes the first and second microphones.

Claim 38 Canceled.

39. (Currently amended) The system of claim ~~34~~38, wherein the headset includes the first and second microphones.

40. (New) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals, the voice detection subsystem comprising at least one manually activated voice activity detector (VAD) for generating the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including two unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

41. (New) A communications system, comprising:

PAGE 10/17 * RCVD AT 6/4/2007 1:55:10 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/7 * DNIS:2738300 * CSID:14083421909 * DURATION (mm-ss):05-22

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals;

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including two unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise; and

a portable headset comprising the microphones and at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

42. (New) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals, wherein the voice detection subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including

PAGE 11/17 * RCVD AT 6/4/2007 1:55:10 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/7 * DNIS:2738300 * CSID:14083421909 * DURATION (mm-ss):05-22

an omnidirectional microphone and a unidirectional microphone separated by a distance, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

43. (New) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals;

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including an omnidirectional microphone and a unidirectional microphone separated by a distance, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise; and

a portable a portable headset that includes the microphones along with at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

PAGE 12/17 * RCVD AT 6/4/2007 1:55:10 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/7 * DNIS:2738300 * CSID:14083421909 * DURATION (mm-ss):05-22

Attorney Docket No. ALPH.P020

RECEIVED
CENTRAL FAX CENTER
JUN 04 2007

REMARKS

Petition for extension of time

This response is submitted with a Petition for an extension of time (1 month) under 37 C.F.R. § 1.136(a) to respond to the Office action. The fee under 37 C.F.R. § 1.17(a) is also submitted herewith.

Status of the claims

Claims 1-38 are pending in the application. Claims 1, 18, and 34 have been amended herein. Claims 9, 25, and 38 have been canceled herein without prejudice. Claims 40-43 have been added. No new matter is introduced by the new claims. Allowable subject matter was indicated in the Office action as further referenced below.

Allowable subject matter

Claims 8, 9, 15, 24, 25, 31, 38and 39 were objected to as being dependent on a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants have amended the claims accordingly to overcome these objections and place the claims in condition for allowance as indicated by the Examiner.

Claim 1 now includes the limitations of claim 8.

Claim 18 now includes the limitations of claim 24.

Claim 34 now includes the limitations of claim 38.

New claim 40 includes the limitations of original claim 1 and claim 9.

New claim 41 includes the limitations of original claim 1 and claims 12, 13, and 15.

New claim 42 includes the limitations of original claim 18 and claim25.

New claim 43 includes the limitations of original claim 18 and claims 28, 29, and 31.

Rejections under 35 U.S.C. § 103

Claims 1-4, 6, and 7 were rejected under 35 U.S.C. § 103 as being unpatentable

PAGE 13/17 * RCVD AT 6/4/2007 1:55:10 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/7 * DNIS:2738300 * CSID:14083421909 * DURATION (mm-ss):05-22

over Yoshida et al., U.S. Patent No. 5,473,702 (hereinafter "Yoshida") in view of Oh et al., U.S. Patent No. 5,353,376 (hereinafter "Oh").

Claim 5 was rejected under 35 U.S.C. § 103 as being unpatentable over Yoshida in view of Oh, and further in view of Park et al., U.S. Patent No. 5,590,241 (hereinafter "Park").

Claims 10-14, 16, and 17 were rejected under 35 U.S.C. § 103 as being unpatentable over Yoshida in view of Oh, and further in view of Housni, U.S. Patent No. 6,795,713 (hereinafter "Housni").

Claims 18-21, and 23 were rejected under 35 U.S.C. § 103 as being unpatentable over Yoshida in view of Ouyang et al., U.S. Patent Publication No. 2003/0044025 (hereinafter "Ouyang").

Claim 22 was rejected under 35 U.S.C. § 103 as being unpatentable over Yoshida in view of Ouyang, and further in view of Park.

Claims 26-30, 32, and 33 were rejected under 35 U.S.C. § 103 as being unpatentable over Yoshida in view of Ouyang, and further in view of Housni.

Claims 34 and 37 were rejected under 35 U.S.C. § 103 as being unpatentable over Yoshida in view of Housni.

Claim 35 was rejected under 35 U.S.C. § 103 as being unpatentable over Yoshida in view of Housni, and further in view of Oh.

Claim 36 was rejected under 35 U.S.C. § 103 as being unpatentable over Yoshida in view of Housni, and further in view of Ouyang.

Applicants have amended the claims to overcome the rejections in the manner suggested by the examiner. The independent claims are now allowable as indicated in the "Allowable Subject Matter" section of the Office action. All of the dependent claims now depend from allowable independent claims. Accordingly, Applicants respectfully submit that the rejections are overcome.

AUTHORIZATION TO CHARGE DEPOSIT ACCOUNT

Please use our Deposit account no. 503616 to pay any fee deficiencies and credit any overpayments during the pendency of this application.

PAGE 14/17 * RCVD AT 6/4/2007 1:55:10 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/7 * DNIS:2738300 * CSID:14083421909 * DURATION (mm-ss):05-22

Attorney Docket No. ALPH.P020

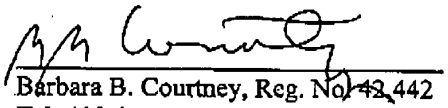
CONCLUSION

Applicants respectfully submit that the claims as amended are allowable over the prior art. Applicants respectfully request withdrawal of the rejections and allowance of the claims. If the Examiner determines that a phone conference would expedite allowance of the application, the Examiner is respectfully encouraged to call the undersigned.

Respectfully submitted,

Courtney Staniford & Gregory LLP

Date: June 4, 2007



Barbara B. Courtney, Reg. No. 42,442
Tel. 408-342-1902

Courtney Staniford & Gregory LLP
P.O. Box 9686
San Jose, CA 95157
Tel. 408-342-1902
Fax. 408-342-1909

PAGE 15/17 * RCVD AT 6/4/2007 1:55:10 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-3/7 * DNIS:2738300 * CSID:14083421909 * DURATION (mm-ss):05-22

RECEIVED
CENTRAL FAX CENTER
JUN 04 2007

PTO/SB/22 (12-04)
Approved for use through 07/31/2006. 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.

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.P020
Application Number 10/400,282	Filed 03/27/2003
For Microphone and voice activity detection (VAD) configurations for use with communication systems	
Art Unit 2615	Examiner Brian T. Pendleton

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	$ 120
☐ Two months (37 CFR 1.17(a)(2))	$450	$225	$
☐ Three months (37 CFR 1.17(a)(3))	$1020	$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.

☑ 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 503616; 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 — June 4, 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.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

06/05/2007 TLO111 00000015 10400282
01 FC:1251 120.00 OP

Document code: WFEE

United States Patent and Trademark Office
Sales Receipt for Accounting Date: 06/08/2007

RLLOYD SALE #00000001 Mailroom Dt: 06/04/2007 503616 10400282

01	FC : 2202	25.00	DA
02	FC : 2201	400.00	DA

PATENT APPLICATION FEE DETERMINATION RECORD
Effective January 1, 2003

Application or Docket Number: 10400282

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	39	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	39 minus 20=	* 19
INDEPENDENT CLAIMS	3 minus 3 =	*
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	375.00	OR	BASIC FEE	750.00
X$ 9=	171	OR	XS18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL	546	OR	TOTAL	

6/4/07

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	* 40	Minus	** 39	= 1
Independent	* 7	Minus	*** 3	= 4
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 25=	25	OR	XS18=	
X100=	400	OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE	425	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=	
X42=		OR	X84=	
+140=		OR	+280=	
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=	
X42=		OR	X84=	
+140=		OR	+280=	
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.

Meta Platforms, Inc. - Exhibit 1002
Page 247 of 686



Attorney Docket No. ALPH.P020 Patent

Transmittal of Supplemental Amendment

Certification Under 37 C.F.R. §1.10 (if applicable)

EV 708 402 415 US
"Express Mail" Label Number

July 25, 2007
Date of Transmission

I hereby certify that this application, and any other documents referred to as enclosed herein are being deposited in an envelope with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR §1.10 on the date indicated above and addressed to the Mail Stop Amendment, Commissioner for Patents, PO Box 1450, Alexandria, VA. 22313-1450

Jerry Donnard
(Print Name of Person Mailing Application)

(Signature of Person Mailing Application)

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:

Gregory C. Burnett et al.

Application No. 10/400,282

Filed: March 27, 2003

For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS

) Examiner: Brian T. Pendleton

) Art Unit: 2615

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

SUPPLEMENTAL AMENDMENT

Sir:

Please enter the following amendments to the specification and drawings to correct informalities.

IN THE SPECIFICATION

On page 21, lines 17-25, replace the entire paragraph with the following paragraph as amended.

The areas of sensitivity 1102-1108 include areas of optimal sensitivity A-F where speech can be reliably detected by a SSM, under an embodiment. The areas of optimal sensitivity A-F include, but are not limited to, the area behind the ear A, the area ~~above the ear~~ below the ear B, the mid-cheek area C of the jaw, the area in front of the ear canal D, the area E inside the ear canal in contact with the mastoid bone or other vibrating tissue, and the nose F. Placement of an accelerometer/SSM in the proximity of any of these areas of sensitivity 1102-1108 will work with a headset, but a handset requires contact with the cheek, jaw, head, or neck. The above areas are only meant to guide, and there may be other areas not specified where useful vibrations can also be detected.

REMARKS

Applicants respectfully request entry of the foregoing amendments in the application.

Respectfully submitted,

Courtney Staniford & Gregory LLP

Date: July 25, 2007

Barbara B. Courtney, Reg. No. 42,442
Tel. 408-342-1902

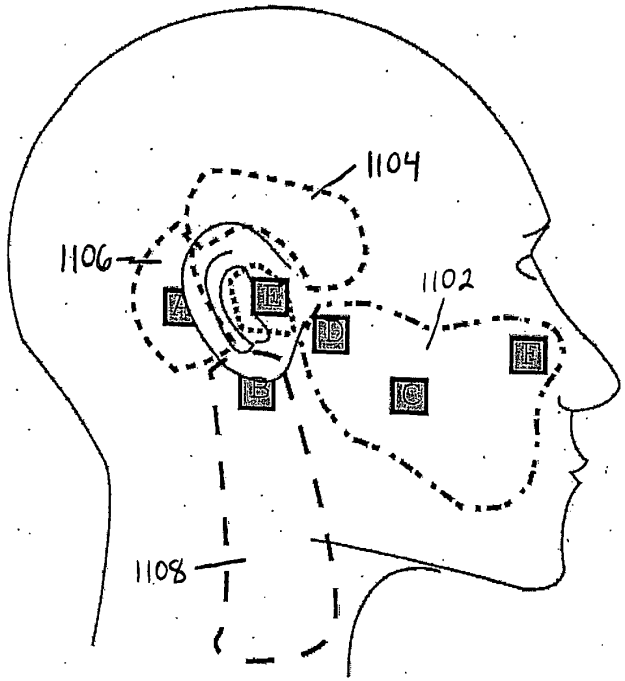
Courtney Staniford & Gregory LLP
P.O. Box 9686
San Jose, CA 95157
Tel. 408-342-1902
Fax. 408-342-1909

Meta Platforms, Inc. - Exhibit 1002
Page 250 of 686

IN THE DRAWINGS

Please replace figures 1-29 of the drawings with the formalized and amended drawings submitted herewith. No new matter is added by the amendments, which merely correct informalities. Specifically, Figure 11A, the description for item B – Area Below the Ear. A marked-up copy of Figure 11A, labeled "Annotated Sheet" is included.

ANNOTATED SHEET



A - Area Behind The Ear
B - Area ~~Above~~ BELOW The Ear
C - Mid Cheek Area
D - Area In Front of Ear Canal
E - Inside Ear Canal in Contact with Mastoid Bone Or Other Vibrating Tissue
F - Nose

FIGURE 11A

OIPE IAP66 JUL 25 2007 PATENT & TRADEMARK OFFICE

Meta Platforms, Inc. - Exhibit 1002
Page 252 of 686

OIPE IAP66
JUL 25 2007
PATENT & TRADEMARK OFFICE

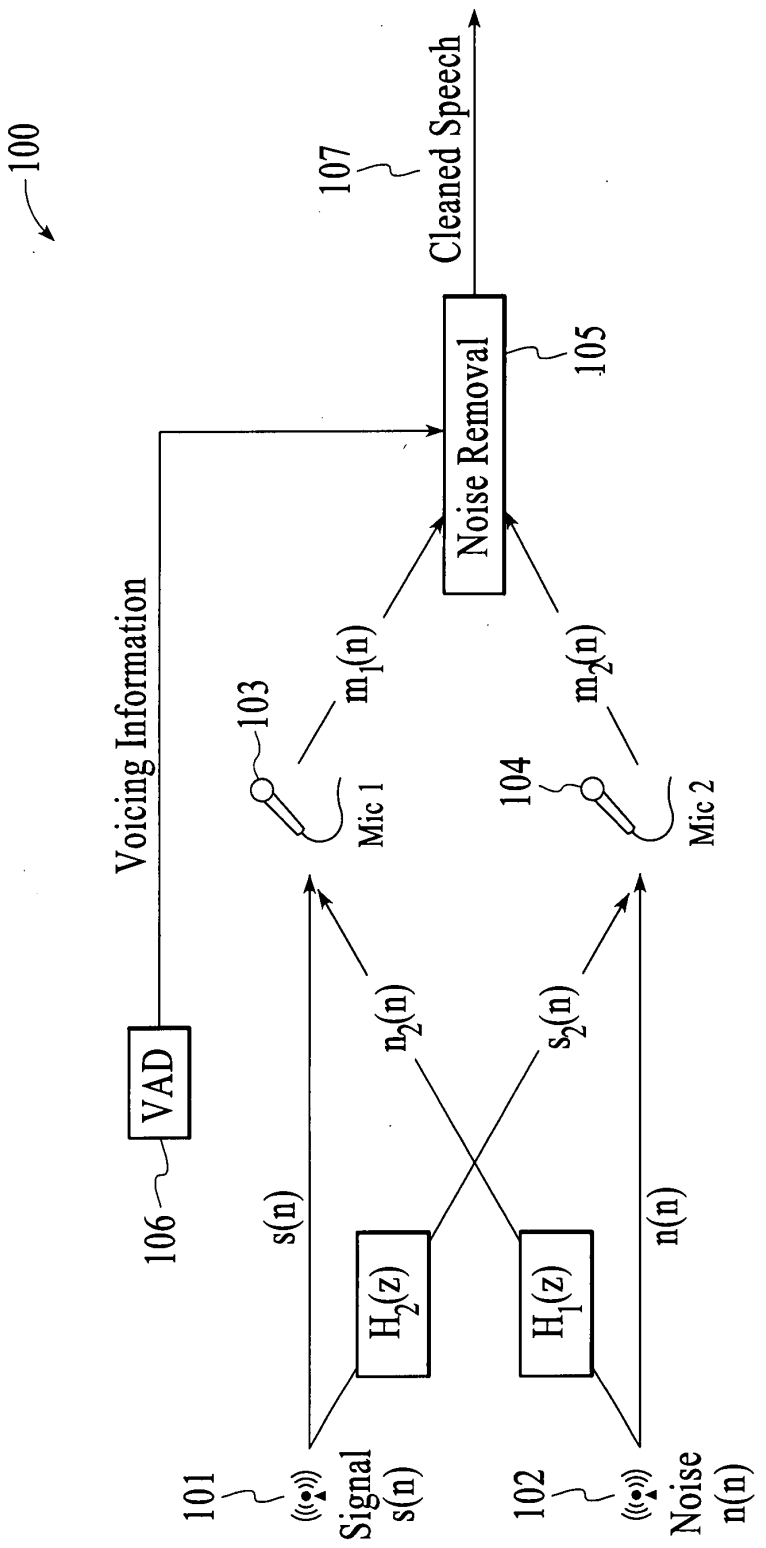


FIG.1

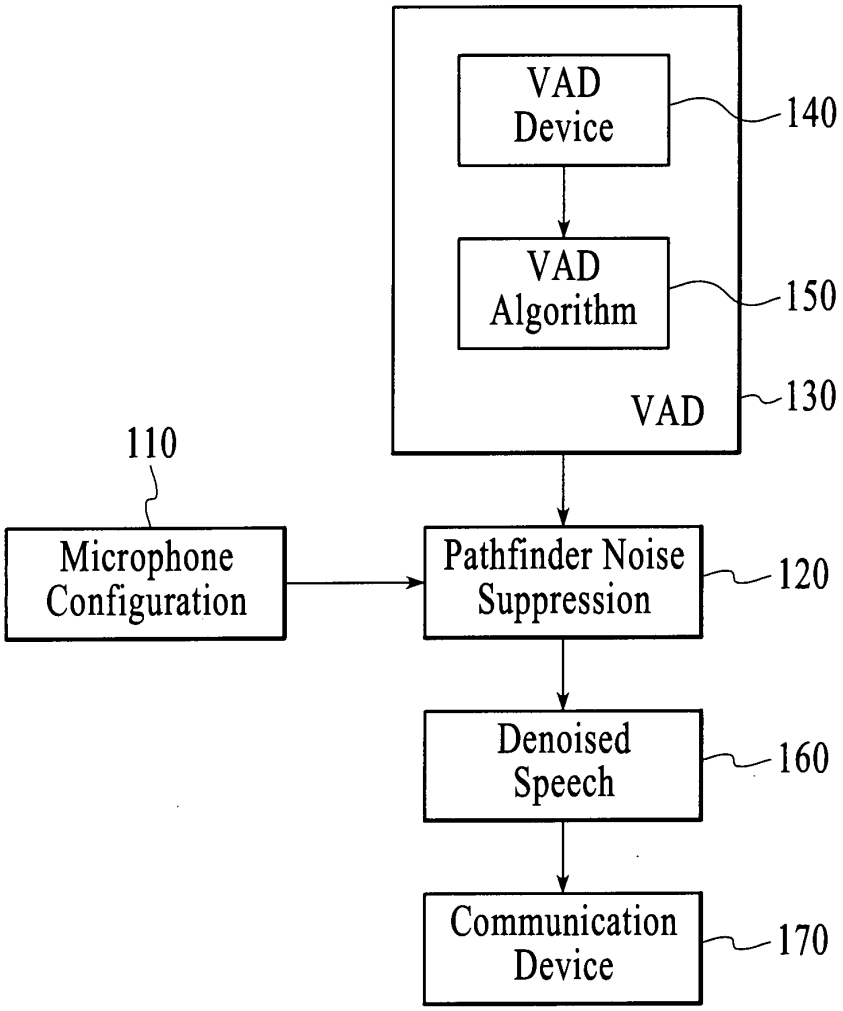

VAD
Device
140
VAD
Algorithm
150
VAD
130
110
Microphone
Configuration
Pathfinder Noise
Suppression
120
Denoised
Speech
160
Communication
Device
170

FIG.1A

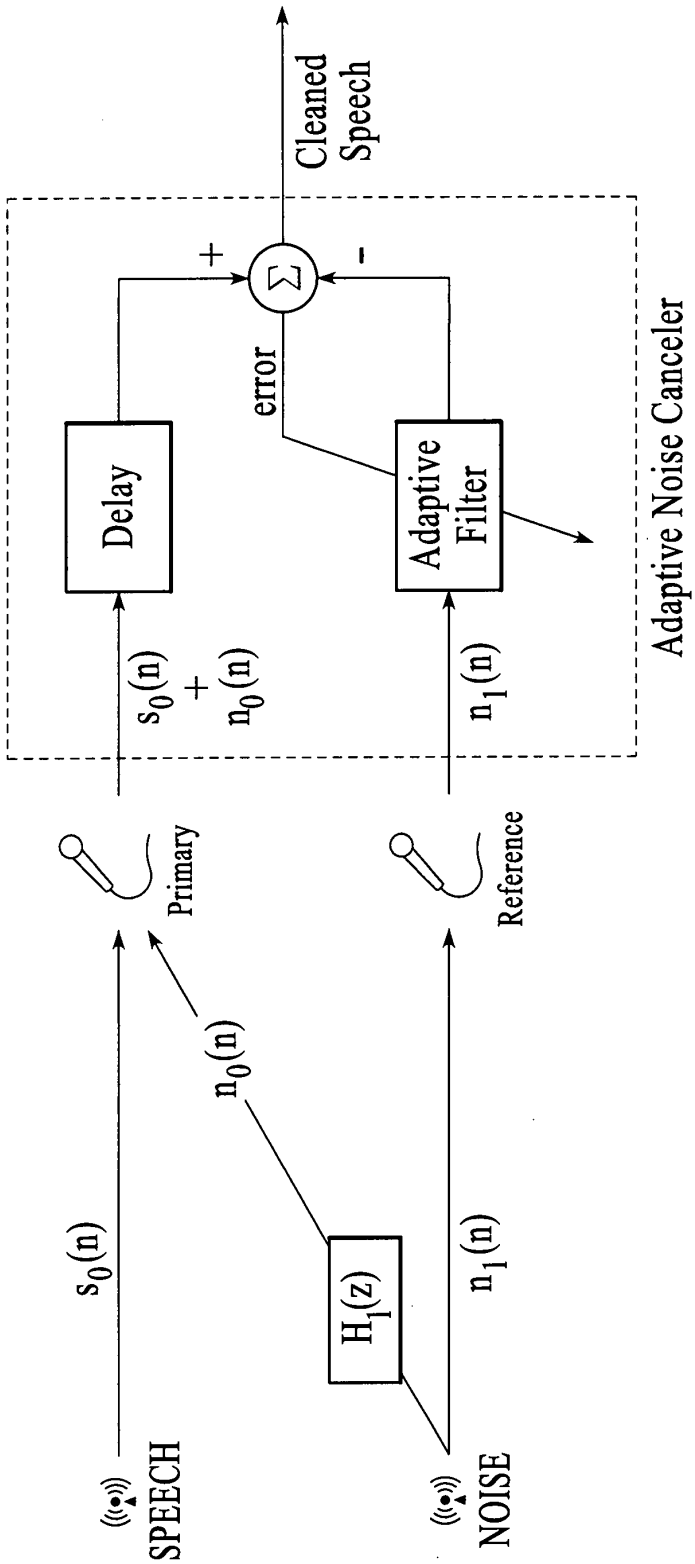


FIG.1B
(PRIOR ART)

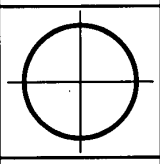
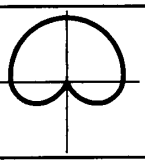
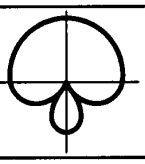
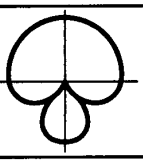
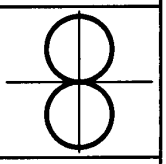
		UNIDIRECTIONAL			
Characteristic	Omni-Directional	Cardioid	Super-Cardioid	Hyper-Cardioid	Bi-Directional
Polar Response Pattern					
Coverage Angle	360°	131°	115°	105°	90°
Angle of Maximum Rejection (null angle)	—	180°	126°	110°	90°
Rear Rejection (relative to front)	0	25 dB	12 dB	6 dB	0
Ambient Sound Sensitivity (relative to omni)	100%	33%	27%	25%	33%
Distance Factor (relative to omni)	1	1.7	1.9	2	1.7

FIG.2
(PRIOR ART)

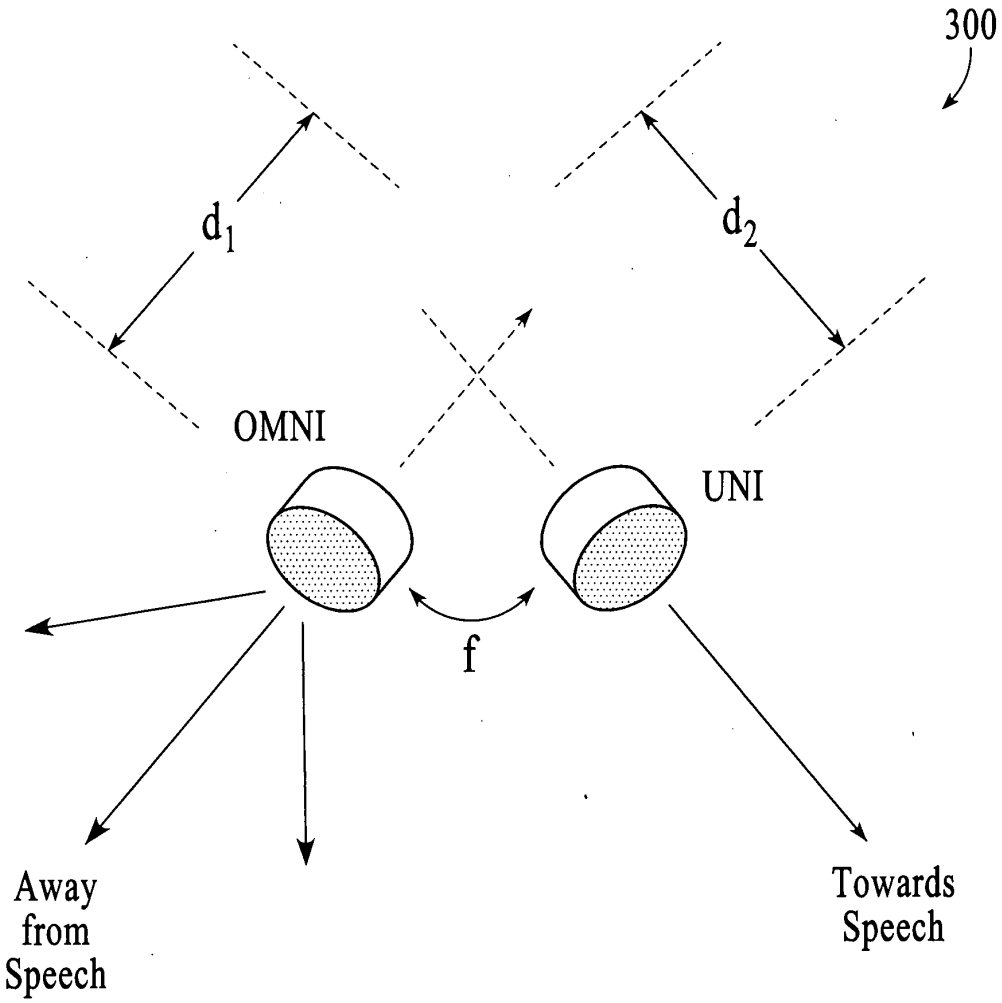


FIG.3A

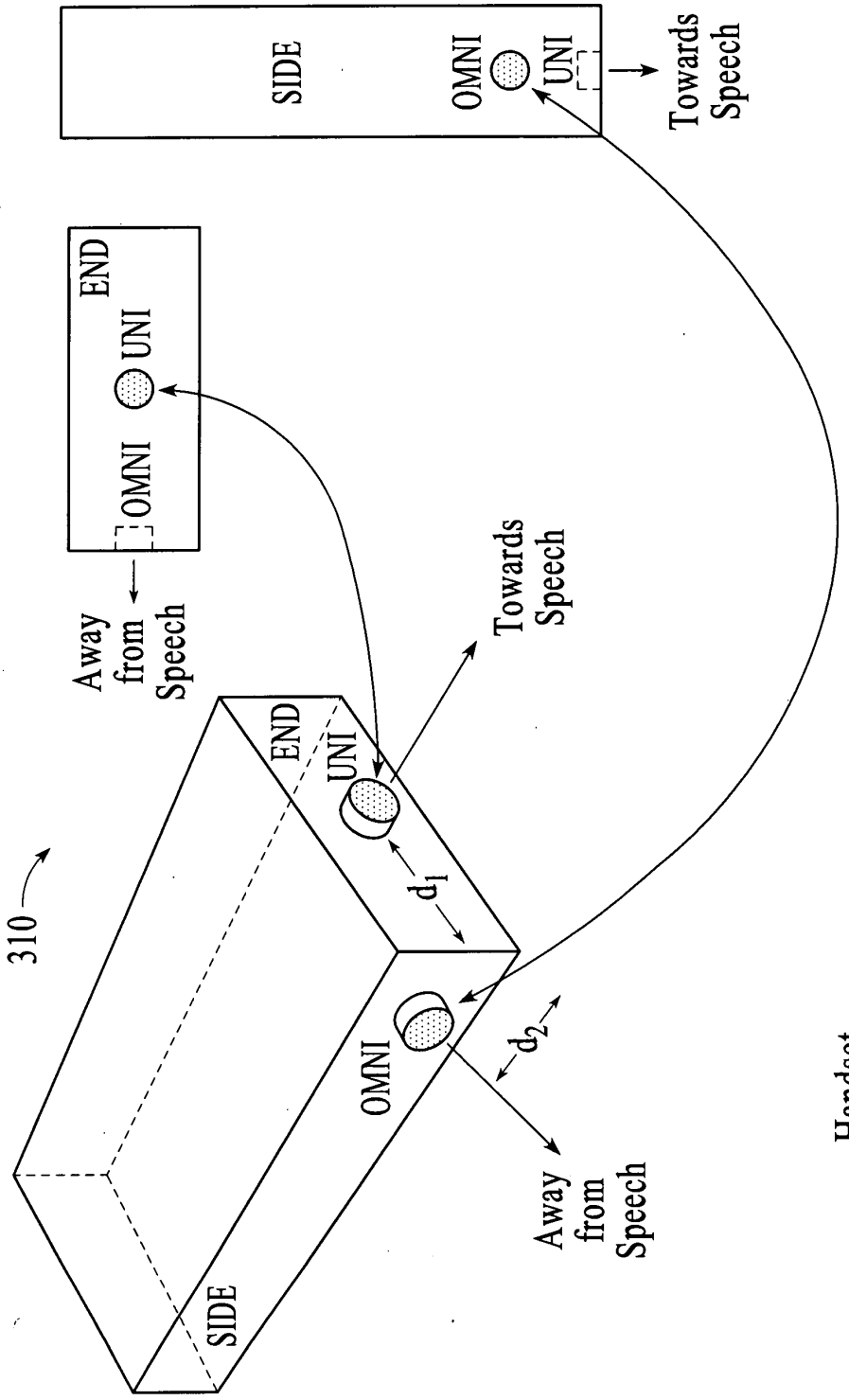

SIDE
OMNI
UNI
Towards Speech
END
UNI
OMNI
Away from Speech
Towards Speech
310
END
UNI
d_1
OMNI
d_2
Away from Speech
SIDE
Handset

FIG.3B

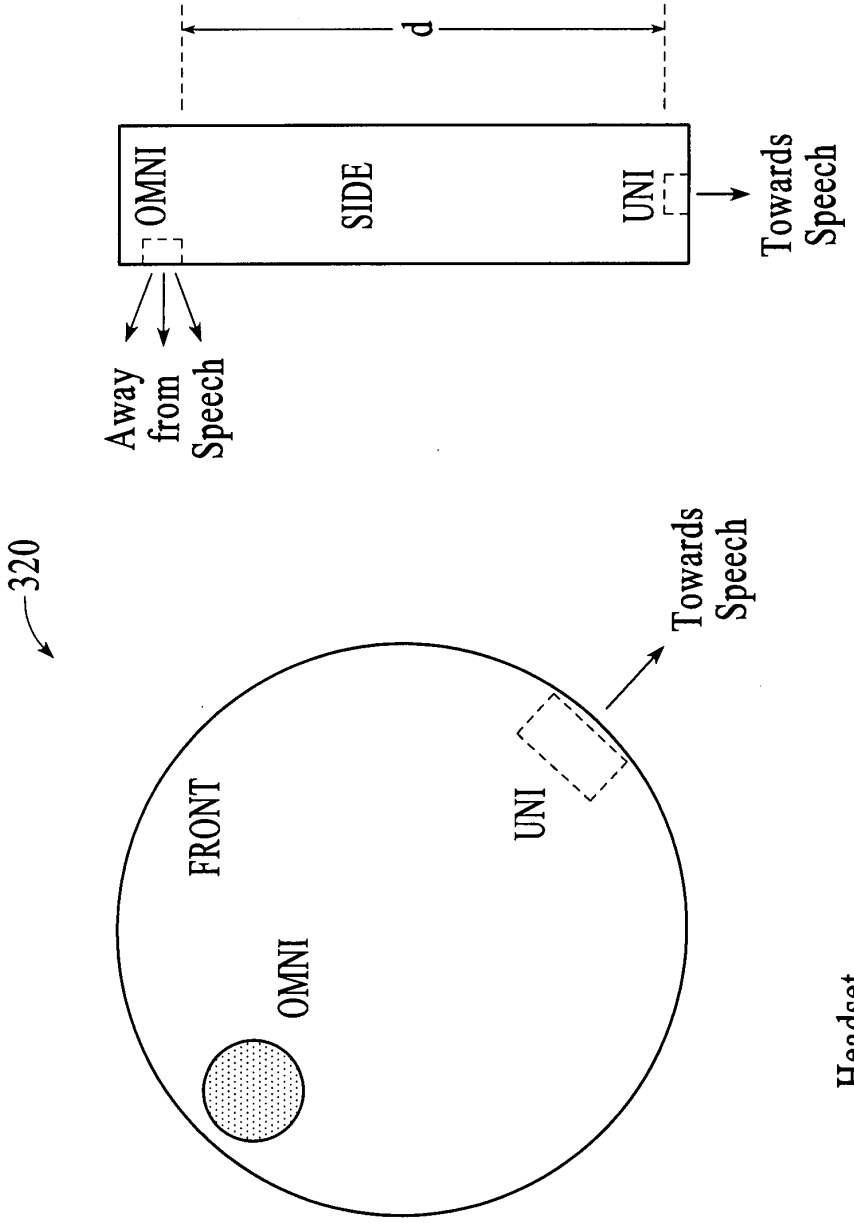

320
FRONT
OMNI
UNI
Towards Speech
Headset
d
OMNI
SIDE
UNI
Towards Speech
Away from Speech

FIG.3C

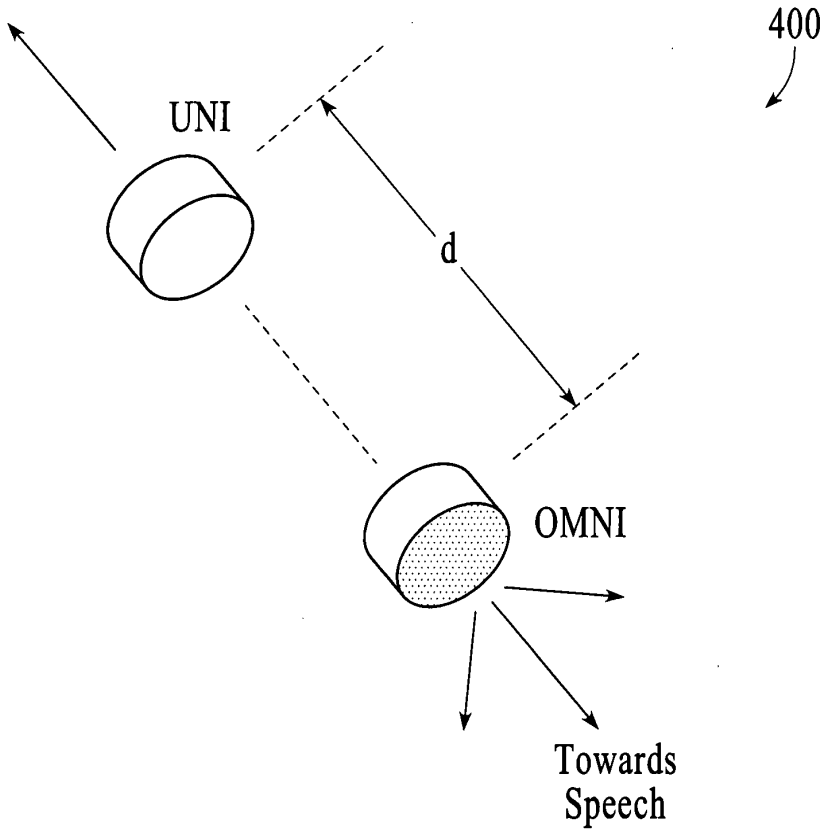


FIG.4A

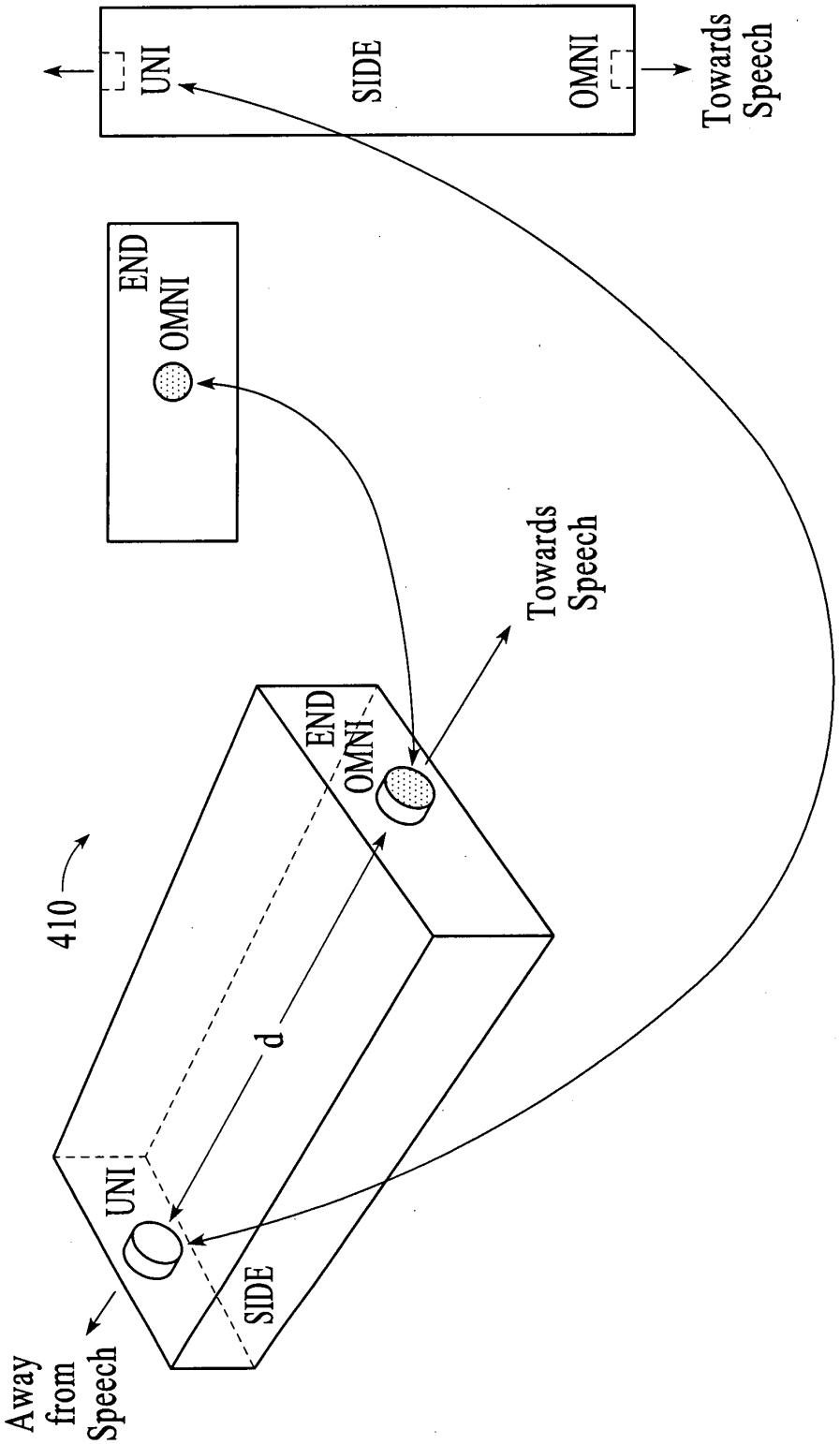

UNI
SIDE
OMNI
Towards Speech
END OMNI
Towards Speech
END OMNI
410
d
UNI
SIDE
Away from Speech
Handset

FIG.4B

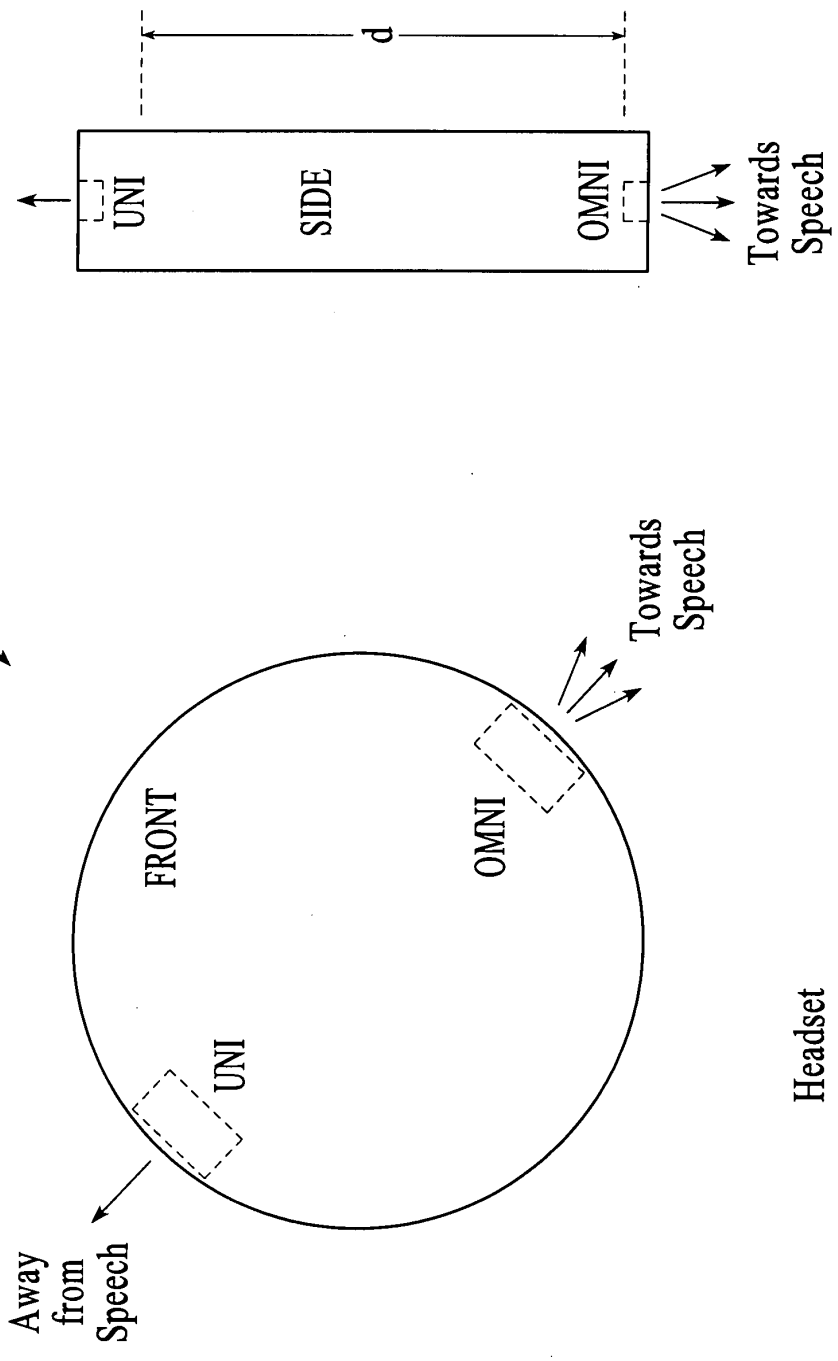

d
UNI
SIDE
OMNI
Towards Speech
420
FRONT
OMNI
Towards Speech
UNI
Away from Speech
Headset

