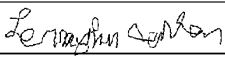


CERTIFICATION OF MICRO ENTITY STATUS (GROSS INCOME BASIS)				
Application Number or Control Number (if applicable):		Patent Number (if applicable):		
First Named Inventor: Levaughn Denton		Title of Invention: Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters		
<p>The applicant hereby certifies the following—</p> <p>(1) SMALL ENTITY REQUIREMENT - The applicant qualifies as a small entity as defined in 37 CFR 1.27.</p> <p>(2) APPLICATION FILING LIMIT - Neither the applicant nor the inventor nor a joint inventor has been named as the inventor or a joint inventor on more than four previously filed U.S. patent applications, excluding provisional applications and international applications under the Patent Cooperation Treaty (PCT) for which the basic national fee under 37 CFR 1.492(a) was not paid, and also excluding patent applications for which the applicant has assigned all ownership rights or is obligated to assign all ownership rights as a result of the applicant's previous employment.</p> <p>(3) GROSS INCOME LIMIT ON APPLICANTS AND INVENTORS - Neither the applicant nor the inventor nor a joint inventor, in the calendar year preceding the calendar year in which the applicable fee is being paid, had a gross income, as defined in section 61(a) of the Internal Revenue Code of 1986 (26 U.S.C. 61(a)), exceeding the "Maximum Qualifying Gross Income" reported on the USPTO website at http://www.uspto.gov/patents/law/micro_entity.jsp which is equal to three times the median household income for that preceding calendar year, as most recently reported by the Bureau of the Census.</p> <p>(4) GROSS INCOME LIMIT ON PARTIES WITH AN "OWNERSHIP INTEREST" - Neither the applicant nor the inventor nor a joint inventor has assigned, granted, or conveyed, nor is under an obligation by contract or law to assign, grant, or convey, a license or other ownership interest in the application concerned to an entity that, in the calendar year preceding the calendar year in which the applicable fee is being paid, had a gross income, as defined in section 61(a) of the Internal Revenue Code of 1986, exceeding the "Maximum Qualifying Gross Income" reported on the USPTO website at http://www.uspto.gov/patents/law/micro_entity.jsp which is equal to three times the median household income for that preceding calendar year, as most recently reported by the Bureau of the Census.</p>				
SIGNATURE by a party set forth in 37 CFR 1.33(b)				
Signature				
Name		Levaughn Denton		
Date	10/5/2018	Telephone	(718) 864 - 4375	Registration No.
☐	There is more than one inventor and I am one of the inventors who are jointly identified as the applicant. Additional certification form(s) signed by the other joint inventor(s) are included with this form.			

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.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	New Application
Filing Date	Herewith
First Named Inventor	Levaughn Denton
Title	Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters
Art Unit	Unassigned
Examiner Name	Unassigned
Attorney Docket Number	2305LD01UTL1USCIP

SIGNATURE of Applicant or Patent Practitioner

Signature	/David Postolski/	Date (Optional)	
Name	David Postolski	Registration Number	67547
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			
NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.			
☐ *Total of _____ forms are submitted.			

This collection of information is required by 37 CFR 1.131, 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.

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

- ☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:
- OR
- ☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

- ☒ The address associated with the above-mentioned Customer Number

OR

- ☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

--

- ☒ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☐ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	10/5/2018
Name	Levaughn Denton		
Title			

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 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.

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		MULTI-FREQUENCY SENSING METHOD AND APPARATUS USING MOBILE-BASED CLUSTERS		
First Named Inventor/Applicant Name:		Levaughn Denton		
Filer:		David D. Postolski/Anthony Noonan		
Attorney Docket Number:		2305 LD 01 UTL 1 US CIP		
Filed as Micro Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
BASIC FILING FEE-UTILITY	3011	1	75	75
UTILITY SEARCH FEE	3111	1	165	165
UTILITY EXAMINATION FEE	3311	1	190	190
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				430

Electronic Acknowledgement Receipt	
EFS ID:	36102821
Application Number:	16421141
International Application Number:	
Confirmation Number:	7908
Title of Invention:	MULTI-FREQUENCY SENSING METHOD AND APPARATUS USING MOBILE-BASED CLUSTERS
First Named Inventor/Applicant Name:	Levaughn Denton
Customer Number:	75207
Filer:	David D. Postolski/Anthony Noonan
Filer Authorized By:	David D. Postolski
Attorney Docket Number:	2305 LD 01 UTL 1 US CIP
Receipt Date:	23-MAY-2019
Filing Date:	
Time Stamp:	17:39:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$430
RAM confirmation Number	052419INTEFSW17394400
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	2305LD01UTL1USCIP_ADS.pdf	1822703	no	8
			3bb13ab5a66cec2d8be15beb1a14478415685c2d		
Warnings:					
Information:					
2		2305LD01UTL1USCIP_Application_FINAL.pdf	378196	yes	42
			b55dc359aa895d017e1317c66b1ddd7dbfb0531		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	35	
	Claims		36	41	
	Abstract		42	42	
Warnings:					
Information:					
3	Oath or Declaration filed	2305LD01UTL1USCIP_DEC.pdf	150415	no	2
			a19e38f4b11965c18330105ee8b92c05c7b6ac28		
Warnings:					
Information:					
4	Drawings-only black and white line drawings	2305LD01UTL1USCIP_Drawing_s_FINAL.pdf	1027267	no	10
			39d9911f14af4afdbcb8359c70c511f153ad3e		
Warnings:					
Information:					
5	Certification of Micro Entity (Gross Income Basis)	2305LD01UTL1USCIP_MICRO.pdf	134501	no	2
			024dfda43d8741425361bffd7feacf5f44a4235		

Warnings:					
Information:					
6	Power of Attorney	2305LD01UTL1USCIP_POA.pdf	147153	no	2
			2d19d71e630d2a2939b741391b40e9432947e973		
Warnings:					
Information:					
7	Fee Worksheet (SB06)	fee-info.pdf	35023	no	2
			314c1a3b79515efcb03d272a454383c83f407fa4		
Warnings:					
Information:					
Total Files Size (in bytes):				3695258	
<p>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.</p> <p><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.</p> <p><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.</p> <p><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.</p>					

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	2305LD01UTL1USCIP
		Application Number	
Title of Invention	Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters		
<p>The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.</p> <p>This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.</p>			

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor	1				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Levaughn		Denton			
Residence Information (Select One) • US Residency Non US Residency Active US Military Service						
City	Baisley Park	State/Province	NY	Country of Residence	US	
Mailing Address of Inventor:						
Address 1	160-21 118th Rd					
Address 2						
City	Baisley Park	State/Province	NY			
Postal Code	11434	Country	US			
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.						
Add						

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.		
For further information see 37 CFR 1.33(a).		
☐ An Address is being provided for the correspondence information of this application.		
Customer Number	75207	
Email Address		Add Email Remove Email

Application Information:

Title of the Invention	Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters		
Attorney Docket Number	2305LD01UTL1USCIP	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	10	Suggested Figure for Publication (if any)	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	2305LD01UTL1USCIP
		Application Number	
Title of Invention	Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters		

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	75207		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation in part of	14862304	2015-09-23

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	2305LD01UTL1USCIP
		Application Number	
Title of Invention	Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters		
Prior Application Status	Expired	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
14862304	Claims benefit of provisional	62054286	2014-09-23
Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation in part of	16155919	2018-10-10
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)	Remove
Additional Foreign Priority Data may be generated within this form by selecting the Add button.				Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	2305LD01UTL1USCIP
		Application Number	
Title of Invention	Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	2305LD01UTL1USCIP
		Application Number	
Title of Invention	Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.				
Applicant	1			<input type="button" value="Remove"/>
<p>If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.</p>				
		<input type="button" value="Clear"/>		
Assignee	Legal Representative under 35 U.S.C. 117		Joint Inventor	
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest		
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:				
<div style="border: 1px solid black; height: 20px; width: 100%;"></div>				
Name of the Deceased or Legally Incapacitated Inventor: <div style="border: 1px solid black; width: 400px; height: 20px;"></div>				
If the Applicant is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>
Mailing Address Information For Applicant:				
Address 1		<div style="border: 1px solid black; height: 20px; width: 100%;"></div>		
Address 2		<div style="border: 1px solid black; height: 20px; width: 100%;"></div>		
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	2305LD01UTL1USCIP
		Application Number	
Title of Invention	Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters		

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First Name	David	Last Name	Postolski	Registration Number
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	2305LD01UTL1USCIP
		Application Number	
Title of Invention	Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters		

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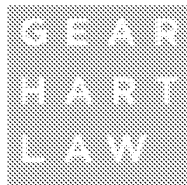
Non-Provisional Patent Application Entitled :

**MULTI-FREQUENCY SENSING METHOD AND APPARATUS USING
MOBILE-BASED CLUSTERS**

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Attorney Docket No. 2305 LD 01 UTL 1 US CIP

**MULTI-FREQUENCY SENSING METHOD AND APPARATUS USING
MOBILE-BASED CLUSTERS**

INVENTOR

Levaughn Denton

CLAIM OF PRIORITY

This application is a Continuation-In-Part of U.S. Non-Provisional Patent Application No. 16/155,919, filed October 10, 2018, which is a Continuation of U.S. Non-Provisional Patent Application No. 14/862,304, filed September 23, 2015, which claims priority from U.S. Patent Provisional Application No.: 62/054,286, filed on September 23, 2014, the contents of which are hereby fully incorporated by reference.

FIELD OF THE EMBODIMENTS

The invention and its embodiments relate to audio manipulation and sound management systems, particularly for home audio systems, public address systems, sound reinforcement systems, vehicle audio systems, ultrasonic transducers, infrasonic transducers, electro-optical transducers, microwave transducers, and associated software for these applications.

BACKGROUND OF THE EMBODIMENTS

Each year sound companies spend billions of dollars on audio technologies and audio research to find new ways to improve audio quality in performance settings. Very often sound systems are designed to be used in a specific environment. For example, in a vehicle or private room setting, audio manipulation and output quality techniques and technologies are either

prescriptive or adaptive – neither of which require the need for audio engineering professionals. However, in other situations such as at a concert venue, a wide array of audio professionals must be employed. This can include monitor engineers, system technicians, and front-of-house engineers. These professionals operate mixing consoles and audio control units to produce
5 desirable, high-quality audio output.

Whether prescriptive or adaptive, manned or unmanned, perceived sound quality is a function of complex transducer-based technologies and acoustic treatment that are typically controlled, managed and manipulated by humans, and/or audio software and hardware. As such, both human and physical capital are required to produce first-rate sound quality. However, even
10 when the necessary human and capital has been spent, it can still be very difficult to effectively manage audio outputs in real-time. This is due to improper calibrations of signal propagation and signal degradation, as well as unwanted harmonics and soundwave reflections.

Particularly in an outdoor setting, single-source sound systems typically produce an intermittent mix of unintelligible sounds and echoes due to a given venue's size and openness. A
15 popular solution for addressing the echo issue is to utilize distributed sound systems. Traditional distributed sound systems are less susceptible to sound variance than single source systems. However, even when these distributed systems are used, temperature gradients and wind can still steer sound in undesirable ways.

Another issue related to the size of a performance venue is when audio and video fall out
20 of sync. As live musical performances become more and more elaborate by including digital art and screens on-stage, it is becoming increasingly difficult to reliably sync audio and video in large venues, due to highly reverberant surfaces and long decay times.

Also impacting audio intelligibility during a live performance is crowd noise. At a live event, it is not uncommon for crowds to generate noise approaching 105dB. When this occurs, audio engineers must manipulate the supporting sound system output so that the performance audio remains 5-8 decibels higher than the noise generated by crowd. This action results in performance sound being broadcast above 110 dB, the range where the volume of sound begins to pose danger to human listeners. Frequently, audio system operators find it difficult to granularly control the loud perception of a given individual listener while managing loudness perception for the remainder of the audience. In a case where an audio quality trade-off decision has to be made, a common industry practice is to execute a remediation plan that favors the majority of listeners while the minority of listeners are forced to suffer through it.