FIG.4C

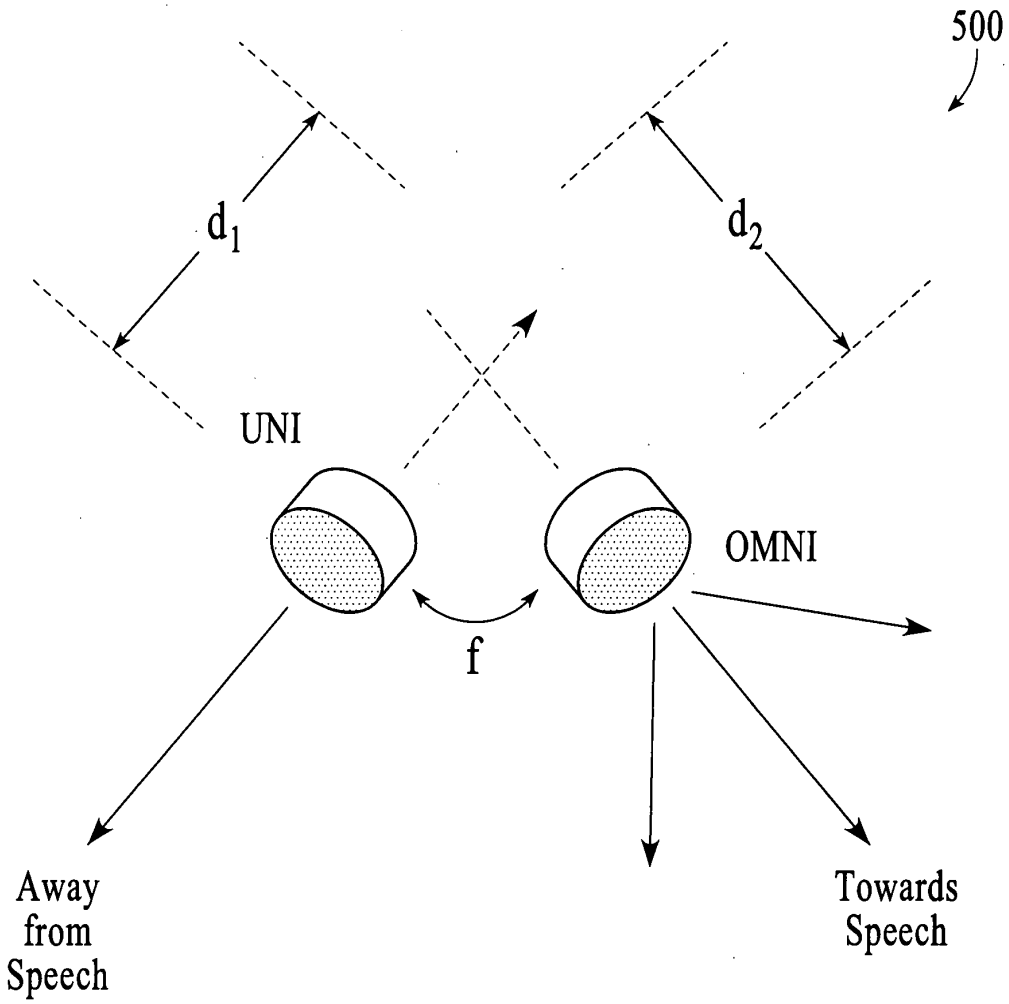


FIG.5A

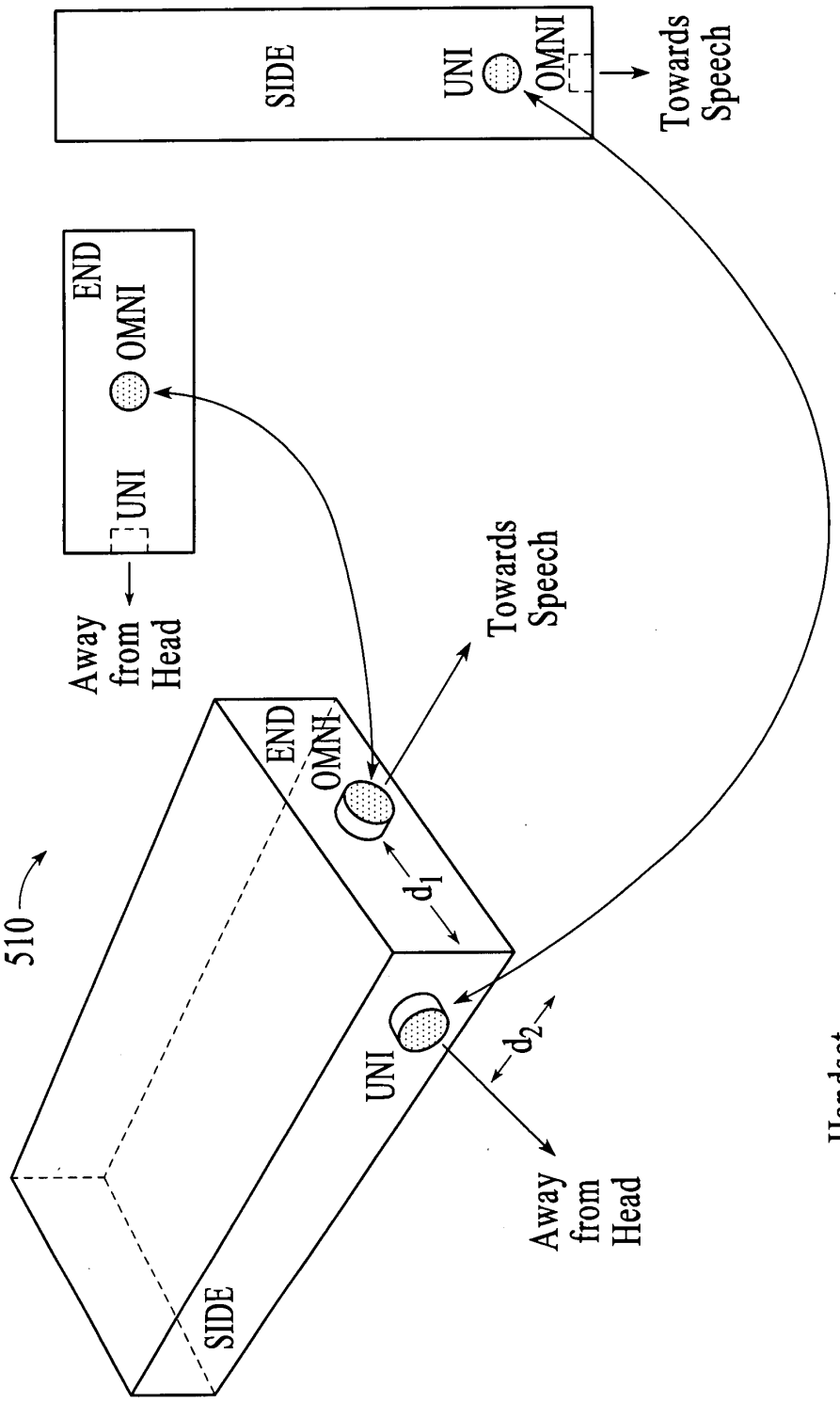

SIDE
UNI
OMNI
Towards Speech
END
OMNI
UNI
Away from Head
Towards Speech
510
END
OMNI
d_1
UNI
d_2
SIDE
Away from Head
Handset

FIG.5B

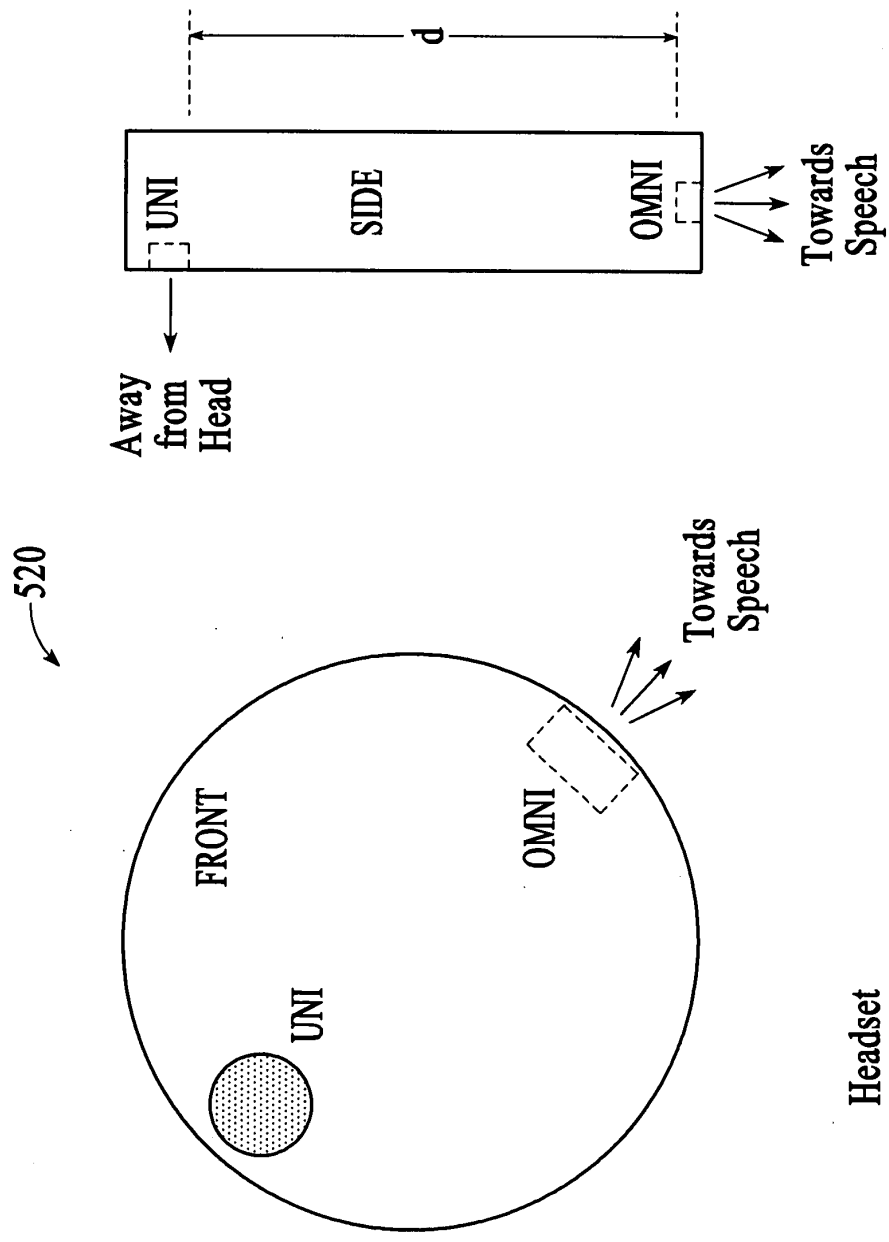

520
FRONT
UNI
OMNI
Towards Speech
Headset
d
UNI
SIDE
OMNI
Towards Speech
Away from Head

FIG.5C

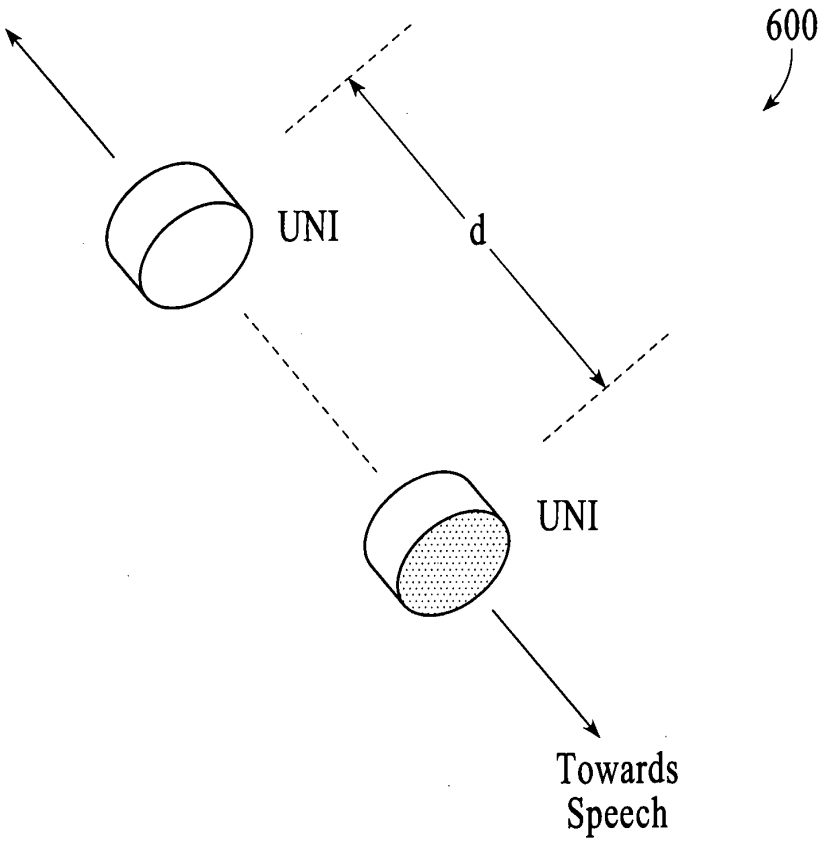


FIG.6A

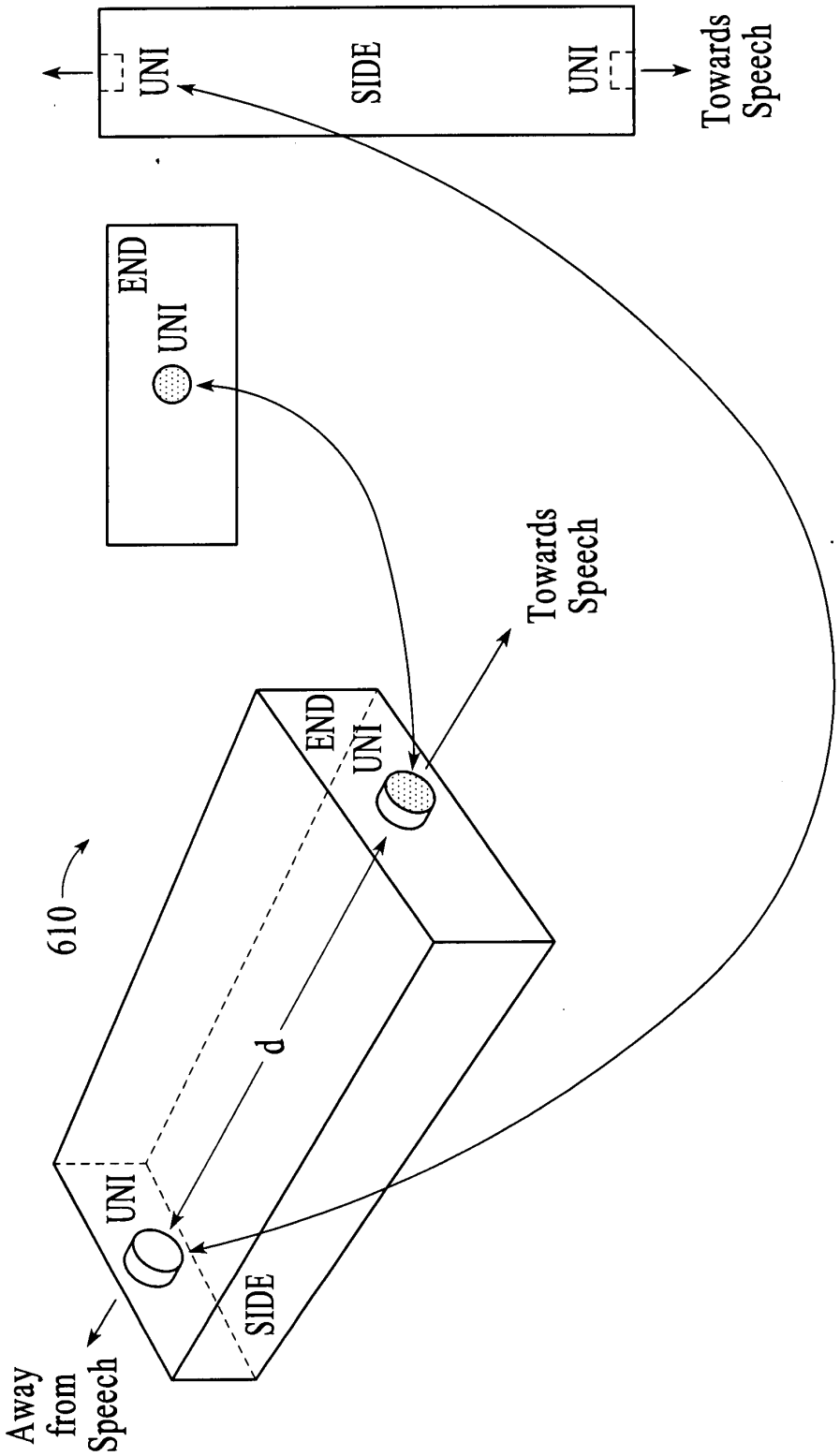

UNI
SIDE
UNI
Towards Speech
END
UNI
Towards Speech
610
END
UNI
d
UNI
SIDE
Away from Speech
Handset

FIG.6B

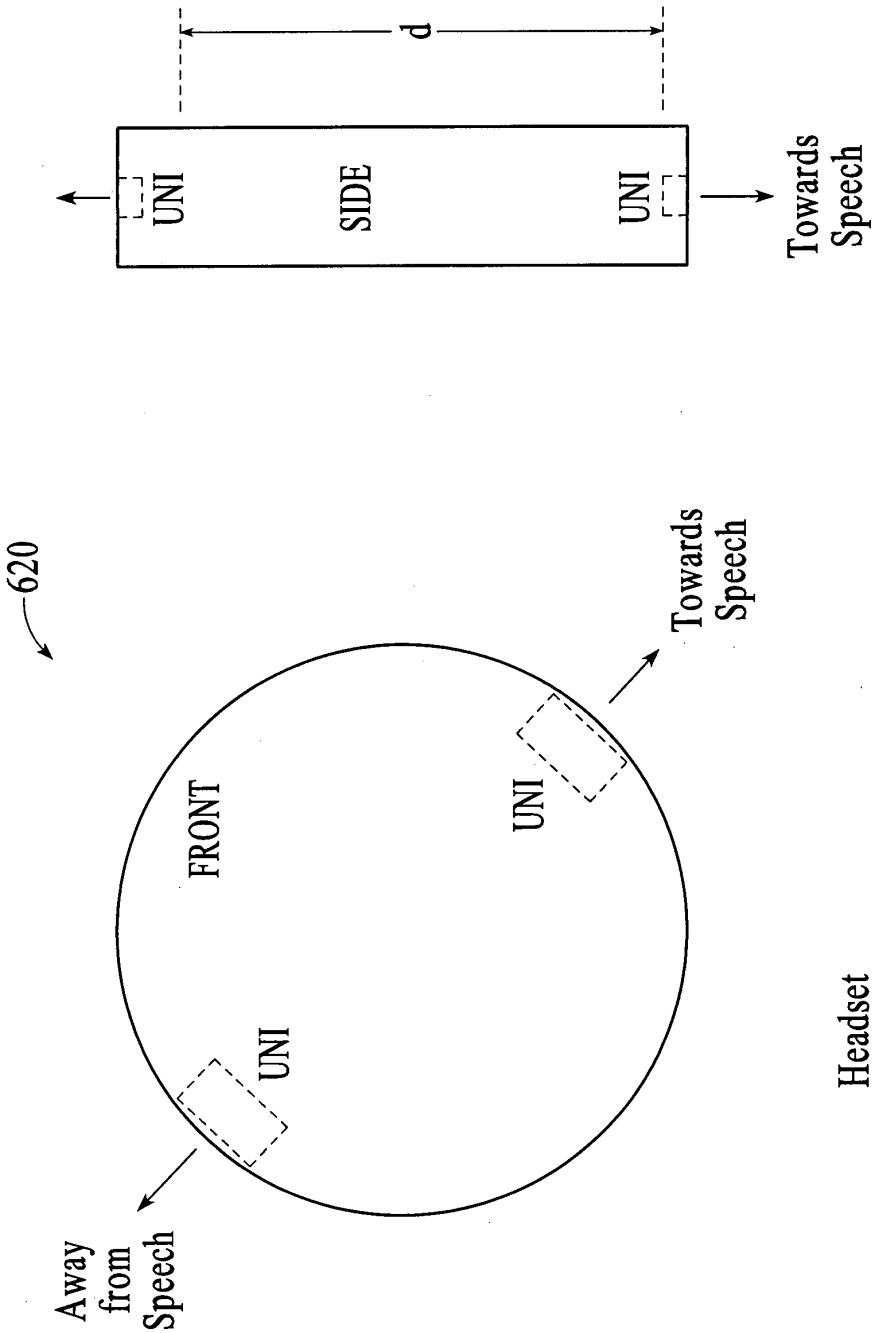

d
UNI
SIDE
UNI
Towards Speech
620
FRONT
UNI
UNI
Towards Speech
Away from Speech
Headset

FIG.6C

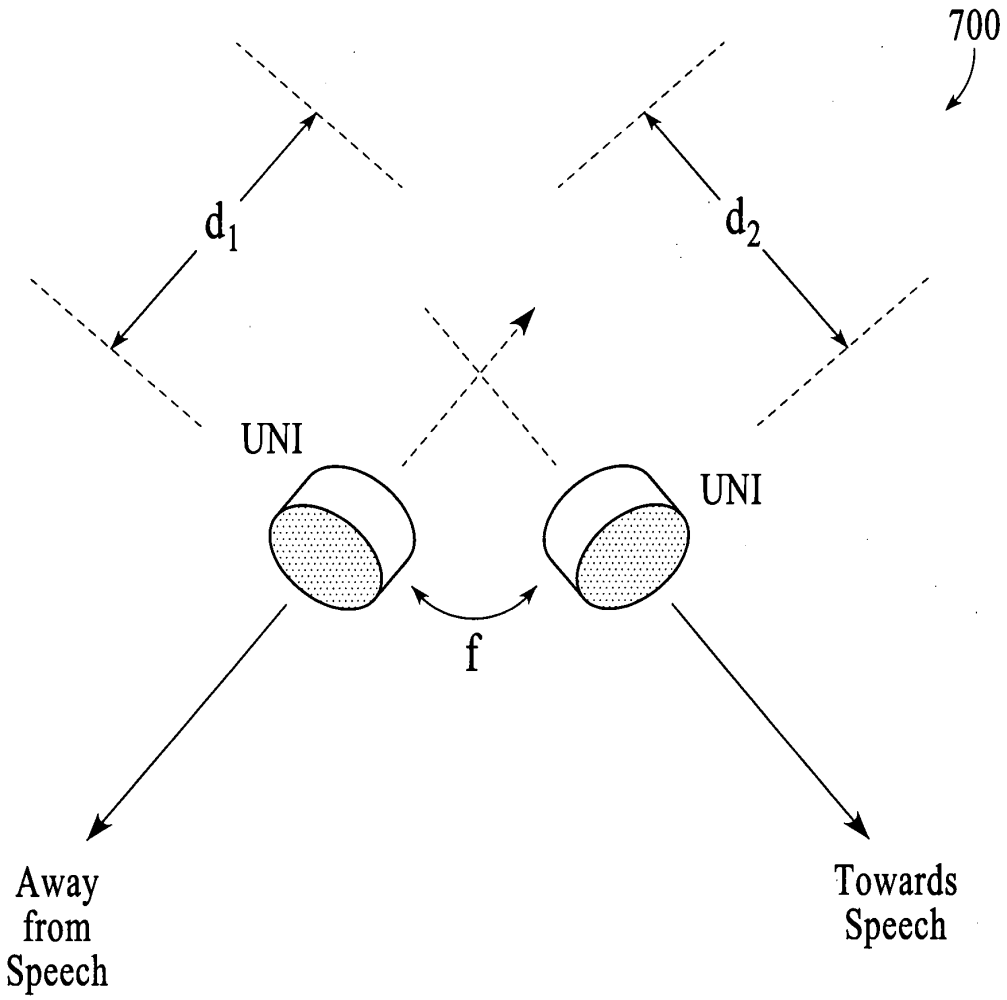


FIG.7A

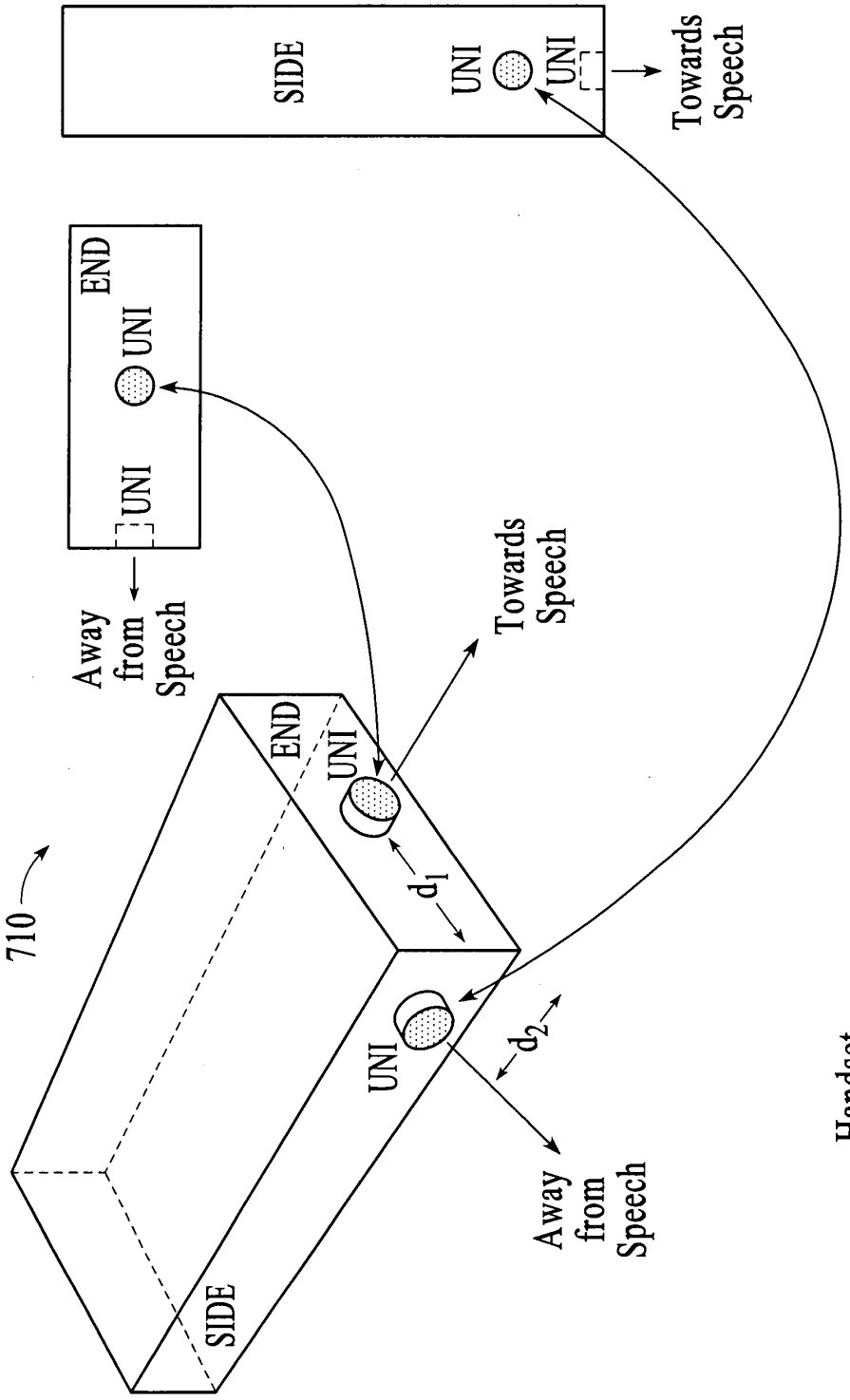

SIDE
UNI
UNI
Towards Speech
END
UNI
UNI
Away from Speech
Towards Speech
710
END
UNI
d_1
UNI
d_2
Away from Speech
SIDE
Handset

FIG.7B

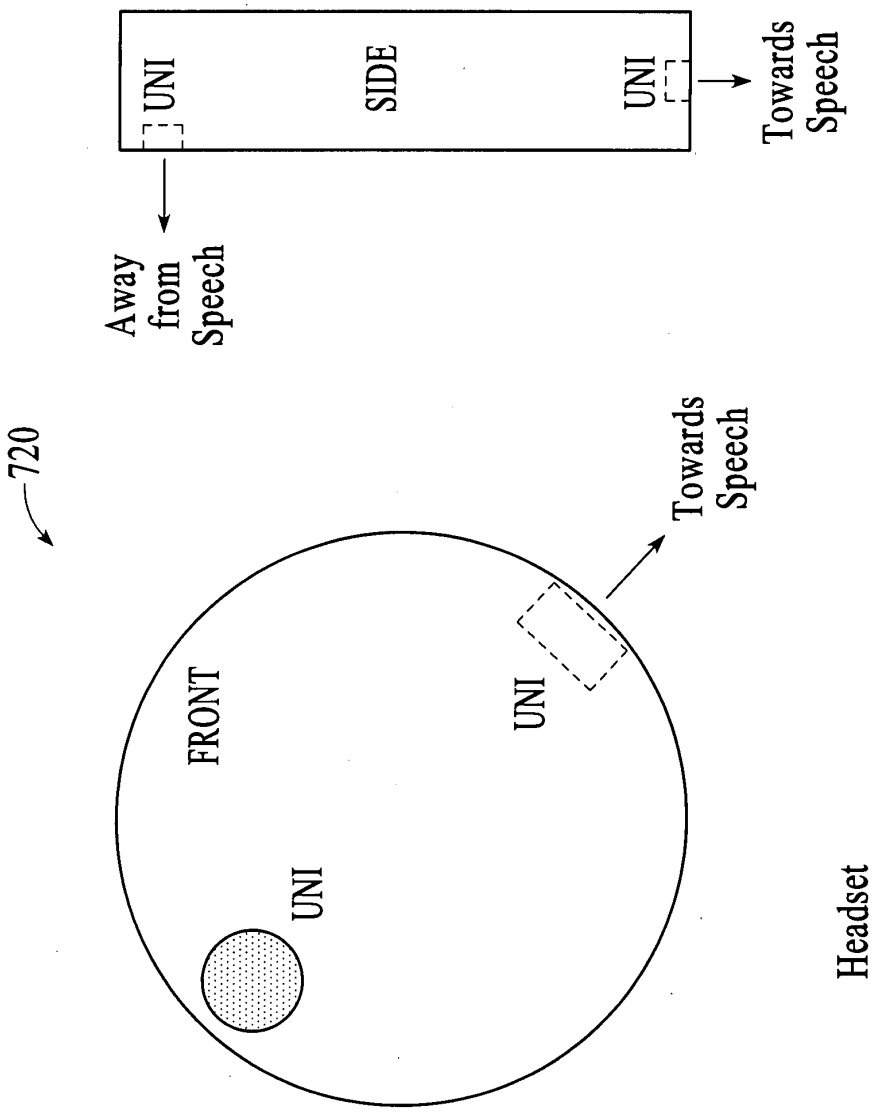

720
FRONT
UNI
UNI
Towards Speech
Headset
UNI
SIDE
UNI
Towards Speech
Away from Speech

FIG.7C

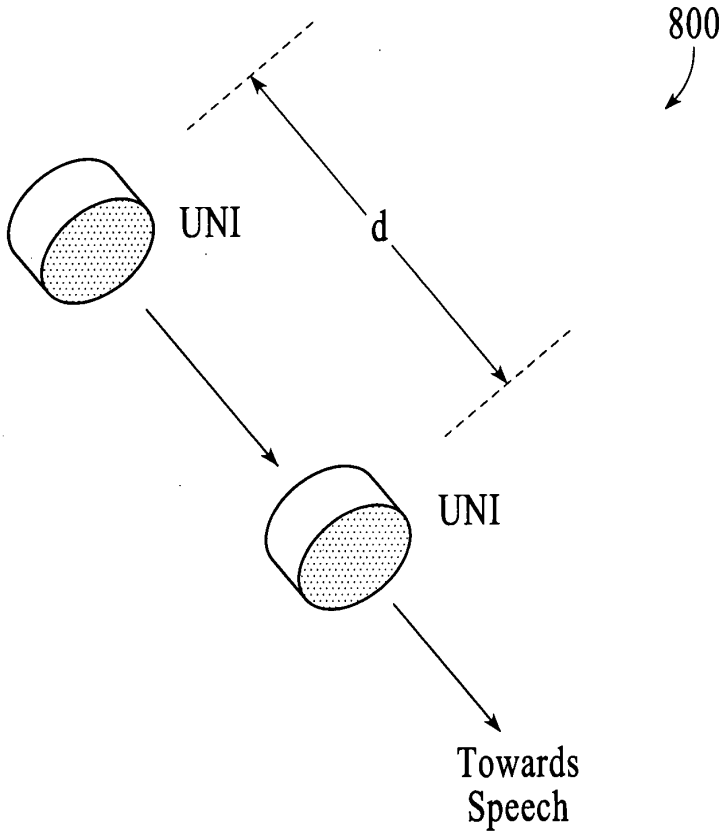


FIG.8A

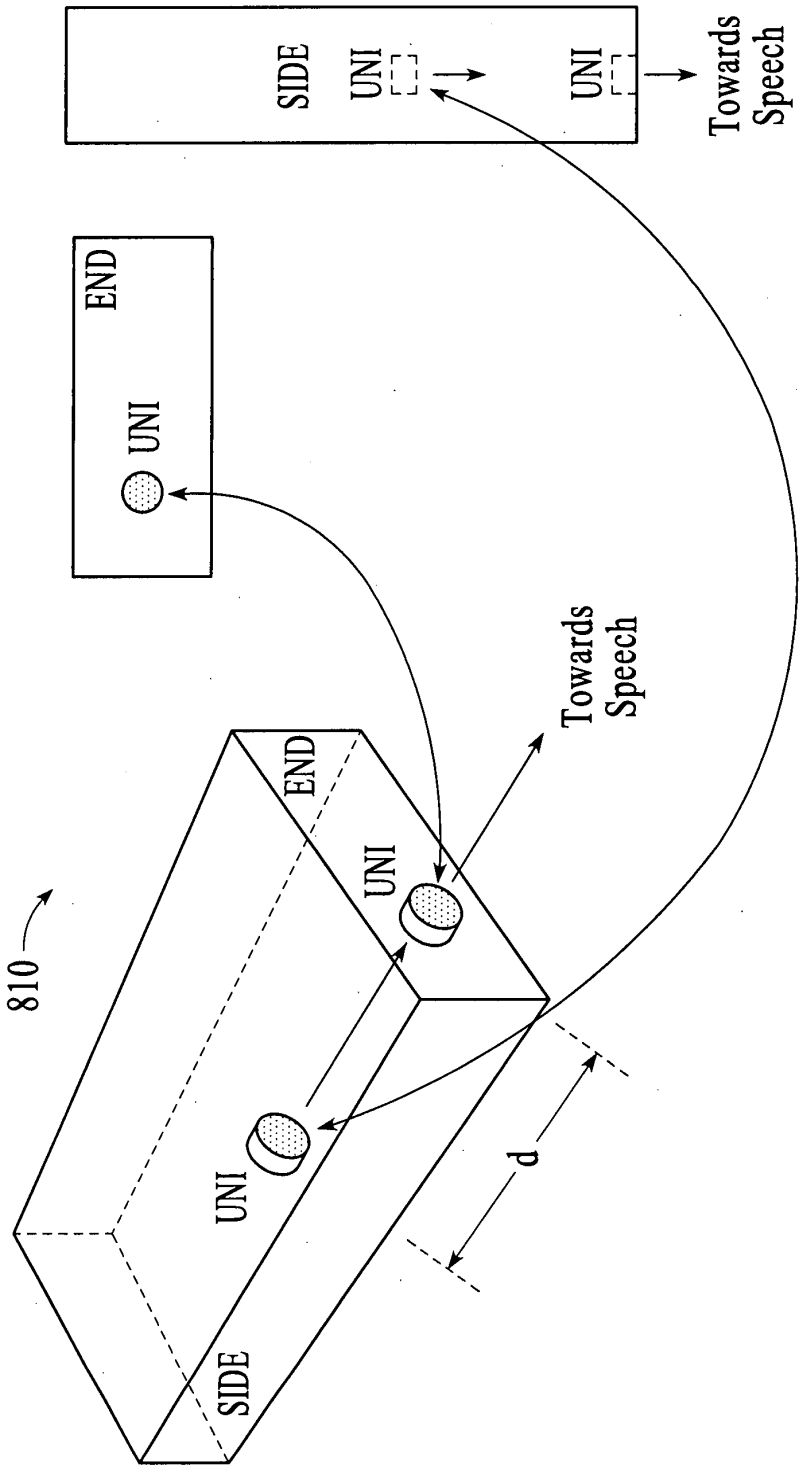

SIDE
UNI
UNI
Towards Speech
END
UNI
Towards Speech
810
END
UNI
UNI
SIDE
d
Handset

FIG.8B

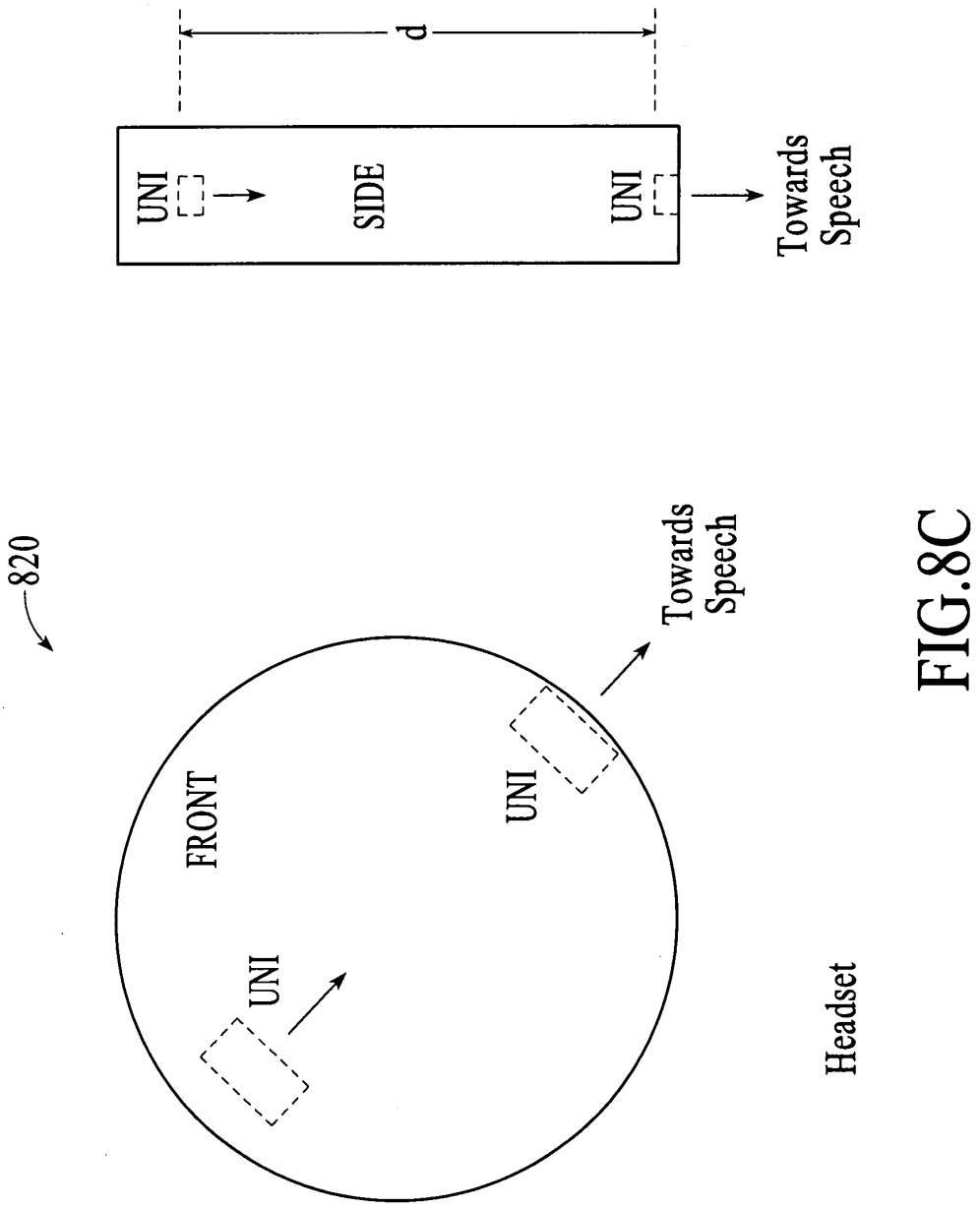

d
UNI
SIDE
UNI
Towards Speech
820
FRONT
UNI
UNI
Towards Speech
Headset

FIG.8C

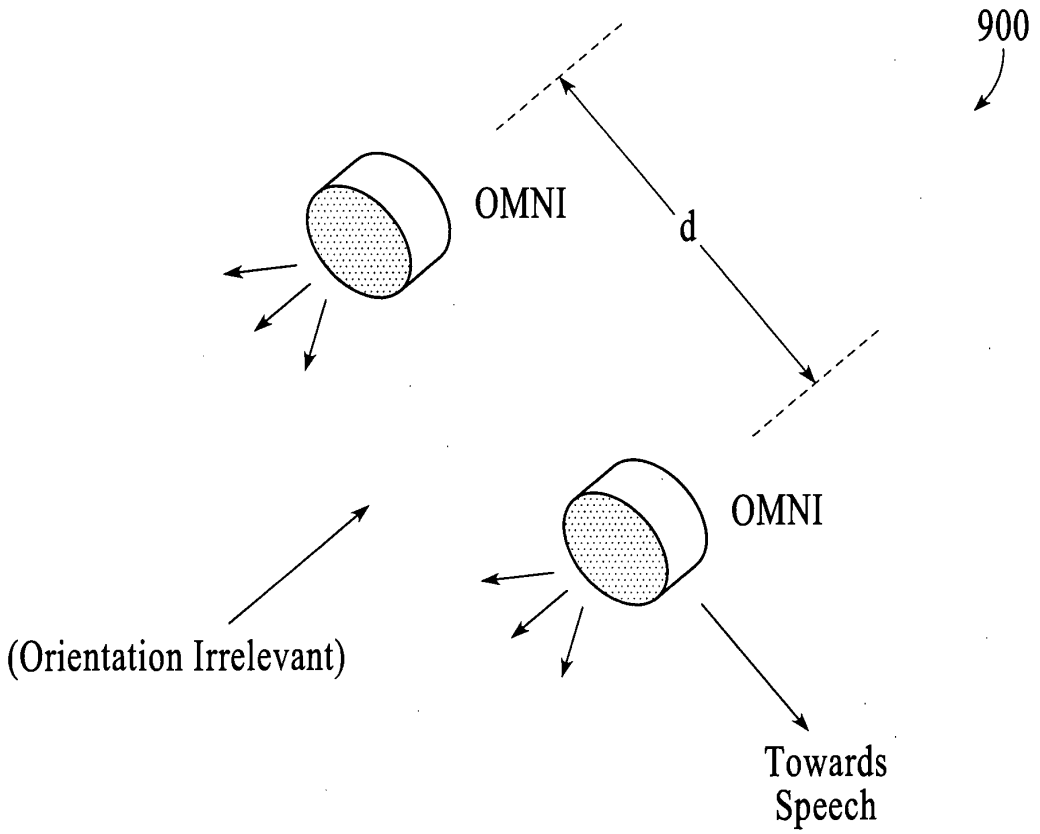


FIG.9A

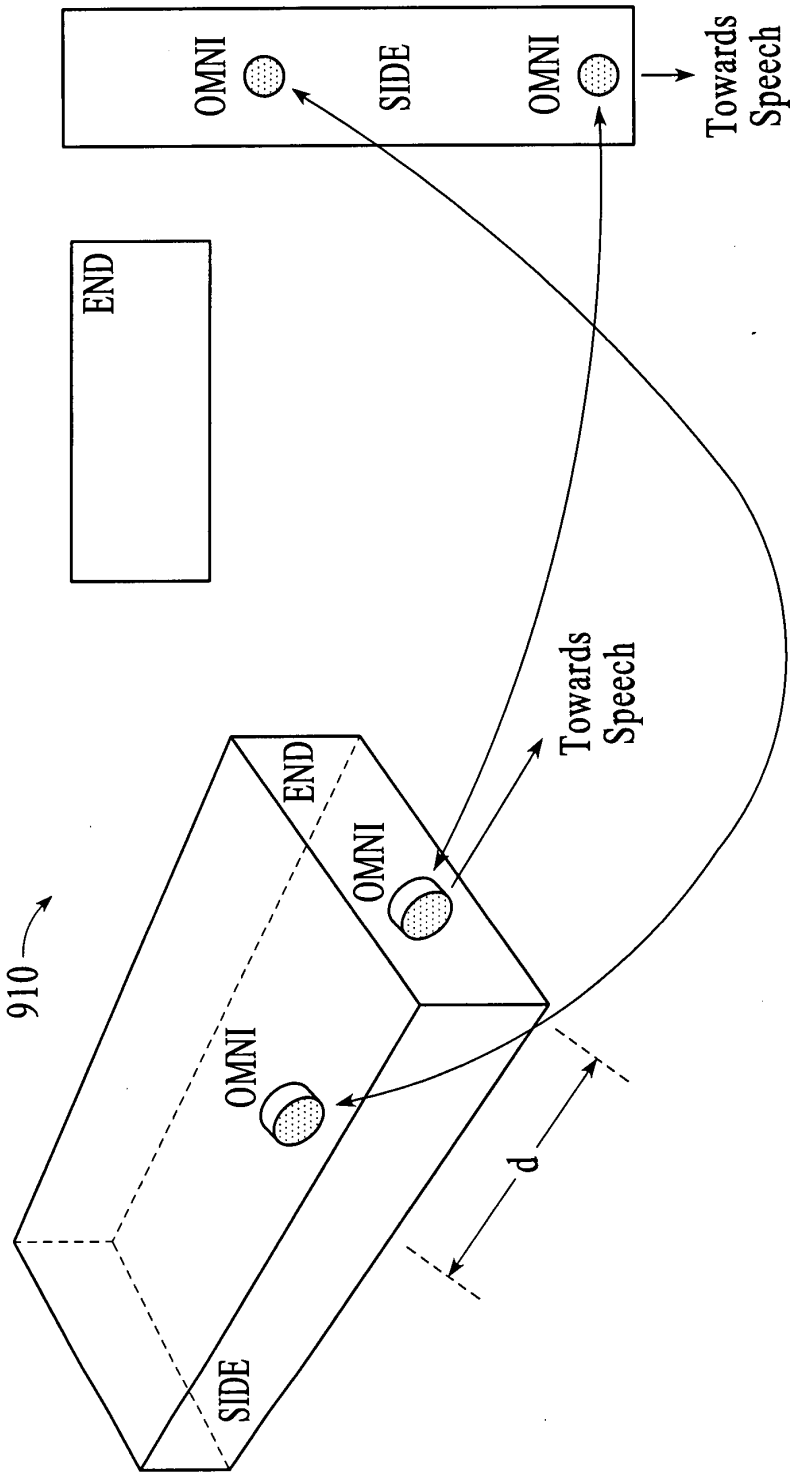

OMNI
SIDE
OMNI
Towards Speech
END
Towards Speech
END
OMNI
910
OMNI
d
SIDE
Handset