In other instances, when various pieces of audio equipment are slightly, or completely out-of-phase, it can be difficult for audio system operators to correct these out-of-phase issues in a short period of time.

A myriad of audio functions are necessary to provide a dynamic range of audio playback and fidelity. To meet heightened demands and address new challenges, the devices of today will not only have to handle traditional telephony voice communication and low-fidelity voice recording, but also, these devices must be capable of incorporating new hardware and software to create new functions and applications such as sensing infrasonic, ultrasonic, blue light and millimeter wave exposure and reporting, and in some cases, autonomous manipulation of audio outputs. Further, such demands create the need to process signals using 'low-loss' methods by moving much of the processing function away from hardware and into software optimized to do so.

Review of related technology:

Line6, Inc. has created a 'smart mixing system' for non-wearable ubiquitous computing devices that enables wireless and touchscreen control of live sound system components. This is accomplished via a wired connection between standard audio hardware and a proprietary physical interface. While this system integrates and controls live sound system components via
5 touchscreen devices, it unfortunately relies on audio engineers to operate it, and does not incorporate a listener-centric way to autonomously solve audio issues experienced by an audience.

United States Patent No.: 5,668,884 pertains to an audio enhancement system and method of use with a sound system for producing primary sound from at least one main loudspeaker
10 located at a main position. The audio enhancement system comprises at least one wireless transmitter, time delay circuitry, and plural augmented sound producing subsystems. Each sound subsystem is a portable unit arranged to be carried by a person located remote from the main loudspeaker and includes a wireless receiver and an associated transducer device, e.g., a pair of stereo headphones. The transmitter broadcasts an electrical signal which is representative of the
15 electrical input signal provided to the main loudspeaker. The broadcast signal is received by the receiver and is demodulated and amplified to drive the transducer so that it produces augmented sound substantially in synchronism with the sound arriving from the main loudspeaker. To achieve that end the time delay circuitry delays the electrical signal which is provided to the transducer for a predetermined period of time corresponding generally to the time period it takes
20 for the primary sound to propagate through the air from the main loudspeaker to the remote location at which the person is located.

United States Patent No.: 7,991,171 pertains to a method and apparatus for processing an audio signal in multiple audio frequency bands while minimizing undesirable changes in tonal

qualities of the audio signal by determining an initial gain adjustment factor for each audio frequency band resulting from the application of an audio processing technique. A final gain adjustment factor for each band is selected from a corresponding set of weighted or unweighted initial gain adjustment factors. The set of initial gain adjustment factors from which the final gain adjustment factor for a specified audio frequency band is obtained is derived from other audio frequency bands that have the frequency of the specified band as a harmonic frequency. Changes in audio signal level within one audio frequency band thereby affect the signal level of harmonic frequencies to decrease relative changes in volume between a fundamental frequency and its harmonics.

10 United States Patent No.: 8,315,398 pertains to a method of adjusting a loudness of an audio signal may include receiving an electronic audio signal and using one or more processors to process at least one channel of the audio signal to determine a loudness of a portion of the audio signal. This processing may include processing the channel with a plurality of approximation filters that can approximate a plurality of auditory filters that further approximate a human hearing system. In addition, the method may include computing at least one gain based at least in part on the determined loudness to cause a loudness of the audio signal to remain substantially constant for a period of time. Moreover, the method may include applying the gain to the electronic audio signal.

20 United States Patent No.: 8,452,432 pertains to a user-friendly system for real time performance and user modification of one or more previously recorded musical compositions facilitates user involvement in the creative process of a new composition that reflects the user's personal style and musical tastes. Such a system may be implemented in a small portable electronic device such as a handheld smartphone that includes a stored library of musical

material including original and alternative versions of each of several different components of a common original musical composition, and a graphic user interface that allows the user to select at different times while that original composition is being performed, which versions of which components are to be incorporated to thereby create in real time a new performance that includes
5 elements of the original performance, preferably enhanced at various times with user selected digital sound effects including stuttering and filtering. The system may also optionally comprise a visualizer module that renders a visual animation that is responsive to at least the rhythm and amplitude of the system's audio output, not only for entertainment value but also to provide visual feedback for the user.

10 United States Patent No.: 8,594,319 pertains to methods and apparatuses for adjusting audio content when more multiple audio objects are directed toward a single audio output device. The amplitude, white noise content, and frequencies can be adjusted to enhance overall sound quality or make content of certain audio objects more intelligible. Audio objects are classified by a class category, by which they can be assigned class specific processing. Audio objects classes
15 can also have a rank. The rank of an audio object's class is used to give priority to or apply specific processing to audio objects in the presence of other audio objects of different classes.

United States Patent Publication No.: 2007/0217623 pertains to a real-time processing apparatus capable of controlling power consumption without performing complex arithmetic processing and requiring a special memory resource. The real-time processing apparatus includes
20 an audio encoder that performs a signal processing in real time on an audio signal, a second audio encoder that performs the signal processing with a smaller throughput in real time on the audio, an audio execution step number notification unit that measures step number showing a level of the throughput in the signal processing by operating the 1st audio encoder or second

audio encoder, and an audio visual system control unit that executes control so that the first audio encoder operates when the measured step number is less than a threshold value provided beforehand and the second audio encoder operates when the step number is equal to or greater than the threshold value.

5 United States Patent Publication No.: 2011/0134278 pertains to an image/audio data sensing module incorporated in a case of an electronic apparatus. The image/audio data sensing module comprises: at least one image sensor, for sensing an image datum; a plurality of audio sensors, for sensing at least one audio datum; a processor, for processing the image datum and the audio datum according to a control instruction set to generate a processed image data stream
10 and at least one processed audio data stream, and combining the processed image data stream and the processed audio data stream to generate an output data stream following a transceiver interface standard; a transceiver interface, for receiving the control instruction set and transmitting the output data stream via a multiplexing process; and a circuit board, wherein the image sensor, the audio sensors and the transceiver interface are coupled to the circuit board, and
15 the processor is provided on the circuit board.

 United States Patent Publication No.: 2013/0044131 pertains to a method for revealing changes in settings of an analog control console, the method comprising: receiving a captured image of the analog control console; creating a composite image by superimposing the captured image and a live image of the analog control console; and displaying the composite image.

20 United States Patent Publication No.: 2013/0294618 pertains to a method and devices of sound volume management and control in the attended areas. According to the proposed method and system variants the sound reproducing system comprises: sounding mode appointment device, central station for audio signal transmittance; one or more peripheral stations for audio

signal reception and playback; appliance for listener's location recognition; computing device for performing calculation concerning sounding parameters at the points of each listener's location and for performing calculation of controlling parameters for system tuning. The system can be operated wirelessly and can compose a local network.

5 Various devices are known in the art. However, their structure and means of operation are substantially different from the present invention. Such devices fail to provide a device that can help develop a participant's knowledge in a multitude of different subject areas, while simultaneously engaging the participant physically. At least one embodiment of this invention is presented in the drawings below and will be described in more detail herein.

10

SUMMARY OF THE EMBODIMENTS

According to an aspect of the present invention, a system is provided. The system includes an audio control source; at least one cluster of at least one computing device, the at least one computing device including: a sound sensing mechanism, configured to sense a noise; and a
15 wireless transceiver, configured to wirelessly transmit and receive data from the audio control source. The system further includes at least one output device, including: a power source for operating the output device; a speaker for outputting sound; and a communication mechanism, for receiving electronic information from the audio control source. The system additionally includes the audio control source, in electronic communication the at least one cluster and the at
20 least one output device, the audio control source including: a memory, containing computer-executable instructions for connecting to the at least one cluster, and varying an output of the at least one output device, providing an interface; and a processor, for executing the computer-executable instructions, wherein the computer-executable instructions include: identifying one or

more sounds within the noise; isolating the one or more sounds; determining is one or more of the one or more sounds includes a frequency outside of a predetermined threshold; if one or more of the one or more sounds includes the frequency outside of the predetermined threshold, altering the one or more of the one or more sounds so that the frequency does not fall outside of the
5 predetermined threshold; and outputting the one or more sounds on the at least one output device.

It is an object of the present invention to provide the system, wherein the system further includes an interfacing mechanism, the interfacing mechanism including: a network adapter, configured to transmit and receive electronic information through both wired and wireless
10 communication; and at least one input mechanism, configured to: manipulate the interfacing mechanism; and vary the output of the at least one output device.

It is an object of the present invention to provide the system, wherein the sound-sensing mechanism is an omnidirectional transducer.

It is an object of the present invention to provide the system, wherein the sound-sensing
15 mechanism is selected from the group consisting of an ultrasonic transducer and an infrasonic transducer.

It is an object of the present invention to provide the system, wherein energy sensing mechanisms is selected from the group consisting of a microwave transducer; and an electro-optical transducer.

20 It is an object of the present invention to provide the system, wherein the sensed noise includes infrasonic or ultrasonic soundwaves.

It is an object of the present invention to provide the system, wherein the predetermined threshold equates to a frequency determined to pose a risk of harm to a human's body (e.g. a

retina and blue lights from screens, loud noise and a user's hearing capabilities, RF exposure limits and electrosensitivity, millimeter waves and cell growth or heart variability.

It is an object of the present invention to provide the system, wherein the computer-executable instructions further include: if one or more of the one or more sounds includes the
5 frequency outside of the predetermined threshold, notifying a user, via a notification, that one or more of the one or more sounds includes the frequency outside of the predetermined threshold.

It is an object of the present invention to provide the system, wherein the notification is an audible notification.

It is an object of the present invention to provide the system, wherein the system further
10 includes an in-ear device, wherein an audio output of the in-ear device auto-adjusts based on signal energy sensed within a cluster or surrounding clusters.

It is an object of the present invention to provide the system, wherein the computer-executable instructions further include panning the sensed noise.

It is an object of the present invention to provide the system, wherein the computer-
15 executable instructions further include adding one or more audio effects to the sensed noise.

It is an object of the present invention to provide the system, wherein the computer-executable instructions further include equalizing the sensed noise.

It is an object of the present invention to provide the system, wherein the altering the one or more of the one or more sounds so that the frequency does not fall outside of the
20 predetermined threshold is performed automatically.

It is an object of the present invention to provide the system wherein the system is further configured to sense and/or analyze infra/ultra-sonic waves (e.g., mm waves), visible light (e.g.

smart devices that have sensors that sense blue light from electronic screens and/or analyze and report prolonged exposure to the blue light) and radio waves.

According to another aspect of the present invention, a method of altering sensed noise prior to outputting the sensed noise is provided. The method includes providing at least one
5 audio control source and providing at least one cluster of at least one computing device, the at least one computing device including: a sound sensing mechanism, configured to sense a noise; and a wireless transceiver, configured to wirelessly transmit and receive data from the audio control source; at least one output device, including: a power source for operating the output device; a speaker for outputting sound; and a communication mechanism, for receiving
10 electronic information from the audio control source; and the audio control source, in electronic communication the at least one cluster and the at least one output device, the audio control source including: a memory, containing computer-executable instructions for connecting to the at least one cluster, and varying an output of the at least one output device, providing an interface; and a processor, for executing the computer-executable instructions. The method further
15 includes identifying one or more sounds within the noise; isolating the one or more sounds; determining if one or more of the one or more sounds includes a frequency outside of a predetermined threshold; if one or more of the one or more sounds includes the frequency outside of the predetermined threshold, altering the one or more of the one or more sounds so that the frequency does not fall outside of the predetermined threshold; and outputting the one or
20 more sounds on the at least one output device.