FIG.9B

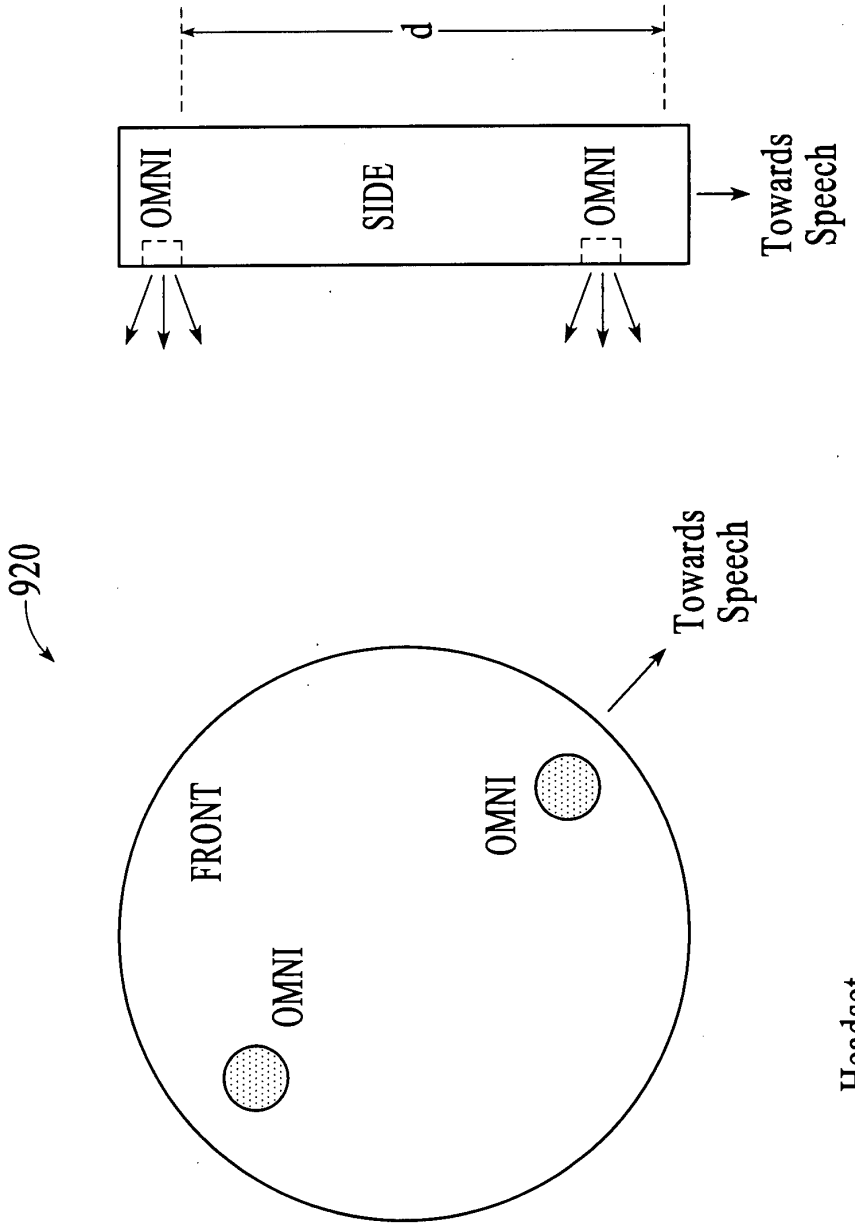

d
OMNI
SIDE
OMNI
Towards Speech
920
Towards Speech
FRONT
OMNI
OMNI
Headset

FIG.9C

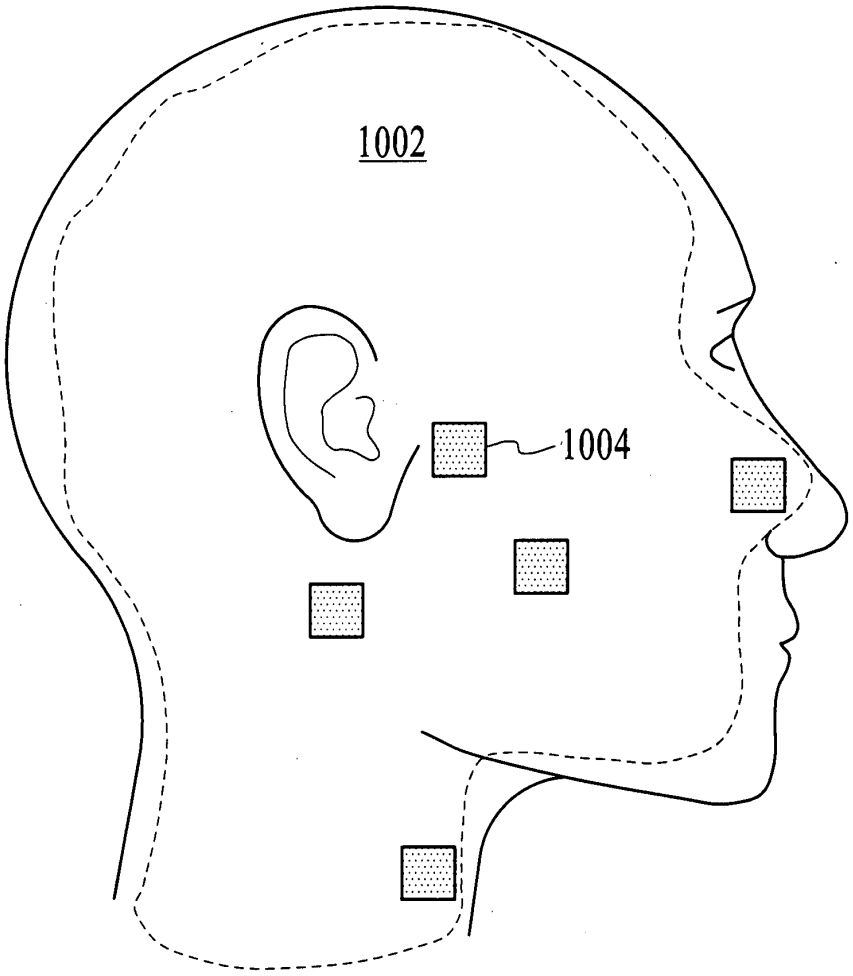


FIG.10A

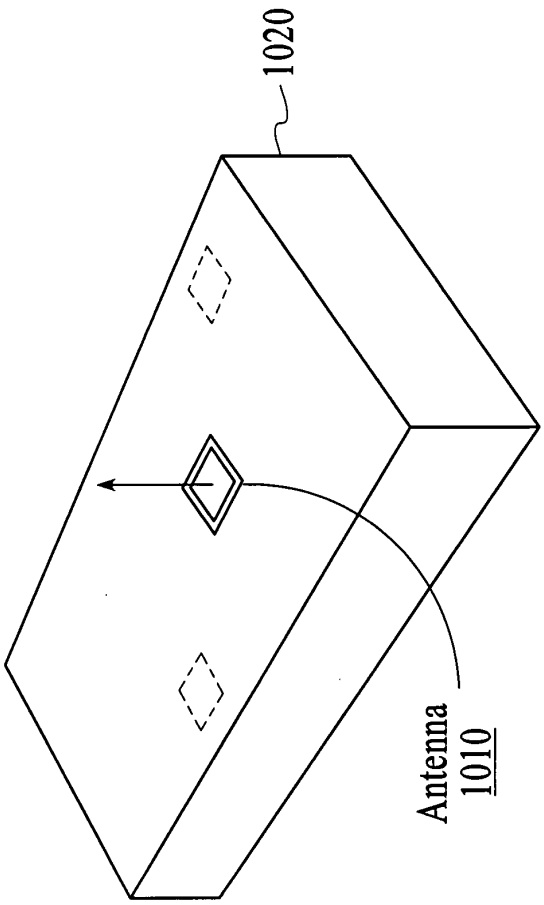


FIG.10B

A - Area Behind the Ear
B - Area Below the Ear
C - Mid Cheek Area
D - Area in Front of Ear Canal
E - Inside Ear Canal in Contact with Mastoid Bone or Other Vibrating Tissue
F - Nose

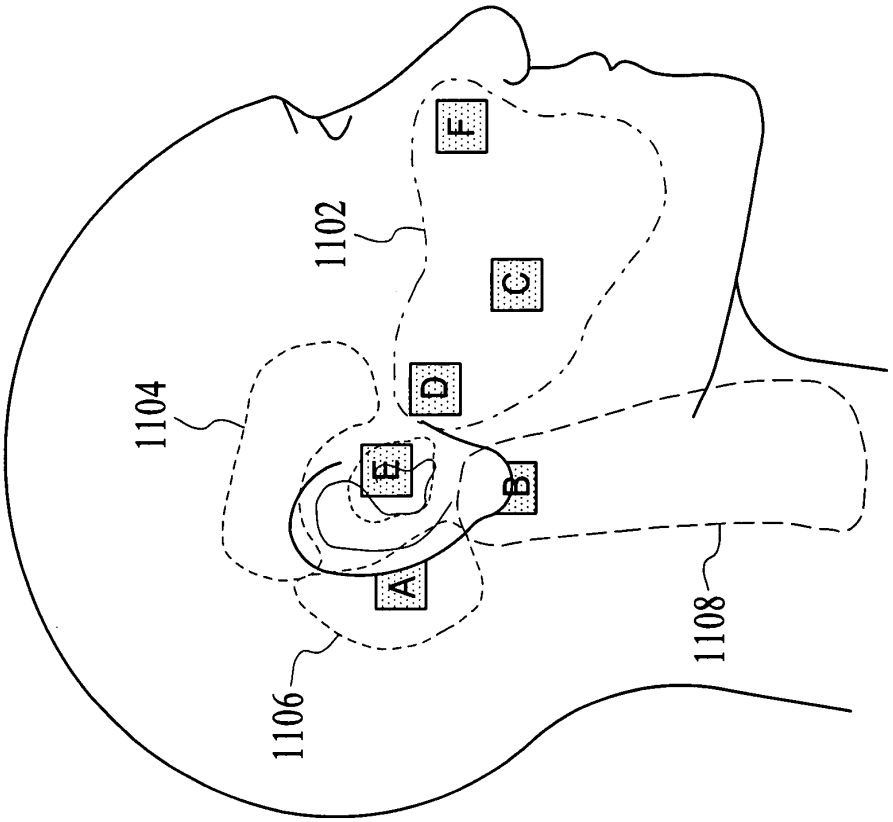


FIG.11A

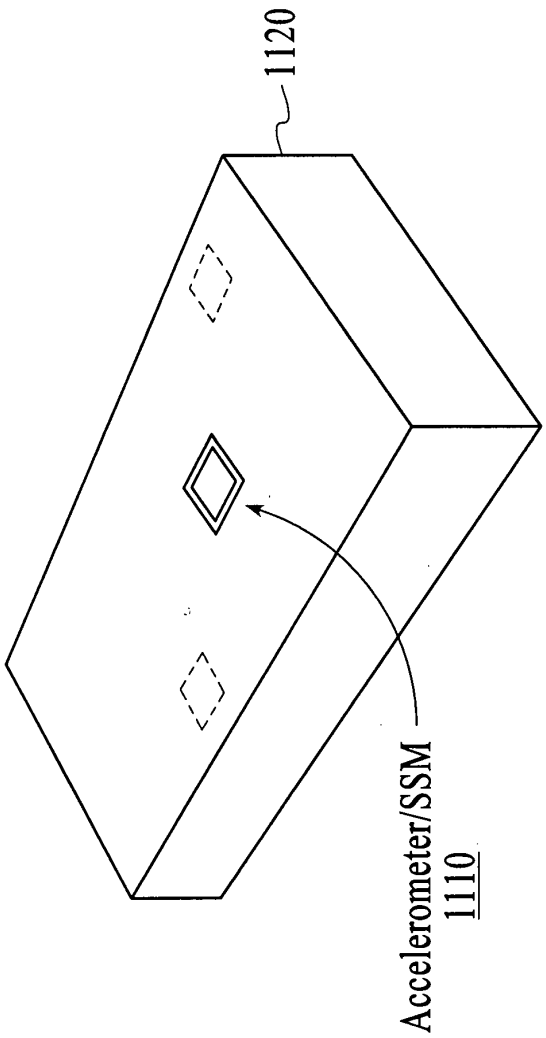
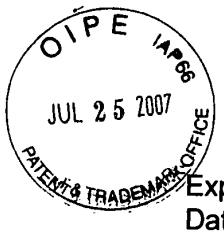


FIG.11B

07-26-07

2615



EXPRESS MAIL CERTIFICATE OF MAILING

"Express Mail" mailing label number: EV 708 402 415 US
Date of Deposit: July 25, 2007
I hereby certify that I am causing the paper(s) and/or fee(s) indicated below to be deposited with the United States Postal Service "Express Mail Post Office to Addressee" service on the date indicated above and that the paper(s) and/or fee(s) have been addressed to **Mail Stop Amendment, Commissioner for Patents, PO Box 1450, Alexandria, VA 22313-1450**.

Jerry Donnard
(Typed or printed name of person mailing paper(s) or fee(s))

(Signature of person mailing paper or fee)

7-25-2007
(Date signed)

Serial/Patent No.: 10/400,282 Filing/Issue Date: March 27, 2003 Client: AliphCom
Title: Microphone and Voice Activity Detection (VAD) Configurations for Use With Communication Systems

Atty. Docket No.: ALPH.P020 Date Mailed: July 25, 2007

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 (Replacement, 29 sheets)
- ☐ Declaration & Power of Attorney (pgs.)
- ☐ Assignment & Cover Sheet (pgs.)
- ☐ Power of Attorney by Assignee (pgs.)
- ☐ Nonpublication Request (35 USC 122(b))
- ☑ Other Copy of Annotated Sheet for Figure 11A
- ☐ Petition for Extension of Time (month(s))
- ☐ Information Disclosure Statement & PTO/SB/08A
- ☐ Issue Fee Transmittal
- ☑ Submission of Supplemental Amendment
- ☐ Notice of Appeal
- ☐ Appeal Brief (pgs. in triplicate)
- ☐ Reply Brief
- ☐ Response to Notice of Missing Parts
- ☐ Utility Patent Application Transmittal
- ☐ Fee Transmittal (in duplicate)
- ☑ Itemized Postcard
- ☑ Express Mail Certificate of Mailing
- ☑ Express Mail No. **EV 708 402 415 US**
- ☐ Authorization to Charge Credit Card Amt $

PATENT APPLICATION FEE DETERMINATION RECORD
Effective January 1, 2003

Application or Docket Number: 10400282

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	39	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	39 minus 20=	* 19
INDEPENDENT CLAIMS	3 minus 3 =	*
MULTIPLE DEPENDENT CLAIM PRESENT		☐

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

SMALL ENTITY ☑ OR OTHER THAN SMALL ENTITY

RATE	FEE		RATE	FEE
BASIC FEE	375.00	OR	BASIC FEE	750.00
XS 9=	171	OR	XS18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL	546	OR	TOTAL	

6/4/07

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	* 40	Minus	** 39	= 1
Independent	* 7	Minus	*** 3	= 4
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY OR OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
XS 9=	25	OR	XS18=	
X42=	900	OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE	925	OR	TOTAL ADDIT. FEE	

7/25/07

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				☐

SOME

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
XS 9=		OR	XS18=	
X42=		OR	X84=	
+140=		OR	+280=	
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
XS 9=		OR	XS18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 2 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.

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1602	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/18 14:18
S1	150	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S3	850	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S4	641	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S5	6	brennan.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:28
S6	6	("5136577" | "5329587" | "5544080" | "5887059" | "6070137" | "6487295").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/10/15 15:33
S7	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:22
S8	11	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:32
S9	1	("5406622").PN.	USPAT	OR	OFF	2007/10/16 10:24
S10	2	burnett.in. and microphone and (voice near2 activity) and ("15" near2 centimeters)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:38
S11	0	EP-1483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:37

Meta Platforms, Inc. - Exhibit 1002
Page 284 of 686

EAST Search History

S12	0	EP-2001483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S13	0	EP-483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S14	0	WO-20030906031-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S15	0	WO-030906031-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:39
S16	194	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:40
S17	33	"381"/$.ccls. and (voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:04
S18	7	"381"/$.ccls. and (voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (unidirectional)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:40
S19	1	burnett.in. and microphone and ((voice near2 activity) same (manual$2 near2 activat$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:20
S20	1	"381"/$.ccls. and (manuall$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:40
S21	1	"381"/$.ccls. and (manual$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:41

EAST Search History

S22	3	(manual$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:42
S23	10	(manual$3 near2 (operat$3 activat$3)) same (VAD)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:42
S24	2	"381"/$.ccls. and (voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) same (headset earphon$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:44
S25	7	"381"/$.ccls. and (voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (headset earphon$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:44
S26	5	burnett.in. and microphone and ((voice near2 activity) same subsystem)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:54
S27	35	("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.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/10/16 18:19
S28	1	(glottal near2 electromagnetic near2 sensor$1) with antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:22
S29	6	burnett.in. and microphone and (voice near2 activity) and glottal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 15:59

EAST Search History

S30	12	(glottal near2 electromagnetic near2 micropower near2 sensor$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:22
S31	1	burnett.in. and microphone and (voice near2 activity) and (transceiver same headset)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:02
S32	1	burnett.in. and microphone and (voice near2 activity) and transceiver	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:02
S33	2	"381"/$.ccls. and (voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (transceiver)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:17
S34	29	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (transceiver)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:20
S35	6	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (transceiver) and (headset headphone$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:20
S36	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:22
S37	1	S36 and headset	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:23
S38	0	headset same transceiver same (voice near2 activity near2 detect3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:23
S39	0	(headset same transceiver) and (voice near2 activity near2 detect3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:24
S40	5	(headset same transceiver) and (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:24

EAST Search History

S41	35	(headset same transceiver) and (noise near2 (suppress$3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 18:59
S42	1	(headset same transceiver) same (noise near2 (suppress$3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:25
S43	35	(headset same transceiver) and (noise near2 (suppress$3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 18:59

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.
10/400,282	03/27/2003	Gregory C. Burnett	ALPH.P020	1397

53186 7590 10/30/2007
COURTNEY STANIFORD & GREGORY LLP
P.O. BOX 9686
SAN JOSE, CA 95157

EXAMINER	
FAULK, DEVONA E	

ART UNIT	PAPER NUMBER
2615	

MAIL DATE	DELIVERY MODE
10/30/2007	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)	
	10/400,282	BURNETT ET AL.	
	Examiner	Art Unit	
	Devona E. Faulk	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 *25 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) *1-7,9-23,25-37 and 39-43* 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) *1-7,9-23,25-37 and 39-43* 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 *7/25/2007* 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

Response to Remarks

1. Claims 8,9,15,24,25,31,38 and 39 were objected to being dependent upon a rejected based claim and indicated as allowable if rewritten in independent form. .

2. Claim 8 was rejected, so it was mistakenly included in the list of objected to claims.

3. The indicated allowability of claims 9,15,24,25,31,38 and 39 is withdrawn in view of the newly discovered reference(s) to *In re Venner* and Yoshida. Rejections based on the newly cited reference(s) follow.

4. Claims 40-43 are new.

Drawings

5. 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, the headset, transceiver and handset 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

6. Claims 1-7,9-17,18-23,25-33 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. Claims 1 and 18 recite "..the voice detection subsystem comprises two unidirectional microphones separated by a distance and having an angle between maximums of spatial response curve of each microphone, wherein the distance is approximately in the range of 0 to 15 centimeters and wherein the angle is approximately in the range of zero to 180 degrees; and at least one voice activity detector...". The specification discloses that the communications system comprises two unidirectional microphones, a denoising

subsystem and a voice detection system. The claim as recited seems to recite that the voice detection subsystem includes the denoising system, however the denoising system is not part of the voice detection subsystem, it is part of the communications system. Furthermore, the claim language recites that both the voice detection subsystem and the denoising subsystem include two unidirectional microphones. The specification only discloses two microphones, not four as the claim would seem to indicate. The claim language as recited does not comply to the written description.

7. 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.

8. Claims 1-7,9-17,18-23,25-37,39-41 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. Claims 1,18,34,40 and 41 recite "... two microphones separated by a distance and having an angle between maximums..". The angle between maximums language is confusing. Clarity is needed with regards to what this means. The examiner has just interpreted this as having an angle between the two microphones.

Claim Rejections - 35 USC § 103

9. 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.

10. Claims 1-4, 6,7,40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Oh et al. (US 5,353,376).

Regarding claim 1, Yoshida discloses a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals, the voice detection system (Figure 4) comprising,

two microphones (Figures 1 and 4) and

at least one voice activity detector (VAD) algorithm for processing the voice activity signals and generating the control signals (300 Figure 4; column 8, lines 14-20); and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including **two** microphones, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform

estimate from the acoustic signal when the acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25.

Yoshida fails to disclose that the microphones are unidirectional and separated by a distance and having an angle between maximums of a spatial response curve of each microphone. Oh discloses a system for improved speech acquisition for a hands-free system in a noise environment comprising unidirectional microphones that are separated by a distance and having an angle between maximums of a spatial response curve of each microphone and that the two microphones are unidirectional (column 7, lines 14-25). It would have been obvious to modify Yoshida by having the microphones be unidirectional for the purpose of improving the performance of the noise cancellation system (Oh; column 7, lines 22-25).

separated by a distance and having an angle between maximums of a spatial response curve of each microphone

Regarding the recited claim language of "..wherein the distance is approximately in the range of 0 to 15 centimeters and wherein the angle is approximately in the range of 0 to 180 degrees..." , in view of the prior art, it would have been obvious to try to have the microphones separated at a distance in the range of 0 to 15 centimeters and having an angle that in the range of 0 to 180 degrees, with a reasonable expectation of success. All elements of claims 2,3, and 7 are comprehended by the rejection of claim 1.

Regarding claims 4 and 6, the examiner takes official notice that it was well known in the art at the time of the invention to use glottal electromagnetic sensors and skin microphones to generate voice signals. It would have been obvious to one of

ordinary skill in the art to modify Yoshida as modified to use such sensors in the place of the microphones for the purpose of improving the voice detection performance.

Claim 40 is rejected using Yoshida and Oh as applied above to claim 1. Regarding the ".. manually activated.." language of **claims 9 and 40**, the examiner asserts that per *In re Venner* the court held that providing an automatic means to replace a manual activity which accomplished the same result is not sufficient to distinguish over the prior art. Therefore, the examiner asserts that the opposite is true as well that providing a manual means to replace an automatic means is not sufficient to overcome the prior art. It would have been obvious to modify Yoshida as modified so that the VAD is manually operated to give the user more control over when the VAD

11. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Oh et al. (US 5,353,376) in further view of Park et al. (US 5,590,241).

Regarding claim 5, Yoshida as modified fails to disclose that the voice detection subsystem comprises an accelerometer sensor in contact with the skin of the user and a voice activity detector for processing the accelerometer sensor voice activity signals. Park discloses a speech processing system comprising accelerometer 34 and noise microphone 31. It would have been obvious to one of ordinary skill in the art at the time of invention to modify the Yoshida as modified to have an accelerometer coupled to the power monitoring circuit 300 (voice activity detector), for the purpose of generating voice activity signals directly from the source.

12. Claims 10-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Oh et al. (US 5,353,376) in further view of Housni (US 6,795,713).

Regarding claim 10, Yoshida as modified by Oh fails to disclose that the system includes a portable handset that includes the microphones. Yoshida teaches of a two microphone system. Housni discloses a portable handset 1 which includes microphones 3 and 12 for wireless communication. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to implement the circuitry of Yoshida et al as modified in a portable handset for the purpose of improving wireless speech communication.

Regarding claims 11 and 15, the modified Yoshida as modified provides a voice detection subsystem and denoising subsystem in the anti-noise circuitry of the portable handset

Regarding claim 12, the portable handset 1 of Housni includes a speaker 4.

Regarding claims 13 and 14, the portable handset of Housni inherently couples to another wireless phone via wireless couplings.

All elements of claims 16 and 17 are comprehended by the rejection of claim 12.

13. Claims 18-21,23,25,34,35,39,41,42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Oh et al. (US 5,353,376) in further view of Ouyang et al. (US 2003/0044025).

Regarding claim 18, Yoshida discloses a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals, wherein the voice detection system (Figure 4) further comprises:

two microphones (Figures 1 and 4) and

at least one voice activity detector (VAD) algorithm for processing the voice activity signals and generating the control signals (300 Figure 4; column 8, lines 14-20); and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including **two** microphones, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25.
Yoshida fails to disclose that the microphones are unidirectional and separated by a distance and having an angle between maximums of a spatial response curve of each microphone. Oh discloses a system for improved speech acquisition for a hands-free

system in a noise environment comprising unidirectional microphones that are separated by a distance and having an angle between maximums of a spatial response curve of each microphone (column 7, lines 14-25). It would have been obvious to modify Yoshida by having the microphones separated by a distance and having an angle between maximums for the purpose of improving the performance of the noise cancellation system (Oh; column 7, lines 22-25).

Yoshida as modified does not disclose one omnidirectional microphone and one unidirectional microphone, the microphones separated by a distance. Ouyang et al teach a microphone system for a speakerphone comprising omnidirectional microphone 20 and unidirectional microphone 12 and noise suppression circuit 11 (denoising system). The system advantageously determines the source of noise and suppresses it using the unidirectional microphone as a reference. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Yoshida as modified by substituting the microphone configuration of Ouyang et al, for the microphones 1 and 2 for the purpose of improving the performance of the noise cancellation system.

Regarding the recited claim language of "..wherein the distance is approximately in the range of 0 to 15 centimeters and wherein the angle is approximately in the range of 0 to 180 degrees..." , in view of the prior art, it would have been obvious to try to have the microphones separated at a distance in the range of 0 to 15 centimeters and having an angle that in the range of 0 to 180 degrees, with a reasonable expectation of success.

All elements of claims 19 and 20 are comprehended by the rejection of claim 18.

Regarding claims 21 and 23, the examiner takes official notice that it was well known in the art at the time of the invention to use glottal electromagnetic sensors and skin microphones to generate voice signals. It would have been obvious to one of ordinary skill in the art to modify Yoshida as modified to use such sensors in the place of the microphones for the purpose of improving the voice detection performance.

Regarding claim 25, the examiner asserts that per In re Venner the court held that providing an automatic means to replace a manual activity which accomplished the same result is not sufficient to distinguish over the prior art. Therefore, the examiner asserts that the opposite is true as well that providing a manual means to replace an automatic means is not sufficient to overcome the prior art. It would have been obvious to modify Yoshida as modified so that the VAD is manually operated to give the user more control over when the VAD

Regarding claim 34, Yoshida discloses a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals (Figure 4) and :

two microphones (Figures 1 and 4) and

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals (300 Figure 4; column 8, lines 14-20); and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the

microphones including **a first and second** microphone separated by distance and having an angle between maximums of a spatial response curve of each microphone, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25).

Yoshida fails to discloses that the microphones are separated by a distance and having an angle between maximums of a spatial response curve of each microphone. Oh discloses a system for improved speech acquisition for a hands-free system in a noise environment comprising unidirectional microphones that are separated by a distance and having an angle between maximums of a spatial response curve of each microphone and that the two microphones are unidirectional (column 7, lines 14-25). It would have been obvious to modify Yoshida by having the microphones separated by a distance and having an angle between maximums for the purpose of improving the performance of the noise cancellation system (Oh; column 7, lines 22-25).

Yoshida as modified fails to disclose a transceiver that couples information between the communications network and a user via a headset.

Turnbull discloses a transceiver that couples information between the communications network and a user via a headset (transceiver 185, column 28, lines 53-65). It would have been obvious to modify Yoshida as modified in order to allow for wireless transmission.

All elements of claim 35 are comprehended by the rejection of claim 34.

Regarding claim 39, the examiner takes official notice that a headset having two microphones was well known in the art at the time of the invention. It would have been obvious to modify Yoshida as modified so that the headset includes the microphones in order to improve voice detection.

Claim 41 is rejected using Yoshida as modified by Oh and Turnbull as applied to claim 34 above.

Claim 42 is rejected using Yoshida, Oh and Ouyang as applied above to claim 18. Regarding the ".. manually activated.." language, the examiner asserts that per In re Venner the court held that providing an automatic means to replace a manual activity which accomplished the same result is not sufficient to distinguish over the prior art. Therefore, the examiner asserts that the opposite is true as well that providing a manual means to replace an automatic means is not sufficient to overcome the prior art. It would have been obvious to modify Yoshida as modified so that the VAD is manually operated to give the user more control over when the VAD.

14. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Oh et al. (US 5,353,376) in further view of Ouyang et al. (US 2003/0044025) in further view of Park et al. (US 5,590,241).

Regarding claim 22, Yoshida as modified fails to disclose that the voice detection subsystem comprises an accelerometer sensor in contact with the skin of the user and a voice activity detector for processing the accelerometer sensor voice activity signals. Park discloses a speech processing system comprising accelerometer 34 and noise microphone 31. It would have been obvious to one of ordinary skill in the art at the time of invention to modify the Yoshida as modified to have an accelerometer coupled to the power monitoring circuit 300 (voice activity detector), for the purpose of generating voice activity signals directly from the source.

15. Claims 26-33,36,37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Oh et al. (US 5,353,376) in further view of Ouyang et al. (US 2003/0044025) in further view of Housni (US 6,795,713). Regarding claims 26 and 36, Yoshida as modified by Oh fails to disclose that the system includes a portable handset that includes the two microphones. Yoshida teaches of a two microphone system. Housni discloses a portable handset 1 which includes microphones 3 and 12 for wireless communication. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to implement the circuitry of Yoshida et al as modified in a portable handset for the purpose of improving wireless speech communication.

Regarding claims 27 and 31, modified Yoshida as modified provides a voice detection subsystem and denoising subsystem in the anti-noise circuitry of the portable handset

Regarding claim 28, the portable handset 1 of Housni includes a speaker 4.

Regarding claims 29 and 30, the portable handset of Housni inherently couples to another wireless phone via wireless couplings.

All elements of claims 32 and 33 are comprehended by the rejection of claim 28.

Regarding claim 37, Yoshida as modified discloses a portable transceiver having microphones 3 and 12 and an antinoise circuit (see Housni as applied to claims 26 and 36).

16. Claims 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025) in further view of Turnbull et al. (US 6,980,092).

Regarding claim 43, Yoshida discloses a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals (300, Figure 4; column 8, lines 14-20) and :

two microphones (Figures 1 and 4) and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of

the microphones including two microphones separated by distance, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25).

Yoshida does not disclose one omnidirectional microphone and one unidirectional microphone, the microphones separated by a distance. Ouyang et al teach a microphone system for a speakerphone comprising omnidirectional microphone 20 and unidirectional microphone 12 and noise suppression circuit 11 (denoising system). The system advantageously determines the source of noise and suppresses it using the unidirectional microphone as a reference. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Yoshida as modified by substituting the microphone configuration of Ouyang et al, for the microphones 1 and 2 for the purpose of improving the performance of the noise cancellation system.

Yoshida as modified fails to disclose a portable headset that includes the microphones along with at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular phones, satellite telephones, portable telephones, wireline telephones, internet telephones,

wireless transceivers, wireless communication radio, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

Turnbull discloses a portable headset that couples to a cellular phone (column 28, lines 53-65). It would have been obvious to modify Yoshida as modified in order to allow for wireless transmission.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Devona E. Faulk whose telephone number is 571-272-7515. The examiner can normally be reached on 8 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on 571-272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DEF

VIVIAN CHIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

Notice of References Cited	Application/Control No. 10/400,282	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner Devona E. Faulk	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-5,353,376	10-1994	Oh et al.	704/233
*	B	US-5,473,702	12-1995	Yoshida et al.	381/94.7
*	C	US-5,590,241	12-1996	Park et al.	704/227
*	D	US-2003/0044025	03-2003	Ouyang et al.	381/92
*	E	US-6,795,713	09-2004	Housni, Jamal	455/550.1
*	F	US-6,980,092	12-2005	Turnbull et al.	340/425.5
	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
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	Pendleton, Brian T	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	01/23/2007	10/18/2007							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	O	-							
	9	O	✓							
	10	✓	✓							
	11	✓	✓							
	12	✓	✓							
	13	✓	✓							
	14	✓	✓							
	15	O	✓							
	16	✓	✓							
	17	✓	✓							
	18	✓	✓							
	19	✓	✓							
	20	✓	✓							
	21	✓	✓							
	22	✓	✓							
	23	✓	✓							
	24	O	-							
	25	O	✓							
	26	✓	✓							
	27	✓	✓							
	28	✓	✓							
	29	✓	✓							
	30	✓	✓							
	31	O	✓							
	32	✓	✓							
	33	✓	✓							
	34	✓	✓							
	35	✓	✓							
	36	✓	✓							

Meta Platforms, Inc. - Exhibit 1002
Page 309 of 686

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	**Art Unit**
	Pendleton, Brian T	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	01/23/2007	10/18/2007							
	37	✓	✓							
	38	O	-							
	39	O	✓							
	40		✓							
	41		✓							
	42		✓							
	43		✓							

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	Pendleton, Brian T	2615

SEARCHED

Class	Subclass	Date	Examiner
381	94.1,94.2,94.3,94.7,92	1/22/07	BTP
704	226,233	1/22/07	BTP
381	71.6,94.1,94.7,92,110	10/15/2007	DEF
704	226,233	10/18/2007	DEF

SEARCH NOTES

Search Notes	Date	Examiner
East Word Search	1/22/07	
Assignee/Inventor Search	10/16/2007,10/17/2007	DEF
word search	10/16/2007,10/17/2007	DEF

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner

Atty. Docket No. ALPH.P020 *PATENT*

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	)	
	)	Examiner: Devona E. Faulk
Gregory C. Burnett, et al.	)	Art Unit: 2615
	)	
Application No.: 10/400,282	)	
	)	
Filed: March 27, 2003	)	
	)	
For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS	)	

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 30, 2007. Please enter and consider the following amendments and Remarks.

IN THE CLAIMS

1. (Currently amended) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals~~, the voice detection subsystem comprising,~~; and

~~two unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone, wherein the distance is approximately in the range of zero (0) to 15 centimeters and wherein the angle is approximately in the range of zero (0) to 180 degrees; and~~

~~at least one voice activity detector (VAD) algorithm for processing the voice activity signals and generating the control signals; and~~

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem ~~including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including two unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone~~ comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

Meta Platforms, Inc. - Exhibit 1002
Page 313 of 686

Claims 2 and 3 (Canceled).

4. (Original) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.

5. (Original) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one accelerometer sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.

6. (Original) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one skin-surface microphone sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.

7. (Original) The system of claim 1, wherein the voice detection subsystem receives voice activity signals via couplings with the microphones.

Claim 8 (Canceled).

Meta Platforms, Inc. - Exhibit 1002
Page 314 of 686

9. (Original) The system of claim 1, wherein the voice detection subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals.

10. (Original) The system of claim 1, further including a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

11. (Original) The system of claim 10, wherein the portable handset includes at least one of the voice detection subsystem and the denoising subsystem.

12. (Original) The system of claim 1, further including a portable headset that includes the microphones along with at least one speaker device.

13. (Original) The system of claim 12, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

14. (Original) The system of claim 13, wherein the portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings.

15. (Original) The system of claim 13, wherein the communication device includes at least one of the voice detection subsystem and the denoising subsystem.

Meta Platforms, Inc. - Exhibit 1002
Page 315 of 686

16. (Original) The system of claim 12, wherein the portable headset includes at least one of the voice detection subsystem and the denoising subsystem.

17. (Original) The system of claim 12, wherein the portable headset is a portable communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

Claims 18-40 (Canceled).

41. (Currently amended) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals;

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem ~~including microphones coupled to provide acoustic signals of an environment to components of the denoising subsystem, a configuration of the microphones including two unidirectional microphones separated by a distance and having an angle between maximums of a spatial response curve of each microphone~~ comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the

denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise; and

a portable headset comprising the microphones and at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

Claims 42-43 (Canceled).

44. (New) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is a unidirectional microphone.

45. (New) The system of claim 44, wherein the first microphone and the second microphone are separated by a distance in a range of approximately zero (0) centimeters to 15 centimeters.

46. (New) The system of claim 44, wherein the angle is in a range of approximately zero (0) degrees to 180 degrees.

47. (New) The system of claim 44, wherein the angle is in a range of approximately zero (0) degrees to 135 degrees.

48. (New) The system of claim 44, wherein the angle is in a range of approximately zero (0) degrees to 90 degrees.

Meta Platforms, Inc. - Exhibit 1002
Page 317 of 686

49. (New) The system of claim 1, wherein the first microphone is an omnidirectional microphone and the second microphone is a unidirectional microphone.

50. (New) The system of claim 49, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

51. (New) The system of claim 49, wherein the angle is approximately in a range of 30 degrees to 180 degrees.

52. (New) The system of claim 49, wherein the angle is approximately in a range of 60 degrees to 180 degrees.

53. (New) The system of claim 49, wherein the angle is approximately in a range of 90 degrees to 180 degrees.

54. (New) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is an omnidirectional microphone.

55. (New) The system of claim 54, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

Meta Platforms, Inc. - Exhibit 1002
Page 318 of 686

REMARKS

Claims 1-7, 9-23, 25-37, and 39-43 are pending in the application. Claims 1 and 41 are amended herein. Claims 2, 3, and 18-23, 25-37, 39, 40, 42, and 43 are canceled herein without prejudice. New claims 44-55 are added herein. 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 headset: Figure 3C, element 320; Figure 4C, element 420; Figure 5C, element 520; Figure 6C, element 620; Figure 7C, element 720; Figure 8C, element 820; Figure 9C, element 920; Figure 10B, element 1020; and Figure 11B, element 1120. Applicants respectfully direct the examiner to the following figures and the corresponding description as support for the handset: Figure 3B, element 310; Figure 4B, element 410; Figure 5B, element 510; Figure 6B, element 610; Figure 7B, element 710; Figure 8B, element 810; Figure 9B, element 910; Figure 10B, element 1020; and Figure 11B, element 1120. Consequently, as the drawings currently show every feature of the invention specified in the claims, Applicants request withdrawal of this objection. The application does not currently include any claims directed to a transceiver, thus no drawings showing a transceiver are required.

Rejections under 35 U.S.C. § 112

Applicants respectfully submit that the amendments presented herein overcome the rejections under 35 U.S.C. § 112, first paragraph and second paragraph. Applicants respectfully request withdrawal of the rejection.