It is an object of the present invention to provide the method, wherein the at least one computing device further includes: an interfacing mechanism, the interfacing mechanism including: a network adapter, configured to transmit and receive electronic information through

both wired and wireless communication; and at least one input mechanism, configured to:
manipulate the interfacing mechanism; and vary the output of the at least one output device.

It is an object of the present invention to provide the method, wherein the sound-sensing mechanism is an omnidirectional transducer.

5 It is an object of the present invention to provide the method, wherein the predetermined threshold equates to a frequency determined to pose a risk of harm to a user's hearing capabilities.

 It is an object of the present invention to provide the method, wherein the method further includes, if one or more of the one or more sounds includes the frequency outside of the
10 predetermined threshold, notifying a user, via a notification, that one or more of the one or more sounds includes the frequency outside of the predetermined threshold.

 It is an object of the present invention to provide the method, wherein the notification is an audible notification.

 It is an object of the present invention to provide the method, wherein the method further
15 includes panning the sensed noise.

 It is an object of the present invention to provide the method, wherein the method further includes adding one or more audio effects to the sensed noise.

 It is an object of the present invention to provide the method, wherein the method further includes equalizing the sensed noise.

20 It is an object of the present invention to provide the method, wherein the altering the one or more of the one or more sounds so that the frequency does not fall outside of the predetermined threshold is performed automatically.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a schematic view of an embodiment of one cluster of the present invention with some interfaced devices.

FIG. 2 shows a schematic view of how interfaced devices create a sound fingerprint.

5 **FIG. 3** shows an illustration of an embodiment of the system of the present invention engaging in inter-cluster, cluster-to-audio control source; and cluster-to-cluster data sharing.

FIG. 4 shows a flow chart outlining an embodiment of the method of the present invention.

10 **FIGs. 5-6** show a flow chart outlining an embodiment of the method of the present invention.

FIG. 7A shows an illustration showing an embodiment of the present invention located in an automobile.

FIG. 7B shows an illustration showing an embodiment of the present invention located in an indoor theatre.

15 **FIG. 7C** shows an illustration showing an embodiment of the present invention located in an outdoor stadium.

FIG. 8 shows a flow chart outlining an embodiment of the method of the present invention.

20 DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiments of the present invention will now be described with reference to the drawings. Identical elements in the various figures are identified with the same reference numerals.

Reference will now be made in detail to each embodiment of the present invention. Such embodiments are provided by way of explanation of the present invention, which is not intended to be limited thereto. In fact, those of ordinary skill in the art may appreciate upon reading the present specification and viewing the present drawings that various modifications and variations
5 can be made thereto.

As a threshold matter, it should be noted that whenever the phrases “microphone” or “microphone-equipped” are used, it is intended to mean any device that is capable of detecting sound, not merely microphones. For example, a high-performance low frequency antenna connected to a software-defined radio may be used to input sound observations into the system,
10 or a piezo-electric diaphragm may be used to measure the vibrations the correspond to a given sound. These examples are provided to give greater clarity as to what the term “microphone” should be interpreted as, and not construed as a limiting example.

The system of the present invention operates by integrating clusters of various computing devices and wearable computers with sound management techniques and methods so that various
15 sound “fingerprints” can be developed and used to visualize how sound is being perceived in micro-areas within a larger venue. In various embodiments, the system of the present invention can be integrated into an individual’s home, vehicle audio system, concert venues, and other locations where sound is played. In addition, the system’s components allow for the present invention to be scaled to accommodate sound management and monitoring control within the
20 largest of venues such as stadiums and other sports arenas.

Due to the devices that are integrated into the system having the ability to sense the frequency and magnitude of audio signals, a sound fingerprint (summary) can be generated from deterministic methods. These fingerprints are then communicated to an audio control source and

can subsequently be processed and used to communicate with external applications and things such as third-party sound databases. However, the purpose of this system is not to be confused. In addition to the sound fingerprinting ability of the present invention, it is also capable of utilizing a series of methods to sense and control audio output in various venues.

5 In an alternative embodiment, the present invention is located in a train or airport station that has an intercom system that functions poorly when noisy crowds are present. If an audio control source within these facilities is able to autonomously collect audio data via a series of integrated devices, then with the present invention, the same audio control source can adjust system outputs accordingly in order to make important intercom announcements intelligible. In
10 yet another embodiment, a user can enter in EQ parameters in their integrated computing device to ensure that both the audio perceived by them, and the audio perceived by their device is in accordance with some predetermined parameters/settings. While many short-range wireless technologies can be used with the present invention, preferably one or more of the following technologies will be used: ANT+, Bluetooth, cellular, IEEE 802.15.4, IEEE 802.22, ISA 100a,
15 Infrared, ISM (band), NFC, RFID, WPAN, UWS, WI-FI, Wireless HART, Wireless HD/USB, ZigBee, or Z-wave.

 In yet another preferred embodiment, various in-ear systems may be integrated into the present invention, software-defined and/or cognitive-defined based in-ear transceivers can be used to wirelessly communicate with an audio control source and thus, the output of such an in-
20 ear monitor can be autonomously adjusted after sensing audio output. A given output can be adjusted according to what is sensed within specified location or what is sensed at external clusters. Similarly to a software-defined and/or cognitive-defined based in-ear transceivers, an in-ear monitor system for use with the present invention will preferably comprise hardware such

as, earphones, at least one body pack receiver, at least one mixer and at least one transmitter. These functions can also be adjusted and controlled via the audio control source of the present invention.

According to an embodiment, the functions of the present invention include sensing and
5 isolating frequency bands associated with musical instruments/human voices in the following order: midrange, highs, and lows. According to an embodiment, the functions further include separating like frequencies (panning). According to an embodiment, the functions additionally include balancing the volume, controlling the dynamic range of the frequencies sensed (compression), performing subtractive and additive equalization, and/or adding audio effects to
10 provide additional depth and texture.

Loud noises can often lead to stress and hearing loss. For example, certain frequencies and volumes can cause stress in pets, and loud music and other forms of loud sounds have put approximately 1.1 billion young people at risk of suffering from hearing loss. Furthermore, military veterans are 30% more likely to suffer from severe hearing loss than non-veterans. In
15 fact, according to the DoD's Hearing Center for Excellence (HCE), hearing loss is the most-widespread injury among returning veterans, driving hearing loss payments to exceed \$2 billion in 2016. The present invention provides for an interdisciplinary and technologically advanced approach to hearing loss prevention.

It is important to note that noise pollution not only produces negative health outcomes for
20 humans, but also, can produce negative outcomes for pets. Loud noises and obtrusive, artificial light negatively affect pets such as cats and dogs, and can eventually lead to abnormal behaviors, like excessive whining, trembling, barking and panting. These behaviors are a result of the pets trying to cope with the stress tied to phenomena within their environment, and if left unchecked,

can cause panic disorders such as, e.g., separation anxiety, which is not healthy for both pet owners and pets. It is therefore an object of the present invention to provide a method wherein at least one sound and/or light sensing device can be affixed or integrated into a pet wearable (e.g. dog collar).

5 Hearing loss can be considered an inevitable cost of military exercises and war. However, real-time alerts using mobile devices creates an opportunity to implement preventative measures, ultimately reducing hazardous exposure time and thus injury. Study considerations include, data sets, hearing loss incidents among veterans (on the rise), current preventative measures, gear, and equipment such as jet engines and other inherently noisy machinery.

10 In summary, various embodiments of the present invention are in response to the DoD commitment to reduce the number of military personnel that suffer from hearing loss injury by 1) analyzing hazardous sounds in real-time 2) alerting service members using wearable mobile devices (new preventative technique).

 According to an embodiment, the present invention provides for a mobile cluster-based
15 apparatus that analyzes, reports, and controls outputs based on a range of inputs over a swath of frequency bands, with distinct applications including sound output control, hazardous millimeter-wave, blue light or RF detection and reporting, and ultrasonic and infrasonic wave detection and reporting. In a blue light sensing application, a wearable in close proximity to a user's retina (e.g. located on a collar of a smart jacket) can measure prolonged blue light retina exposure and
20 report the issue back to the user.

 According to an embodiment, the apparatus is configurable and uses standard computing devices, such as wearables, tablets, and mobile phones, to measure various frequency bands

across multiple points, allowing a single user to visualize and adjust sound output, and in some cases, detect and report hazardous signals.

Each year, sound companies spend billions of dollars on audio technologies and audio research to find new ways to improve audio quality in performance settings. Proposed is an apparatus and method that creatively tackles the issue of poor audio quality and sound perception across various spaces by integrating consumer-based mobile devices, wearable computers and sound management systems. The ubiquitous computing devices in this method and apparatus senses soundwaves, associates sensed audio levels with specific clusters (locations), predicts whether or not an audio-related issue is likely to occur within a specific cluster (for instance, predicts if an echo is likely to occur), and adjusts audio intensity (and related EQs) accordingly to improve audio output quality.

Key features of the Mobile Cluster-Based Audio Adjusting Method and Apparatus include:

- User/listener-based sound management and control
- Scalable platform that can incorporate future tech - that is, new functionalities can be added because the method and apparatus is designed to seamlessly integrate additional components including, but not limited to, software applications such as a 'sound preference' application that sets user-based sound perception settings on a mobile device or wearable computer.
- Integrates with existing audio hardware and software - such as in-ear systems, mixer boards and other related audio consoles
- Autonomous audio sensing

- Can be configured, manufactured and sold across different industries (e.g. automobile or audio electronic industries)

- Can be used in sound fingerprint and music publishing/performance applications (e.g. in a performance venue, fingerprint data can be sent directly to music publishing entities from the

5 described clusters

- Can interface with various communication offerings such as e-mail, SMS, and visual screens (for instance, communicative updates can be sent with sensed audio measurements. A specific example – an SMS that reads a “too loud in section A’/cluster A)

- Can support a fixed or unfixed number of “sensing units”

10 Referring to FIG. 1, an embodiment of one cluster 101 of the present invention with some interfaced devices. Specifically, three embodiments of at least one computing device 102 are shown; wearable glasses, wearable watch, and a smartphone. It should be noted that while these three devices are listed as exemplary examples, any device with a sound sensing mechanism 150 and a way to transmit any recorded data is suitable for use as one of said at least one computing

15 devices 102. According to an embodiment, the sound sensing apparatus may be an omnidirectional transducer, an ultrasonic transducer, an infrasonic transducer, a microwave transducer, and/or any other suitable sound sensing apparatus, while maintaining spirit of the present invention. The sound sensing mechanisms of at least one computing device 102 will be able convert perceived sounds into electronic signals so that the recorded information may be

20 transmitted to neighboring clusters 101, or an audio control source (See FIG. 3), as desired. This data will be transmitted using either one or a combination of short-range wireless technologies, namely, ANT+, Bluetooth, cellular, IEEE 802.15.4, IEEE 802.22, ISA 100a, Infrared, ISM (band), NFC, RFID, WPAN, UWS, WI-FI, Wireless HART, Wireless HD/USB, ZigBee, or Z-

wave. Preferably, transducers integrated into these computing devices have an output signal that is fed into the input of an analog-to-digital converter (“ADC”) and can incorporate software and cognitive-defined radios to broaden the selection of compatible wireless communication interfaces and limit radio component footprints. According to an embodiment, the at least one
5 computing device 102 includes one or more wireless transceivers 155.

FIG. 2 shows a schematic view of how interfaced devices create a sound fingerprint. The sound transmission of the audio energy 109 sensed by the at least one computing device 102 propagates through air and is received by at least one computing device 102 using the transmission path outlined in Figure 2.