Rejections under 35 U.S.C. § 103

Applicants respectfully submit that the amendments presented herein overcome the rejection of claims 1-4, 6, 7, and 40 under 35 U.S.C. § 103(a) as being unpatentable over Yoshida, US patent number 5,473,702 (hereinafter "Yoshida"), in view of Oh, US patent number 5,353,376 (hereinafter "Oh"). Applicants respectfully traverse the rejection.

Applicants respectfully submit that the amendments presented herein overcome the rejection of claim 5 under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Oh and in further view of Park et al., US patent number 5,590,241 (hereinafter "Park"). Applicants respectfully traverse the rejection.

Applicants respectfully submit that the amendments presented herein overcome the rejection of claims 10-17 under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Oh and in further view of Housni, US patent number 6,795,713 (hereinafter "Housni"). Applicants respectfully traverse the rejection.

Applicants respectfully submit that the amendments presented herein overcome the rejection of claims 18-21, 23, 25, 34, 35, 39, 41, and 42 under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Oh and in further view of Ouyang, US patent application publication number 2003/0044025 (hereinafter "Ouyang"). Applicants respectfully traverse the rejection.

Applicants respectfully submit that the amendments presented herein overcome the rejection of claim 22 under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Oh, in further view of Ouyang, in further view of Park. Applicants respectfully traverse the rejection.

Meta Platforms, Inc. - Exhibit 1002
Page 320 of 686

Applicants respectfully submit that the amendments presented herein overcome the rejection of claim 43 under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Ouyang, in further view of Turnbull et al., US patent number 6,980,092 (hereinafter "Turnbull"). Applicants respectfully traverse the rejection.

Regarding the rejections under 35 U.S.C. § 103(a) addressed herein, Applicants respectfully submit that none of Yoshida, Oh, Park, Housni, Ouyang, and/or Turnbull, alone or in any combination, disclose a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added). Thus, Applicants submit that claims 1, 4-7, 9-17, 41, and 44-55 are patentable over Yoshida, Oh, Park, Housni, Ouyang, and/or Turnbull, alone or in any combination,

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 Faulk is respectfully requested telephone the undersigned to facilitate resolution of any issues remaining 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 (Attorney Docket number ALPH.P020).

Respectfully submitted,
Courtney Staniford & Gregory LLP

Date: April 30, 2008

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 (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.P020
Application Number 10/400,282	Filed March 27, 2003
For Microphone and Voice Activity Detection (VAD) Configurations for Use With Communication Systems	
Art Unit 2615	Examiner Devona E. Faulk

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 _____



Signature — April 30, 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:	10400282
Filing Date:	27-Mar-2003
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Richard L. Gregory/Jerry Donnard
Attorney Docket Number:	ALPH.P020
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($)
Miscellaneous:				
			Total in USD ($)	**1050**

Electronic Acknowledgement Receipt

EFS ID:	3235732
Application Number:	10400282
International Application Number:	
Confirmation Number:	1397
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
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.P020
Receipt Date:	30-APR-2008
Filing Date:	27-MAR-2003
Time Stamp:	17:43:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1050
RAM confirmation Number	3522
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_ALPHP020.pdf	995351 fc3e937502c478d99d169ea9f119094db7081f837	yes	13

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Miscellaneous Incoming Letter	1	1
Amendment - After Non-Final Rejection	2	12
Extension of Time	13	13

Warnings:

Information:

2	Fee Worksheet (PTO-06)	fee-info.pdf	8196 e3911a79625be38467014a7bf7fbeaa866c7eae3	no	2

Warnings:

Information:

Total Files Size (in bytes):	1003547

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.P020 Patent

Transmittal of Documents

Certification Under 37 C F R. §1 8(a)

Transmitted via **April 30, 2008**
Date of Transmission

USPTO EFS

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 fee.

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
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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 10/400,282	Filing Date 03/27/2003	☐ To be Mailed

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

AMENDMENT	04/30/2008	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 27	Minus	** 40	= 0	X $25 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 2	Minus	***7	= 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	

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) 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:
/WANDA D. MITCHELL/

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.

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.
10/400,282	03/27/2003	Gregory C. Burnett	ALPH.P020	1397

53186 7590 08/18/2008
COURTNEY STANIFORD & GREGORY LLP
P.O. BOX 9686
SAN JOSE, CA 95157

EXAMINER	
FAULK, DEVONA E	
ART UNIT	PAPER NUMBER
2615	

MAIL DATE	DELIVERY MODE
08/18/2008	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)	
	10/400,282	BURNETT ET AL.	
	Examiner	Art Unit	
	DEVONA E. FAULK	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 *30 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) *1,4-7,9-17,41 and 44-55* 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) *1,4-7,9-17,41 and 44-55* 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 *7/25/07* 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

Response to Arguments

1. Applicant's arguments filed 4/30/08, regarding the 103 rejections, have been fully considered but they are not persuasive.

2. The applicant has amended the claims but only asserts that the prior art fails to disclose the newly recited claim language. There is no discussion as to why the prior art fails to read on the newly recited claim language. Furthermore, the examiner asserts that the newly recited claim language is implicit.

3. Applicant's arguments, filed 4/30/08, with respect to the drawing objection have been fully considered and are persuasive. The drawing objection has been withdrawn.

4. Claims 2,3,8,18-40,42,43 are cancelled.

5. Claims 44-55 are new.

Claim Objections

6. Claims 1 and 41 are objected to because of the following informalities: Claims 1 and 41 recite ".comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising system". The specification discloses on page 12, lines 23-30, that

"With reference to FIG. 1, in this configuration the UNI microphone is used as the speech microphone 103 and an OMNI is used as the noise microphone 104. They are normally used within a few centimeters of each other, but can be located 15 or more centimeters apart and still function adequately. FIG. 3A shows a general configuration 300 using a unidirectional speech microphone and an omnidirectional noise microphone, under an embodiment. **The relative angle f between a vector normal to the face of the microphones is approximately in the range of 60 to 135 degrees. The distances d1 and d2 are each approximately in the range of zero (0) to 15 centimeters.** "

The specification only discloses that a vector(s) is (are) normal to the face of the microphones. Appropriate correction is required.

Specification

7. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required. Claims 1 and 41 recite ".comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising system". The specification discloses on page 12, lines 23-30, that

"With reference to FIG. 1, in this configuration the UNI microphone is used as the speech microphone 103 and an OMNI is used as the noise microphone 104. They are normally used within a few centimeters of each other, but can be located 15 or more centimeters apart and still function adequately. FIG. 3A shows a general configuration 300 using a unidirectional speech microphone and an omnidirectional noise microphone, under an embodiment. **The relative angle .function. between a vector**

normal to the face of the microphones is approximately in the range of 60 to 135 degrees. The distances d.sub.1 and d.sub.2 are each approximately in the range of zero (0) to 15 centimeters. "

The specification only discloses that a vector(s) is (are) normal to the face of the microphones.

Claim Rejections - 35 USC § 102

8. 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.

9. Claims 1 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoshida et al. (US 5,473,702) in view of Oh et al. (US 5,353,376).

Regarding claim 1, Yoshida discloses a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative

to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising system (microphones 1 and 2, Figure 4),

components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25.

All elements of claim 7 are comprehended by the rejection of claim 1.

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 4, 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702).

Regarding claims 4 and 6, the examiner takes official notice that it was well known in the art at the time of the invention to use glottal electromagnetic sensors and skin microphones to generate voice signals. It would have been obvious to one of

ordinary skill in the art to modify Yoshida as modified to use such sensors in the place of the microphones for the purpose of improving the voice detection performance.

Regarding claim 9, the examiner asserts that per In re Venner the court held that providing an automatic means to replace a manual activity which accomplished the same result is not sufficient to distinguish over the prior art. Therefore, the examiner asserts that the opposite is true as well that providing a manual means to replace an automatic means is not sufficient to overcome the prior art. It would have been obvious to modify Yoshida as modified so that the VAD is manually operated to give the user more control over when the VAD

12. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Oh et al. (US 5,353,376) in further view of Park et al. (US 5,590,241).

Regarding claim 5, Yoshida as modified fails to disclose that the voice detection subsystem comprises an accelerometer sensor in contact with the skin of the user and a voice activity detector for processing the accelerometer sensor voice activity signals. Park discloses a speech processing system comprising accelerometer 34 and noise microphone 31. It would have been obvious to one of ordinary skill in the art at the time of invention to modify the Yoshida as modified to have an accelerometer coupled to the power monitoring circuit 300 (voice activity detector), for the purpose of generating voice activity signals directly from the source.

13. Claims 10-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Housni (US 6,795,713).

Regarding claim 10, Yoshida fails to disclose that the system includes a portable handset that includes the microphones. Yoshida teaches of a two microphone system. Housni discloses a portable handset 1 which includes microphones 3 and 12 for wireless communication. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to implement the circuitry of Yoshida et al in a portable handset for the purpose of improving wireless speech communication.

Regarding claims 11 and 15, the modified Yoshida as modified provides a voice detection subsystem and denoising subsystem in the anti-noise circuitry of the portable handset .

Regarding claim 12, the portable handset 1 of Housni includes a speaker 4.

Regarding claims 13 and 14, the portable handset of Housni inherently couples to another wireless phone via wireless couplings.

All elements of claims 16 and 17 are comprehended by the rejection of claim 12.

14. Claims 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Turnbull et al. (US 6,980,092).

Regarding claim 43, Yoshida discloses a communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals (300, Figure 4; column 8, lines 14-20) ; and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising system (microphones 1 and 2, Figure 4), components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25).

Yoshida fails to disclose a portable headset that includes the microphones along with at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular phones, satellite telephones, portable telephones, wireline telephones, internet telephones, wireless transceivers, wireless communication radio, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

Turnbull discloses a portable headset that couples to a cellular phone (column 28, lines 53-65). It would have been obvious to modify Yoshida in order to allow for wireless transmission.

15. Claims 44-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in further view of Oh et al. (US 5,353,376).
Yoshida fails to disclose that the microphones are unidirectional and separated by a distance and having an angle between maximums of a spatial response curve of each microphone. Oh discloses a system for improved speech acquisition for a hands-free system in a noise environment comprising unidirectional microphones that are separated by a distance and having an angle between maximums of a spatial response curve of each microphone and that the two microphones are unidirectional (column 7, lines 14-25). It would have been obvious to modify Yoshida by having the microphones be unidirectional for the purpose of improving the performance of the noise cancellation system (Oh; column 7, lines 22-25).

Regarding claim 45, Yoshida as modified discloses that the microphones are separated . Yoshida as modified fails to disclose that the separation distanceis in a range of approximately 0 to 15 cm. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the separation distance is in the range of 0 to 15 cm in order to meet a certain design specification.

Regarding claims 46-48, Yoshida as modified discloses that a second vector forms an angle relative to a first vector (implicit). Yoshida as modified fails to disclose that the angle is in a range of approximately 0 to either of 180,135 and 90 degrees. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the angle is in a range as claimed for the benefit of meeting a design specification

16. Claims 49-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in further view of Ouyang et al. (US 2003/0044025).

Regarding claims 49 and 54, Yoshida does not disclose one omnidirectional microphone and one unidirectional microphone, the microphones separated by a distance. Ouyang et al teach a microphone system for a speakerphone comprising omnidirectional microphone 20 and unidirectional microphone 12 and noise suppression circuit 11 (denoising system). The system advantageously determines the source of noise and suppresses it using the unidirectional microphone as a reference. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Yoshida by substituting the microphone configuration of Ouyang et al, for the microphones 1 and 2 for the purpose of improving the performance of the noise cancellation system.

Regarding claims 50 and 55, Yoshida as modified discloses that the microphones are separated . Yoshida as modified fails to disclose that the separation distance is in a

range of approximately 0 to 15 cm. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the separation distance is in the range of 0 to 15 cm in order to meet a certain design specification.

Regarding claims 51-53, Yoshida as modified discloses that a second vector forms an angle relative to a first vector (implicit). Yoshida as modified fails to disclose that the angle is in a range of approximately 0 to either of 180,135 and 90 degrees. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the angle is in a range as claimed for the benefit of meeting a design specification

Conclusion

17. 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.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DEVONA E. FAULK whose telephone number is (571)272-7515. The examiner can normally be reached on 8 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on 571-272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/HUYEN D. LE/
Primary Examiner, Art Unit 2615

/Devona E. Faulk/
Examiner, Art Unit 2615

Notice of References Cited	Application/Control No. 10/400,282	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner DEVONA E. FAULK	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-5,353,376	10-1994	Oh et al.	704/233
*	B	US-5,473,702	12-1995	Yoshida et al.	381/94.7
*	C	US-2003/0044025	03-2003	Ouyang et al.	381/92
*	D	US-6,980,092	12-2005	Turnbull et al.	340/425.5
*	E	US-6,795,713	09-2004	Housni, Jamal	455/550.1
	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.

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	8	brennan.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:09
L2	0	burnett.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:11
L3	11	burnett.in. and microphone and array	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:12
L4	174	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
L5	926	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
L6	700	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
L7	1729	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
L8	0	L3 and vector near10 normal near10 mouth near10 user	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:42
L9	0	L3 and (vector near10 normal near10 mouth)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43

L10	0	L3 and (vector near10 (normal perpendicu$3) near10 mouth)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43
L11	3	L3 and (vector)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43
S1	150	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S3	850	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S4	641	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S5	6	brennan.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:28
S6	6	("5136577" | "5329587" | "5544080" | "5887059" | "6070137" | "6487295").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/10/15 15:33
S7	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")). PN.	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:22
S8	11	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/25 09:51
S9	1	("5406622").PN.	USPAT	OR	OFF	2007/10/16 10:24
S10	2	burnett.in. and microphone and (voice near2 activity) and ("15" near2 centimeters)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:38

S11	0	EP-1483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:37
S12	0	EP-2001483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S13	0	EP-483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S14	0	WO-20030906031-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S15	0	WO-030906031-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:39
S16	194	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:40
S17	33	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:04
S18	7	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) and (unidirectional)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:40
S19	1	burnett.in. and microphone and ((voice near2 activity) same (manual$2 near2 activat $3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:20
S20	1	"381"/$.ccls. and (manuall$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:40

S21	1	"381"/$.ccls. and (manual$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:41
S22	3	(manual$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect $3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:42
S23	10	(manual$3 near2 (operat$3 activat$3)) same (VAD)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:42
S24	2	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) same (headset earphon$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:44
S25	7	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) and (headset earphon$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:44
S26	5	burnett.in. and microphone and ((voice near2 activity) same subsystem)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:54
S27	35	("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.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/10/16 18:19

S28	1	(glottal near2 electromagnetic near2 sensor $1) with antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:22
S29	6	burnett.in. and microphone and (voice near2 activity) and glottal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 15:59
S30	12	(glottal near2 electromagnetic near2 micropower near2 sensor$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:22
S31	1	burnett.in. and microphone and (voice near2 activity) and (transceiver same headset)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:02
S32	1	burnett.in. and microphone and (voice near2 activity) and transceiver	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:02
S33	2	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) and (transceiver)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:17
S34	29	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (transceiver)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:20
S35	6	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (transceiver) and (headset headphone$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:20
S36	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:22
S37	1	S36 and headset	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:23
S38	0	headset same transceiver same (voice near2 activity near2 detect3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:23

S39	0	(headset same transceiver) and (voice near2 activity near2 detect3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:24
S40	5	(headset same transceiver) and (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:24
S41	35	(headset same transceiver) and (noise near2 (suppress $3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 18:59
S42	1	(headset same transceiver) same (noise near2 (suppress $3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:25
S43	35	(headset same transceiver) and (noise near2 (suppress $3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 18:59
S44	1602	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/18 14:18
S45	1	burnett.in. and microphone and (voice near2 activity) and (angle same maximums)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/25 09:51
S46	173	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S47	923	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S48	1468	(381/92,111,122).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59

S49	1720	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S50	11	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S51	79	burnett.in. and microphone $1 and (voice)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S52	12	burnett.in. and microphone $1 and (voice) and VAD	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 10:00
S53	6	burnett.in. and microphone $1 and (voice) and VAD and (correlat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 10:33

8/14/08 11:43:31 AM
C:\Documents and Settings\DFaulk\My Documents\EAST\Workspaces\10400282.wsp

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	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	01/23/2007	10/18/2007	08/14/2008						
	1	✓	✓	✓						
	2	✓	✓	-						
	3	✓	✓	-						
	4	✓	✓	✓						
	5	✓	✓	✓						
	6	✓	✓	✓						
	7	✓	✓	✓						
	8	O	-	-						
	9	O	✓	✓						
	10	✓	✓	✓						
	11	✓	✓	✓						
	12	✓	✓	✓						
	13	✓	✓	✓						
	14	✓	✓	✓						
	15	O	✓	✓						
	16	✓	✓	✓						
	17	✓	✓	✓						
	18	✓	✓	-						
	19	✓	✓	-						
	20	✓	✓	-						
	21	✓	✓	-						
	22	✓	✓	-						
	23	✓	✓	-						
	24	O	-	-						
	25	O	✓	-						
	26	✓	✓	-						
	27	✓	✓	-						
	28	✓	✓	-						
	29	✓	✓	-						
	30	✓	✓	-						
	31	O	✓	-						
	32	✓	✓	-						
	33	✓	✓	-						
	34	✓	✓	-						
	35	✓	✓	-						
	36	✓	✓	-						

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	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	01/23/2007	10/18/2007	08/14/2008						
	37	✓	✓	-						
	38	O	-	-						
	39	O	✓	-						
	40		✓	-						
	41		✓	✓						
	42		✓	-						
	43		✓	-						
	44			✓						
	45			✓						
	46			✓						
	47			✓						
	48			✓						
	49			✓						
	50			✓						
	51			✓						
	52			✓						
	53			✓						
	54			✓						
	55			✓						

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	2615

SEARCHED			
Class	Subclass	Date	Examiner
381	94.1,94.2,94.3,94.7,92	1/22/07	BTP
704	226,233	1/22/07	BTP
381	71.6,94.1,94.7,92,110	10/15/2007	DEF
704	226,233	10/18/2007	DEF
381	71.6,94.1,94.7	7/29/08, 8/14/08	DEF
704	226,233	7/29/08,8/14/08	DEF

SEARCH NOTES		
Search Notes	Date	Examiner
East Word Search	1/22/07	
Assignee/Inventor Search	10/16/2007,10/17/2007	DEF
word search	10/16/2007,10/17/2007	DEF
additonal search	7/29/08, 8/14/08	DEF

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

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.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	10400282	Filing Date	2003-03-27	Docket Number (if applicable)	ALPH.P020	Art Unit	2615
First Named Inventor	Gregory C. Burnett			Examiner Name	Devona E. Faulk		

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)	2009-02-18
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:	10400282
Filing Date:	27-Mar-2003
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Richard L. Gregory/Jerry Donnard
Attorney Docket Number:	ALPH.P020

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:	4814598
Application Number:	10400282
International Application Number:	
Confirmation Number:	1397
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
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.P020
Receipt Date:	18-FEB-2009
Filing Date:	27-MAR-2003
Time Stamp:	15:16:54
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	553
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_ALPHP020.pdf	1686084 5c186b23735b723c4543ce394d0ef780149c8d11	yes	19

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Miscellaneous Incoming Letter	1	1
Amendment After Final	2	18
Extension of Time	19	19

Warnings:

Information:

2	Request for Continued Examination (RCE)	RCE_ALPHP020.pdf	768073 edc2bbcab62bf58361a189486e65018b27e22814	no	3

Warnings:

Information:

3	Fee Worksheet (PTO-06)	fee-info.pdf	32135 e4f9aa50b14a61689b5f5365af3d7b67e6955730	no	2

Warnings:

Information:

Total Files Size (in bytes):	2486292

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.P020

Patent

Transmittal of Documents

Certification Under 37 C.F.R. §1.8(a)

Transmitted via

USPTO EFS

February 18, 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;
Petition for Extension of Time;
Request for Continued Examination;
Electronic payment of filing fees.

Atty. Docket No. ALPH.P020 *PATENT*

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	)	
	)	Examiner: Devona E. Faulk
Gregory C. Burnett, et al.	)	Art Unit: 2615
	)	
Application No.: 10/400,282	)	
	)	
Filed: March 27, 2003	)	
	)	
For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS	)	

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 August 18, 2008. 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.

IN THE SPECIFICATION

Please amend the paragraph on page 12, line 23 to page 13, line 3 as follows:

With reference to **Figure 1**, in this configuration the UNI microphone is used as the speech microphone 103 and an OMNI is used as the noise microphone 104. They are normally used within a few centimeters of each other, but can be located 15 or more centimeters apart and still function adequately. **Figure 3A** shows a general configuration 300 using a unidirectional speech microphone and an omnidirectional noise microphone, under an embodiment. The relative angle *f* between a vector normal to the face of the microphones (a vector normal to UNI microphone is line labeled "TOWARDS SPEECH", and a vector normal to OMNI microphone is line labeled "AWAY FROM SPEECH") is approximately in the range of 60 to 135 degrees. The distances d_1 and d_2 are each approximately in the range of zero (0) to 15 centimeters. **Figure 3B** shows a general configuration 310 in a handset using a unidirectional speech microphone and an omnidirectional noise microphone, under the embodiment of Figure 3A. **Figure 3C** shows a general configuration 320 in a headset using a unidirectional speech microphone and an omnidirectional noise microphone, under the embodiment of Figure 3A.

IN THE CLAIMS

1. (Previously presented) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

Claims 2 and 3 (Canceled).

4. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.

5. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one accelerometer sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.

6. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one skin-surface microphone sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.

7. (Previously presented) The system of claim 1, wherein the voice detection subsystem receives voice activity signals via couplings with the microphones.

Claim 8 (Canceled).

9. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals.

10. (Previously presented) The system of claim 1, further including a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

11. (Previously presented) The system of claim 10, wherein the portable handset includes at least one of the voice detection subsystem and the denoising subsystem.

12. (Previously presented) The system of claim 1, further including a portable headset that includes the microphones along with at least one speaker device.

13. (Previously presented) The system of claim 12, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

14. (Previously presented) The system of claim 13, wherein the portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings.

15. (Previously presented) The system of claim 13, wherein the communication device includes at least one of the voice detection subsystem and the denoising subsystem.

16. (Previously presented) The system of claim 12, wherein the portable headset includes at least one of the voice detection subsystem and the denoising subsystem.

17. (Previously presented) The system of claim 12, wherein the portable headset is a portable communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

Claims 18-40 (Canceled).

41. (Previously presented) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals;

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise; and

a portable headset comprising the microphones and at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

Claims 42-43 (Canceled).

44. (Previously presented) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is a unidirectional microphone.

45. (Previously presented) The system of claim 44, wherein the first microphone and the second microphone are separated by a distance in a range of approximately zero (0) centimeters to 15 centimeters.

46. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately zero (0) degrees to 180 degrees.

47. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately zero (0) degrees to 135 degrees.

48. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately zero (0) degrees to 90 degrees.

49. (Previously presented) The system of claim 1, wherein the first microphone is an omnidirectional microphone and the second microphone is a unidirectional microphone.

50. (Previously presented) The system of claim 49, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

51. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 30 degrees to 180 degrees.

52. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 60 degrees to 180 degrees.

53. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 90 degrees to 180 degrees.

54. (Previously presented) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is an omnidirectional microphone.

55. (Previously presented) The system of claim 54, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

REMARKS

Claims 1, 4-7, 9-17, 41, and 44-55 are pending in the application. Claims 1, 4-7, 9-17, 41, and 44-55 are rejected. 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).

Claim Objections

Claims 1 and 41 are objected to because of informalities. Regarding the informality described in the office action at pages 2 and 3, Applicant herein amends the portion of the specification on pages 12 and 13 relating to Figure 3A to clarify the description of the vectors normal to the face of each of the two microphones, as follows:

> **Figure 3A** shows a general configuration 300 using a unidirectional speech microphone and an omnidirectional noise microphone, under an embodiment. The relative angle *f* between a vector normal to the face of the microphones (vector normal to UNI microphone is line labeled "TOWARDS SPEECH", and vector normal to OMNI microphone is line labeled "AWAY FROM SPEECH") is approximately in the range of 60 to 135 degrees. The distances d_1 and d_2 are each approximately in the range of zero (0) to 15 centimeters (as amended herein).

The amendment herein to the specification does not add any new material. Applicant further reminds Examiner Faulk that the definition of "normal" according to Webster's Third New International Dictionary of the English Language Unabridged is "a line perpendicular to the tangent line to a curve at a point of the curve." It is shown in Figure 3A of the instant application that the line labeled "TOWARDS SPEECH" is a vector or a line perpendicular to a tangent line to the face of the UNI microphone at a point on the face of the UNI microphone where the line labeled "TOWARDS

SPEECH" intersects the face of the UNI microphone. Figure 3A also shows that the line labeled "AWAY FROM SPEECH" is a vector or line perpendicular to a tangent line to the face of the OMNI microphone at a point on the face of the OMNI microphone where the line labeled "AWAY FROM SPEECH" intersects the face of the OMNI microphone. Figure 3A also shows the relative angle "f" between the TOWARDS SPEECH vector and the AWAY FROM SPEECH vector.

Applicant submits that the amendment to the specification herein overcomes the objection to claims 1 and 41 and requests withdrawal of the objection. More particularly, with reference to claims 1 and 41, and in view of the above remarks, the first microphone of the array (e.g., UNI microphone) has a first vector (e.g., TOWARDS SPEECH vector) normal to a front of the first microphone, the first vector (e.g., TOWARDS SPEECH vector) defining the axis to be toward a mouth of a user, and the second microphone (e.g., OMNI microphone) of the array has a second vector (e.g., AWAY FROM SPEECH vector) normal to a front of the second microphone, wherein the second vector (e.g., AWAY FROM SPEECH vector) forms an angle (e.g., angle f) relative to the first vector (e.g., TOWARDS SPEECH vector). Thus, the specification discloses, with reference to at least Figure 3A, that a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, as claimed in claims 1 and 41. For at least these reasons, Applicant respectfully requests withdrawal of the objection to claims 1 and 41.

Specification

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. Applicant herein amends the portion of the specification on pages 12 and 13 relating to Figure 3A to clarify the description of the vectors normal to the face of each of the two microphones, as follows:

> **Figure 3A** shows a general configuration 300 using a unidirectional speech microphone and an omnidirectional noise microphone, under an embodiment. The relative angle *f* between a vector normal to the face of the microphones (a vector normal to UNI microphone is line labeled "TOWARDS SPEECH", and a vector normal to OMNI microphone is line labeled "AWAY FROM SPEECH") is approximately in the range of 60 to 135 degrees. The distances d_1 and d_2 are each approximately in the range of zero (0) to 15 centimeters (as amended herein).

The amendment herein to the specification does not add any new material. Applicant further reminds Examiner Faulk that the definition of "normal" according to Webster's Third New International Dictionary of the English Language Unabridged is "a line perpendicular to the tangent line to a curve at a point of the curve." It is shown in Figure 3A of the instant application that the line labeled "TOWARDS SPEECH" is a vector or a line perpendicular to the tangent line to the face of the UNI microphone at a point on the face of the UNI microphone where the line labeled "TOWARDS SPEECH" intersects the face of the UNI microphone. Figure 3A also shows that the line labeled "AWAY FROM SPEECH" is a vector or line perpendicular to the tangent line to the face of the OMNI microphone at a point on the face of the OMNI microphone where the line labeled "AWAY FROM SPEECH" intersects the face of the UNI microphone. Figure 3A also shows the relative angle f between the TOWARDS SPEECH vector and the AWAY FROM SPEECH vector.

Rejections under 35 U.S.C. § 102

Claims 1 and 7 are rejected under 35 U.S.C. § 102(b) as being anticipated by Yoshida et al., US patent number 5,473,702 (hereinafter "Yoshida"), in view of Oh et al., US patent number 5,353,376 (hereinafter "Oh"). Applicant notes that a proper rejection under 35 U.S.C. § 102(b) can only make use of a single reference; thus, Applicant assumes in the response that follows that the Examiner has rejected claims 1 and 7 using only Yoshida and not using any portion of Oh. Applicants respectfully traverse the rejection.

Applicant respectfully submits that the claims as presented herein are patentably distinct from Yoshida. Moreover, Yoshida fails to teach each and every element of claim 1 as presented herein.

To be proper, an anticipation rejection requires that a cited reference teach each and every element of the rejected claim(s). As discussed below, it is clearly apparent that Yoshida does not teach each and every element of claim 1 as presented herein.

Regarding claim 1, Applicants submit that Yoshida does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector (emphasis added).

The office action, at pages 4 and 5, references Yoshida, Figure 4 (elements 1 and 2) in support of the contention that Yoshida discloses all elements of claim 1. Figures 1 and 4 of Yoshida show two microphones 1 and 2. Yoshida discloses that microphone 1 is disposed relatively close to a voice source and picks up both voice input and background noise (column 3, lines 10-13). Yoshida discloses that microphone 2 is disposed relatively far from the voice source and picks up mainly noise (column 3, lines 16-18). However, Yoshida includes no further description regarding the relative positioning of the two microphones. Therefore, while Yoshida shows a system having two microphones, Yoshida does not show or describe a first microphone of an array having a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, and a second microphone of the array having a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector (emphasis added).

For at least these reasons, Applicant respectfully submits that claim 1 is not anticipated by Yoshida.

As claim 7 depends from claim 1 and includes further limitations thereon, and since claim 1 is not anticipated by Yoshida, Applicant submits that claim 7 is not anticipated by Yoshida.

Rejections under 35 U.S.C. § 103

Claims 4, 6, and 9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida. Applicants respectfully traverse the rejection.

Regarding claim 1, Applicants submit that Yoshida does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector (emphasis added).

The office action, at pages 4 and 5, references Yoshida, Figure 4 (elements 1 and 2) in support of the contention that Yoshida discloses all elements of claim 1. Figures 1 and 4 of Yoshida show two microphones 1 and 2. Yoshida discloses that microphone 1 is disposed relatively close to a voice source and picks up both voice input and background noise (column 3, lines 10-13). Yoshida discloses that microphone 2 is disposed relatively far from the voice source and picks up mainly noise (column 3, lines 16-18). However, Yoshida includes no further description regarding the relative positioning of the two microphones. Therefore, while Yoshida shows a system having two microphones, Yoshida does not show or describe a first microphone of an array having a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, and a second microphone of the array having a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector (emphasis added).

For at least these reasons, Applicant respectfully submits that claim 1 is patentable over Yoshida.

As claims 4, 6, and 9 depend from claim 1 and include further limitations thereon, and since claim 1 is not anticipated by Yoshida, Applicant submits that claims 4, 6, and 9 are not anticipated by Yoshida.

Claim 5 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Oh and in further view of Park et al., US patent number 5,590,241 (hereinafter "Park"). Applicants respectfully traverse the rejection.

Regarding claim 1, Applicants submit that Yoshida does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector (emphasis added). Furthermore, none of Yoshida, Oh, and/or Park, alone or in any combination, disclose a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added).

As claim 5 depends from claim 1 and includes further limitations thereon, and since claim 1 is not anticipated by Yoshida, Oh, and/or Park, Applicant submits that claim 5 is not anticipated by Yoshida, Oh, and/or Park.

Claims 10-17 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Housni, US patent number 6,795,713 (hereinafter "Housni"). Applicants respectfully traverse the rejection.

Applicants submit that claim 1 is not anticipated by Yoshida in view of Housni, as described above. Furthermore, none of Yoshida and/or Housni, alone or in any combination, disclose a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added).

As claims 10-17 depend from claim 1 and include further limitations thereon, and since claim 1 is not anticipated by Yoshida and/or Housni, Applicant submits that claims 10-17 are not anticipated by Yoshida and/or Housni.

Claim 41 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Turnbull et al., US patent number 6,980,092 (hereinafter "Turnbull"). Applicants respectfully traverse the rejection.

Regarding claim 41, and as described in detail above, Applicants submit that Yoshida does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector (emphasis added). Additionally, Turnbull does not disclose a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the

microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added). Thus, Applicant submits that claim 41 is not anticipated by Yoshida and/or Turnbull.

Claims 44-48 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Oh. Applicants respectfully traverse the rejection.

Applicants submit that claim 1 is not anticipated by Yoshida, as described above. Furthermore, none of Yoshida and/or Oh, alone or in any combination, disclose a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added). Therefore, claim 1 is not anticipated by Yoshida and/or Oh, alone and/or in any combination.

As claims 44-48 depend from claim 1 and include further limitations thereon, and since claim 1 is not anticipated by Yoshida and/or Oh, Applicant submits that claims 44-48 are not anticipated by Yoshida and/or Oh.

Claims 49-55 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Ouyang et al., US Patent Application Publication 2003/0044025 ("Ouyang"). Applicants respectfully traverse the rejection.

Applicants submit that claim 1 is not anticipated by Yoshida, as described above. Furthermore, none of Yoshida and/or Ouyang, alone or in any combination, disclose a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the

microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added). Therefore, claim 1 is not anticipated by Yoshida and/or Ouyang, alone and/or in any combination.

As claims 49-55 depend from claim 1 and include further limitations thereon, and since claim 1 is not anticipated by Yoshida and/or Ouyang, Applicant submits that claims 49-55 are not anticipated by Yoshida and/or Ouyang.

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 Faulk is respectfully requested telephone the undersigned to facilitate resolution of any issues remaining 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 (Attorney Docket No. ALPH.P020).

Respectfully submitted,
Courtney Staniford & Gregory LLP

Date: February 18, 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
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.P020
Application Number 10/400,282	Filed March 27, 2003
For Microphone and Voice Activity Detection (VAD) Configurations for Use With Communication Systems	
Art Unit 2615	Examiner Devona E. Faulk

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 _____



Signature — February 18, 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)
Approved for use through 1/31/2007. OMB 0651-0032
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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 10/400,282	Filing Date 03/27/2003	☒ To be Mailed

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

AMENDMENT	02/18/2009	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 27	Minus	** 40	= 0	X $26 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 2	Minus	***7	= 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	

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) 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:
/NICHELE PETERSON/

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.

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.
10/400,282	03/27/2003	Gregory C. Burnett	ALPH.P020	1397

53186 7590 03/16/2009
COURTNEY STANIFORD & GREGORY LLP
P.O. BOX 9686
SAN JOSE, CA 95157

EXAMINER	
FAULK, DEVONA E	
ART UNIT	PAPER NUMBER
2614	

MAIL DATE	DELIVERY MODE
03/16/2009	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)	
	10/400,282	BURNETT ET AL.	
	Examiner	Art Unit	
	DEVONA E. FAULK	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 *18 February 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) *1,4-7,9-17,41 and 44-55* 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) *1,4-7,9-17,41 and 44-55* 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 *25 July 2007* 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

Continued Examination Under 37 CFR 1.114

1. 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 2/18/09 has been entered.

Response to Arguments

1. Applicant's arguments, filed 2/18/09 with respect to the rejection(s) of claim(s) 1,4-7,9-17,41 and 44-55 under 102(b) and 103 (a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Ouyang.

2. Claims 2,3,8,18-40,42-43 are cancelled.

Claim Rejections - 35 USC § 102

1. 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.

2. Claims 1 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoshida et al. (US 5,473,702) in view of Oh et al. (US 5,353,376).

Regarding claim 1, Yoshida discloses a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising system (microphones 1 and 2, Figure 4),

components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25.

All elements of claim 7 are comprehended by the rejection of claim 1.

Claim Rejections - 35 USC § 103

3. 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.

4. Claims 1,7 and 49-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025).

Regarding claim 1, Yoshida discloses a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector wherein a second microphone of the array has a second vector, the microphone array providing acoustic signals of an environment to components of the denoising system (microphones 1 and 2, Figure 4),

components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the

acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25.

Yoshida fails to explicitly disclose wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector. Yoshida does not teach what types of microphones are used. Ouyang teaches of using an omnidirectional microphone (20, Figure 1) and a uni-directional microphone (12, Figure 1). The examiner asserts that

Furthermore, MPEP 2114....states that while features of an apparatus may be recited either structurally or functionally, claims <directed to >an< apparatus must be distinguished from the prior art in terms of structure rather than function. Also, a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Yoshida as modified by Ouyang clearly has the structural limitations of the claim and the intended use of the lumens cannot differentiate the claimed apparatus from the prior art.

All elements of claim 7 are comprehended by the rejection of claim 1.

Regarding claims 49 and 54, Yoshida does not disclose one omnidirectional microphone and one unidirectional microphone, the microphones separated by a distance. Ouyang et al teach a microphone system for a speakerphone comprising

omnidirectional microphone 20 and unidirectional microphone 12 and noise suppression circuit 11 (denoising system). The system advantageously determines the source of noise and suppresses it using the unidirectional microphone as a reference. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Yoshida by substituting the microphone configuration of Ouyang et al, for the microphones 1 and 2 for the purpose of improving the performance of the noise cancellation system.

Regarding claims 50 and 55, Yoshida as modified discloses that the microphones are separated . Yoshida as modified fails to disclose that the separation distance is in a range of approximately 0 to 15 cm. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the separation distance is in the range of 0 to 15 cm in order to meet a certain design specification.

Regarding claims 51-53, Yoshida as modified discloses that a second vector forms an angle relative to a first vector (implicit). Yoshida as modified fails to disclose that the angle is in a range of approximately 0 to either of 180,135 and 90 degrees. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the angle is in a range as claimed for the benefit of meeting a design specification

5. Claims 4, 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025).

Regarding claims 4 and 6, the examiner takes official notice that it was well known in the art at the time of the invention to use glottal electromagnetic sensors and skin microphones to generate voice signals. It would have been obvious to one of ordinary skill in the art to modify Yoshida as modified to use such sensors in the place of the microphones for the purpose of improving the voice detection performance.

Regarding claim 9, the examiner asserts that per In re Venner the court held that providing an automatic means to replace a manual activity which accomplished the same result is not sufficient to distinguish over the prior art. Therefore, the examiner asserts that the opposite is true as well that providing a manual means to replace an automatic means is not sufficient to overcome the prior art. It would have been obvious to modify Yoshida as modified so that the VAD is manually operated to give the user more control over when the VAD

6. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025) in further view of Park et al. (US 5,590,241).

Regarding claim 5, Yoshida as modified fails to disclose that the voice detection subsystem comprises an accelerometer sensor in contact with the skin of the user and a voice activity detector for processing the accelerometer sensor voice activity signals. Park discloses a speech processing system comprising accelerometer 34 and noise

microphone 31. It would have been obvious to one of ordinary skill in the art at the time of invention to modify the Yoshida as modified to have an accelerometer coupled to the power monitoring circuit 300 (voice activity detector), for the purpose of generating voice activity signals directly from the source.

7. Claims 10-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025) in view of Housni (US 6,795,713).

Regarding claim 10, Yoshida fails to disclose that the system includes a portable handset that includes the microphones. Yoshida teaches of a two microphone system. Housni discloses a portable handset 1 which includes microphones 3 and 12 for wireless communication. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to implement the circuitry of Yoshida et al in a portable handset for the purpose of improving wireless speech communication.

Regarding claims 11 and 15,Yoshida as modified provides a voice detection subsystem and denoising subsystem in the anti-noise circuitry of the portable handset .

Regarding claim 12, the portable handset 1 of Housni includes a speaker 4.

Regarding claims 13 and 14, the portable handset of Housni inherently couples to another wireless phone via wireless couplings.

All elements of claims 16 and 17 are comprehended by the rejection of claim 12.

8. Claims 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025) in view of Turnbull et al. (US 6,980,092).

Regarding claim 41, Yoshida discloses a communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals (300, Figure 4; column 8, lines 14-20) ; and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector wherein a second microphone of the array has a second vector, the microphone array providing acoustic signals of an environment to components of the denoising system (microphones 1 and 2, Figure 4),

components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25).

Yoshida fails to explicitly disclose wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector. Yoshida does not teach what types of microphones are used. Ouyang teaches of using an omnidirectional microphone (20, Figure 1) and a uni-directional microphone (12, Figure 1). The examiner asserts that

Furthermore, MPEP 2114....states that while features of an apparatus may be recited either structurally or functionally, claims <directed to >an< apparatus must be distinguished from the prior art in terms of structure rather than function. Also, a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Yoshida as modified by Ouyang clearly has the structural limitations of the claim and the intended use of the lumens cannot differentiate the claimed apparatus from the prior art.

Yoshida as modified fails to disclose a portable headset that includes the microphones along with at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular phones, satellite telephones, portable telephones, wireline telephones, internet telephones, wireless transceivers, wireless communication radio, personal digital assistants (PDAs),

personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

Turnbull discloses a portable headset that couples to a cellular phone (column 28, lines 53-65). It would have been obvious to modify Yoshida as modified in order to allow for wireless transmission.

9. Claims 44-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025) in further view of Oh et al. (US 5,353,376).

Regarding claim 44, Yoshida as modified fails to disclose that the microphones are unidirectional. Oh discloses a system for improved speech acquisition for a hands-free system in a noise environment comprising unidirectional microphones that are separated by a distance and having an angle between maximums of a spatial response curve of each microphone and that the two microphones are unidirectional (column 7, lines 14-25). It would have been obvious to modify Yoshida as modified by having the microphones be unidirectional for the purpose of improving the performance of the noise cancellation system (Oh; column 7, lines 22-25).

Regarding claim 45, Yoshida as modified discloses that the microphones are separated. Yoshida as modified fails to disclose that the separation distance is in a range of approximately 0 to 15 cm. The examiner asserts that this is a matter of design choice.

It would have been obvious to modify Yoshida as modified so that the separation distance is in the range of 0 to 15 cm in order to meet a certain design specification.