10 Assuming that Figure 2 depicts audio transmission in an indoor setting, at specified time intervals, each computing device measures the sound pressure level (SPL) and sound power level (SWL):

$$SPL = SWL + 10 \log \left[\frac{Q_{\theta}}{4\pi r^2} + \frac{4}{R_C} \right]$$

Where:

15 SPL = Sound pressure level dB

SWL = Sound power level = $10 \log_{10}(W/ W_{ref})$

W is the total sound power radiated from a source with respect to a reference power (W_{ref}) dBW re 10^{-12} Watts.

r = distance from source m

20 *Q_{θ} = directivity factor of the source in the direction of r*

S = total surface area of a room m^2

α_{av} = average absorption coefficient in a room

$$R_C = \text{room constant} = \frac{S\alpha_{av}}{1-\alpha_{av}} m^2$$

Over time, each computing device in Figure 2 detects differences in pressure (i.e. change in pressure vs. time) and converts the differences into an electrical signal. A Fast Fourier Transform is implemented (locally or in a cloud) to measure the relative amplitudes of the frequencies ‘sensed’ and to perform other frequency domain analyses.

5 It is important to note that in any given indoor environment, R_C , α_{av} , and S can be predetermined and made available to each computing device, approximated or deemed negligible. Also note that each computing device in Figure 2 has a microphone. Computing devices may also obtain sound observations via a high-performance low frequency antenna.

Turning to Fig. 3 an illustration of an embodiment of the system of the present invention
10 engaging in intra-cluster, cluster-to-audio control source; and cluster-to-cluster data sharing. Here, each cluster has a given location 110 (i.e. specified location) to accurately isolate and associate the sensed data. In one embodiment, the present invention is able to adjust a given output device 160 based on its proximity to a given location 110 of a cluster. In alternative embodiments, output devices 160 can be adjusted based on their proximity to more than one
15 cluster. Devices in each cluster can either communicate directly to each other or an audio control source 111, devices within a cluster can communicate to a single device within that cluster which can serve as a gateway to other clusters and/or audio control source 111. In some embodiments, the present invention further comprising an in-ear monitoring device 112. According to an embodiment, the output devices 160 may include a power source 165 (such as, e.g., a battery or
20 other suitable power source 160), a speaker 170, a communication mechanism 175 (such as, e.g., a wired and/or wireless transceiver), and/or any other suitable mechanisms (as shown in FIG. 1). According to an embodiment, the audio control source 111 includes a memory 180, a processor 182, an interface mechanism 184, and/or at least one input mechanism 186. According to an

embodiment, the interface mechanism 184 is a graphical user interface with a display (e.g., a touch screen display). According to an embodiment, the at least one output device 160 is located within said at least one cluster 101, such that said audio control source 111 may alter the power supplied to said speaker 170 in real-time.

5 The embodiment depicted here shows devices that sense audio signal energy within the confines of a single cluster and then sends data directly to an audio control unit and other clusters. Therefore, not only can these computing devices wirelessly share sensed data with each other, but, also, data can be shared with an audio control source 111 (for audio output management purposes) and other devices in other clusters. Depending on the audio signal energy
10 sensed within a specific cluster(s), audio control source 111 adjusts any connected output devices in either a single cluster, or multiple clusters to ensure high quality/fidelity output.

 FIG. 4 shows a flow chart outlining an embodiment of the method of the present invention. Here, method 200 is comprised of a number of steps. In step 201, initially, both desired and undesired audio output signals are sensed and subsequently analyzed. In step 202,
15 the method proceeds to determine whether or not the input signals match a set of predefined thresholds. If there is only negligible output audio, that is, if the audio within an environment is outside of a specified frequency range, the method proceeds to step 203 where the devices in each cluster operate in sleep mode. If there is indeed sensible audio output, the method proceeds to step 204 where the present invention determines if the predefined threshold or EQ setting is
20 breached. If this threshold is breached, the method moves to step 205 where the first device that sensed the breach will (preferably, wirelessly) communicate its signal measurements to other devices within its cluster and the receiving device will conduct the same audio measurements to confirm the threshold breach. Preferably, step 205 is repeated amongst all of the devices within a

single cluster, to provide more robust data sets. Once the breach confirmation stage is completed, in step 206, the present invention moved to step 207 where at least one computing device is chosen to communicate the breach to. Finally, in step 208, when the present invention, via the audio control source, adjusts audio levels at the at least one output device to transform undesired
5 audio outputs to desired audio outputs.

Referring now to FIGs. 5-6, a flowchart 300 of an embodiment of the present invention is illustratively depicted, in accordance with an embodiment of the present invention.

According to an embodiment, the present invention isolates and/or separates sounds within band, reports findings of those sounds to a cloud-based system for audio signal processing
10 (if necessary), and sends control commands to one or more commercial mixing consoles and/or audio control sources to alter the audio output (if necessary), and then communicate with apparatus devices to share and confirm sensed audio findings (if necessary). According to an embodiment, these sounds are associated with different frequencies and/or are associated with one or more instruments.

15 At step 305, audio/noise is sensed by one or more audio sensing devices. According to an embodiment, the one or more sensing devices are microphones.

At steps 310-315, the volume between the sensed audio is balanced. That is, one or more instruments and/or frequencies are identified and isolated from the sensed audio (at step 310), and the signal amplitude of each instrument is manipulated using a mixing console/audio source
20 (at step 315). It is noted, however, that, at step 310, the identified sounds need not always be instruments. The sounds may be any suitable identifiable sounds, while maintaining the spirit of the present invention.

According to an embodiment, the present system may sense different types of phenomena (e.g., it may sense audio using an audio transducer such as a microphone, it may include a smartwatch and/or other similar device that may be able to sense ultrasonic waves using an ultrasonic transducer, and/or the system may incorporate one or more various suitable types of transducers). According to an embodiment, the system may be configured to sense environmental phenomena outside of the acoustic frequency range by using a variety of transducers. In those cases, the underlying functionality of the system generally remains the same, regardless of the input phenomena sensed. The system may measure the intensity of an acoustic wave, ultrasonic wave, infrasonic wave, and/or any other suitable waves.

According to an embodiment, the system may incorporate various input/output functions/details, such as those shown in Table 1. According to an embodiment, the system is configured to sense, analyze, and/or control audio outputs.