Regarding claims 46-48, Yoshida as modified discloses that a second vector forms an angle relative to a first vector (implicit). Yoshida as modified fails to disclose that the angle is in a range of approximately 0 to either of 180,135 and 90 degrees. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the angle is in a range as claimed for the benefit of meeting a design specification

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DEVONA E. FAULK whose telephone number is (571)272-7515. The examiner can normally be reached on 8 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on 571-272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Devona E. Faulk/
Examiner, Art Unit 2614

Notice of References Cited	Application/Control No. 10/400,282	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner DEVONA E. FAULK	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-5,353,376	10-1994	Oh et al.	704/233
*	B	US-5,473,702	12-1995	Yoshida et al.	381/94.7
*	C	US-5,590,241	12-1996	Park et al.	704/227
*	D	US-2003/0044025	03-2003	Ouyang et al.	381/92
*	E	US-6,795,713	09-2004	Housni, Jamal	455/550.1
*	F	US-6,980,092	12-2005	Turnbull et al.	340/425.5
	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
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	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	01/23/2007	10/18/2007	08/14/2008	03/12/2009					
	1	✓	✓	✓	✓					
	2	✓	✓	-	-					
	3	✓	✓	-	-					
	4	✓	✓	✓	✓					
	5	✓	✓	✓	✓					
	6	✓	✓	✓	✓					
	7	✓	✓	✓	✓					
	8	O	-	-	-					
	9	O	✓	✓	✓					
	10	✓	✓	✓	✓					
	11	✓	✓	✓	✓					
	12	✓	✓	✓	✓					
	13	✓	✓	✓	✓					
	14	✓	✓	✓	✓					
	15	O	✓	✓	✓					
	16	✓	✓	✓	✓					
	17	✓	✓	✓	✓					
	18	✓	✓	-	-					
	19	✓	✓	-	-					
	20	✓	✓	-	-					
	21	✓	✓	-	-					
	22	✓	✓	-	-					
	23	✓	✓	-	-					
	24	O	-	-	-					
	25	O	✓	-	-					
	26	✓	✓	-	-					
	27	✓	✓	-	-					
	28	✓	✓	-	-					
	29	✓	✓	-	-					
	30	✓	✓	-	-					
	31	O	✓	-	-					
	32	✓	✓	-	-					
	33	✓	✓	-	-					
	34	✓	✓	-	-					
	35	✓	✓	-	-					
	36	✓	✓	-	-					

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	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	01/23/2007	10/18/2007	08/14/2008	03/12/2009					
	37	✓	✓	-	-					
	38	O	-	-	-					
	39	O	✓	-	-					
	40		✓	-	-					
	41		✓	✓	✓					
	42		✓	-	-					
	43		✓	-	-					
	44			✓	✓					
	45			✓	✓					
	46			✓	✓					
	47			✓	✓					
	48			✓	✓					
	49			✓	✓					
	50			✓	✓					
	51			✓	✓					
	52			✓	✓					
	53			✓	✓					
	54			✓	✓					
	55			✓	✓					

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	2615

SEARCHED			
Class	Subclass	Date	Examiner
381	94.1,94.2,94.3,94.7,92	1/22/07	BTP
704	226,233	1/22/07	BTP
381	71.6,94.1,94.7,92,110	10/15/2007	DEF
704	226,233	10/18/2007	DEF
381	71.6,94.1,94.7	7/29/08, 8/14/08	DEF
704	226,233	7/29/08,8/14/08	DEF
381	71.7,94.1,94.7,110,92	3/12/09	DEF

SEARCH NOTES		
Search Notes	Date	Examiner
East Word Search	1/22/07	
Assignee/Inventor Search	10/16/2007,10/17/2007	DEF
word search	10/16/2007,10/17/2007	DEF
additonal search	7/29/08, 8/14/08	DEF
additional search	3/12/09	DEF

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

/DEVONA E FAULK/ Examiner.Art Unit 2614	

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:17
L2	4	L1 and $4direction$2	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:17
L3	1	L1 and uni	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:39
L4	1	L1 and omni	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:39
L5	192	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/03/12 23:55
L6	990	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/03/12 23:55
L7	769	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/03/12 23:55
S1	150	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S3	850	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S4	641	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S5	6	brennan.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:28

S6	6	("5136577" | "5329587" | "5544080" | "5887059" | "6070137" | "6487295").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/10/15 15:33
S7	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:22
S8	11	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/25 09:51
S9	1	("5406622").PN.	USPAT	OR	OFF	2007/10/16 10:24
S10	2	burnett.in. and microphone and (voice near2 activity) and ("15" near2 centimeters)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:38
S11	0	EP-1483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:37
S12	0	EP-2001483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S13	0	EP-483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S14	0	WO-20030906031-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S15	0	WO-030906031-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:39
S16	194	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:40

S17	33	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:04
S18	7	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) and (unidirectional)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:40
S19	1	burnett.in. and microphone and ((voice near2 activity) same (manual$2 near2 activat $3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:20
S20	1	"381"/$.ccls. and (manuall$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:40
S21	1	"381"/$.ccls. and (manual$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:41
S22	3	(manual$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect $3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:42
S23	10	(manual$3 near2 (operat$3 activat$3)) same (VAD)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:42
S24	2	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) same (headset earphon$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:44
S25	7	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) and (headset earphon$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:44
S26	5	burnett.in. and microphone and ((voice near2 activity) same subsystem)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:54

S27	35	("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.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/10/16 18:19
S28	1	(glottal near2 electromagnetic near2 sensor $1) with antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:22
S29	6	burnett.in. and microphone and (voice near2 activity) and glottal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 15:59
S30	12	(glottal near2 electromagnetic near2 micropower near2 sensor$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:22
S31	1	burnett.in. and microphone and (voice near2 activity) and (transceiver same headset)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:02
S32	1	burnett.in. and microphone and (voice near2 activity) and transceiver	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:02
S33	2	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) and (transceiver)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:17

S34	29	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (transceiver)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:20
S35	6	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (transceiver) and (headset headphone$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:20
S36	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:22
S37	1	S36 and headset	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:23
S38	0	headset same transceiver same (voice near2 activity near2 detect3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:23
S39	0	(headset same transceiver) and (voice near2 activity near2 detect3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:24
S40	5	(headset same transceiver) and (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:24
S41	35	(headset same transceiver) and (noise near2 (suppress $3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 18:59
S42	1	(headset same transceiver) same (noise near2 (suppress $3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:25
S43	35	(headset same transceiver) and (noise near2 (suppress $3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 18:59
S44	1602	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/18 14:18

S45	1	burnett.in. and microphone and (voice near2 activity) and (angle same maximums)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/25 09:51
S46	173	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S47	923	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S48	1468	(381/92,111,122).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S49	1720	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S50	11	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S51	79	burnett.in. and microphone $1 and (voice)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S52	12	burnett.in. and microphone $1 and (voice) and VAD	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 10:00
S53	6	burnett.in. and microphone $1 and (voice) and VAD and (correlat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 10:33
S54	8	brennan.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:09

S55	0	burnett.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:11
S56	11	burnett.in. and microphone and array	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:12
S57	174	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S58	926	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S59	700	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S60	1729	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S61	0	S56 and vector near10 normal near10 mouth near10 user	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:42
S62	0	S56 and (vector near10 normal near10 mouth)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43
S63	0	S56 and (vector near10 (normal perpendicu$3) near10 mouth)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43
S64	3	S56 and (vector)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43

3/12/2009 11:56:11 PM
C:\Documents and Settings\dfaulk\My Documents\EAST\Workspaces\10400282.wsp

Attorney Docket No. ALPH.P020

PATENT

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	)	
	)	Examiner: Devona E. Faulk
Gregory C. Burnett, et al.	)	Art Unit: 2614
	)	
Application No.: 10/400,282	)	
	)	
Filed: March 27, 2003	)	
	)	
For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS	)	

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

RESPONSE TO OFFICE ACTION

Sir:

This is in response to the Office action mailed March 16, 2009. Please enter and consider the following Amendments and Remarks addressing all points raised by the Office Action as follows.

AMENDMENTS

IN THE CLAIMS

1. (Previously presented) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

Claims 2 and 3 (Canceled).

4. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.

5. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one accelerometer sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.

6. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one skin-surface microphone sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.

7. (Previously presented) The system of claim 1, wherein the voice detection subsystem receives voice activity signals via couplings with the microphones.

Claim 8 (Canceled).

9. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals.

10. (Previously presented) The system of claim 1, further including a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

11. (Previously presented) The system of claim 10, wherein the portable handset includes at least one of the voice detection subsystem and the denoising subsystem.

12. (Previously presented) The system of claim 1, further including a portable headset that includes the microphones along with at least one speaker device.

13. (Previously presented) The system of claim 12, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

14. (Previously presented) The system of claim 13, wherein the portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings.

15. (Previously presented) The system of claim 13, wherein the communication device includes at least one of the voice detection subsystem and the denoising subsystem.

16. (Previously presented) The system of claim 12, wherein the portable headset includes at least one of the voice detection subsystem and the denoising subsystem.

17. (Previously presented) The system of claim 12, wherein the portable headset is a portable communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

Claims 18-40 (Canceled).

41. (Previously presented) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals;

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise; and

a portable headset comprising the microphones and at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

Claims 42-43 (Canceled).

44. (Previously presented) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is a unidirectional microphone.

45. (Previously presented) The system of claim 44, wherein the first microphone and the second microphone are separated by a distance in a range of approximately zero (0) centimeters to 15 centimeters.

46. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately zero (0) degrees to 180 degrees.

47. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately zero (0) degrees to 135 degrees.

48. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately zero (0) degrees to 90 degrees.

49. (Previously presented) The system of claim 1, wherein the first microphone is an omnidirectional microphone and the second microphone is a unidirectional microphone.

50. (Previously presented) The system of claim 49, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

51. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 30 degrees to 180 degrees.

52. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 60 degrees to 180 degrees.

53. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 90 degrees to 180 degrees.

54. (Previously presented) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is an omnidirectional microphone.

55. (Previously presented) The system of claim 54, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

REMARKS

Claims 1, 4-7, 9-17, 41, and 44-55 are pending in the application. Claims 1, 4-7, 9-17, 41, and 44-55 are rejected. Applicants respectfully request entry of the remarks herein and 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. § 102

Claims 1 and 7 are rejected under 35 U.S.C. § 102(b) as being anticipated by Yoshida et al., US patent number 5,473,702 (hereinafter "Yoshida"), in view of Oh et al., US patent number 5,353,376 (hereinafter "Oh"). Applicant fails to understand this rejection in view of the statements in the "Response to Arguments" section of this Office Action, which states the following at page 2:

> "Applicant's arguments, filed 2/18/09 with respect to the rejection(s) of claim(s) 1, 4-7, 9-17, 41, and 44-45 under 102(b) and 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Ouyang."

In spite of this statement in the "Response to Arguments" section, the rejection of claims 1 and 7 under 35 U.S.C. § 102(b) as being anticipated by Yoshida in view of Oh appears to be an exact duplicate of the same rejection used in the preceding office action mailed August 18, 2008. Therefore, while the current Office Action states the previous rejection has been withdrawn, the rejection is included in this current Office Action.

Additionally, Applicant notes that a proper rejection under 35 U.S.C. § 102(b) can only make use of a single reference only. Thus, Applicant submits the rejection of claims 1 and 7 under 35 U.S.C. § 102(b) as being anticipated by Yoshida in view of Oh

is improper and should be withdrawn. Applicant respectfully demands withdrawal of this rejection.

Assuming, arguendo, that the rejection of claims 1 and 7 under 35 U.S.C. § 102(b) as being anticipated by Yoshida in view of Oh was proper, Applicant respectfully submits that the claims as presented herein are patentably distinct from Yoshida in view of Oh. Moreover, Yoshida and/or Oh each fails to teach each and every element of claim 1 as presented herein.

To be proper, an anticipation rejection requires that a cited reference teach each and every element of the rejected claim(s). As discussed below, it is clearly apparent that neither Yoshida nor Oh teaches each and every element of claim 1 as presented herein.

Regarding claim 1, Applicants submit that Yoshida does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector (emphasis added).

The office action, at page 3, references Yoshida, Figure 4 (elements 1 and 2) in support of the contention that Yoshida discloses all elements of claim 1. Figures 1 and 4 of Yoshida show two microphones 1 and 2. Yoshida discloses that microphone 1 is disposed relatively close to a voice source and picks up both voice input and background noise (column 3, lines 10-13). Yoshida discloses that microphone 2 is disposed relatively far from the voice source and picks up mainly noise (column 3, lines 16-18). However, Yoshida includes no further description regarding the relative positioning of the two microphones. Therefore, while Yoshida shows a system having two microphones, Yoshida does not show or describe a first microphone of an array having a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, and a second microphone of the array having a

second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector (emphasis added).

In addition to the reasons states above, the Office Action states, at page 5, that "Yoshida fails to explicitly disclose wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector." Therefore, Examiner Faulk is apparently in agreement that claim 1 is not anticipated by Yoshida.

For at least these reasons, Applicant respectfully submits that claim 1 is not anticipated by Yoshida.

As claim 7 depends from claim 1 and includes further limitations thereon, and since claim 1 is not anticipated by Yoshida, Applicant submits that claim 7 is not anticipated by Yoshida.

Applicant also does not find any teaching in Oh that describes a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added). Thus, for at least these reasons, Applicant respectfully submits that claim 1 is not anticipated by Oh.

As claim 7 depends from claim 1 and includes further limitations thereon, and since claim 1 is not anticipated by Oh, Applicant submits that claim 7 is not anticipated by Oh.

Rejections under 35 U.S.C. § 103

Claims 1, 7, and 49-55 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Ouyang et al., US Patent Application Publication number US 2003/0044025 ("Ouyang"). Applicants respectfully traverse the rejection.

As described in detail above, Applicant submits that Yoshida does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector.

Furthermore, the Office Action states, at page 5, that "Yoshida fails to explicitly disclose wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector." Applicant agrees with this statement.

Furthermore, Applicant submits that Ouyang does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector.

The Office Action states the following, at page 5:

> "Ouyang teaches of using an omnidirectional microphone (20, Figure 1) and a uni-directional microphone (12, Figure 1). The examiner asserts that Furthermore, MPEP 2114 … states that while features of an apparatus may be recited either structurally or functionally, claims <directed to >an< apparatus must

> be distinguished from the prior art in terms of structure rather than function. Also, a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex Parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).
>
> Yoshida as modified by Ouyang clearly has the structural limitations of the claim and the intended use of the lumens cannot differentiate the claimed apparatus from the prior art."

Applicant submits that claim 1 does not include a limitation of "an omnidirectional microphone and a uni-directional microphone", so the description in Ouyang of an omnidirectional microphone and a uni-directional microphone does not overcome the deficiencies of Yoshida and, thus, does not make claim 1 unpatentable.

The Examiner asserts that claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. Applicant respectfully submits that claim 1 is distinguished from the prior art in terms of structure rather than function. For example, claim 1 recites structure in the limitation "the denoising subsystem comprising a microphone array including a plurality of microphones and an axis"; a microphone array including a plurality of microphones and an axis is clearly structure and not function.

The structure of the microphone array recited in claim 1 is further defined in claim 1 using language that describes a relative orientation of microphones of the microphone array (see claim 1, "a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector"). A description of a relative orientation between components of an array is clearly structure, and thus not a functional limitation. Therefore, Applicant submits that claim 1 includes numerous structural limitations not found in the combination of Yoshida and Ouyang, where the structural limitations of

claim 1 describe a microphone array and a relative orientation of microphones of the microphone array.

The Examiner also asserts that a claim containing a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus if the prior art apparatus teaches all the structural limitations of the claim. Applicant is of the opinion that this assertion by the Examiner does not apply to claim 1 because none of the conditions of this assertion are met by claim 1. As a first point, the prior art does not teach all the structural limitations of the claim because Yoshida in view of Ouyang does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector.

Further, the novel structural limitations of claim 1 recite nothing of the manner in which the claimed apparatus is intended to be employed. As described above, the limitations of claim 1 missing from the combination of Yoshida and Ouyang are structural limitations (see claim 1, "a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector"). Consequently, because the limitations of claim 1 missing from the combination of Yoshida and Ouyang are structural limitations, the structural limitations recite nothing of the manner in which the claimed apparatus is intended to be employed.

For at least these reasons, Applicant respectfully submits that claim 1 is patentable over Yoshida in view of Ouyang.

As claims 4, 6, 7, 9, and 49-55 depend from claim 1 and include further limitations thereon, and since claim 1 is not anticipated by Yoshida in view of Ouyang, Applicant submits that claims 4, 6, 7, 9, and 49-55 are patentable over Yoshida in view of Ouyang.

Claim 5 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Ouyang and in further view of Park et al., US patent number 5,590,241 (hereinafter "Park"). Applicants respectfully traverse the rejection.

Regarding claim 1, Applicants submit that Yoshida in view of Ouyang does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector (emphasis added). Furthermore, none of Yoshida, Ouyang, and/or Park, alone or in any combination, disclose a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added).

As claim 5 depends from claim 1 and includes further limitations thereon, and since claim 1 is not anticipated by Yoshida, Ouyang, and/or Park, Applicant submits that claim 5 is not anticipated by Yoshida, Oh, and/or Park.

Claims 10-17 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Ouyang and further in view of Housni, US patent number 6,795,713 (hereinafter "Housni"). Applicants respectfully traverse the rejection.

Regarding claim 1, Applicants submit that Yoshida in view of Ouyang does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector (emphasis added). Furthermore, none of Yoshida, Ouyang, and/or Housni, alone or in any combination, disclose a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added).

As claims 10-17 depend from claim 1 and include further limitations thereon, and since claim 1 is not anticipated by Yoshida, Ouyang and/or Housni, Applicant submits that claims 10-17 are not anticipated by Yoshida, Ouyang and/or Housni.

Claim 41 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Ouyang and further in view of Turnbull et al., US patent number 6,980,092 (hereinafter "Turnbull"). Applicants respectfully traverse the rejection.

Regarding claim 41, and as described in detail above, Applicants submit that Yoshida in view of Ouyang does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector (emphasis added).

Additionally, Turnbull does not disclose a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added). Thus, Applicant submits that claim 41 is not anticipated by Yoshida, Ouyang and/or Turnbull.

Claims 44-48 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Ouyang and further in view of Oh. Applicants respectfully traverse the rejection.

Applicants submit that claim 1 is not anticipated by Yoshida in view of Ouyang, as described above. Furthermore, none of Yoshida, Ouyang and/or Oh, alone or in any combination, disclose a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, the microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added). Therefore, claim 1 is not anticipated by Yoshida, Ouyang and/or Oh, alone and/or in any combination.

As claims 44-48 depend from claim 1 and include further limitations thereon, and since claim 1 is not anticipated by Yoshida, Ouyang and/or Oh, Applicant submits that claims 44-48 are not anticipated by Yoshida, Ouyang and/or Oh.

Conclusion

In view of the foregoing Amendments and Remarks, Applicants respectfully

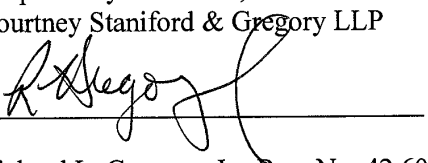
submit that any objections and rejections have been overcome, and the claims are now allowable. Prompt allowance of the application is earnestly solicited. Examiner Faulk is respectfully requested telephone the undersigned to facilitate resolution of any issues remaining prior to allowance of the application.

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 (Attorney Docket No. ALPH.P020).

Respectfully submitted,
Courtney Staniford & Gregory LLP

Date: September 16, 2009



Richard L. Gregory, Jr., Reg. No. 42,607
Email: rgregory@csgip.com
Tel. 408-342-1900
Fax. 408-342-1909

Courtney Staniford & Gregory LLP
10001 N. De Anza Blvd., STE 300
Cupertino, CA 95014

PTO/SB/22 (01-09)
Approved for use through 02/28/2009 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 it 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.P020
Application Number 10/400,282	Filed March 27, 2003
For Microphone and Voice Activity Detection (VAD) Configurations for Use with Communication Systems	
Art Unit 2614	Examiner Devona E. Faulk

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.

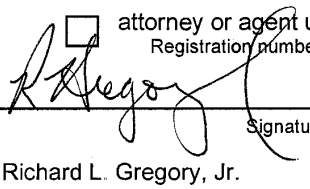
I am the

☐ 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 _____



Signature — September 16, 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:	10400282
Filing Date:	27-Mar-2003
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Richard L. Gregory/Rob Rathbun
Attorney Docket Number:	ALPH.P020

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:	6083432
Application Number:	10400282
International Application Number:	
Confirmation Number:	1397
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
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.P020
Receipt Date:	16-SEP-2009
Filing Date:	27-MAR-2003
Time Stamp:	14:26:35
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	396
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_ALPHP020.pdf	1695964 cf48ae1d7b4a95aaecc0b655b7ac0ab5bcf42b48	yes	19

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Miscellaneous Incoming 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	30304 895d15b42b83d23a9a7f14e9741388f5c73807b3	no	2

Warnings:

Information:

Total Files Size (in bytes):	1726268

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.P020 Patent

Transmittal of Documents

Certification Under 37 C.F.R. §1.8(a)

Transmitted via **USPTO EFS**

September 16, 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);
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
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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 10/400,282	Filing Date 03/27/2003	☐ To be Mailed

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

AMENDMENT		(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
	09/16/2009	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 27	Minus	** 40	= 0	X $26 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 2	Minus	***7	= 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	

AMENDMENT		(Column 1)		(Column 2)	(Column 3)					
		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:
/MARQUITA D. JONES/

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.

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.
10/400,282	03/27/2003	Gregory C. Burnett	ALPH.P020	1397

53186 7590 12/09/2009

COURTNEY STANIFORD & GREGORY LLP
10001 N. De Anza Blvd., Suite 300
Cupertino, CA 95014

EXAMINER	
FAULK, DEVONA E	
ART UNIT	PAPER NUMBER
2614	

MAIL DATE	DELIVERY MODE
12/09/2009	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)	
	10/400,282	BURNETT ET AL.	
	Examiner	Art Unit	
	DEVONA E. FAULK	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 *16 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) *1,4-7,9-17,41 and 44-55* 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) *1,4-7,9-17,41 and 44-55* 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 *25 July 2007* 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

Response to Arguments

1. Applicant's arguments, regarding the 102 rejections, filed 9/16/09, with respect to claims 1 and 7 have been fully considered and are persuasive. The 102 rejection of claims 1 and 7 has been withdrawn. The examiner asserts that the examiner copied the previous rejection into that action before completing it and neglected to delete that section. The 102 rejection was in error as obvious by the use of two references. The examiner is maintaining the 103 rejections of the claims.

2. Applicant's arguments, regarding the 103 rejections, filed 9/16/09 have been fully considered but they are not persuasive. The applicant asserts that Ouyang does not disclose " a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector. " The applicant further asserts that claim 1 is distinguished from the prior art in terms of structure rather than function. For example, claim 1 recites structure in the limitation "the denoising subsystem comprising a microphone array including a plurality of microphones and an axis"; a microphone array including a plurality of microphones and an axis is clearly structure and not function.

The examiner asserts that Yoshida discloses the structure, two microphones and there is implicitly an axis (Figure 1).

The applicant further essentially asserts that the structure of the microphone array recited in claim 1 is further defined in claim 1 using language that describes a relative orientation of microphones of the microphone array (see claim 1, "a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector"). A description of a relative orientation between components of an array is clearly structure, and thus not a functional limitation. Therefore, Applicant submits that claim 1 includes numerous structural limitations not found in the combination of Yoshida and Ouyang, where the structural limitations of claim 1 describe a microphone array and a relative orientation of microphones of the microphone array. The examiner asserts that the vector language is implicit. Furthermore, the examiner maintains that the vector language is not structural but functional. There is no physical structure that represents or defines the vectors in the communication system. There is a line that represents the vector in the figures to best illustrate what is meant by the claim language but in actuality there is are no lines that physically represent the vectors in the communication system.

The examiner is making this a non-final to correct some mistakes in the previous rejection.

3. Claims 2,3,8,18-40,42,43 are cancelled.

Claim Rejections - 35 USC § 103

4. 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.

5. Claims 1,7 and 49-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025). Regarding claim 1, Yoshida discloses a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector wherein a second microphone of the array has a second vector, the microphone array providing acoustic signals of an environment to components of the denoising system (microphones 1 and 2, Figure 4),

components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic

signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25.

Yoshida fails to explicitly disclose wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector. The examiner asserts that this in implicit.

Furthermore, the MPEP 2114....states that while features of an apparatus may be recited either structurally or functionally, claims <directed to >an< apparatus must be distinguished from the prior art in terms of structure rather than function. Also, a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Yoshida as modified by Ouyang clearly has the structural limitations of the claim and the intended use of the lumens cannot differentiate the claimed apparatus from the prior art.

All elements of claim 7 are comprehended by the rejection of claim 1.

Regarding claims 49 and 54, Yoshida does not disclose one omnidirectional microphone and one unidirectional microphone, the microphones separated by a distance. Ouyang et al teach a microphone system for a speakerphone comprising omnidirectional microphone 20 and unidirectional microphone 12 and noise suppression

circuit 11 (denoising system). The system advantageously determines the source of noise and suppresses it using the unidirectional microphone as a reference. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Yoshida by substituting the microphone configuration of Ouyang et al, for the microphones 1 and 2 for the purpose of improving the performance of the noise cancellation system.

Regarding claims 50 and 55, Yoshida as modified discloses that the microphones are separated . Yoshida as modified fails to disclose that the separation distance is in a range of approximately 0 to 15 cm. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the separation distance is in the range of 0 to 15 cm in order to meet a certain design specification.

Regarding claims 51-53, Yoshida as modified discloses that a second vector forms an angle relative to a first vector (implicit). Yoshida as modified fails to disclose that the angle is in a range of approximately 0 to either of 180,135 and 90 degrees. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the angle is in a range as claimed for the benefit of meeting a design specification

6. Claims 4, 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025).

Regarding claims 4 and 6, the examiner takes official notice that it was well known in the art at the time of the invention to use glottal electromagnetic sensors and skin microphones to generate voice signals. It would have been obvious to one of ordinary skill in the art to modify Yoshida as modified to use such sensors in the place of the microphones for the purpose of improving the voice detection performance.

Regarding claim 9, the examiner asserts that per In re Venner the court held that providing an automatic means to replace a manual activity which accomplished the same result is not sufficient to distinguish over the prior art. Therefore, the examiner asserts that the opposite is true as well that providing a manual means to replace an automatic means is not sufficient to overcome the prior art. It would have been obvious to modify Yoshida as modified so that the VAD is manually operated to give the user more control over when the VAD

7. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025) in further view of Park et al. (US 5,590,241).

Regarding claim 5, Yoshida as modified fails to disclose that the voice detection subsystem comprises an accelerometer sensor in contact with the skin of the user and a voice activity detector for processing the accelerometer sensor voice activity signals. Park discloses a speech processing system comprising accelerometer 34 and noise microphone 31. It would have been obvious to one of ordinary skill in the art at the time of invention to modify the Yoshida as modified to have an accelerometer coupled to the

power monitoring circuit 300 (voice activity detector), for the purpose of generating voice activity signals directly from the source.

8. Claims 10-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025) in view of Housni (US 6,795,713).

Regarding claim 10, Yoshida fails to disclose that the system includes a portable handset that includes the microphones. Yoshida teaches of a two microphone system. Housni discloses a portable handset 1 which includes microphones 3 and 12 for wireless communication. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to implement the circuitry of Yoshida et al in a portable handset for the purpose of improving wireless speech communication.

Regarding claims 11 and 15,Yoshida as modified provides a voice detection subsystem and denoising subsystem in the anti-noise circuitry of the portable handset .

Regarding claim 12, the portable handset 1 of Housni includes a speaker 4.

Regarding claims 13 and 14, the portable handset of Housni inherently couples to another wireless phone via wireless couplings.

All elements of claims 16 and 17 are comprehended by the rejection of claim 12.

9. Claims 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025) in view of Turnbull et al. (US 6,980,092).

Regarding claim 41, Yoshida discloses a communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals (300, Figure 4; column 8, lines 14-20) ; and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem comprising a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array has a first vector wherein a second microphone of the array has a second vector, the microphone array providing acoustic signals of an environment to components of the denoising system (microphones 1 and 2, Figure 4),

components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25).

Yoshida fails to explicitly disclose wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second

vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector. The examiner asserts that this in implicit.

Furthermore, the MPEP 2114....states that while features of an apparatus may be recited either structurally or functionally, claims <directed to >an< apparatus must be distinguished from the prior art in terms of structure rather than function. Also, a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).
Yoshida as modified by Ouyang clearly has the structural limitations of the claim and the intended use of the lumens cannot differentiate the claimed apparatus from the prior art.

Yoshida as modified fails to disclose a portable headset that includes the microphones along with at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular phones, satellite telephones, portable telephones, wireline telephones, internet telephones, wireless transceivers, wireless communication radio, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

Turnbull discloses a portable headset that couples to a cellular phone (column 28, lines 53-65). It would have been obvious to modify Yoshida as modified in order to allow for wireless transmission.

10. Claims 44-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025) in further view of Oh et al. (US 5,353,376).

Regarding claim 44, Yoshida as modified fails to disclose that the microphones are unidirectional. Oh discloses a system for improved speech acquisition for a hands-free system in a noise environment comprising unidirectional microphones that are separated by a distance and having an angle between maximums of a spatial response curve of each microphone and that the two microphones are unidirectional (column 7, lines 14-25). It would have been obvious to modify Yoshida as modified by having the microphones be unidirectional for the purpose of improving the performance of the noise cancellation system (Oh; column 7, lines 22-25).

Regarding claim 45, Yoshida as modified discloses that the microphones are separated. Yoshida as modified fails to disclose that the separation distance is in a range of approximately 0 to 15 cm. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the separation distance is in the range of 0 to 15 cm in order to meet a certain design specification.

Regarding claims 46-48, Yoshida as modified discloses that a second vector forms an angle relative to a first vector (implicit). Yoshida as modified fails to disclose that the angle is in a range of approximately 0 to either of 180,135 and 90 degrees. The

examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the angle is in a range as claimed for the benefit of meeting a design specification

Conclusion

11. **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.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DEVONA E. FAULK whose telephone number is (571)272-7515. The examiner can normally be reached on 8 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on 571-272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Devona E. Faulk/
Primary Examiner, Art Unit 2614

Notice of References Cited	Application/Control No. 10/400,282	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner DEVONA E. FAULK	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-5,353,376	10-1994	Oh et al.	704/233
*	B	US-5,473,702	12-1995	Yoshida et al.	381/94.7
*	C	US-5,590,241	12-1996	Park et al.	704/227
*	D	US-2003/0044025	03-2003	Ouyang et al.	381/92
*	E	US-6,795,713	09-2004	Housni, Jamal	455/550.1
*	F	US-6,980,092	12-2005	Turnbull et al.	340/425.5
	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
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	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	01/23/2007	10/18/2007	08/14/2008	03/12/2009	12/07/2009				
	1	✓	✓	✓	✓	✓				
	2	✓	✓	-	-	-				
	3	✓	✓	-	-	-				
	4	✓	✓	✓	✓	✓				
	5	✓	✓	✓	✓	✓				
	6	✓	✓	✓	✓	✓				
	7	✓	✓	✓	✓	✓				
	8	O	-	-	-	-				
	9	O	✓	✓	✓	✓				
	10	✓	✓	✓	✓	✓				
	11	✓	✓	✓	✓	✓				
	12	✓	✓	✓	✓	✓				
	13	✓	✓	✓	✓	✓				
	14	✓	✓	✓	✓	✓				
	15	O	✓	✓	✓	✓				
	16	✓	✓	✓	✓	✓				
	17	✓	✓	✓	✓	✓				
	18	✓	✓	-	-	-				
	19	✓	✓	-	-	-				
	20	✓	✓	-	-	-				
	21	✓	✓	-	-	-				
	22	✓	✓	-	-	-				
	23	✓	✓	-	-	-				
	24	O	-	-	-	-				
	25	O	✓	-	-	-				
	26	✓	✓	-	-	-				
	27	✓	✓	-	-	-				
	28	✓	✓	-	-	-				
	29	✓	✓	-	-	-				
	30	✓	✓	-	-	-				
	31	O	✓	-	-	-				
	32	✓	✓	-	-	-				
	33	✓	✓	-	-	-				
	34	✓	✓	-	-	-				
	35	✓	✓	-	-	-				
	36	✓	✓	-	-	-				

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	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	01/23/2007	10/18/2007	08/14/2008	03/12/2009	12/07/2009				
	37	✓	✓	-	-	-				
	38	O	-	-	-	-				
	39	O	✓	-	-	-				
	40		✓	-	-	-				
	41		✓	✓	✓	✓				
	42		✓	-	-	-				
	43		✓	-	-	-				
	44			✓	✓	✓				
	45			✓	✓	✓				
	46			✓	✓	✓				
	47			✓	✓	✓				
	48			✓	✓	✓				
	49			✓	✓	✓				
	50			✓	✓	✓				
	51			✓	✓	✓				
	52			✓	✓	✓				
	53			✓	✓	✓				
	54			✓	✓	✓				
	55			✓	✓	✓				

Meta Platforms, Inc. - Exhibit 1002
Page 447 of 686

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	2615

SEARCHED			
Class	Subclass	Date	Examiner
381	94.1,94.2,94.3,94.7,92	1/22/07	BTP
704	226,233	1/22/07	BTP
381	71.6,94.1,94.7,92,110	10/15/2007	DEF
704	226,233	10/18/2007	DEF
381	71.6,94.1,94.7	7/29/08, 8/14/08	DEF
704	226,233	7/29/08,8/14/08	DEF
381	71.7,94.1,94.7,110,92	3/12/09	DEF
381	71.6,94.1,94.7,110,92,111	12/7/09	DEF

SEARCH NOTES		
Search Notes	Date	Examiner
East Word Search	1/22/07	
Assignee/Inventor Search	10/16/2007,10/17/2007	DEF
word search	10/16/2007,10/17/2007	DEF
additonal search	7/29/08, 8/14/08	DEF
additional search	3/12/09	DEF

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

	/DEVONA E FAULK/ Primary Examiner.Art Unit 2614

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	215	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/12/07 09:14
L2	1050	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/12/07 09:14
L3	1660	(381/92,111,122).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/12/07 09:14
S1	150	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S3	850	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S4	641	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S5	6	brennan.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:28
S6	6	("5136577" | "5329587" | "5544080" | "5887059" | "6070137" | "6487295").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/10/15 15:33
S7	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:22

S8	11	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/25 09:51
S9	1	("5406622").PN.	USPAT	OR	OFF	2007/10/16 10:24
S10	2	burnett.in. and microphone and (voice near2 activity) and ("15" near2 centimeters)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:38
S11	0	EP-1483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:37
S12	0	EP-2001483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S13	0	EP-483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S14	0	WO-20030906031-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S15	0	WO-030906031-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:39
S16	194	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:40
S17	33	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:04

S18	7	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) and (unidirectional)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:40
S19	1	burnett.in. and microphone and ((voice near2 activity) same (manual$2 near2 activat $3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:20
S20	1	"381"/$.ccls. and (manuall$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:40
S21	1	"381"/$.ccls. and (manual$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:41
S22	3	(manual$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect $3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:42
S23	10	(manual$3 near2 (operat$3 activat$3)) same (VAD)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:42
S24	2	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) same (headset earphon$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:44
S25	7	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) and (headset earphon$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:44
S26	5	burnett.in. and microphone and ((voice near2 activity) same subsystem)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:54

S27	35	("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.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/10/16 18:19
S28	1	(glottal near2 electromagnetic near2 sensor $1) with antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:22
S29	6	burnett.in. and microphone and (voice near2 activity) and glottal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 15:59
S30	12	(glottal near2 electromagnetic near2 micropower near2 sensor$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:22
S31	1	burnett.in. and microphone and (voice near2 activity) and (transceiver same headset)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:02
S32	1	burnett.in. and microphone and (voice near2 activity) and transceiver	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:02
S33	2	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) and (transceiver)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:17

S34	29	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (transceiver)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:20
S35	6	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (transceiver) and (headset headphone$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:20
S36	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:22
S37	1	S36 and headset	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:23
S38	0	headset same transceiver same (voice near2 activity near2 detect3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:23
S39	0	(headset same transceiver) and (voice near2 activity near2 detect3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:24
S40	5	(headset same transceiver) and (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:24
S41	35	(headset same transceiver) and (noise near2 (suppress $3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 18:59
S42	1	(headset same transceiver) same (noise near2 (suppress $3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:25
S43	35	(headset same transceiver) and (noise near2 (suppress $3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 18:59
S44	1602	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/18 14:18

S45	1	burnett.in. and microphone and (voice near2 activity) and (angle same maximums)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/25 09:51
S46	173	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S47	923	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S48	1468	(381/92,111,122).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S49	1720	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S50	11	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S51	79	burnett.in. and microphone $1 and (voice)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S52	12	burnett.in. and microphone $1 and (voice) and VAD	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 10:00
S53	6	burnett.in. and microphone $1 and (voice) and VAD and (correlat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 10:33
S54	8	brennan.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:09

S55	0	burnett.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:11
S56	11	burnett.in. and microphone and array	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:12
S57	174	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S58	926	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S59	700	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S60	1729	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S61	0	S56 and vector near10 normal near10 mouth near10 user	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:42
S62	0	S56 and (vector near10 normal near10 mouth)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43
S63	0	S56 and (vector near10 (normal perpendicu$3) near10 mouth)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43
S64	3	S56 and (vector)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43

S65	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:17
S66	4	S65 and $4direction$2	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:17
S67	1	S65 and uni	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:39
S68	1	S65 and omni	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:39
S69	192	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/03/12 23:55
S70	990	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/03/12 23:55
S71	769	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/03/12 23:55
S72	20	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/23 15:36
S73	20	burnett.in. and microphone and (voice near2 (detect$3 activity))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/23 15:45
S74	17	burnett.in. and microphone and (voice near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/23 15:45
S75	2	burnett.in. and microphone and (voice near2 activity) and ("15" near2 centimeters) and axis	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/30 16:06
S76	13	burnett.in. and microphone and (voice near2 (detect$3 activity)) and axis	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/30 16:07

EAST Search History (Interference)

<This search history is empty>

12/7/2009 9:15:02 AM
C:\Documents and Settings\dfaulk\My Documents\EAST\Workspaces\10400282.wsp

Attorney Docket No. ALPH.P020

PATENT

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	)	
	)	Examiner: Devona E. Faulk
Gregory C. Burnett, et al.	)	Art Unit: 2614
	)	
Application No.: 10/400,282	)	
	)	
Filed: March 27, 2003	)	
	)	
For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS	)	

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

RESPONSE TO OFFICE ACTION

Sir:

This is a response to the Office Action mailed December 9, 2009. Applicant respectfully requests entry of the following Amendments and consideration of the Remarks.

AMENDMENTS

IN THE CLAIMS

1. (Currently amended) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones ~~and an axis~~, wherein a first microphone of the array ~~has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector~~is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

Claims 2 and 3 (Canceled).

4. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.

5. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one accelerometer sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.

6. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one skin-surface microphone sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.

7. (Previously presented) The system of claim 1, wherein the voice detection subsystem receives voice activity signals via couplings with the microphones.

Claim 8 (Canceled).

9. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals.

10. (Previously presented) The system of claim 1, further including a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

11. (Previously presented) The system of claim 10, wherein the portable handset includes at least one of the voice detection subsystem and the denoising subsystem.

12. (Previously presented) The system of claim 1, further including a portable headset that includes the microphones along with at least one speaker device.

13. (Previously presented) The system of claim 12, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

14. (Previously presented) The system of claim 13, wherein the portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings.

15. (Previously presented) The system of claim 13, wherein the communication device includes at least one of the voice detection subsystem and the denoising subsystem.

16. (Previously presented) The system of claim 12, wherein the portable headset includes at least one of the voice detection subsystem and the denoising subsystem.

17. (Previously presented) The system of claim 12, wherein the portable headset is a portable communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

Claims 18-40 (Canceled).

41. (Currently amended) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals;

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones ~~and an axis~~, wherein a first microphone of the array ~~has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector~~is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic

signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise; and

a portable headset comprising the microphones and at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

Claims 42-43 (Canceled).

44. (Previously presented) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is a unidirectional microphone.

45. (Previously presented) The system of claim 44, wherein the first microphone and the second microphone are separated by a distance in a range of approximately zero (0) centimeters to 15 centimeters.

46. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately zero (0) degrees to 180 degrees.

47. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately zero (0) degrees to 135 degrees.

48. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately zero (0) degrees to 90 degrees.

49. (Previously presented) The system of claim 1, wherein the first microphone is an omnidirectional microphone and the second microphone is a unidirectional microphone.

50. (Previously presented) The system of claim 49, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

51. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 30 degrees to 180 degrees.

52. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 60 degrees to 180 degrees.

53. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 90 degrees to 180 degrees.

54. (Previously presented) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is an omnidirectional microphone.

55. (Previously presented) The system of claim 54, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

REMARKS

Claims 1, 4-7, 9-17, 41, and 44-55 are pending in the application. Claims 1, 4-7, 9-17, 41, and 44-55 are rejected. Claims 1 and 41 are amended herein. No new material is added by the amendments herein.

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, 7, and 49-55 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Ouyang et al., US Patent Application Publication number US 2003/0044025 ("Ouyang"). Applicants respectfully traverse the rejection.

Regarding claim 1, as amended, Applicants submit that Yoshida does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position (emphasis added).

Applicant submits that Yoshida shows two microphones 1 and 2 (Figures 1 and 2). Yoshida discloses that microphone 1 is disposed relatively close to a voice source and picks up both voice input and background noise (column 3, lines 10-13). Yoshida discloses that microphone 2 is disposed relatively far from the voice source and picks up mainly noise (column 3, lines 16-18). However, Yoshida includes no further description regarding the relative positioning of the two microphones. Therefore, while Yoshida shows a system having two microphones, Yoshida does not show or describe a first microphone of an array fixed at a first position relative to a mouth of a

user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position (emphasis added).

Additionally, the Office Action states, at page 5, that "Yoshida fails to explicitly disclose wherein a first microphone of the array has a first vector normal to a front of the first microphone, the first vector defining the axis to be toward a mouth of a user, wherein a second microphone of the array has a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector." Applicant agrees with this statement.

The Office Action also states, at page 5, that "Yoshida as modified by Ouyang clearly has the structural limitations of the claim and the intended use of the lumens cannot differentiate the claimed apparatus from the prior art." Applicant does not understand this statement as the invention as claimed in amended claim 1 does not include "lumens" and, furthermore, Applicant finds no teaching relating to "lumens" in Ouyang. Consequently, Applicant finds no support or reference in the Office Action to any portion of Ouyang that overcomes the deficient teaching of Yoshida in view of amended claim 1.

In further support of this opinion, Applicant submits Ouyang teaches a microphone circuit that includes a uni-directional microphone, an omni-directional microphone, and a background noise suppression circuit (paragraph 0034). The omni-directional microphone is located in close physical proximity to the uni-directional microphone such that an acoustic source is approximately equal distance from both the omni-directional microphone and the uni-directional microphone (paragraph 0037). Ouyang teaches a single embodiment of the microphone circuit as a desk top speaker phone that embodies the microphone circuit (paragraph 0047). In the desk top speaker phone, the uni-directional microphone and the omni-directional microphone are positioned in a front-facing region of a housing in close proximity to each other such that an acoustic source spaced apart from the speaker phone is approximately the same

distance from each of the omni-directional microphone and the uni-directional microphone (paragraph 48; figure 3).

The embodiment taught in Ouyang therefore describes two microphones positioned in a face of a housing surface such that the two microphones face in the same direction outward from the housing surface and, as such, position the microphones such that an acoustic source is approximately equal distance from a face of both microphones. Consequently, Applicant submits that Ouyang does not disclose a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position (emphasis added).

The Examiner asserts that claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. Applicant respectfully submits that amended claim 1 is distinguished from the prior art in terms of structure rather than function. For example, amended claim 1 recites structure in the limitation "the denoising subsystem comprising a microphone array including a plurality of microphones"; a microphone array including a plurality of microphones is clearly structure and not function.

The structure of the microphone array recited in amended claim 1 is further defined in amended claim 1 using language that describes a relative orientation of microphones of the microphone array (see amended claim 1, "a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position"). A description of a relative orientation between components of an array is clearly structure, and thus not a functional limitation. Therefore, Applicant submits that amended claim 1 includes

numerous structural limitations not found in the combination of Yoshida and Ouyang, where the structural limitations of amended claim 1 describe a microphone array and a relative orientation of microphones of the microphone array.

The Examiner also asserts that a claim containing a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus if the prior art apparatus teaches all the structural limitations of the claim. Applicant is of the opinion that this assertion by the Examiner does not apply to amended claim 1 because none of the conditions of this assertion are met by amended claim 1. As a first point, the prior art does not teach all the structural limitations of the claim because Yoshida in view of Ouyang does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position.

Further, the novel structural limitations of amended claim 1 recite nothing of the manner in which the claimed apparatus is intended to be employed. As described above, the limitations of amended claim 1 missing from the combination of Yoshida and Ouyang are structural limitations (see amended claim 1, "a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position"). Consequently, because the limitations of amended claim 1 missing from the combination of Yoshida and Ouyang are structural limitations, the structural limitations recite nothing of the manner in which the claimed apparatus is intended to be employed.

For at least these reasons, Applicant respectfully submits that amended claim 1 is patentable over Yoshida in view of Ouyang.

As claims 4, 6, 7, 9, and 49-55 depend from amended claim 1 and include further limitations thereon, and since amended claim 1 is not anticipated by Yoshida in view of Ouyang, Applicant submits that claims 4, 6, 7, 9, and 49-55 are patentable over Yoshida in view of Ouyang.

Claim 5 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Ouyang and in further view of Park et al., US patent number 5,590,241 (hereinafter "Park"). Applicants respectfully traverse the rejection.

Regarding amended claim 1, Applicants submit that Yoshida in view of Ouyang does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position (emphasis added). Furthermore, none of Yoshida, Ouyang, and/or Park, alone or in any combination, disclose a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, the microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added).

As claim 5 depends from amended claim 1 and includes further limitations thereon, and since amended claim 1 is not anticipated by Yoshida, Ouyang, and/or Park, Applicant submits that claim 5 is not anticipated by Yoshida, Oh, and/or Park.

Claims 10-17 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Ouyang and further in view of Housni, US patent number 6,795,713 (hereinafter "Housni"). Applicants respectfully traverse the rejection.

Regarding amended claim 1, Applicants submit that Yoshida in view of Ouyang does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position (emphasis added). Furthermore, none of Yoshida, Ouyang, and/or Housni, alone or in any combination, disclose a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, the microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added).

As claims 10-17 depend from amended claim 1 and include further limitations thereon, and since amended claim 1 is not anticipated by Yoshida, Ouyang and/or Housni, Applicant submits that claims 10-17 are not anticipated by Yoshida, Ouyang and/or Housni.

Claim 41 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Ouyang and further in view of Turnbull et al., US patent number 6,980,092 (hereinafter "Turnbull"). Applicants respectfully traverse the rejection.

Regarding claim 41, as amended herein, and as described in detail above, Applicants submit that Yoshida in view of Ouyang does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position (emphasis added). Additionally, Turnbull does not disclose a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones and an axis, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, the microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added). Thus, Applicant submits that amended claim 41 is not anticipated by Yoshida, Ouyang and/or Turnbull.

Claims 44-48 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Ouyang and further in view of Oh. Applicants respectfully traverse the rejection.

Applicants submit that amended claim 1 is not anticipated by Yoshida in view of Ouyang, as described above. Furthermore, none of Yoshida, Ouyang and/or Oh, alone or in any combination, disclose a communications system, comprising a denoising subsystem including a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second

position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, the microphone array providing acoustic signals of an environment to components of the denoising subsystem (emphasis added). Therefore, amended claim 1 is not anticipated by Yoshida, Ouyang and/or Oh, alone and/or in any combination.

As claims 44-48 depend from amended claim 1 and include further limitations thereon, and since amended claim 1 is not anticipated by Yoshida, Ouyang and/or Oh, Applicant submits that claims 44-48 are not anticipated by Yoshida, Ouyang and/or Oh.

Conclusion

In view of the foregoing Amendments and Remarks, Applicant respectfully submits that the rejections under 35 U.S.C. §103, have been overcome, and their withdrawal is respectfully requested. Applicant submits that claims 1, 4-7, 9-17, 41, and 44-55 are in condition for allowance. The allowance of the claims is earnestly requested. If in the opinion of Examiner FAULK a telephone conference would expedite the prosecution of the subject application, or if there are any issues that remain to be resolved prior to allowance of the claims, Examiner FAULK is encouraged to call Rick Gregory at (408) 342-1900.

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 (Attorney Docket No. ALPH.P020).

Respectfully submitted,
Courtney Staniford & Gregory LLP

Date: June 9, 2010

Richard L. Gregory, Jr., Reg. No. 42,607
Email: rgregory@csgip.com
Tel. 408-342-1900
Fax. 408-342-1909

Courtney Staniford & Gregory LLP
10001 N. De Anza Blvd., STE 300
Cupertino, CA 95014

PTO/SB/22 (01-09)
Approved for use through 02/28/2009. 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 it 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.P020
Application Number 10/400,282	Filed March 27, 2003
For Microphone and Voice Activity Detection (VAD) Configurations for Use with Communication Systems	
Art Unit 2614	Examiner Devona E. Faulk

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./	June 09, 2010
Signature	Date
Richard L. Gregory, Jr.	408-342-1900
Typed or printed name	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:	10400282
Filing Date:	27-Mar-2003
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Richard L. Gregory/Rob Rathbun
Attorney Docket Number:	ALPH.P020

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:	7776791
Application Number:	10400282
International Application Number:	
Confirmation Number:	1397
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
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.P020
Receipt Date:	09-JUN-2010
Filing Date:	27-MAR-2003
Time Stamp:	13:10:56
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	9826
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_ALPHP020.pdf	2382659 776fe1ec4f0a04143a6ad55b72dac62a73961ff0	yes	18

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Transmittal Letter	1	1
Amendment/Req. Reconsideration-After Non-Final Reject	2	17
Extension of Time	18	18

Warnings:

Information:

2	Fee Worksheet (PTO-875)	fee-info.pdf	30302 0ffdd145ad8c1b7a11b2b2652bb4d154189acfc4	no	2

Warnings:

Information:

Total Files Size (in bytes):	2412961

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.P020 Patent

Transmittal of Documents

Certification Under 37 C.F.R. §1.8(a)

Transmitted via **June 9, 2010**
Date of Transmission

USPTO EFS

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);
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
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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 10/400,282	Filing Date 03/27/2003	☐ To be Mailed

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

AMENDMENT	06/09/2010	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 27	Minus	** 40	= 0	X $26 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 2	Minus	***7	= 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	

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) 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:
/phyllis canty/

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.

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.
10/400,282	03/27/2003	Gregory C. Burnett	ALPH.P020	1397

53186 7590 08/17/2010
COURTNEY STANIFORD & GREGORY LLP
PO Box 9807
San Jose, CA 95157

EXAMINER	
FAULK, DEVONA E	
ART UNIT	PAPER NUMBER
2614	

MAIL DATE	DELIVERY MODE
08/17/2010	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)	
	10/400,282	BURNETT ET AL.	
	Examiner	Art Unit	
	DEVONA E. FAULK	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 *09 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) *1,4-7,9-17,41 and 44-55* 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) *1,4-7,9-17,41 and 44-55* 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 *7/25/07* 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

Response to Arguments

1. Applicant's arguments filed 6/9/10 have been fully considered but they are not persuasive. The applicant has amended the claims and essentially asserts that the prior art fails to read on the amended claim language. The examiner disagrees. Although the applicant asserts that the prior art fails to read on the amended claim language, the applicant admits that prior art Yoshida teach of two microphones, one microphone disposed relatively close to a voice source and the other disposed relatively far from the voice source (page 8). The examiner agrees and asserts additionally that the Yoshida reads on the " such that the second position forms an angle relative to the first position" language. The examiner asserts that implicitly some angle is formed relative to the first position.

2. Claims 2,3,8,18-40,42-43 are cancelled.

Claim Rejections - 35 USC § 102

3. 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.

4. Claims 1 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoshida et al. (US 5,473,702).

Regarding claim 1, Yoshida discloses a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals (Figure 4); and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array **is fixed at a first position** relative to a mouth of user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position (microphone 1 reads on first microphone and microphone 2 reads on second microphone, Figures 1 and 2; column 3, lines 10-18; the angle formed is implicit),

the microphone array providing acoustic signals of an environment to components of the denoising system (microphones 1 and 2, Figure 4),

components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic

signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25).

All elements of claim 7 are comprehended by the rejection of claim 1.

Claim Rejections - 35 USC § 103

5. 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.

6. Claims 49-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025).

Regarding claims 49 and 54, Yoshida does not disclose one omnidirectional microphone and one unidirectional microphone, the microphones separated by a distance. Ouyang et al teach a microphone system for a speakerphone comprising omnidirectional microphone 20 and unidirectional microphone 12 and noise suppression circuit 11 (denoising system). The system advantageously determines the source of noise and suppresses it using the unidirectional microphone as a reference. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Yoshida by substituting the microphone configuration of Ouyang et al, for the microphones 1 and 2 for the purpose of improving the performance of the noise cancellation system.

Regarding claims 50 and 55, Yoshida as modified discloses that the microphones are separated . Yoshida as modified fails to disclose that the separation distance is in a range of approximately 0 to 15 cm. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the separation distance is in the range of 0 to 15 cm in order to meet a certain design specification.

Regarding claims 51-53, Yoshida as modified discloses that a second vector forms an angle relative to a first vector (implicit). Yoshida as modified fails to disclose that the angle is in a range of approximately 0 to either of 180,135 and 90 degrees. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the angle is in a range as claimed for the benefit of meeting a design specification

7. Claims 4, 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702).

Regarding claims 4 and 6, the examiner takes official notice that it was well known in the art at the time of the invention to use glottal electromagnetic sensors and skin microphones to generate voice signals. It would have been obvious to one of ordinary skill in the art to modify Yoshida to use such sensors in the place of the microphones for the purpose of improving the voice detection performance.

Regarding claim 9, the examiner asserts that per In re Venner the court held that providing an automatic means to replace a manual activity which accomplished the same result is not sufficient to distinguish over the prior art. Therefore, the examiner asserts that the opposite is true as well that providing a manual means to replace an automatic means is not sufficient to overcome the prior art. It would have been obvious to modify Yoshida as modified so that the VAD is manually operated to give the user more control over when the VAD.

8. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Park et al. (US 5,590,241).

Regarding claim 5, Yoshida fails to disclose that the voice detection subsystem comprises an accelerometer sensor in contact with the skin of the user and a voice activity detector for processing the accelerometer sensor voice activity signals. Park discloses a speech processing system comprising accelerometer 34 and noise microphone 31. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Yoshida to have an accelerometer coupled to the power monitoring circuit 300 (voice activity detector), for the purpose of generating voice activity signals directly from the source.

9. Claims 10-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Housni (US 6,795,713).

Regarding claim 10, Yoshida fails to disclose that the system includes a portable handset that includes the microphones. Yoshida teaches of a two microphone system. Housni discloses a portable handset 1 which includes microphones 3 and 12 for wireless communication. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to implement the circuitry of Yoshida et al in a portable handset for the purpose of improving wireless speech communication.

Regarding claims 11 and 15,Yoshida as modified provides a voice detection subsystem and denoising subsystem in the anti-noise circuitry of the portable handset .

Regarding claim 12, the portable handset 1 of Housni includes a speaker 4.

Regarding claims 13 and 14, the portable handset of Housni inherently couples to another wireless phone via wireless couplings.

All elements of claims 16 and 17 are comprehended by the rejection of claim 12.

10. Claims 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025) in view of Turnbull et al. (US 6,980,092).

Regarding claim 41, Yoshida discloses a communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals (300, Figure 4; column 8, lines 14-20) ; and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem comprising a microphone array including a plurality

of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position (microphone 1 reads on first microphone and microphone 2 reads on second microphone, Figures 1 and 2; column 3, lines 10-18; the angle formed is implicit),

, the microphone array providing acoustic signals of an environment to components of the denoising system (microphones 1 and 2, Figure 4),

components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25).

Yoshida as modified fails to disclose a portable headset that includes the microphones along with at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular phones, satellite telephones, portable telephones, wireline telephones, internet telephones,

wireless transceivers, wireless communication radio, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

Turnbull discloses a portable headset that couples to a cellular phone (column 28, lines 53-65). It would have been obvious to modify Yoshida as modified in order to allow for wireless transmission.

11. Claims 44-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Ouyang et al. (US 2003/0044025) in further view of Oh et al. (US 5,353,376).

Regarding claim 44, Yoshida as modified fails to disclose that the microphones are unidirectional. Oh discloses a system for improved speech acquisition for a hands-free system in a noise environment comprising unidirectional microphones that are separated by a distance and having an angle between maximums of a spatial response curve of each microphone and that the two microphones are unidirectional (column 7, lines 14-25). It would have been obvious to modify Yoshida as modified by having the microphones be unidirectional for the purpose of improving the performance of the noise cancellation system (Oh; column 7, lines 22-25).

Regarding claim 45, Yoshida as modified discloses that the microphones are separated. Yoshida as modified fails to disclose that the separation distance is in a range of approximately 0 to 15 cm. The examiner asserts that this is a matter of design choice.

It would have been obvious to modify Yoshida as modified so that the separation distance is in the range of 0 to 15 cm in order to meet a certain design specification.

Regarding claims 46-48, Yoshida as modified discloses that a second vector forms an angle relative to a first vector (implicit). Yoshida as modified fails to disclose that the angle is in a range of approximately 0 to either of 180,135 and 90 degrees. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the angle is in a range as claimed for the benefit of meeting a design specification

Conclusion

12. 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.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DEVONA E. FAULK whose telephone number is (571)272-7515. The examiner can normally be reached on 8 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on 571-272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Devona E. Faulk/
Primary Examiner, Art Unit 2614

Notice of References Cited	Application/Control No. 10/400,282	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner DEVONA E. FAULK	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-5,353,376	10-1994	Oh et al.	704/233
*	B	US-5,473,702	12-1995	Yoshida et al.	381/94.7
*	C	US-5,590,241	12-1996	Park et al.	704/227
*	D	US-2003/0044025	03-2003	Ouyang et al.	381/92
*	E	US-6,795,713	09-2004	Housni, Jamal	455/550.1
*	F	US-6,980,092	12-2005	Turnbull et al.	340/425.5
	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
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	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	01/23/2007	10/18/2007	08/14/2008	03/12/2009	12/07/2009	08/13/2010			
	1	✓	✓	✓	✓	✓	✓			
	2	✓	✓	-	-	-	✓			
	3	✓	✓	-	-	-	✓			
	4	✓	✓	✓	✓	✓	✓			
	5	✓	✓	✓	✓	✓	✓			
	6	✓	✓	✓	✓	✓	✓			
	7	✓	✓	✓	✓	✓	✓			
	8	O	-	-	-	-	-			
	9	O	✓	✓	✓	✓	✓			
	10	✓	✓	✓	✓	✓	✓			
	11	✓	✓	✓	✓	✓	✓			
	12	✓	✓	✓	✓	✓	✓			
	13	✓	✓	✓	✓	✓	✓			
	14	✓	✓	✓	✓	✓	✓			
	15	O	✓	✓	✓	✓	✓			
	16	✓	✓	✓	✓	✓	✓			
	17	✓	✓	✓	✓	✓	✓			
	18	✓	✓	-	-	-	-			
	19	✓	✓	-	-	-	-			
	20	✓	✓	-	-	-	-			
	21	✓	✓	-	-	-	-			
	22	✓	✓	-	-	-	-			
	23	✓	✓	-	-	-	-			
	24	O	-	-	-	-	-			
	25	O	✓	-	-	-	-			
	26	✓	✓	-	-	-	-			
	27	✓	✓	-	-	-	-			
	28	✓	✓	-	-	-	-			
	29	✓	✓	-	-	-	-			
	30	✓	✓	-	-	-	-			
	31	O	✓	-	-	-	-			
	32	✓	✓	-	-	-	-			
	33	✓	✓	-	-	-	-			
	34	✓	✓	-	-	-	-			
	35	✓	✓	-	-	-	-			
	36	✓	✓	-	-	-	-			

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	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	01/23/2007	10/18/2007	08/14/2008	03/12/2009	12/07/2009	08/13/2010			
	37	✓	✓	-	-	-	-			
	38	O	-	-	-	-	-			
	39	O	✓	-	-	-	-			
	40		✓	-	-	-	-			
	41		✓	✓	✓	✓	✓			
	42		✓	-	-	-	-			
	43		✓	-	-	-	-			
	44			✓	✓	✓	✓			
	45			✓	✓	✓	✓			
	46			✓	✓	✓	✓			
	47			✓	✓	✓	✓			
	48			✓	✓	✓	✓			
	49			✓	✓	✓	✓			
	50			✓	✓	✓	✓			
	51			✓	✓	✓	✓			
	52			✓	✓	✓	✓			
	53			✓	✓	✓	✓			
	54			✓	✓	✓	✓			
	55			✓	✓	✓	✓			

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	2615

SEARCHED			
Class	Subclass	Date	Examiner
381	94.1,94.2,94.3,94.7,92	1/22/07	BTP
704	226,233	1/22/07	BTP
381	71.6,94.1,94.7,92,110	10/15/2007	DEF
704	226,233	10/18/2007	DEF
381	71.6,94.1,94.7	7/29/08, 8/14/08	DEF
704	226,233	7/29/08,8/14/08	DEF
381	71.7,94.1,94.7,110,92	3/12/09	DEF
381	71.6,94.1,94.7,110,92,111	12/7/09	DEF

SEARCH NOTES		
Search Notes	Date	Examiner
East Word Search	1/22/07	
Assignee/Inventor Search	10/16/2007,10/17/2007	DEF
word search	10/16/2007,10/17/2007	DEF
additonal search	7/29/08, 8/14/08	DEF
additional search	3/12/09	DEF
reviewed applicant's arguments/ applied same art to claims	8/13/10	DEF

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

	/DEVONA E FAULK/ Primary Examiner.Art Unit 2614

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	9	burnett.in. and (microphone near10 mouth) and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2010/08/13 14:25
L2	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2010/08/13 15:05
S1	150	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S3	850	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S4	641	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S5	6	brennan.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:28
S6	6	("5136577" | "5329587" | "5544080" | "5887059" | "6070137" | "6487295").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/10/15 15:33
S7	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:22
S8	11	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/25 09:51
S9	1	("5406622").PN.	USPAT	OR	OFF	2007/10/16 10:24

S10	2	burnett.in. and microphone and (voice near2 activity) and ("15" near2 centimeters)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:38
S11	0	EP-1483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:37
S12	0	EP-2001483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S13	0	EP-483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S14	0	WO-20030906031-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S15	0	WO-030906031-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:39
S16	194	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:40
S17	33	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:04
S18	7	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) and (unidirectional)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:40
S19	1	burnett.in. and microphone and ((voice near2 activity) same (manual$2 near2 activat $3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:20

S20	1	"381"/$.ccls. and (manuall$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:40
S21	1	"381"/$.ccls. and (manual$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:41
S22	3	(manual$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect $3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:42
S23	10	(manual$3 near2 (operat$3 activat$3)) same (VAD)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:42
S24	2	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) same (headset earphon$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:44
S25	7	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) and (headset earphon$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:44
S26	5	burnett.in. and microphone and ((voice near2 activity) same subsystem)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:54
S27	35	("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"	US-PGPUB; USPAT; USOCR	OR	OFF	2007/10/16 18:19

		"6430295").PN.				
S28	1	(glottal near2 electromagnetic near2 sensor $1) with antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:22
S29	6	burnett.in. and microphone and (voice near2 activity) and glottal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 15:59
S30	12	(glottal near2 electromagnetic near2 micropower near2 sensor$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:22
S31	1	burnett.in. and microphone and (voice near2 activity) and (transceiver same headset)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:02
S32	1	burnett.in. and microphone and (voice near2 activity) and transceiver	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:02
S33	2	"381"/$.ccls. and (voice near2 activity near2 detect $3) same (noise near2 (reduct$3 suppress$3)) and (transceiver)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:17
S34	29	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (transceiver)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:20
S35	6	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (transceiver) and (headset headphone$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:20
S36	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")). PN.	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:22
S37	1	S36 and headset	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:23

S38	0	headset same transceiver same (voice near2 activity near2 detect3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:23
S39	0	(headset same transceiver) and (voice near2 activity near2 detect3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:24
S40	5	(headset same transceiver) and (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:24
S41	35	(headset same transceiver) and (noise near2 (suppress $3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 18:59
S42	1	(headset same transceiver) same (noise near2 (suppress $3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:25
S43	35	(headset same transceiver) and (noise near2 (suppress $3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 18:59
S44	1602	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/18 14:18
S45	1	burnett.in. and microphone and (voice near2 activity) and (angle same maximums)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/25 09:51
S46	173	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S47	923	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59

S48	1468	(381/92,111,122).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S49	1720	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S50	11	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S51	79	burnett.in. and microphone $1 and (voice)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S52	12	burnett.in. and microphone $1 and (voice) and VAD	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 10:00
S53	6	burnett.in. and microphone $1 and (voice) and VAD and (correlat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 10:33
S54	8	brennan.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:09
S55	0	burnett.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:11
S56	11	burnett.in. and microphone and array	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:12
S57	174	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14

S58	926	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S59	700	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S60	1729	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S61	0	S56 and vector near10 normal near10 mouth near10 user	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:42
S62	0	S56 and (vector near10 normal near10 mouth)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43
S63	0	S56 and (vector near10 (normal perpendicu$3) near10 mouth)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43
S64	3	S56 and (vector)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43
S65	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:17
S66	4	S65 and $4direction$2	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:17
S67	1	S65 and uni	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:39
S68	1	S65 and omni	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:39
S69	192	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/03/12 23:55

S70	990	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/03/12 23:55
S71	769	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/03/12 23:55
S72	20	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/23 15:36
S73	20	burnett.in. and microphone and (voice near2 (detect$3 activity))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/23 15:45
S74	17	burnett.in. and microphone and (voice near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/23 15:45
S75	2	burnett.in. and microphone and (voice near2 activity) and ("15" near2 centimeters) and axis	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/30 16:06
S76	13	burnett.in. and microphone and (voice near2 (detect$3 activity)) and axis	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/30 16:07
S77	215	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/12/07 09:14
S78	1050	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/12/07 09:14
S79	1660	(381/92,111,122).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/12/07 09:14

EAST Search History (Interference)

<This search history is empty>

8/13/2010 3:46:59 PM
C:\Documents and Settings\dfaulk\My Documents\EAST\Workspaces\10400282.wsp

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
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 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: 98195

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: 98195

OR

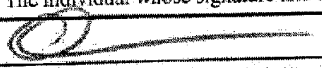
☐ Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address:

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	10/10/10
Name	Gregory C. BURNETT	Telephone	503-227-4761
Title	Chief Scientist		

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.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/96 (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.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: ALIPHCOM, Inc.

Application No./Patent No.: 10/400,282 Filed/Issue Date: March 27, 2003

Titled:

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 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 013928, Frame 0808, 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).

☐ 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.

/Richard L. Gregory, Jr./ February 16, 2011

Signature Date

Richard L. Gregory, Jr. 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.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	9462228
Application Number:	10400282
International Application Number:	
Confirmation Number:	1397
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
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.P020
Receipt Date:	16-FEB-2011
Filing Date:	27-MAR-2003
Time Stamp:	18:18:02
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		ALPHP020_POA.pdf	520262 21d7951c14b03d29411d5026b2b8d5d67b a96b90	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal 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):	520262	

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.P020 Patent

Transmittal of Documents

Certification Under 37 C.F.R. §1.8(a)

Transmitted via **February 16, 2011**
Date of Transmission

USPTO EFS

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)

Power of Attorney;
Statement Under 37 CFR 3.73(b).

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
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.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	10400282	Filing Date	2003-03-27	Docket Number (if applicable)	ALPH.P020	Art Unit	2614
First Named Inventor	Gregory C. Burnett			Examiner Name	Devona E. Faulk		

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 _____

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)	2011-02-17
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:	10400282
Filing Date:	27-Mar-2003
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Richard L. Gregory/Rob Rathbun
Attorney Docket Number:	ALPH.P020

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:	9471980
Application Number:	10400282
International Application Number:	
Confirmation Number:	1397
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
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.P020
Receipt Date:	17-FEB-2011
Filing Date:	27-MAR-2003
Time Stamp:	18:23:04
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	4815
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		ALPHP020_Amendment_Response.pdf	2684297 a258ad8ff0464f57ab1ccf0c767379a9e451bcc8	yes	20

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Transmittal Letter	1	1
Amendment After Final	2	19
Extension of Time	20	20

Warnings:					
Information:					
2	Request for Continued Examination (RCE)	ALPHP020_RCE.pdf	700078 be5926b27449f2414d0c92e3cbc15c0a2b6fd079	no	3
Warnings:					
Information:					
3	Fee Worksheet (PTO-875)	fee-info.pdf	32193 104000f09eeae7308d8cb92682b5e8b9e79b9d49	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3416568		

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.P020 Patent

Transmittal of Documents

Certification Under 37 C.F.R. §1.8(a)

Transmitted via **February 17, 2011**
Date of Transmission

USPTO EFS

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;
Request for Continued Examination (RCE);
Electronic payment of filing fees.

Attorney Docket No. ALPH.P020

PATENT

IN THE UNITED STATES PATENT OFFICE

In Re Patent Application of:	)	
	)	Examiner: Devona E. Faulk
Gregory C. Burnett, et al.	)	Art Unit: 2614
	)	
Application No.: 10/400,282	)	
	)	
Filed: March 27, 2003	)	
	)	
For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS	)	

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

RESPONSE TO OFFICE ACTION

Sir:

This is a response to the Office Action mailed August 17, 2010. Applicant respectfully requests entry of the following Amendments and consideration of the Remarks.

AMENDMENTS

IN THE CLAIMS

1. (Currently amended) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.

Claims 2 and 3 (Canceled).

4. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.

5. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one accelerometer sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.

6. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one skin-surface microphone sensor in contact with skin of a user for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.

7. (Previously presented) The system of claim 1, wherein the voice detection subsystem receives voice activity signals via couplings with the microphones.

Claim 8 (Canceled).

9. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals.

10. (Previously presented) The system of claim 1, further including a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline

telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

11. (Previously presented) The system of claim 10, wherein the portable handset includes at least one of the voice detection subsystem and the denoising subsystem.

12. (Previously presented) The system of claim 1, further including a portable headset that includes the microphones along with at least one speaker device.

13. (Previously presented) The system of claim 12, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

14. (Previously presented) The system of claim 13, wherein the portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings.

15. (Previously presented) The system of claim 13, wherein the communication device includes at least one of the voice detection subsystem and the denoising subsystem.

16. (Previously presented) The system of claim 12, wherein the portable headset includes at least one of the voice detection subsystem and the denoising subsystem.

17. (Previously presented) The system of claim 12, wherein the portable headset is a portable communication device selected from among cellular telephones,

satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

Claims 18-40 (Canceled).

41. (Currently amended) A communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals;

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise; and

a portable headset comprising the microphones and at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios,

personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

Claims 42-43 (Canceled).

44. (Previously presented) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is a unidirectional microphone.

45. (Previously presented) The system of claim 44, wherein the first microphone and the second microphone are separated by a distance in a range of approximately zero (0) centimeters to 15 centimeters.

46. (Currently amended) The system of claim 44, wherein the angle is in a range of approximately greater than zero (0) degrees ~~to~~ and one of equal to and less than 180 degrees.

47. (Currently amended) The system of claim 44, wherein the angle is in a range of approximately greater than zero (0) degrees ~~to~~ and one of equal to and less than 135 degrees.

48. (Currently amended) The system of claim 44, wherein the angle is in a range of approximately greater than zero (0) degrees ~~to~~ and one of equal to and greater than 90 degrees.

49. (Previously presented) The system of claim 1, wherein the first microphone is an omnidirectional microphone and the second microphone is a unidirectional microphone.

50. (Previously presented) The system of claim 49, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

51. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 30 degrees to 180 degrees.

52. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 60 degrees to 180 degrees.

53. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 90 degrees to 180 degrees.

54. (Previously presented) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is an omnidirectional microphone.

55. (Previously presented) The system of claim 54, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

REMARKS

Claims 1, 4-7, 9-17, 41, and 44-55 are pending in the application. Claims 1, 4-7, 9-17, 41, and 44-55 are rejected. Claims 1, 41, and 46-48 are amended herein. No new material is added by the amendments herein.

Request for Continued Examination under 37 C.F.R. 1.114

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. § 102

Claims 1 and 7 are rejected under 35 U.S.C. § 102(b) as being unpatentable over Yoshida et al., United States (US) Patent Number 5,473,702 ("Yoshida"). Applicant respectfully submits that the claims as presented herein are patentably distinct from Yoshida. Moreover, and as supported below, Yoshida fails to teach each and every element of claims 1 and 7 as presented herein.

Regarding claim 1, as amended, Applicant submits that Yoshida does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees (emphasis added).

Applicant submits that Yoshida shows two microphones 1 and 2 (Figures 1 and 2). Yoshida discloses that microphone 1 is disposed relatively close to a voice source

and picks up both voice input and background noise (column 3, lines 10-13). Yoshida discloses that microphone 2 is disposed relatively far from the voice source and picks up mainly noise (column 3, lines 16-18). However, Yoshida includes no further description regarding the relative positioning of the two microphones. Therefore, while Yoshida shows a system having two microphones, Yoshida does not show or describe a first microphone of an array fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees (emphasis added).

The Office Action states at page 2 that Yoshida reads on the "such that the second position forms an angle relative to the first position" language, and that "implicitly some angle is formed relative to the first position." Applicant disagrees with this statement. Applicant submits that Yoshida does describe a configuration in which a first microphone is disposed relatively close to a voice source and a second microphone is disposed relatively far from the voice source (emphasis added). However, a physical relationship between a voice source and each of two microphones described in Yoshida is different than a physical relationship between the front of two microphones as claimed in claim 1. More specifically, Applicant submits that, while the physical relationship between a voice source and each of two microphones described in Yoshida may imply generic information about a difference in angles between the voice source and each of two microphones, the physical relationship between each microphone and a voice source does not describe or even imply any information about the physical relationship between the front of the two microphones (emphasis added).

Furthermore, Applicant reminds the examiner that all limitations of the claim are to be considered. To that point, Yoshida does not describe a microphone array in which a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the

mouth (emphasis added). Additionally, Yoshida does not describe a microphone array in which a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth (emphasis added). Furthermore, Yoshida does not describe a relationship between a first microphone and a second microphone in which a second position of a second microphone forms an angle relative to a first position of a first microphone, wherein the angle is greater than zero degrees (emphasis added).

For at least these reasons, Applicant respectfully submits that amended claim 1 is not anticipated by Yoshida.

As claim 7 depends from amended claim 1 and includes further limitations thereon, and since amended claim 1 is not anticipated by Yoshida, Applicant submits that claim 7 is not anticipated by Yoshida.

Rejections under 35 U.S.C. § 103

Claims 49-55 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 Ouyang et al., US Patent Application Publication number US 2003/0044025 ("Ouyang"). Applicant respectfully traverses the rejection.

Regarding claim 1, as amended, Applicant submits that Yoshida does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees (emphasis added).

Applicant submits that Yoshida shows two microphones 1 and 2 (Figures 1 and 2). Yoshida discloses that microphone 1 is disposed relatively close to a voice source and picks up both voice input and background noise (column 3, lines 10-13). Yoshida

discloses that microphone 2 is disposed relatively far from the voice source and picks up mainly noise (column 3, lines 16-18). However, Yoshida includes no further description regarding the relative positioning of the two microphones. Therefore, while Yoshida shows a system having two microphones, Yoshida does not show or describe a microphone array in which a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth (emphasis added). Additionally, Yoshida does not describe a microphone array in which a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth (emphasis added). Furthermore, Yoshida does not describe a relationship between a first microphone and a second microphone in which a second position of a second microphone forms an angle relative to a first position of a first microphone, wherein the angle is greater than zero degrees (emphasis added).

The Office Action states at page 4 that, regarding claims 49 and 54, Yoshida does not disclose one omnidirectional microphone and one unidirectional microphone, the microphones separated by a distance. Applicant agrees with this statement. The Office Action states however that it would have been obvious to modify Yoshida by substituting the microphone configuration of Ouyang. Applicant disagrees with this assertion.

Applicant submits Ouyang teaches a microphone circuit that includes a uni-directional microphone, an omni-directional microphone, and a background noise suppression circuit (paragraph 0034). The omni-directional microphone is located in close physical proximity to the uni-directional microphone such that an acoustic source is approximately equal distance from both the omni-directional microphone and the uni-directional microphone (paragraph 0037). Ouyang teaches a single embodiment of the microphone circuit as a desk top speaker phone that embodies the microphone circuit (paragraph 0047). In the desk top speaker phone, the uni-directional microphone and the omni-directional microphone are positioned in a front-facing region of a housing in close proximity to each other such that an acoustic source spaced

apart from the speaker phone is approximately the same distance from each of the omni-directional microphone and the uni-directional microphone (paragraph 48; figure 3).

The embodiment taught in Ouyang therefore describes two microphones positioned in a face of a housing surface such that the two microphones face in the same direction outward from the housing surface and, as such, position the microphones such that an acoustic source is approximately equal distance from a face of both microphones. Consequently, Ouyang does not show or describe a microphone array in which a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth (emphasis added). Additionally, Ouyang does not describe a microphone array in which a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth (emphasis added). Furthermore, Ouyang does not describe a relationship between a first microphone and a second microphone in which a second position of a second microphone forms an angle relative to a first position of a first microphone, wherein the angle is greater than zero degrees (emphasis added).

Therefore, Applicant submits that Ouyang does not disclose a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees (emphasis added). Therefore, Ouyang does not overcome the deficiencies of Yoshida with regard to claim 1.

As claims 49-55 depend from amended claim 1 and include further limitations thereon, and since amended claim 1 is not anticipated by Yoshida in view of Ouyang, Applicant submits that claims 49-55 are not anticipated by Yoshida in view of Ouyang.

The Office Action states at page 5 that, regarding claims 50 and 55, while Yoshida in view of Ouyang is silent as to separation distance, separation distance is a matter of design choice. Applicant disagrees and officially challenges this assertion, and further submits that this rejection is improper. Applicant submits that in any signal collection and processing system all elements of a configuration collectively affect operation of the system. As neither Yoshida nor Ouyang describe a first microphone and the second microphone separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters, Applicant requests the examiner provide a reference that describes this configuration. Therefore, Applicant submits that claims 50 and 55 are patentable over Yoshida in view of Ouyang.

The Office Action states at page 5 that, regarding claims 51-53, while Yoshida in view of Ouyang is silent as to relative angle between the fronts of two microphones, relative angle is a matter of design choice. Applicant disagrees and officially challenges this assertion, and further submits that this rejection is improper. Applicant submits that in any signal collection and processing system all elements of a configuration collectively affect operation of the system. As neither Yoshida nor Ouyang describe any configuration in which an angle is approximately in a range of 30 degrees to 180 degrees, an angle is approximately in a range of 60 degrees to 180 degrees, and an angle is approximately in a range of 90 degrees to 180 degrees, Applicant requests the examiner provide a reference that describes this configuration. Therefore, Applicant submits that claims 51-53 are patentable over Yoshida in view of Ouyang.

Claims 4, 6, and 9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida. Applicant respectfully traverses the rejection.

Regarding claim 1, and as described in detail above, Yoshida does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the

mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees (emphasis added).

As claims 4, 6, and 9 depend from amended claim 1 and include further limitations thereon, and since amended claim 1 is not anticipated by Yoshida, Applicant submits that claims 4, 6, and 9 are not anticipated by Yoshida.

Claim 5 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Park et al., US patent number 5,590,241 (hereinafter "Park"). Applicant respectfully traverses the rejection.

Regarding amended claim 1, Applicant submits that Yoshida does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees (emphasis added).

Furthermore, Yoshida and Park, alone or in any combination, do not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees (emphasis added).

As claim 5 depends from amended claim 1 and includes further limitations thereon, and since amended claim 1 is not anticipated by Yoshida and/or Park, Applicant submits that claim 5 is not anticipated by Yoshida and/or Park.

Claims 10-17 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Housni, US patent number 6,795,713 (hereinafter "Housni"). Applicant respectfully traverses the rejection.

Regarding amended claim 1, and as described in detail above, Applicant submits that Yoshida does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees (emphasis added).

Furthermore, Yoshida and Housni, alone or in any combination, do not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees (emphasis added).

As claims 10-17 depend from amended claim 1 and include further limitations thereon, and since amended claim 1 is not anticipated by Yoshida and/or Housni, Applicant submits that claims 10-17 are not anticipated by Yoshida and/or Housni.

Claim 41 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Ouyang and further in view of Turnbull et al., US patent number 6,980,092 (hereinafter "Turnbull"). Applicant respectfully traverses the rejection.

Regarding claim 41, as amended herein, and as described in detail above with reference to claim 1, Applicant submits that Yoshida in view of Ouyang does not disclose a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees (emphasis added).

Additionally, Turnbull does not disclose a communications system, comprising a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees (emphasis added). Thus, Applicant submits that amended claim 41 is not anticipated by Yoshida, Ouyang and/or Turnbull.

Claims 44-48 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Ouyang and further in view of Oh et al., US Patent Number 5,353,376 ("Oh"). Applicant respectfully traverses the rejection.

Applicant submits that amended claim 1 is not anticipated by Yoshida in view of Ouyang, as described in detail above. Furthermore, none of Yoshida, Ouyang

and/or Oh, alone or in any combination, disclose a communications system, comprising a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of a user, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees (emphasis added). Therefore, amended claim 1 is not anticipated by Yoshida, Ouyang and/or Oh, alone and/or in any combination.

As claims 44-48 depend from amended claim 1 and include further limitations thereon, and since amended claim 1 is not anticipated by Yoshida, Ouyang and/or Oh, Applicant submits that claims 44-48 are not anticipated by Yoshida, Ouyang and/or Oh.

Conclusion

In view of the foregoing Amendments and Remarks, Applicant respectfully submits that the rejections under 35 U.S.C. §102 and §103 have been overcome, and their withdrawal is respectfully requested. Applicant submits that claims 1, 4-7, 9-17, 41, and 44-55 are in condition for allowance. The allowance of the claims is earnestly requested. If in the opinion of Examiner FAULK a telephone conference would expedite the prosecution of the subject application, or if there are any issues that remain to be resolved prior to allowance of the claims, Examiner FAULK is encouraged to email Rick Gregory at rick@gregorymartensen.com or call (408) 676-8080.

Respectfully submitted,
Gregory & Martensen, LLP

Date: February 17, 2011

Richard L. Gregory, Jr., Reg. No. 42,607
Email: rick@gregorymartensen.com
Tel. (408) 676-8080
Fax: (281) 501-1731

Gregory & Martensen LLP
2018 Bissonnet Street
Houston, TX 77005
Fax: (408) 342-1909

PTO/SB/22 (01-09)
Approved for use through 02/28/2009. 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 it 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.P020
Application Number 10/400,282	Filed March 27, 2003
For Microphone and Voice Activity Detection (VAD) Configurations for Use with Portable Communication Systems	
Art Unit 2614	Examiner Devona E. Faulk

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./	February 17, 2011
Signature	Date
Richard L. Gregory, Jr.	408-676-8080
Typed or printed name	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)
Approved for use through 1/31/2007. OMB 0651-0032
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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 10/400,282	Filing Date 03/27/2003	☐ To be Mailed

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

AMENDMENT	02/17/2011	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 27	Minus	** 40	= 0	X $26 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 2	Minus	***7	= 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	

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	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:
/MARQUITA D. JONES/

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.

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	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/400,282	03/27/2003	Gregory C. Burnett	ALPH.P020

CONFIRMATION NO. 1397

98195
Gregory & Martensen LLP
2018 Bissonnet Street
Houston, TX 77005

POA ACCEPTANCE LETTER

OC000000046128991

Date Mailed: 02/25/2011

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/16/2011.

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.

/sleutchit/

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
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/400,282	03/27/2003	Gregory C. Burnett	ALPH.P020

CONFIRMATION NO. 1397

53186
COURTNEY STANIFORD & GREGORY LLP
PO Box 9807
San Jose, CA 95157

POWER OF ATTORNEY NOTICE

OC000000046128956

Date Mailed: 02/25/2011

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/16/2011.

- 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).

/sleutchit/

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
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.
10/400,282	03/27/2003	Gregory C. Burnett	ALPH.P020	1397

98195 7590 06/23/2011

Gregory & Martensen LLP
2018 Bissonnet Street
Houston, TX 77005

EXAMINER	
FAULK, DEVONA E	
ART UNIT	PAPER NUMBER
2614	

NOTIFICATION DATE	DELIVERY MODE
06/23/2011	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):

rick@gregorymartensen.com
mike@gregorymartensen.com
vlad@gregorymartensen.com

Office Action Summary	Application No.	Applicant(s)	
	10/400,282	BURNETT ET AL.	
	Examiner	Art Unit	
	DEVONA FAULK	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 February 2011*.

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) *1,4-7,9-17,41 and 44-55* 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) *1,4-7,9-17,41 and 44-55* 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 *7/25/07* 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

Continued Examination Under 37 CFR 1.114

1. 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 2/17/11 has been entered.

Response to Arguments

2. Applicant's arguments, regarding a first position oriented towards the mouth and the other position away from the mouth, filed 2/17/11, with respect to the rejection(s) of claim(s) 1, 4-7,9-17,41,44-55 -under 102 and 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Vaudrey et al.

3. Claims 2,3,8,18-40,42-43 are cancelled.

4. The examiner contacted the applicant's representative to see if prosecution could be expedited but no response was received from the applicant's representative.

5. The applicant's representative is welcome to contact the examiner to see if prosecution can be expedited.

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 1,4,6,7, 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Vaudrey et al. (US 6,963,649).

Regarding claim 1, Yoshida discloses a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals (Figure 4); and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of user, wherein the first position orients a front of the first microphone, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone such that the second position forms an angle relative to the first position (microphone 1 reads on first microphone and microphone 2 reads on second microphone, Figures 1 and 2; column 3, lines 10-18; the angle formed is implicit),

the microphone array providing acoustic signals of an environment to components of the denoising system (microphones 1 and 2, Figure 4),

components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals

using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25).

Yoshida teaches of two microphones being oriented in a position.

Yoshida fails to explicitly teaches wherein the first position orients a front of the first microphone towards the mouth, wherein the second position orients a front of the second microphone away from the mouth. Vaudrey teaches of a first position orients a front of the first microphone towards the mouth, wherein the second position orients a front of the second microphone away from the mouth (column 4, lines 27-35; column 10, claims 6 and 13). It would have been obvious to modify Yoshida so that one microphone is oriented towards the mouth and the other away from the mouth for the benefit of improved noise cancelation.

Yoshida as modified teaches of an angle. Yoshida as modified fails to disclose that the angle is greater than zero. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the angle is greater than zero to provide improved noise cancelation.

All elements of claim 7 are comprehended by the rejection of claim 1.

Regarding claims 4 and 6, the examiner takes official notice that it was well known in the art at the time of the invention to use glottal electromagnetic sensors and skin microphones to generate voice signals. It would have been obvious to one of ordinary skill in the art to modify Yoshida to use such sensors in the place of the microphones for the purpose of improving the voice detection performance.

Regarding claim 9, the examiner asserts that per In re Venner the court held that providing an automatic means to replace a manual activity which accomplished the same result is not sufficient to distinguish over the prior art. Therefore, the examiner asserts that the opposite is true as well that providing a manual means to replace an automatic means is not sufficient to overcome the prior art. It would have been obvious to modify Yoshida as modified so that the VAD is manually operated to give the user more control over when the VAD.

8. Claims 49-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Vaudrey et al. (US 6,963,649) in further view of Ouyang et al. (US 2003/0044025).

Regarding claims 49 and 54, Yoshida as modified does not disclose one omnidirectional microphone and one unidirectional microphone, the microphones separated by a distance. Ouyang et al teach a microphone system for a speakerphone comprising omnidirectional microphone 20 and unidirectional microphone 12 and noise suppression circuit 11 (denoising system). The system advantageously determines the source of noise and suppresses it using the unidirectional microphone as a reference. It

would have been obvious to one of ordinary skill in the art at the time of invention to modify Yoshida as modified by substituting the microphone configuration of Ouyang et al, for the microphones 1 and 2 for the purpose of improving the performance of the noise cancellation system.

Regarding claims 50 and 55, Yoshida as modified discloses that the microphones are separated . Yoshida as modified fails to disclose that the separation distance is in a range of approximately 0 to 15 cm. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the separation distance is in the range of 0 to 15 cm in order to meet a certain design specification.

Regarding claims 51-53, Yoshida as modified discloses that a second vector forms an angle relative to a first vector (implicit). Yoshida as modified fails to disclose that the angle is in a range of approximately 0 to either of 180,135 and 90 degrees. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the angle is in a range as claimed for the benefit of meeting a design specification

9. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Vaudrey et al. (US 6,963,649) in further view of Park et al. (US 5,590,241).

Regarding claim 5, Yoshida as modified fails to disclose that the voice detection subsystem comprises an accelerometer sensor in contact with the skin of the user and a voice activity detector for processing the accelerometer sensor voice activity signals. Park discloses a speech processing system comprising accelerometer 34 and noise microphone 31. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Yoshida as modified to have an accelerometer coupled to the power monitoring circuit 300 (voice activity detector), for the purpose of generating voice activity signals directly from the source.

10. Claims 10-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Vaudrey et al. (US 6,963,649) view of Housni (US 6,795,713).

Regarding claim 10, Yoshida as modified fails to disclose that the system includes a portable handset that includes the microphones. Yoshida as modified teaches of a two microphone system (Yoshida). Housni discloses a portable handset 1 which includes microphones 3 and 12 for wireless communication. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to implement the circuitry of Yoshida as modified in a portable handset for the purpose of improving wireless speech communication.

Regarding claims 11 and 15, Yoshida as modified provides a voice detection subsystem and denoising subsystem in the anti-noise circuitry of the portable handset .

Regarding claim 12, the portable handset 1 of Housni includes a speaker 4.

Regarding claims 13 and 14, the portable handset of Housni inherently couples to another wireless phone via wireless couplings.

All elements of claims 16 and 17 are comprehended by the rejection of claim 12.

11. Claims 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Vaudrey et al. (US 6,963,649) in further view of Turnbull et al. (US 6,980,092).

Regarding claim 41, Yoshida discloses a communications system, comprising:

a voice detection subsystem receiving voice activity signals that include information of human voicing activity and automatically generating control signals using information of the voice activity signals (300, Figure 4; column 8, lines 14-20) ; and

a denoising subsystem coupled to the voice detection subsystem (20, Figure 4) , the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth of user, wherein the first position orients a front of the first microphone, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone such that the second position forms an angle relative to the first position (microphone 1 reads on first microphone and microphone 2 reads on second microphone, Figures 1 and 2; column 3, lines 10-18; the angle formed is implicit),

, the microphone array providing acoustic signals of an environment to components of the denoising system (microphones 1 and 2, Figure 4),

components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise (column 3, lines 22-26 and 39-45; column 7, line 65- column 8, line 25).

Yoshida teaches of two microphones being oriented in a position.

Yoshida fails to explicitly teaches wherein the first position orients a front of the first microphone towards the mouth, wherein the second position orients a front of the second microphone away from the mouth. Vaudrey teaches of a first position orients a front of the first microphone towards the mouth, wherein the second position orients a front of the second microphone away from the mouth (column 4, lines 27-35; column 10, claims 6 and 13). It would have been obvious to modify Yoshida so that one microphone is oriented towards the mouth and the other away from the mouth for the benefit of improved noise cancelation.

Yoshida as modified fails to disclose a portable headset that includes the microphones along with at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular phones, satellite telephones, portable telephones, wireline telephones, internet telephones,

wireless transceivers, wireless communication radio, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

Turnbull discloses a portable headset that couples to a cellular phone (column 28, lines 53-65). It would have been obvious to modify Yoshida as modified in order to allow for wireless transmission.

Yoshida as modified teaches of an angle. Yoshida as modified fails to disclose that the angle is greater than zero. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the angle is greater than zero to provide improved noise cancelation.

12. Claims 44-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 5,473,702) in view of Vaudrey et al. (US 6,963,649) in further view of Oh et al. (US 5,353,376).

Regarding claim 44, Yoshida as modified fails to disclose that the microphones are unidirectional. Oh discloses a system for improved speech acquisition for a hands-free system in a noise environment comprising unidirectional microphones that are separated by a distance and having an angle between maximums of a spatial response curve of each microphone and that the two microphones are unidirectional (column 7, lines 14-25). It would have been obvious to modify Yoshida as modified by having the microphones be unidirectional for the purpose of improving the performance of the noise cancellation system (Oh; column 7, lines 22-25).

Regarding claim 45, Yoshida as modified discloses that the microphones are separated. Yoshida as modified fails to disclose that the separation distance is in a range of approximately 0 to 15 cm. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the separation distance is in the range of 0 to 15 cm in order to meet a certain design specification.

Regarding claims 46-48, Yoshida as modified discloses that a second vector forms an angle relative to a first vector (implicit). Yoshida as modified fails to disclose that the angle is in a range of approximately greater than 0 and one of equal to and less than 180,135 and 90 degrees. The examiner asserts that this is a matter of design choice. It would have been obvious to modify Yoshida as modified so that the angle is in a range as claimed for the benefit of improved noise cancelation.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DEVONA FAULK whose telephone number is (571)272-7515. The examiner can normally be reached on 8 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on 571-272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Devona E. Faulk/
Primary Examiner, Art Unit 2614

Notice of References Cited	Application/Control No. 10/400,282	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner DEVONA FAULK	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-5,473,702	12-1995	Yoshida et al.	381/94.7
*	B	US-6,963,649	11-2005	Vaudrey et al.	381/94.7
*	C	US-5,353,376	10-1994	Oh et al.	704/233
*	D	US-5,590,241	12-1996	Park et al.	704/227
*	E	US-6,795,713	09-2004	Housni, Jamal	455/550.1
*	F	US-6,980,092	12-2005	Turnbull et al.	340/425.5
*	G	US-2003/0044025	03-2003	Ouyang et al.	381/92
	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
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA FAULK	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	01/23/2007	10/18/2007	08/14/2008	03/12/2009	12/07/2009	08/13/2010	06/06/2011		
	1	✓	✓	✓	✓	✓	✓	✓		
	2	✓	✓	-	-	-	-	-		
	3	✓	✓	-	-	-	-	-		
	4	✓	✓	✓	✓	✓	✓	✓		
	5	✓	✓	✓	✓	✓	✓	✓		
	6	✓	✓	✓	✓	✓	✓	✓		
	7	✓	✓	✓	✓	✓	✓	✓		
	8	O	-	-	-	-	-	✓		
	9	O	✓	✓	✓	✓	✓	✓		
	10	✓	✓	✓	✓	✓	✓	✓		
	11	✓	✓	✓	✓	✓	✓	✓		
	12	✓	✓	✓	✓	✓	✓	✓		
	13	✓	✓	✓	✓	✓	✓	✓		
	14	✓	✓	✓	✓	✓	✓	✓		
	15	O	✓	✓	✓	✓	✓	✓		
	16	✓	✓	✓	✓	✓	✓	✓		
	17	✓	✓	✓	✓	✓	✓	✓		
	18	✓	✓	-	-	-	-	-		
	19	✓	✓	-	-	-	-	-		
	20	✓	✓	-	-	-	-	-		
	21	✓	✓	-	-	-	-	-		
	22	✓	✓	-	-	-	-	-		
	23	✓	✓	-	-	-	-	-		
	24	O	-	-	-	-	-	-		
	25	O	✓	-	-	-	-	-		
	26	✓	✓	-	-	-	-	-		
	27	✓	✓	-	-	-	-	-		
	28	✓	✓	-	-	-	-	-		
	29	✓	✓	-	-	-	-	-		
	30	✓	✓	-	-	-	-	-		
	31	O	✓	-	-	-	-	-		
	32	✓	✓	-	-	-	-	-		
	33	✓	✓	-	-	-	-	-		
	34	✓	✓	-	-	-	-	-		
	35	✓	✓	-	-	-	-	-		
	36	✓	✓	-	-	-	-	-		

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA FAULK	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	01/23/2007	10/18/2007	08/14/2008	03/12/2009	12/07/2009	08/13/2010	06/06/2011		
	37	✓	✓	-	-	-	-	-		
	38	O	-	-	-	-	-	-		
	39	O	✓	-	-	-	-	-		
	40		✓	-	-	-	-	-		
	41		✓	✓	✓	✓	✓	✓		
	42		✓	-	-	-	-	-		
	43		✓	-	-	-	-	-		
	44			✓	✓	✓	✓	✓		
	45			✓	✓	✓	✓	✓		
	46			✓	✓	✓	✓	✓		
	47			✓	✓	✓	✓	✓		
	48			✓	✓	✓	✓	✓		
	49			✓	✓	✓	✓	✓		
	50			✓	✓	✓	✓	✓		
	51			✓	✓	✓	✓	✓		
	52			✓	✓	✓	✓	✓		
	53			✓	✓	✓	✓	✓		
	54			✓	✓	✓	✓	✓		
	55			✓	✓	✓	✓	✓		

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	2615

SEARCHED			
Class	Subclass	Date	Examiner
381	94.1,94.2,94.3,94.7,92	1/22/07	BTP
704	226,233	1/22/07	BTP
381	71.6,94.1,94.7,92,110	10/15/2007	DEF
704	226,233	10/18/2007	DEF
381	71.6,94.1,94.7	7/29/08, 8/14/08	DEF
704	226,233	7/29/08,8/14/08	DEF
381	71.7,94.1,94.7,110,92	3/12/09	DEF
381	71.6,94.1,94.7,110,92,111	12/7/09	DEF
381	71.6,94.1,94.7,110,92,11	6/1,3,18/11	DEF
704	226,233	6/1,3,18/11	DEF

SEARCH NOTES		
Search Notes	Date	Examiner
East Word Search	1/22/07	
Assignee/Inventor Search	10/16/2007,10/17/2007	DEF
word search	10/16/2007,10/17/2007	DEF
additonal search	7/29/08, 8/14/08	DEF
additional search	3/12/09	DEF
reviewed applicant's arguments/ applied same art to claims	8/13/10	DEF
additional search	6/1,3,18/11	DEF

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

	/DEVONA E FAULK/ Primary Examiner.Art Unit 2614

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L7	4351	(381/94.1-94.7,110,71.6,92,111,122).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2011/06/18 20:31
L8	2244	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2011/06/18 20:31
S1	150	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S3	850	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S4	641	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:27
S5	6	brennan.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/15 15:28
S6	6	("5136577" | "5329587" | "5544080" | "5887059" | "6070137" | "6487295").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/10/15 15:33
S7	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:22
S8	11	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/25 09:51
S9	1	("5406622").PN.	USPAT	OR	OFF	2007/10/16 10:24

S10	2	burnett.in. and microphone and (voice near2 activity) and ("15" near2 centimeters)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:38
S11	0	EP-1483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:37
S12	0	EP-2001483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S13	0	EP-483591-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S14	0	WO-20030906031-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:38
S15	0	WO-030906031-$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:39
S16	194	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress $3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 10:40
S17	33	"381"/$.ccls. and (voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:04
S18	7	"381"/$.ccls. and (voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (unidirectional)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:40
S19	1	burnett.in. and microphone and ((voice near2 activity) same (manual $2 near2 activat$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:20
S20	1	"381"/$.ccls. and (manuall$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:40

S21	1	"381"/$.ccls. and (manual$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:41
S22	3	(manual$3 near2 (operat$3 activat$3)) same (voice near2 activity near2 detect $3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:42
S23	10	(manual$3 near2 (operat$3 activat$3)) same (VAD)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:42
S24	2	"381"/$.ccls. and (voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) same (headset earphon$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:44
S25	7	"381"/$.ccls. and (voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (headset earphon$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:44
S26	5	burnett.in. and microphone and ((voice near2 activity) same subsystem)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 15:54
S27	35	("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.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/10/16 18:19
S28	1	(glottal near2 electromagnetic near2 sensor$1) with antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:22
S29	6	burnett.in. and microphone and (voice near2 activity) and glottal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 15:59

S30	12	(glottal near2 electromagnetic near2 micropower near2 sensor$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/16 18:22
S31	1	burnett.in. and microphone and (voice near2 activity) and (transceiver same headset)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:02
S32	1	burnett.in. and microphone and (voice near2 activity) and transceiver	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:02
S33	2	"381"/$.ccls. and (voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress$3)) and (transceiver)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:17
S34	29	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress $3)) and (transceiver)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:20
S35	6	(voice near2 activity near2 detect$3) same (noise near2 (reduct$3 suppress $3)) and (transceiver) and (headset headphone$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:20
S36	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:22
S37	1	S36 and headset	US-PGPUB; USPAT	OR	OFF	2007/10/17 16:23
S38	0	headset same transceiver same (voice near2 activity near2 detect3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:23
S39	0	(headset same transceiver) and (voice near2 activity near2 detect3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:24
S40	5	(headset same transceiver) and (voice near2 activity near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:24
S41	35	(headset same transceiver) and (noise near2 (suppress$3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 18:59

S42	1	(headset same transceiver) same (noise near2 (suppress$3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 16:25
S43	35	(headset same transceiver) and (noise near2 (suppress$3 reduct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/17 18:59
S44	1602	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/18 14:18
S45	1	burnett.in. and microphone and (voice near2 activity) and (angle same maximums)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2007/10/25 09:51
S46	173	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S47	923	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S48	1468	(381/92,111,122).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S49	1720	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S50	11	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S51	79	burnett.in. and microphone$1 and (voice)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 09:59
S52	12	burnett.in. and microphone$1 and (voice) and VAD	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 10:00

S53	6	burnett.in. and microphone$1 and (voice) and VAD and (correlat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/07/29 10:33
S54	8	brennan.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:09
S55	0	burnett.in. and VAD and (filterbank)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:11
S56	11	burnett.in. and microphone and array	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:12
S57	174	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S58	926	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S59	700	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S60	1729	(704/226,233).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:14
S61	0	S56 and vector near10 normal near10 mouth near10 user	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:42
S62	0	S56 and (vector near10 normal near10 mouth)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43
S63	0	S56 and (vector near10 (normal perpendicu$3) near10 mouth)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43

S64	3	S56 and (vector)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2008/08/14 10:43
S65	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:17
S66	4	S65 and $4direction$2	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:17
S67	1	S65 and uni	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:39
S68	1	S65 and omni	US-PGPUB; USPAT	OR	OFF	2009/03/12 23:39
S69	192	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/03/12 23:55
S70	990	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/03/12 23:55
S71	769	(381/92).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/03/12 23:55
S72	20	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/23 15:36
S73	20	burnett.in. and microphone and (voice near2 (detect$3 activity))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/23 15:45
S74	17	burnett.in. and microphone and (voice near2 detect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/23 15:45
S75	2	burnett.in. and microphone and (voice near2 activity) and ("15" near2 centimeters) and axis	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/30 16:06
S76	13	burnett.in. and microphone and (voice near2 (detect$3 activity)) and axis	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/11/30 16:07

S77	215	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/12/07 09:14
S78	1050	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/12/07 09:14
S79	1660	(381/92,111,122).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2009/12/07 09:14
S80	9	burnett.in. and (microphone near10 mouth) and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2010/08/13 14:25
S81	5	(("5473702") or ("5353376") or ("20030044025") or ("5590241") or ("6795713")).PN.	US-PGPUB; USPAT	OR	OFF	2010/08/13 15:05
S82	242	(381/71.6).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2010/08/13 15:46
S83	1128	(381/94.1,94.7,110).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2010/08/13 15:46
S93	27	burnett.in. and microphone and (voice near2 activity)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2011/06/01 11:02
S94	26	burnett.in. and microphone and (voice near2 activity) and $2nois$3 and frequency and speech	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2011/06/01 11:03
S95	19	burnett.in. and microphone and (voice near2 activity) and $2nois$3 and frequency and speech and angle	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2011/06/01 11:04
S96	237	"L3" and (toward$1 direct$2 away) near5 mouth	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2011/06/03 17:19

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1909	(704/226,233).CCLS.	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/18 19:42
L2	3533	(381/94.1-94.7,110,71.6,92,111,122).CCLS.	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/18 19:42
L3	11	L2 and ((microphone sensor) near5 toward$2 near5 mouth) and ((microphone sensor) near5 away near5 mouth)	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/18 19:43
L4	0	burnett.in. and microphone and (voice near2 activity) and denois$3 and (angle near5 (great$2 larg$2) near5 (zero "0"))	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/18 19:47
L5	2	burnett.in. and microphone and (voice near2 activity) and denois$3 and (angle near5 (zero "0"))	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/18 19:47
L6	0	L2 and ((microphone sensor) near5 toward$2 near5 mouth) and ((microphone sensor) near5 away near5 mouth) and (angle near5 (zero "0"))	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/18 19:52
S84	1851	(704/226,233).CCLS.	US-PGPUB; USPAT; UPAD	OR	OFF	2011/03/17 14:34
S85	3426	(381/94.1-94.7,110,71.6,92,111,122).CCLS.	US-PGPUB; USPAT; UPAD	OR	OFF	2011/03/17 14:34
S86	11	S85 and ((microphone sensor) near5 toward$2 near5 mouth) and ((microphone sensor) near5 away near5 mouth)	US-PGPUB; USPAT; UPAD	OR	OFF	2011/03/17 14:36
S87	2	S84 and ((microphone sensor) near5 toward$2 near5 mouth) and ((microphone sensor) near5 away near5 mouth)	US-PGPUB; USPAT; UPAD	OR	OFF	2011/03/17 14:36
S88	25	burnett.in. and microphone and (voice near2 activity) and denois$3	US-PGPUB; USPAT; UPAD	OR	OFF	2011/03/17 14:38
S89	8	petit.in. and microphone and (voice near2 activity) and denois$3	US-PGPUB; USPAT; UPAD	OR	OFF	2011/03/17 14:38

S90	4	asseily.in. and microphone and (voice near2 activity) and denois$3	US-PGPUB; USPAT; UPAD	OR	OFF	2011/03/17 14:38
S91	3	einaudi.in. and microphone and (voice near2 activity) and denois$3	US-PGPUB; USPAT; UPAD	OR	OFF	2011/03/17 14:39
S92	1	aliphcom.AS. and microphone and (voice near2 activity) and denois$3	US-PGPUB; USPAT; UPAD	OR	OFF	2011/03/17 14:39
S97	1897	(704/226,233).CCLS.	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/03 17:17
S98	3513	(381/94.1-94.7,110,71.6,92,111,122).CCLS.	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/03 17:17
S99	1	("5473702").PN.	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/03 17:17
S100	141	"L3" and (toward$1 direct$2 away) near5 mouth	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/03 17:19
S101	0	S99 and (toward$1 direct$2 away) near5 mouth	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/03 17:20
S102	35	S97 and (toward$1 direct$2 away) near5 mouth	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/03 17:20
S103	94	S98 and (microphone sensor) near10 (toward$1 direct$2 away) near5 mouth	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/03 17:20
S104	24	S97 and (microphone sensor) near10 (toward$1 direct$2 away) near5 mouth	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/03 17:20
S105	15	S104 and subtract$3	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/03 17:28
S106	3513	(381/94.1-94.7,110,71.6,92,111,122).CCLS.	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/03 18:36

S107	0	S106 and (calculat$3 determin$3) near10 noise near10 (each every) near10 subband near10 (voice speech)	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/03 18:36
S108	1897	(704/226,233).CCLS.	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/03 18:36
S109	0	S108 and (calculat$3 determin$3) near10 noise near10 (each every) near10 subband near10 (voice speech)	US-PGPUB; USPAT; UPAD	OR	OFF	2011/06/03 18:36

6/18/2011 8:32:11 PM
C:\Documents and Settings\dfaulk\My Documents\EAST\Workspaces\10400282.wsp

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
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 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		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.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/96 (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.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Gregory C. Burnett; Nicolas J. Petit; Alexander M. Asseily; Andrew E. Einaudi

Application No./Patent No.: 10/400,282 Filed/Issue Date: March 27, 2003

Titled: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS

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 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 013928, Frame 0808, 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).

☒ 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.**

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 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.

Electronic Acknowledgement Receipt

EFS ID:	11517026
Application Number:	10400282
International Application Number:	
Confirmation Number:	1397
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	98195
Filer:	Scott Susumu Kokka
Filer Authorized By:	
Attorney Docket Number:	ALPH.P020
Receipt Date:	30-NOV-2011
Filing Date:	27-MAR-2003
Time Stamp:	23:59:22
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-049_GPOA_and_Stmt_37C FR373b_asfiled.pdf	925881 d31e0abe1109677fe087fe01016ce862a593 f4cd	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):	925881	

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.

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	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/400,282	03/27/2003	Gregory C. Burnett	ALPH.P020

CONFIRMATION NO. 1397

15516
Kokka & Backus, PC
703 Hight Street
Palo Alto, CA 94301

POA ACCEPTANCE LETTER

OC000000051341599

Date Mailed: 12/13/2011

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

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	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/400,282	03/27/2003	Gregory C. Burnett	ALPH.P020

CONFIRMATION NO. 1397

98195
Gregory & Sawrie LLP
2018 Bissonnet Street
Houston, TX 77005

POWER OF ATTORNEY NOTICE

OC000000051341584

Date Mailed: 12/13/2011

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of: Burnett et al. Application Serial No.: 10/400,282 Filing Date: March 27, 2003 For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS	Confirmation No.: 1397 Examiner: FAULK, Devona E. Group Art Unit: 2614 Date: December 21, 2011 Atty. Docket No.: ALI-049

CERTIFICATE OF TRANSMISSION

I hereby certify that this correspondence is being deposited via EFS-Web with the United States Patent and Trademark Office on December 21, 2011.
Signed: K. Cleland
Kate M. Cleland

AMENDMENT G

Dear Sir or Madam:

Please find enclosed a complete, updated claim listing and remarks in response to the Office Action mailed June 23, 2011.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of: Burnett et al. Application Serial No.: 10/400,282 Filing Date: March 27, 2003 For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS	Confirmation No.: 1397 Examiner: FAULK, Devona E. Group Art Unit: 2614 Date: December 21, 2011 Atty. Docket No.: ALI-049

CERTIFICATE OF TRANSMISSION

I hereby certify that this correspondence is being deposited via EFS-Web with the United States Patent and Trademark Office on December 21, 2011.
Signed: K. Cleland
Kate M. Cleland

AMENDMENT G

Dear Sir or Madam:

Please find enclosed a complete, updated claim listing and remarks in response to the Office Action mailed June 23, 2011.

REMARKS

Claims 1, 5, 6 and 41 have been amended to clarify the subject matter regarded as the invention. Claims 2-3, 7-8, 18-40 and 42-43 have been canceled. Claims 1, 4-6, 9-17, 41 and 44-55 remain pending.

The Examiner has rejected claims 1, 4, 6, 7 and 9 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,473,702 to Yoshida et al. (hereinafter "Yoshida") in view of U.S. Patent No. 6,963,649 to Vaudrey et al. (hereinafter "Vaudrey"). Claims 49-55 were rejected under 35 U.S.C. §103(a) as being unpatentable over Yoshida in view of Vaudrey in further view of U.S. Patent Publication No. 2003/0044025 to Ouyang et al. (hereinafter "Ouyang"). Claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Vaudrey in further view of U.S. Patent No. 5,590,241 to Park et al. (hereinafter "Park"). Claims 10-17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Vaudrey in further view of U.S. Patent No. 6,795,713 to Housni (hereinafter "Housni"). Claim 41 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Vaudrey in further view of U.S. Patent No. 6,980,092 to Turnbull et al. (hereinafter "Turnbull"). Claims 44-48 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Vaudrey in further view of U.S. Patent No. 5,353,376 to Oh et al. (hereinafter "Oh").

The rejections are respectfully traversed. As amended, claim 1 recites "… wherein the voice detection subsystem is configured to receive the voice activity signals using a sensor independent from the microphone array and to output the control signals generated from the voice activity signals to the denoising system, the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array." Neither Yoshida, Vaudrey,

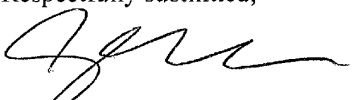
Ouyang, Park, Housni, Turnbull nor Oh describe, disclose, teach, suggest, or motivate "... wherein the voice detection subsystem is configured to receive the voice activity signals using a sensor independent from the microphone array and to output the control signals generated from the voice activity signals to the denoising system, the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array." Thus, Applicants submit that claim 1 is allowable for the reasons stated above.

Claims 4-6 and 9-17 depend from claim 1 and are believed to be allowable for the same reasons described above.

Claim 41 has been amended similarly and is believed to be allowable for the same reasons as described above. Claims 44-55 depend from claim 1 and also are believed to be allowable for the same reasons described above.

Reconsideration of the application and allowance of all claims are respectfully requested based on the preceding remarks. If at any time the Examiner believes that an interview would be helpful, please contact the undersigned.

Respectfully submitted,



Chien-Ju Alice Chuang
Reg. No. 65,914

KOKKA & BACKUS, PC
703 High Street
Palo Alto, CA 94301-2447
Tel: (650) 585-2359
Fax: (650) 566-9922

Electronic Patent Application Fee Transmittal

Application Number:	10400282
Filing Date:	27-Mar-2003
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Chien-Ju Alice Chuang/Kate Cleland
Attorney Docket Number:	ALI-049

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	1270	1270

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
		Total in USD ($)		**1270**

Electronic Acknowledgement Receipt

EFS ID:	11684016
Application Number:	10400282
International Application Number:	
Confirmation Number:	1397
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	15516
Filer:	Chien-Ju Alice Chuang
Filer Authorized By:	
Attorney Docket Number:	ALI-049
Receipt Date:	21-DEC-2011
Filing Date:	27-MAR-2003
Time Stamp:	21:51:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1270
RAM confirmation Number	9715
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/Req. Reconsideration-After Non-Final Reject	ALI-049_Amendment_G_asfiled.pdf	1858324 b2929dc9e248928a19c1295309c10796291ac729	no	10
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30320 137d6eb601d49e85fe3a10c1c2309e4edd167f74	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1888644		

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/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 10/400,282	Filing Date 03/27/2003	☐ To be Mailed

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	0		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	0		TOTAL	

APPLICATION AS AMENDED – PART II

		(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT	12/21/2011	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 11	Minus	** 40	= 0	X $30 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 1	Minus	***7	= 0	X $125 =	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:
/GLORIA TRAMMELL/

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.

CLAIM LISTING

Please cancel claim 7, and amend claims 1, 5, 6 and 41, as indicated below.

1. (Currently amended) A communications system, comprising:

a voice detection subsystem ~~receiving~~configured to receive voice activity signals that includes information [[of]]associated with human voicing activity, the voice detection subsystem configured to ~~and~~ automatically ~~generating~~generate control signals using ~~information of~~ the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth ~~of a user~~, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise,

wherein the voice detection subsystem is configured to receive the voice activity signals using a sensor independent from the microphone array and to output the control signals

generated from the voice activity signals to the denoising system, the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array.

2. – 3. (Canceled)

4. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.

5. (Currently amended) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one accelerometer sensor in contact with skin ~~of a user~~ for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.

6. (Currently amended) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one skin-surface microphone sensor in contact with skin ~~of a user~~ for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.

7. – 8. (Canceled)

9. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals.

10. (Previously presented) The system of claim 1, further including a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

11. (Previously presented) The system of claim 10, wherein the portable handset includes at least one of the voice detection subsystem and the denoising subsystem.

12. (Previously presented) The system of claim 1, further including a portable headset that includes the microphones along with at least one speaker device.

13. (Previously presented) The system of claim 12, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

14. (Previously presented) The system of claim 13, wherein the portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings.

15. (Previously presented) The system of claim 13, wherein the communication device includes at least one of the voice detection subsystem and the denoising subsystem.

16. (Previously presented) The system of claim 12, wherein the portable headset includes at least one of the voice detection subsystem and the denoising subsystem.

17. (Previously presented) The system of claim 12, wherein the portable headset is a portable communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

18. – 40. (Canceled)

Meta Platforms, Inc. - Exhibit 1002
Page 588 of 686

41. (Currently amended) A communications system, comprising:

a voice detection subsystem ~~receiving~~configured to receive voice activity signals that include information [[of]]associated with human voicing activity, the voice detection subsystem configured to ~~and~~ automatically ~~generating~~generate control signals using ~~information of~~ the voice activity signals;

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth ~~of a user~~, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise,

wherein the voice detection subsystem is configured to receive the voice activity signals using a sensor independent from the microphone array and to output the control signals generated from the voice activity signals to the denoising system, the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array; and

a portable headset comprising the plurality of microphones and at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

42. – 43. (Canceled)

44. (Previously presented) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is a unidirectional microphone.

45. (Previously presented) The system of claim 44, wherein the first microphone and the second microphone are separated by a distance in a range of approximately zero (0) centimeters to 15 centimeters.

46. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and less than 180 degrees.

47. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and less than 135 degrees.

48. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and greater than 90 degrees.

49. (Previously presented) The system of claim 1, wherein the first microphone is an omnidirectional microphone and the second microphone is a unidirectional microphone.

50. (Previously presented) The system of claim 49, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

51. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 30 degrees to 180 degrees.

52. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 60 degrees to 180 degrees.

53. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 90 degrees to 180 degrees.

54. (Previously presented) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is an omnidirectional microphone.

55. (Previously presented) The system of claim 54, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

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.
10/400,282	03/27/2003	Gregory C. Burnett	ALI-049	1397

15516 7590 03/20/2012

Kokka & Backus, PC
703 Hight Street
Palo Alto, CA 94301

EXAMINER	
FAULK, DEVONA E	
ART UNIT	PAPER NUMBER
2614	
MAIL DATE	DELIVERY MODE
03/20/2012	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.

Notice of Non-Compliant Amendment (37 CFR 1.121)	Application No.	Applicant(s)
	10/400,282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA FAULK	2614

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

The amendment document filed on *12/21/11* is considered non-compliant because it has failed to meet the requirements of 37 CFR 1.121 or 1.4. In order for the amendment document to be compliant, correction of the following item(s) is required.

THE FOLLOWING MARKED (X) ITEM(S) CAUSE THE AMENDMENT DOCUMENT TO BE NON-COMPLIANT:

- ☐ 1. Amendments to the specification:
  - ☐ A. Amended paragraph(s) do not include markings.
  - ☐ B. New paragraph(s) should not be underlined.
  - ☐ C. Other _____.
- ☐ 2. Abstract:
  - ☐ A. Not presented on a separate sheet. 37 CFR 1.72.
  - ☐ B. Other _____.
- ☐ 3. Amendments to the drawings:
  - ☐ A. The drawings are not properly identified in the top margin as "Replacement Sheet," "New Sheet," or "Annotated Sheet" as required by 37 CFR 1.121(d).
  - ☐ B. The practice of submitting proposed drawing correction has been eliminated. Replacement drawings showing amended figures, without markings, in compliance with 37 CFR 1.84 are required.
  - ☐ C. Other _____.
- ☒ 4. Amendments to the claims:
  - ☒ A. A complete listing of all of the claims is not present.
  - ☒ B. The listing of claims does not include the text of all pending claims (including withdrawn claims)
  - ☒ C. Each claim has not been provided with the proper status identifier, and as such, the individual status of each claim cannot be identified. Note: the status of every claim must be indicated after its claim number by using one of the following status identifiers: (Original), (Currently amended), (Canceled), (Previously presented), (New), (Not entered), (Withdrawn) and (Withdrawn-currently amended).
  - ☐ D. The claims of this amendment paper have not been presented in ascending numerical order.
  - ☒ E. Other: *Claims 41-55 are not presented. The examiner is not clear as to the status of those claims*.
- ☐ 5. Other (e.g., the amendment is unsigned or not signed in accordance with 37 CFR 1.4):

_____

For further explanation of the amendment format required by 37 CFR 1.121, see MPEP § 714.

TIME PERIODS FOR FILING A REPLY TO THIS NOTICE:

1. Applicant is given **no new time period** if the non-compliant amendment is an after-final amendment or an amendment filed after allowance. If applicant wishes to resubmit the non-compliant after-final amendment with corrections, the **entire corrected amendment** must be resubmitted.

2. Applicant is given **one month**, or thirty (30) days, whichever is longer, from the mail date of this notice to supply the correction, if the non-compliant amendment is one of the following: a preliminary amendment, a non-final amendment (including a submission for a request for continued examination (RCE) under 37 CFR 1.114), a supplemental amendment filed within a suspension period under 37 CFR 1.103(a) or (c), and an amendment filed in response to a *Quayle* action. If any of above boxes 1. to 4. are checked, the correction required is only the **corrected section** of the non-compliant amendment in compliance with 37 CFR 1.121.

   Extensions of time are available under 37 CFR 1.136(a) only if the non-compliant amendment is a non-final amendment or an amendment filed in response to a *Quayle* action.

   Failure to timely respond to this notice will result in:
   Abandonment of the application if the non-compliant amendment is a non-final amendment or an amendment filed in response to a *Quayle* action; or
   Non-entry of the amendment if the non-compliant amendment is a preliminary amendment or supplemental amendment.

/Devona E. Faulk/ Primary Examiner, Art Unit 2614	

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for:	Confirmation No.: 1397
Burnett et al.	Examiner: FAULK, Devona E.
Serial No.: 10/400,282	Group Art Unit: 2614
Filing Date: March 27, 2003	Transmission Date: April 20, 2012
For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS	

Certificate of Transmission
I hereby certify that this correspondence is being transmitted via the U.S. Patent and Trademark electronic filing system (EFS-Web) to the USPTO on **April 20, 2012**.

Signed: K. Cleland
Kate M. Cleland

RESPONSE TO NOTICE OF NON-COMPLIANT AMENDMENT

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

Dear Sir or Madam:

In Response to the *Notice of Non-Compliant Amendment*, mailed March 20, 2012, Applicant respectfully submits that the *Notice of Non-Compliant Amendment* was erroneously issued because a complete *Amendment G* was filed on December 21, 2011 ("*Amendment G*") via the U.S. Patent and Trademark Office (USPTO) electronic filing system (EFS-Web) with EFS-ID 11684016, including a complete listing of claims, the text of all pending claims, and the proper status identifier for each claim, in compliance with 37 CFR § 1.121. More specifically, claims 41-55 were presented on pages 6 to 8 of *Amendment G*. A complete copy of *Amendment G* is available on the USPTO Patent Application Information Retrieval (PAIR) system online, with a posted "Mail Room Date" of December 21, 2011. A copy of *Amendment G* also is re-submitted herewith. A copy of the *Notice* is also submitted herewith.

Please contact the undersigned representative below if you have any further questions or require any additional information.

Respectfully submitted,



Chien-Ju Alice Chuang
Reg. No. 65,914

KOKKA & BACKUS, PC
703 High Street
Palo Alto, CA 94301
Telephone: (650) 585-2359
Facsimile: (650) 566-9922

Electronic Acknowledgement Receipt	
EFS ID:	11684016
Application Number:	10400282
International Application Number:	
Confirmation Number:	1397
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	15516
Filer:	Chien-Ju Alice Chuang
Filer Authorized By:	
Attorney Docket Number:	ALI-049
Receipt Date:	21-DEC-2011
Filing Date:	27-MAR-2003
Time Stamp:	21:51:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1270
RAM confirmation Number	9715
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/Req. Reconsideration-After Non-Final Reject	ALI-049_Amendment_G_asfiled.pdf	1858324 b2929dc9e248928a19c1295309c10796291ac729	no	10
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30320 137d6eb601d49e85fe3a10c1c2309e4edd167f74	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1888644		

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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of: Burnett et al.	Confirmation No.: 1397
Application Serial No.: 10/400,282	Examiner: FAULK, Devona E.
Filing Date: March 27, 2003	Group Art Unit: 2614
For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS	Date: December 21, 2011 Atty. Docket No.: ALI-049

CERTIFICATE OF TRANSMISSION

I hereby certify that this correspondence is being deposited via EFS-Web with the United States Patent and Trademark Office on December 21, 2011.
Signed: K. Cleland
Kate M. Cleland

AMENDMENT G

Dear Sir or Madam:

Please find enclosed a complete, updated claim listing and remarks in response to the Office Action mailed June 23, 2011.

CLAIM LISTING

Please cancel claim 7, and amend claims 1, 5, 6 and 41, as indicated below.

1. (Currently amended) A communications system, comprising:

a voice detection subsystem ~~receiving~~configured to receive voice activity signals that includes information [[of]]associated with human voicing activity, the voice detection subsystem configured to ~~and~~ automatically ~~generating~~generate control signals using ~~information of~~ the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth ~~of a user~~, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise,

wherein the voice detection subsystem is configured to receive the voice activity signals using a sensor independent from the microphone array and to output the control signals

generated from the voice activity signals to the denoising system, the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array.

2. – 3. (Canceled)

4. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.

5. (Currently amended) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one accelerometer sensor in contact with skin ~~of a user~~ for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.

6. (Currently amended) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one skin-surface microphone sensor in contact with skin ~~of a user~~ for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.

7. – 8. (Canceled)

9. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals.

10. (Previously presented) The system of claim 1, further including a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

11. (Previously presented) The system of claim 10, wherein the portable handset includes at least one of the voice detection subsystem and the denoising subsystem.

12. (Previously presented) The system of claim 1, further including a portable headset that includes the microphones along with at least one speaker device.

13. (Previously presented) The system of claim 12, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

14. (Previously presented) The system of claim 13, wherein the portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings.

15. (Previously presented) The system of claim 13, wherein the communication device includes at least one of the voice detection subsystem and the denoising subsystem.

16. (Previously presented) The system of claim 12, wherein the portable headset includes at least one of the voice detection subsystem and the denoising subsystem.

17. (Previously presented) The system of claim 12, wherein the portable headset is a portable communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

18. – 40. (Canceled)

41. (Currently amended) A communications system, comprising:

a voice detection subsystem ~~receiving~~configured to receive voice activity signals that include information [[of]]associated with human voicing activity, the voice detection subsystem configured to ~~and~~ automatically ~~generating~~generate control signals using ~~information of~~ the voice activity signals;

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth ~~of a user~~, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise,

wherein the voice detection subsystem is configured to receive the voice activity signals using a sensor independent from the microphone array and to output the control signals generated from the voice activity signals to the denoising system, the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array; and

a portable headset comprising the plurality of microphones and at least one speaker device, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

42. – 43. (Canceled)

44. (Previously presented) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is a unidirectional microphone.

45. (Previously presented) The system of claim 44, wherein the first microphone and the second microphone are separated by a distance in a range of approximately zero (0) centimeters to 15 centimeters.

46. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and less than 180 degrees.

47. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and less than 135 degrees.

48. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and greater than 90 degrees.

49. (Previously presented) The system of claim 1, wherein the first microphone is an omnidirectional microphone and the second microphone is a unidirectional microphone.

50. (Previously presented) The system of claim 49, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

51. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 30 degrees to 180 degrees.

52. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 60 degrees to 180 degrees.

53. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 90 degrees to 180 degrees.

54. (Previously presented) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is an omnidirectional microphone.

55. (Previously presented) The system of claim 54, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

REMARKS

Claims 1, 5, 6 and 41 have been amended to clarify the subject matter regarded as the invention. Claims 2-3, 7-8, 18-40 and 42-43 have been canceled. Claims 1, 4-6, 9-17, 41 and 44-55 remain pending.

The Examiner has rejected claims 1, 4, 6, 7 and 9 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,473,702 to Yoshida et al. (hereinafter "Yoshida") in view of U.S. Patent No. 6,963,649 to Vaudrey et al. (hereinafter "Vaudrey"). Claims 49-55 were rejected under 35 U.S.C. §103(a) as being unpatentable over Yoshida in view of Vaudrey in further view of U.S. Patent Publication No. 2003/0044025 to Ouyang et al. (hereinafter "Ouyang"). Claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Vaudrey in further view of U.S. Patent No. 5,590,241 to Park et al. (hereinafter "Park"). Claims 10-17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Vaudrey in further view of U.S. Patent No. 6,795,713 to Housni (hereinafter "Housni"). Claim 41 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Vaudrey in further view of U.S. Patent No. 6,980,092 to Turnbull et al. (hereinafter "Turnbull"). Claims 44-48 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of Vaudrey in further view of U.S. Patent No. 5,353,376 to Oh et al. (hereinafter "Oh").

The rejections are respectfully traversed. As amended, claim 1 recites "... wherein the voice detection subsystem is configured to receive the voice activity signals using a sensor independent from the microphone array and to output the control signals generated from the voice activity signals to the denoising system, the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array." Neither Yoshida, Vaudrey,

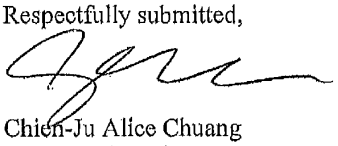
Ouyang, Park, Housni, Turnbull nor Oh describe, disclose, teach, suggest, or motivate "... wherein the voice detection subsystem is configured to receive the voice activity signals using a sensor independent from the microphone array and to output the control signals generated from the voice activity signals to the denoising system, the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array." Thus, Applicants submit that claim 1 is allowable for the reasons stated above.

Claims 4-6 and 9-17 depend from claim 1 and are believed to be allowable for the same reasons described above.

Claim 41 has been amended similarly and is believed to be allowable for the same reasons as described above. Claims 44-55 depend from claim 1 and also are believed to be allowable for the same reasons described above.

Reconsideration of the application and allowance of all claims are respectfully requested based on the preceding remarks. If at any time the Examiner believes that an interview would be helpful, please contact the undersigned.

Respectfully submitted,



Chien-Ju Alice Chuang
Reg. No. 65,914

KOKKA & BACKUS, PC
703 High Street
Palo Alto, CA 94301-2447
Tel: (650) 585-2359
Fax: (650) 566-9922

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.
10/400,282	03/27/2003	Gregory C. Burnett	ALI-049	1397

15516 7590 03/20/2012

Kokka & Backus, PC
703 Hight Street
Palo Alto, CA 94301

EXAMINER	
FAULK, DEVONA E	
ART UNIT	**PAPER NUMBER**
2614	
MAIL DATE	**DELIVERY MODE**
03/20/2012	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.

Notice of Non-Compliant Amendment (37 CFR 1.121)	Application No. 10/400,282	Applicant(s) BURNETT ET AL.
	Examiner DEVONA FAULK	Art Unit 2614

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

The amendment document filed on *12/21/11* is considered non-compliant because it has failed to meet the requirements of 37 CFR 1.121 or 1.4. In order for the amendment document to be compliant, correction of the following item(s) is required.

THE FOLLOWING MARKED (X) ITEM(S) CAUSE THE AMENDMENT DOCUMENT TO BE NON-COMPLIANT:

- ☐ 1. Amendments to the specification:
  - ☐ A. Amended paragraph(s) do not include markings.
  - ☐ B. New paragraph(s) should not be underlined.
  - ☐ C. Other _____.
- ☐ 2. Abstract:
  - ☐ A. Not presented on a separate sheet. 37 CFR 1.72.
  - ☐ B. Other _____.
- ☐ 3. Amendments to the drawings:
  - ☐ A. The drawings are not properly identified in the top margin as "Replacement Sheet," "New Sheet," or "Annotated Sheet" as required by 37 CFR 1.121(d).
  - ☐ B. The practice of submitting proposed drawing correction has been eliminated. Replacement drawings showing amended figures, without markings, in compliance with 37 CFR 1.84 are required.
  - ☐ C. Other _____.
- ☒ 4. Amendments to the claims:
  - ☒ A. A complete listing of all of the claims is not present.
  - ☒ B. The listing of claims does not include the text of all pending claims (including withdrawn claims)
  - ☒ C. Each claim has not been provided with the proper status identifier, and as such, the individual status of each claim cannot be identified. Note: the status of every claim must be indicated after its claim number by using one of the following status identifiers: (Original), (Currently amended), (Canceled), (Previously presented), (New), (Not entered), (Withdrawn) and (Withdrawn-currently amended).
  - ☐ D. The claims of this amendment paper have not been presented in ascending numerical order.
  - ☒ E. Other: *Claims 41-55 are not presented. The examiner is not clear as to the status of those claims*.
- ☐ 5. Other (e.g., the amendment is unsigned or not signed in accordance with 37 CFR 1.4):

For further explanation of the amendment format required by 37 CFR 1.121, see MPEP § 714.

TIME PERIODS FOR FILING A REPLY TO THIS NOTICE:

1. Applicant is given **no new time period** if the non-compliant amendment is an after-final amendment or an amendment filed after allowance. If applicant wishes to resubmit the non-compliant after-final amendment with corrections, the **entire corrected amendment** must be resubmitted.
2. Applicant is given **one month**, or thirty (30) days, whichever is longer, from the mail date of this notice to supply the correction, if the non-compliant amendment is one of the following: a preliminary amendment, a non-final amendment (including a submission for a request for continued examination (RCE) under 37 CFR 1.114), a supplemental amendment filed within a suspension period under 37 CFR 1.103(a) or (c), and an amendment filed in response to a *Quayle* action. If any of above boxes 1. to 4. are checked, the correction required is only the **corrected section** of the non-compliant amendment in compliance with 37 CFR 1.121.

   Extensions of time are available under 37 CFR 1.136(a) only if the non-compliant amendment is a non-final amendment or an amendment filed in response to a *Quayle* action.

   Failure to timely respond to this notice will result in:
   Abandonment of the application if the non-compliant amendment is a non-final amendment or an amendment filed in response to a *Quayle* action; or
   Non-entry of the amendment if the non-compliant amendment is a preliminary amendment or supplemental amendment.

/Devona E. Faulk/ Primary Examiner, Art Unit 2614	

Electronic Acknowledgement Receipt

EFS ID:	12593656
Application Number:	10400282
International Application Number:	
Confirmation Number:	1397
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	15516
Filer:	Chien-Ju Alice Chuang
Filer Authorized By:	
Attorney Docket Number:	ALI-049
Receipt Date:	20-APR-2012
Filing Date:	27-MAR-2003
Time Stamp:	19:03:26
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	Transmittal Letter	ALI-049_Response_to_Notice_asfiled.pdf	1962791 c3f25484c995769c60aa213ba9d277069f1b93d9	no	16

Warnings:	
Information:	

Total Files Size (in bytes):	1962791

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/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 10/400,282	Filing Date 03/27/2003	☐ To be Mailed

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

AMENDMENT	04/20/2012	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 13	Minus	** 40	= 0	X $30 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 1	Minus	***7	= 0	X $125 =	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	

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) 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:
/CHERYL CLARK/

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.

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.
10/400,282	03/27/2003	Gregory C. Burnett	ALI-049	1397

15516 7590 08/14/2012

Kokka & Backus, PC
703 High Street
Palo Alto, CA 94301

EXAMINER	
FAULK, DEVONA E	
ART UNIT	PAPER NUMBER
2614	
MAIL DATE	DELIVERY MODE
08/14/2012	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)	
	10/400,282	BURNETT ET AL.	
	Examiner	Art Unit	
	DEVONA FAULK	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 *21 December 2011*.

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

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ 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

5)☒ Claim(s) *1,4-7,9-17,41 and 44-55* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1,4-7,9-17,41 and 44-55* is/are rejected.

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

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

Application Papers

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

11)☒ The drawing(s) filed on *7/25/07* 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).

12)☐ 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

13)☐ 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

Response to Arguments

1. Applicant's arguments, regarding the newly recite claim language, filed 12/21/11, with respect to the rejection(s) of claim(s) , 1,4-7,9-17,41 and 44-55 under 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.

2. The examiner has determined that a double patent rejection is warranted. Claims 2,3,8,18-40,42-43 are cancelled.

3. The applicant's representative is welcome to contact the examiner to see if prosecution can be expedited.

Double Patenting

4. 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. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *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) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

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).

5. Claim 1 is provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of copending Application No. 10/301237. Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims are similar in scope. .

6. Claim 1 is provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1,22-24 of copending Application No. 12/163647. Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims are similar in scope.

7. Claim 1 is provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1,12,28 and 34 of copending Application No. 12/123364. Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims are similar in scope.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

10/400282	10/301237	12/163647	121/123364
!. (Currently amended) A communications system, comprising: a voice detection subsystem configured to receive voice activity signals that includes information associated with human voicing activity, the voice detection subsystem configured to automatically generate control signals using ~~information~~ of the voice activity signals; and a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is :fixed at a first position relative	1. A method for removing noise from electronic signals, comprising: receiving a plurality of acoustic signals in a first receiving device; receiving a plurality of acoustic signals in a second receiving device, wherein the plurality of acoustic signals include at least one noise signal generated by at least one noise source and at least one voice signal generated by at least one signal source, wherein the at least one signal source comprises a human speaker, and wherein relative locations of the signal source, the first receiving device, and the second receiving device are fixed and known; receiving physiological information associated with human voicing activity of the	1. A device comprising: a headset including a housing; a loudspeaker connected to the housing; a first **microphone** connected to a first side of the housing; a second **microphone** connected to a second side of the housing; and a vent cavity in an interior region of the housing, the vent cavity forming a common rear port of the first **microphone** and the second **microphone** and having a volume that is small relative to a wavelength of acoustic signals received by the first and second microphones. 22. The device of claim 1, comprising a processing component coupled to the first **microphone** and	1. A device comprising: a boom having two receptacles that define an axis; a first **microphone** connected to the boom, the first **microphone** having a first vector normal to a front of the first **microphone,** the first vector approximately parallel with the axis; and a second **microphone** connected to the boom and positioned a first distance from the first **microphone,** the second **microphone** having a second vector normal to a front of the second **microphone,** wherein the second vector forms an angle relative to the first vector. 12. A device comprising: a headset including at least one loudspeaker,

to a mouth, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position [brms an angle relative to the first position, wherein the angle is greater than zero degrees, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals	human speaker, including whether voice activity is present; generating at least one first transfer function representative of the plurality of acoustic noise signals upon determining that voicing activity is absent from the plurality of acoustic signals for at least one specified period; 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 data stream.	the second **microphone**. 23. The device of claim 22, comprising a **voice activity** detector (VAD) coupled to the processing component, the VAD generating **voice activity** signals. 24. The device of claim 22, comprising an adaptive noise removal application coupled to the processing component, the adaptive noise removal application receiving signals from the first and second microphones and generating the output signals.	wherein the headset attaches to a region of a human head; and a **microphone** array connected to the headset, the **microphone** array including a first **microphone** and a second **microphone**, the first **microphone** having a first vector normal to a front of the first **microphone**, the first vector defining an axis, and the second **microphone** positioned a first distance from the first **microphone**, the second **microphone** having a second vector normal to a front of the second **microphone**, wherein the second vector forms an angle relative to the first vector. 28. A device comprising: a first **microphone** having a first vector normal to a front of the first **microphone**, the first vector approximately parallel with an axis oriented in a

using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise~ wherein the voice detection subsystem is configured to receive the voice activity signals using a sensor independent from the microphone array and to output the control signals generated from the voice activity signals to the denoising system~ the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array.			direction toward a mouth of a speaker, wherein the first **microphone** is positioned a first distance from the mouth; and a second **microphone** positioned a second distance from the first **microphone**, the second **microphone** having a second vector normal to a front of the second **microphone**, wherein the second vector forms an angle relative to the first vector, wherein the angle is in a range of approximately zero (0) degrees to 45 degrees. 34. A system comprising: a first **microphone** having a first vector normal to a front of the first **microphone**, the first vector approximately parallel with an axis oriented in a direction toward a mouth of a speaker, wherein the first **microphone** is positioned a first distance from the

			mouth; a second microphone positioned a second distance from the first microphone, the second microphone having a second vector normal to a front of the second microphone, wherein the second vector forms an angle relative to the first vector, wherein the angle is in a range of approximately zero (0) degrees to 45 degrees; and an adaptive noise removal application receiving acoustic signals from the first microphone and the second microphone and generating an output signal, wherein the output signal is a denoised acoustic signal

Allowable Subject Matter

8. The remaining claims would be allowable once the double patent rejection is addressed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DEVONA FAULK whose telephone number is (571)272-7515. The examiner can normally be reached on 8 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on 571-272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Devona E. Faulk/
Primary Examiner, Art Unit 2614

Notice of References Cited	Application/Control No. 10/400,282	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner DEVONA FAULK	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-5,473,702	12-1995	Yoshida et al.	381/94.7
*	B	US-6,963,649	11-2005	Vaudrey et al.	381/94.7
*	C	US-5,353,376	10-1994	Oh et al.	704/233
*	D	US-5,590,241	12-1996	Park et al.	704/227
*	E	US-6,795,713	09-2004	Housni, Jamal	455/550.1
*	F	US-6,980,092	12-2005	Turnbull et al.	340/425.5
*	G	US-2003/0044025	03-2003	Ouyang et al.	381/92
	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
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA FAULK	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	01/23/2007	10/18/2007	08/14/2008	03/12/2009	12/07/2009	08/13/2010	06/06/2011	03/15/2012	
	1	✓	✓	✓	✓	✓	✓	✓	✓	
	2	✓	✓	-	-	-	-	-	-	
	3	✓	✓	-	-	-	-	-	-	
	4	✓	✓	✓	✓	✓	✓	✓	✓	
	5	✓	✓	✓	✓	✓	✓	✓	✓	
	6	✓	✓	✓	✓	✓	✓	✓	✓	
	7	✓	✓	✓	✓	✓	✓	-	-	
	8	O	-	-	-	-	-	-	-	
	9	O	✓	✓	✓	✓	✓	✓	✓	
	10	✓	✓	✓	✓	✓	✓	✓	✓	
	11	✓	✓	✓	✓	✓	✓	✓	✓	
	12	✓	✓	✓	✓	✓	✓	✓	✓	
	13	✓	✓	✓	✓	✓	✓	✓	✓	
	14	✓	✓	✓	✓	✓	✓	✓	✓	
	15	O	✓	✓	✓	✓	✓	✓	✓	
	16	✓	✓	✓	✓	✓	✓	✓	✓	
	17	✓	✓	✓	✓	✓	✓	✓	✓	
	18	✓	✓	-	-	-	-	-	✓	
	19	✓	✓	-	-	-	-	-	✓	
	20	✓	✓	-	-	-	-	-	✓	
	21	✓	✓	-	-	-	-	-	✓	
	22	✓	✓	-	-	-	-	-	✓	
	23	✓	✓	-	-	-	-	-	✓	
	24	O	-	-	-	-	-	-	✓	
	25	O	✓	-	-	-	-	-	✓	
	26	✓	✓	-	-	-	-	-	✓	
	27	✓	✓	-	-	-	-	-	✓	
	28	✓	✓	-	-	-	-	-	✓	
	29	✓	✓	-	-	-	-	-	✓	
	30	✓	✓	-	-	-	-	-	✓	
	31	O	✓	-	-	-	-	-	✓	
	32	✓	✓	-	-	-	-	-	✓	
	33	✓	✓	-	-	-	-	-	✓	
	34	✓	✓	-	-	-	-	-	✓	
	35	✓	✓	-	-	-	-	-	✓	
	36	✓	✓	-	-	-	-	-	✓	

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA FAULK	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	01/23/2007	10/18/2007	08/14/2008	03/12/2009	12/07/2009	08/13/2010	06/06/2011	03/15/2012	
	37	✓	✓	-	-	-	-	-	✓	
	38	O	-	-	-	-	-	-	✓	
	39	O	✓	-	-	-	-	-	✓	
	40		✓	-	-	-	-	-	✓	
	41		✓	✓	✓	✓	✓	✓	✓	
	42		✓	-	-	-	-	-	✓	
	43		✓	-	-	-	-	-	✓	
	44			✓	✓	✓	✓	✓	✓	
	45			✓	✓	✓	✓	✓	✓	
	46			✓	✓	✓	✓	✓	✓	
	47			✓	✓	✓	✓	✓	✓	
	48			✓	✓	✓	✓	✓	✓	
	49			✓	✓	✓	✓	✓	✓	
	50			✓	✓	✓	✓	✓	✓	
	51			✓	✓	✓	✓	✓	✓	
	52			✓	✓	✓	✓	✓	✓	
	53			✓	✓	✓	✓	✓	✓	
	54			✓	✓	✓	✓	✓	✓	
	55			✓	✓	✓	✓	✓	✓	

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1	(10/301237).APP.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/03/15 20:18

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L3	3918	(381/94.1-94.7,110,71.6,92,111,122).CCLS.	US-PGPUB; USPAT; UPAD	OR	OFF	2012/03/15 20:32
L4	2067	(704/226,233).CCLS.	US-PGPUB; USPAT; UPAD	OR	OFF	2012/03/15 20:32

3/ 15/ 2012 8:34:25 PM
C:\ Users\ dfaulk\ Documents\ EAST\ Workspaces\ 10400282.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	2615

SEARCHED

Class	Subclass	Date	Examiner
381	94.1,94.2,94.3,94.7,92	1/22/07	BTP
704	226,233	1/22/07	BTP
381	71.6,94.1,94.7,92,110	10/15/2007	DEF
704	226,233	10/18/2007	DEF
381	71.6,94.1,94.7	7/29/08, 8/14/08	DEF
704	226,233	7/29/08,8/14/08	DEF
381	71.7,94.1,94.7,110,92	3/12/09	DEF
381	71.6,94.1,94.7,110,92,111	12/7/09	DEF
381	71.6,94.1,94.7,110,92,11	6/1,3,18/11	DEF
704	226,233	6/1,3,18/11	DEF
381	71.6,94.1,94.7,110,92,111	3/15/12	DEF
704	226,233	3/15/12	DEF

SEARCH NOTES

Search Notes	Date	Examiner
East Word Search	1/22/07	
Assignee/Inventor Search	10/16/2007,10/17/2007	DEF
word search	10/16/2007,10/17/2007	DEF
additonal search	7/29/08, 8/14/08	DEF
additional search	3/12/09	DEF
reviewed applicant's arguments/ applied same art to claims	8/13/10	DEF
additional search	6/1,3,18/11	DEF
additional search	3/6,15/12	DEF

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner

	/DEVONA E FAULK/ Primary Examiner.Art Unit 2614

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:
Burnett et al.

Application Serial No.: 10/400,282

Filing Date: March 27, 2003

For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS

Examiner: FAULK, Devona E.

Group Art Unit: 2614

Confirmation No.: 1397

Date: January 14, 2013

Atty. Docket No.: ALI-049

CERTIFICATE OF TRANSMISSION

I hereby certify that this correspondence is being transmitted via the U.S. Patent and Trademark Office electronic filing system (EFS-Web) to the USPTO on January 14, 2013.

Signed: _____
Amiee H. Shin

AMENDMENT H

Dear Sir or Madam:

Please find enclosed a complete, updated claim listing and remarks in response to the Office Action mailed August 14, 2012.

CLAIM LISTING

1. (Previously presented) A communications system, comprising:

a voice detection subsystem configured to receive voice activity signals that includes information associated with human voicing activity, the voice detection subsystem configured to automatically generate control signals using the voice activity signals; and

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise,

wherein the voice detection subsystem is configured to receive the voice activity signals using a sensor independent from the microphone array and to output the control signals generated from the voice activity signals to the denoising system, the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array.

2. – 3. (Canceled)

4. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.

5. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one accelerometer sensor in contact with skin for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.

6. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises:

at least one skin-surface microphone sensor in contact with skin for receiving the voice activity signals; and

at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.

7. – 8. (Canceled)

9. (Previously presented) The system of claim 1, wherein the voice detection subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals.

10. (Previously presented) The system of claim 1, further including a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

11. (Previously presented) The system of claim 10, wherein the portable handset includes at least one of the voice detection subsystem and the denoising subsystem.

12. (Previously presented) The system of claim 1, further including a portable headset that includes the microphones along with at least one speaker device.

13. (Previously presented) The system of claim 12, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

14. (Previously presented) The system of claim 13, wherein the portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings.

15. (Previously presented) The system of claim 13, wherein the communication device includes at least one of the voice detection subsystem and the denoising subsystem.

16. (Previously presented) The system of claim 12, wherein the portable headset includes at least one of the voice detection subsystem and the denoising subsystem.

17. (Previously presented) The system of claim 12, wherein the portable headset is a portable communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).

18. – 40. (Canceled)

41. (Previously presented) A communications system, comprising:

a voice detection subsystem configured to receive voice activity signals that include information associated with human voicing activity, the voice detection subsystem configured to automatically generate control signals using the voice activity signals;

a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones, wherein a first microphone of the array is fixed at a first position relative to a mouth, wherein the first position orients a front of the first microphone towards the mouth, wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees, the microphone array providing acoustic signals of an environment to components of the denoising subsystem, components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals, wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise,

wherein the voice detection subsystem is configured to receive the voice activity signals using a sensor independent from the microphone array and to output the control signals generated from the voice activity signals to the denoising system, the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array; and

a portable headset comprising the plurality of microphones and at least one speaker device, wherein the portable headset couples to at least one communication device selected from

among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

42. – 43. (Canceled)

44. (Previously presented) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is a unidirectional microphone.

45. (Previously presented) The system of claim 44, wherein the first microphone and the second microphone are separated by a distance in a range of approximately zero (0) centimeters to 15 centimeters.

46. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and less than 180 degrees.

47. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and less than 135 degrees.

48. (Previously presented) The system of claim 44, wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and greater than 90 degrees.

49. (Previously presented) The system of claim 1, wherein the first microphone is an omnidirectional microphone and the second microphone is a unidirectional microphone.

50. (Previously presented) The system of claim 49, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

51. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 30 degrees to 180 degrees.

52. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 60 degrees to 180 degrees.

53. (Previously presented) The system of claim 49, wherein the angle is approximately in a range of 90 degrees to 180 degrees.

54. (Previously presented) The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is an omnidirectional microphone.

55. (Previously presented) The system of claim 54, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.

REMARKS

Claims 1, 4-6, 9-17, 41 and 44-55 remain pending.

Provisional Non-Statutory Double Patenting Rejection

The Examiner has provisionally rejected claim 1 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of copending U.S. Patent Application No. 10/301,237, claims 1 and 22-24 of copending U.S. Patent Application No. 12/163,647, and claims 1, 12, 28 and 34 of copending U.S. Patent Application No. 12/123,364. Applicant is filing concurrently herewith a terminal disclaimer, in compliance with 37 C.F.R. § 1.321(c), disclaiming the terminal part of the statutory term of any patent granted on the present application, which would extend beyond the expiration date of the full statutory term of any patent(s) granted on U.S. Patent Application No. 10/301,237, U.S. Patent Application No. 12/163,647, and U.S. Patent Application No. 12/123,364. Thus, Applicant submits that this rejection is overcome and respectfully requests that the rejection be withdrawn.

Allowable Subject Matter

The Examiner has indicated that the remaining pending claims, including claims 1, 4-6, 9-17, 41 and 44-55, are allowable once the double patenting rejection is addressed. In view of the terminal disclaimer described above, and being submitted concurrently herewith, allowance of all pending claims is respectfully requested.

///

///

If at any time the Examiner believes that an interview would be helpful, please contact the undersigned.

Respectfully submitted,



Chien-Ju Alice Chuang
Reg. No. 65,914

KOKKA & BACKUS, PC
703 High Street
Palo Alto, CA 94301-2447
Tel: (650) 585-2359
Fax: (650) 566-9922

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Burnett et al.

Application No.: 10/400,282

Filing Date: March 27, 2003

For: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS

Examiner: FAULK, Devona E.

Confirmation No.: 1397

Group Art Unit: 2614

Date: January 14, 2013

Atty. Docket No.: ALI-049

CERTIFICATE OF TRANSMISSION

I hereby certify that this correspondence is being transmitted via the U.S. Patent and Trademark Office electronic filing system (EFS-Web) to the USPTO on **January 14, 2013.**

Signed: _____
Aimee H. Shin

TERMINAL DISCLAIMER UNDER 37 C.F.R. § 1.321 TO OBVIATE A PROVISIONAL OBVIOUSNESS-TYPE DOUBLE PATENTING REJECTION

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir or Madam:

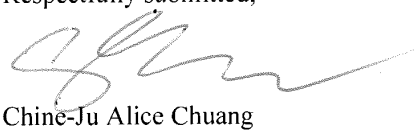
The owner, AliphCom (Assignee), of the entire interest in the above-identified application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the above-identified application (hereafter "instant application"), which would extend beyond the expiration date of the full statutory term defined in 35 U.S.C. 154 and 173 of any patent granted on copending U.S. Patent Application No. 10/301,237 filed on November 21, 2002, U.S. Patent Application No. 12/163,647 filed on June 27, 2008, and U.S. Patent Application No. 12/123,364 filed on May 19, 2008 (collectively "reference patent applications"), as the term of any patent granted on said reference patent applications may be shortened by any terminal disclaimer filed prior to the

patent on the reference patent applications. 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 patent applications 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 above-identified 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(s) granted on said reference patent applications, as the term of any patent(s) granted on said reference patent applications may be shortened by any terminal disclaimer filed prior to the grant of any patent(s) on the copending reference applications, in the event that it later: 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 matter terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

We hereby submit the amount of $80.00 to cover the statutory disclaimer fees for small entity. If any questions arise regarding this statutory disclaimer, please contact the undersigned attorney or agent of record.

Respectfully submitted,



Chine-Ju Alice Chuang
Reg. No. 65,914

Date: January 14, 2013

Kokka & Backus, PC
703 High Street
Palo Alto, CA 94301
Tel: (650) 585-2359
Fax: (650) 566-9922

Electronic Patent Application Fee Transmittal

Application Number:	10400282
Filing Date:	27-Mar-2003
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Chien-Ju Alice Chuang/Amiee Shin
Attorney Docket Number:	ALI-049

Filed as Small 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 - 2 months with $0 paid	2252	1	285	285

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Statutory or terminal disclaimer	2814	1	80	80
		Total in USD ($)		**365**

Electronic Acknowledgement Receipt

EFS ID:	14691995
Application Number:	10400282
International Application Number:	
Confirmation Number:	1397
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	15516
Filer:	Chien-Ju Alice Chuang
Filer Authorized By:	
Attorney Docket Number:	ALI-049
Receipt Date:	14-JAN-2013
Filing Date:	27-MAR-2003
Time Stamp:	20:10:00
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-049_Response_to_Non_Final_Office_Action_asfiled.pdf	106614 0cab00d5d3afe628c6ff26e3d9fde7c3add85ddb	yes	12

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	10
	Terminal Disclaimer Filed	11	12

Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	31917 d079926e666bae03df4c433729a007888bccbb63	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	138531		

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.

Electronic Patent Application Fee Transmittal

Application Number:	10400282
Filing Date:	27-Mar-2003
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Chien-Ju Alice Chuang
Attorney Docket Number:	ALI-049

Filed as Small 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 - 2 months with $0 paid	2252	1	285	285

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Statutory or terminal disclaimer	2814	1	80	80
		Total in USD ($)		**365**

Electronic Acknowledgement Receipt

EFS ID:	14697784
Application Number:	10400282
International Application Number:	
Confirmation Number:	1397
Title of Invention:	Microphone and Voice Activity Detection (VAD) configurations for use with communication systems
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	15516
Filer:	Chien-Ju Alice Chuang
Filer Authorized By:	
Attorney Docket Number:	ALI-049
Receipt Date:	14-JAN-2013
Filing Date:	27-MAR-2003
Time Stamp:	20:41:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$365
RAM confirmation Number	7541
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Fee Worksheet (SB06)	fee-info.pdf	31885 05aaf5f401af1dba2c97e25d0e3e3f5152a69541	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	31885	

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/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 10/400,282	Filing Date 03/27/2003	☐ To be Mailed

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	01/14/2013	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 26	Minus	** 40	= 0	X $31 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 2	Minus	***7	= 0	X $125 =	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:
/KATISCHA WANZER/

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.

Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
	10/400,282	BURNETT ET AL.	

Document Code - DISQ	Internal Document – DO NOT MAIL

TERMINAL DISCLAIMER	☒ APPROVED	☐ DISAPPROVED
Date Filed : 01/14/13	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:

Angie Walker

U.S. Patent and Trademark Office

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

15516 7590 02/20/2013

Kokka & Backus, PC
703 High Street
Palo Alto, CA 94301

EXAMINER
PAUL, DISLER

ART UNIT	PAPER NUMBER
2655	

DATE MAILED: 02/20/2013

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/400,282	03/27/2003	Gregory C. Burnett	ALI-049	1397

TITLE OF INVENTION: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$885	$300	$0	$1185	05/20/2013

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)

15516 7590 02/20/2013

Kokka & Backus, PC
703 High Street
Palo Alto, CA 94301

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.
10/400,282	03/27/2003	Gregory C. Burnett	ALI-049	1397

TITLE OF INVENTION: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$885	$300	$0	$1185	05/20/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
PAUL, DISLER	2655	381-071600

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.
10/400,282	03/27/2003	Gregory C. Burnett	ALI-049	1397

15516 7590 02/20/2013

Kokka & Backus, PC
703 High Street
Palo Alto, CA 94301

EXAMINER	
PAUL, DISLER	

ART UNIT	PAPER NUMBER
2655	

DATE MAILED: 02/20/2013

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 264 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 264 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.

PTOL-85 (Rev. 02/11)

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.

Notice of Allowability	Application No. 10/400,282	Applicant(s) BURNETT ET AL.	
	Examiner DISLER PAUL	Art Unit 2655	

-- 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 *1/14/13*.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are *1,4-6,9-17,41 and 44-55*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ 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.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ 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. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/DISLER PAUL/
Primary Examiner, Art Unit 2655

DETAILED ACTION

Terminal Disclaimer

The terminal disclaimer filed on 1/14/13 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of full statutory term has been reviewed and is accepted. The terminal disclaimer has been recorded.

Allowable Subject Matter

Claims 1, 4-6, 9-17, 41, 44-55 are allowed.

The above claims are allowed after further search since although, the prior arts disclose of the voice detecting subsystem and denoising subsystem but, none of the prior art disclose of such specific as wherein the voice detection subsystem is configured to receive the voice activity signals using a sensor independent from the microphone array and to output the control signals generated from the voice activity signals to the denoising system, the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DISLER PAUL whose telephone number is (571)270-1187. The examiner can normally be reached on 10-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Goins Davetta can be reached on (571) 272-29-57. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DISLER PAUL/
Primary Examiner, Art Unit 2655

Notice of References Cited	Application/Control No. 10/400,282	Applicant(s)/Patent Under Reexamination BURNETT ET AL.	
	Examiner DISLER PAUL	Art Unit 2655	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-5,625,684	04-1997	Matouk et al.	379/392.01
*	D	US-2003/0130839	07-2003	Beaucoup et al.	704/226
*	E	US-7,206,418	04-2007	Yang et al.	381/92
	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
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA FAULK	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	01/23/2007	10/18/2007	08/14/2008	03/12/2009	12/07/2009	08/13/2010	06/06/2011	03/15/2012	02/12/2013
1	1	✓	✓	✓	✓	✓	✓	✓	✓	=
	2	✓	✓	-	-	-	-	-	-	-
	3	✓	✓	-	-	-	-	-	-	-
2	4	✓	✓	✓	✓	✓	✓	✓	✓	=
3	5	✓	✓	✓	✓	✓	✓	✓	✓	=
4	6	✓	✓	✓	✓	✓	✓	✓	✓	=
	7	✓	✓	✓	✓	✓	✓	-	-	-
	8	O	-	-	-	-	-	-	-	-
5	9	O	✓	✓	✓	✓	✓	✓	✓	=
6	10	✓	✓	✓	✓	✓	✓	✓	✓	=
7	11	✓	✓	✓	✓	✓	✓	✓	✓	=
8	12	✓	✓	✓	✓	✓	✓	✓	✓	=
9	13	✓	✓	✓	✓	✓	✓	✓	✓	=
10	14	✓	✓	✓	✓	✓	✓	✓	✓	=
11	15	O	✓	✓	✓	✓	✓	✓	✓	=
12	16	✓	✓	✓	✓	✓	✓	✓	✓	=
13	17	✓	✓	✓	✓	✓	✓	✓	✓	=
	18	✓	✓	-	-	-	-	-	✓	-
	19	✓	✓	-	-	-	-	-	✓	-
	20	✓	✓	-	-	-	-	-	✓	-
	21	✓	✓	-	-	-	-	-	✓	-
	22	✓	✓	-	-	-	-	-	✓	-
	23	✓	✓	-	-	-	-	-	✓	-
	24	O	-	-	-	-	-	-	✓	-
	25	O	✓	-	-	-	-	-	✓	-
	26	✓	✓	-	-	-	-	-	✓	-
	27	✓	✓	-	-	-	-	-	✓	-
	28	✓	✓	-	-	-	-	-	✓	-
	29	✓	✓	-	-	-	-	-	✓	-
	30	✓	✓	-	-	-	-	-	✓	-
	31	O	✓	-	-	-	-	-	✓	-
	32	✓	✓	-	-	-	-	-	✓	-
	33	✓	✓	-	-	-	-	-	✓	-
	34	✓	✓	-	-	-	-	-	✓	-
	35	✓	✓	-	-	-	-	-	✓	-
	36	✓	✓	-	-	-	-	-	✓	-

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	**Art Unit**
	DEVONA FAULK	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	01/23/2007	10/18/2007	08/14/2008	03/12/2009	12/07/2009	08/13/2010	06/06/2011	03/15/2012	02/12/2013
	37	✓	✓	-	-	-	-	-	✓	-
	38	O	-	-	-	-	-	-	✓	-
	39	O	✓	-	-	-	-	-	✓	-
	40		✓	-	-	-	-	-	✓	-
26	41		✓	✓	✓	✓	✓	✓	✓	=
	42		✓	-	-	-	-	-	✓	-
	43		✓	-	-	-	-	-	✓	-
14	44			✓	✓	✓	✓	✓	✓	=
15	45			✓	✓	✓	✓	✓	✓	=
16	46			✓	✓	✓	✓	✓	✓	=
17	47			✓	✓	✓	✓	✓	✓	=
18	48			✓	✓	✓	✓	✓	✓	=
19	49			✓	✓	✓	✓	✓	✓	=
20	50			✓	✓	✓	✓	✓	✓	=
21	51			✓	✓	✓	✓	✓	✓	=
22	52			✓	✓	✓	✓	✓	✓	=
23	53			✓	✓	✓	✓	✓	✓	=
24	54			✓	✓	✓	✓	✓	✓	=
25	55			✓	✓	✓	✓	✓	✓	=

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	**Art Unit**
	DISLER PAUL	2655

CPC		
Symbol	**Type**	**Version**

CPC Combination Sets				
Symbol	**Type**	**Set**	**Ranking**	**Version**

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION									
CLASS	**SUBCLASS**	**CLAIMED**					**NON-CLAIMED**				
381	94.1	H	0	4	B	15 / 00 (2006.01.01)					
CROSS REFERENCE(S)											
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**										
381	92	94.3	94.7								
704	226	233									

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	26	
/DISLER PAUL/ Primary Examiner.Art Unit 2655	02/12/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	**Art Unit**
	DISLER PAUL	2655

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	26	
/DISLER PAUL/ Primary Examiner.Art Unit 2655	02/12/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	**Art Unit**
	DISLER PAUL	2655

☐ 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	16	46												
2	4	17	47												
3	5	18	48												
4	6	19	49												
5	9	20	50												
6	10	21	51												
7	11	22	52												
8	12	23	53												
9	13	24	54												
10	14	25	55												
11	15	28	55												
12	16														
13	17														
26	41														
14	44														
15	45														

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 26	
/DISLER PAUL/ Primary Examiner.Art Unit 2655 (Primary Examiner)	02/12/2013 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10400282	BURNETT ET AL.
	Examiner	Art Unit
	DEVONA E. FAULK	2615

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
381	94.1,94.2,94.3,94.7,92	1/22/07	BTP
704	226,233	1/22/07	BTP
381	71.6,94.1,94.7,92,110	10/15/2007	DEF
704	226,233	10/18/2007	DEF
381	71.6,94.1,94.7	7/29/08, 8/14/08	DEF
704	226,233	7/29/08,8/14/08	DEF
381	71.7,94.1,94.7,110,92	3/12/09	DEF
381	71.6,94.1,94.7,110,92,111	12/7/09	DEF
381	71.6,94.1,94.7,110,92,11	6/1,3,18/11	DEF
704	226,233	6/1,3,18/11	DEF
381	71.6,94.1,94.7,110,92,111	3/15/12	DEF
704	226,233	3/15/12l ; 2/12/13	DEF/DP
381	91-92,94.1-94.3,94.7	2/12/13	DP

SEARCH NOTES		
Search Notes	Date	Examiner
East Word Search	1/22/07	
Assignee/Inventor Search	10/16/2007,10/17/2007	DEF
word search	10/16/2007,10/17/2007	DEF
additonal search	7/29/08, 8/14/08	DEF
additional search	3/12/09	DEF

	/DEVONA E FAULK/ Primary Examiner.Art Unit 2614

SEARCH NOTES		
Search Notes	**Date**	**Examiner**
reviewed applicant's arguments/ applied same art to claims	8/13/10	DEF
additional search	6/1,3,18/11	DEF
additional search	3/6,15/12	DEF

INTERFERENCE SEARCH			
US Class/ CPC Symbol	**US Subclass / CPC Group**	**Date**	**Examiner**
381	92, 94.1,94.3, 94.7	2/12/13	DP
704	226,233	2/12/13	DP

	/DEVONA E FAULK/ Primary Examiner.Art Unit 2614

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

BIB DATA SHEET

CONFIRMATION NO. 1397

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/400,282	03/27/2003	381	2655	ALI-049

APPLICANTS

Gregory C. Burnett, Livermore, CA;
Nicolas J. Petit, San Francisco, CA;
Alexander M. Asseily, San Francisco, CA;
Andrew E. Einaudi, San Francisco, CA;

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

This appln claims benefit of 60/368,209 03/27/2002

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

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **

05/30/2003

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /DISLER PAUL/ Examiner's Signature	☐ Met after Allowance dp Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		CA	29	39	3

ADDRESS

Kokka & Backus, PC
703 High Street
Palo Alto, CA 94301
UNITED STATES

TITLE

Microphone and Voice Activity Detection (VAD) configurations for use with communication systems

FILING FEE RECEIVED		
1036	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

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)

13516 7590 02/20/2013

Kokka & Backus, PC
703 High Street
Palo Alto, CA 94301

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 transmitted via the U.S. Patent and Trademark Office electronic filing system (EFS-Web) to the USPTO on the date indicated below or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Amiee H. Shin	(Depositor's name)
	(Signature)
May 20, 2013	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/400,282	03/27/2003	Gregory C. Burnett	ALI-049	1397

TITLE OF INVENTION: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$885	$300	$0	$1185	05/20/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
PAUL, DISLER	2655	381-071600

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 KOKKA & BACKUS, PC
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

(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. via EFS-Web
- ☐ 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 May 20, 2013

Typed or printed name Scott S. Kokka Registration No. 51,893

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.

Electronic Patent Application Fee Transmittal

Application Number:	10400282
Filing Date:	27-Mar-2003
Title of Invention:	MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS
First Named Inventor/Applicant Name:	Gregory C. Burnett
Filer:	Scott Susumu Kokka
Attorney Docket Number:	ALI-049

Filed as Small 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:				
Utility Appl Issue Fee	2501	1	890	890
Publ. Fee- Early, Voluntary, or Normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1190**

Electronic Acknowledgement Receipt

EFS ID:	15825237
Application Number:	10400282
International Application Number:	
Confirmation Number:	1397
Title of Invention:	MICROPHONE AND VOICE ACTIVITY DETECTION (VAD) CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS
First Named Inventor/Applicant Name:	Gregory C. Burnett
Customer Number:	15516
Filer:	Scott Susumu Kokka
Filer Authorized By:	
Attorney Docket Number:	ALI-049
Receipt Date:	20-MAY-2013
Filing Date:	27-MAR-2003
Time Stamp:	22:33:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1190
RAM confirmation Number	7944
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)	ALI-049_Issue_and_Publication_Fees_asfiled.pdf	329737 dd707f53a8849cd886019ec03321b243c87fe531	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32161 c56ea3977dc2bf9f6414b0cd4af322c876f84463	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	361898		

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.

SEP 08 2003 TRADEMARK

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

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.

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 2

Complet if Kn wn	
Application Number	10/400,282
Filing Date	March 27, 2003
First Named Inventor	Gregory C. Burnett
Group Art Unit	Unknown
Examiner Name	Unknown
Attorney Docket Number	ALPH.P020

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
BTP		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	
		~~6,000,330~~		Nagata	12-28-1999	6,009,396
		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	
		~~5,400,002~~		Silverberg et al.	04-11-1995	5,406,622
BTP		5,517,435		Sugiyama	05-14-1996	

Change(s) applied to document, /D.D./ 3/30/2013

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	1/23/07

*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.

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.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/400,282	06/18/2013	8467543	ALI-049	1397

15516 7590 05/29/2013

Kokka & Backus, PC
703 High Street
Palo Alto, CA 94301

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 977 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, Livermore, CA;
Nicolas J. Petit, San Francisco, CA;
Alexander M. Asseily, San Francisco, CA;
Andrew E. Einaudi, San Francisco, CA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

Large Entity Declaration

Schedule A – Patents assigned to *Assignee*

APPLICATION NUMBER	FILING DATE	PATENT NUMBER	ISSUE DATE
09/986,989	01 June 2004	6743587	N/A
11/474,833	25 March 2008	7349586	N/A
12/009,603	11 October 2011	8036498	N/A
12/163,592	27 June 2008	8254617	
12/163,617	27 June 2008	8280072	
12/606,146	26 October 2009	8321213	
12/606,140	26 October 2009	8326611	
11/199,856	08 August 2005	8340309	
12/058,758	19 February 2008	8382590	
10/940,214	13 September 2004	8398546	
11/481,147	05 July 2006	8403845	
13/454,040	23 April 2012	8446275	
12/772,963	03 May 2010	8452023	
12/354,689	15 January 2009	8452347	
10/400,282	24 March 2003	8467513	
12/163,675	27 June 2008	8477961	
12/772,995	03 May 2010	8488803	
12/006,607	03 January 2008	8489136	
12/139,355	13 June 2008	8494177	
12/244,670	02 October 2008	8503596	
12/772,947	03 May 2010	8503686	
12/139,533	13 June 2008	8503691	
12/139,361	13 June 2008	8503692	
13/246,617	27 September 2011	8509690	
13/429,839	22 March 2012	8529811	
11/925,965	28 October 2007	8708904	
10/430,182	5 May 2003	7068860	
12/032,760	19 February 2008	8295635	



CPA GLOBAL

Liberation House
Castle Street, St Helier
Jersey JE1 1BL
Channel Islands

Tel +44 (0) 1534 888 711
Fax +44 (0) 1534 888 747
enquiries@cpaglobal.com

www.cpaglobal.com

FAX TO:

Pages 10

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

22 January 2015

URGENT

Dear Sirs,

Please see the attached entity status form to be amended to **LARGE** Entity status.

Please can you amend you records accordingly.

Many thanks for your assistance.

Kind regards,

Matthew Allman

Supplier Compliance

E:mallman@cpaglobal.com
T: 011 44 1534 811303
F: 011 44 1534 811347

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 22-Jan-15

Signed

Large Entity Declaration

PATENT
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ASSERTION OF LARGE ENTITY STATUS
PURSUANT TO 37 C.F.R. §1.27 (g)(2)

Commissioner for Patents
Mail Stop M Correspondence
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This communication hereby asserts that the patents identified in the attached Schedule A are entitled to large entity status.

Respectfully submitted,

COMPANY or FIRM NAME AND ADDRESS:

AliphCom dba Jawbone
BodyMedia, Inc.
99 Rhode Island Street
3rd Floor
San Francisco, CA 94103

Signature

Michael Luna
Printed Name

CTO
Title

OR

Reg. # if US Attorney_____

Small Entity Declaration

Schedule A – Patents assigned to *Assignee*

APPLICATION NUMBER	FILING DATE	PATENT NUMBER	ISSUE DATE
10/400282	3/27/2003	8,467,543	6/18/2013

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.

Respectfully submitted,

COMPANY or FIRM NAME AND ADDRESS:

JAWB Acquisition LLC
321 West 44th Street
New York, NY 10036

Luke Conticello

Signature

Luke Conticello

Printed Name

Assignee

Title

Reg. # if US Attorney_____

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 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	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

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)

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 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	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
4			
5			

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
1		
2		
3		
4		
5		

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)

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 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-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	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

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)

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 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-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	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
4			
5			

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
1		
2		
3		
4		
5		

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**

AMENDED

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

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-JRG	10/26/2021	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	8,019,091	9/13/2011	Jawbone Innovations, LLC
2	8,280,072	10/2/2012	Jawbone Innovations, LLC
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

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
1		
2		
3		
4		
5		

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*

AMENDED

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

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-JRG	10/26/2021	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	8,467,543	6/18/2013	Jawbone Innovations, LLC
2	8,503,691	8/6/2013	Jawbone Innovations, LLC
3			
4			
5			

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
1		
2		
3		
4		
5		

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)

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-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
2	7,246,058	7/17/2007	Jawbone Innovations, LLC
3	8,280,072	10/2/2012	Jawbone Innovations, LLC
4	8,321,213	11/17/2012	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	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgment 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)

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-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	10,779,080	9/15/2020	Jawbone Innovations, LLC
2	11,122,357	9/14/2021	Jawbone Innovations, LLC
3	8,467,543	6/18/2013	Jawbone Innovations, LLC
4			
5			

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
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgment 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)

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-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
2	7,246,058	7/17/2007	Jawbone Innovations, LLC
3	8,280,072	10/2/2012	Jawbone Innovations, LLC
4	8,321,213	11/17/2012	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	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

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)

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-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	10,779,080	9/15/2020	Jawbone Innovations, LLC
2	11,122,357	9/14/2021	Jawbone Innovations, LLC
3	8,467,543	6/18/2013	Jawbone Innovations, LLC
4			
5			

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
1			
2			
3			
4			
5			

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**