SYSTEM INPUT	SYSTEM FUNCTION	OUTPUT
Network Interface: Sense audible sounds via mic or comparable audio sensing transducer	Apparatus will isolate/separate sounds within band, report findings to cloud- based system for audio signal processing (if necessary), send control commands to commercial mixing console and/or audio control source to alter audio output (if necessary) and communicate with apparatus devices to share and confirm sensed audio findings (if necessary)	Network Interface Configured to: Control mixing console(s) and/or an audio control source(s) via physical or SDR- based transceiver(s)**
20 - 40 Hz	Sub Bass *(Piano, Synthesizer Strings)	kHz: 125/134 MHz: 13.56/ 600/ 800/850/900/1700/1800/1900 2100/2200/L700/U700/230 0/2400/2500/2700/3500/5200/ 5700/whitespaces between 54 and 860/ GHz:3.6/4.9/5/5.9 /24 to 300 300 GHz to 430 THz
40 - 160 Hz	Bass Band (Drums, Strings, Winds, Vocals, Piano, Synthesizer)	
160 - 300 Hz	Upper Bass Band (Drums, Strings, Winds, Vocals, Piano, Synthesizer)	
300 - 800 Hz	Low-Mid Band (Drums, Strings, Winds, Vocals, Piano, Synthesizer)	
800 - 2.5 kHz	Mid-Range Band (Drums, Strings, Winds, Vocals, Piano, Synthesizer)	
2.5- 5 kHz	Upper Mid Band (Drums, Strings, Winds, Vocals, Piano, Synthesizer)	
5 - 10 kHz	High Frequency Band (Drums - including Cymbals, Synthesizer)	
10 - 20 kHz	Ultra-High Freq Bands (Hi-Hat, Cymbals, Hiss)	

Table 1

It is also noted that the present invention may further have implications in sensing and analyzing millimeter waves, which the human ear cannot hear. Higher-frequency millimeter-waves can possibly have adverse effects on human health. According to an embodiment, the present system can (as shown in Table 2), in real-time, detect and report harmful, high-energy level millimeter waves, which are included in many 5G deployment plans.

SYSTEM INPUT	SYSTEM FUNCTION	OUTPUT
Network Interface: Sense millimeter-waves via a mmWave transducer	Apparatus will detect, analyze, measure and/or report harmful millimeter-waves across several environments	Network Interface Configured to: Report/share data via physical or SDR-based transceiver(s)**
24 to 300 GHz	Identify and measure millimeter-wave characteristics	kHz: 125/134 MHz: 13.56/ 600/ 800/850/900/ 1700/1800/1900 2100/2200/L700/U700/2300/ 2400/2500/2700/3500/5200/5700/ whitespaces between 54 and 860/ GHz:3.6/4.9/5/5.9 /24 to 300 300 GHz to 430 THz

Table 2

Weaponized infrasonic and ultrasonic devices with highly directional energy transmissions can produce both psychological and physical effects on humans. In addition, blue light (short wavelength) emitted from displays is harmful to the retina. For this reason, a light sensing transducer is a part of the apparatus described herein. According to an embodiment, the present system can, in real-time, detect and report harmful infrasonic and ultrasonic devices in weaponized scenarios. According to an embodiment, the apparatus described can (as shown in Table 3), in real-time, detect and report harmful infrasonic and ultrasonic devices in weaponized scenarios.

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SYSTEM INPUT	SYSTEM FUNCTION	OUTPUT
Network Interface: Sense infrasonic, ultrasonic waves, and/or light waves via an ultrasonic, infrasonic or electro-optical transducer	Apparatus will detect, analyze, measure and/or report on harmful ultrasonic or infrasonic waves across several environments	Network Interface Configured to: Report/share data via physical or SDR-based transceiver(s)
18.9 Hz, 0.3 Hz, 7 Hz and 9 Hz 700 kHz to 3.6 MHz 20 to 200 kHz 400 – 770 THz	Identify and measure ultrasonic, infrasonic or visible wave characteristics	kHz: 125/134 MHz: 13.56/ 600/ 800/850/900/1700/1800/1900 2100/2200/L700/U700/ 2300/2400/2500/2700/3500/5200/5700/whitespaces between 54 and 860/ GHz:3.6/4.9/5/5.9 /24 to 300 300 GHz to 430 THz

Table 3

At step 320, it is determined whether the sensed audio includes any audio in frequencies
5 that have been predetermined to be hazardous to human ears. According to an embodiment, if
audio in the hazardous range has been detected, then one or more users are notified, at step 325.
The notification may take the form of a visual notification, an audible notification, and/or any

other suitable form of notification. It is noted, however, that, if automatically corrected, the user need not always be notified.

According to an embodiment, at step 330, the dynamic range of the sensed audio (compressed or limiting) is controlled by sending audio data to a mixing console/audio source or
5 cloud-based system that can identify and mitigate sudden peaks in a sensed audio stream to help sound(s) sit consistently in an audio mix (accomplished by removing sudden peaks). Altering the dynamic range may also be used to eliminate any audio in the predetermined hazardous range. At step 335, the audio is panned. That is, like frequencies in the sensed audio are separated.

10 At step 340, effects that add depth and texture to audio outputs are added and, at step 345, equalization is added using subtractive and/or additive equalization techniques.

According to an embodiment, at step 350, automation is generated that predicts environmental conditions based on sensed data (like echoes and audio wind steers) and, at step 355, volume changes and audio effects are autonomously programmed, accordingly.

15 According to an embodiment, the present invention includes acoustic band applications. Consumer products, such as, e.g., wearables, smartphones, and other portable computing devices autonomously control sound output(s) in private spaces (e.g. cars and homes) and public spaces (e.g. transport stations and theater/concert venues). According to an embodiment, the present system senses audible sounds via a mic or comparable audio sensing transducer and
20 isolates/separates sounds within certain bands, reports findings to cloud-based system(s) for audio signal processing, sends control commands to a commercial mixing console and/or audio control source to alter audio output, and communicates with cluster devices to share and confirm

sensed audio findings. According to an embodiment, the present system outputs to control mixing console(s) and/or an audio control source(s) via physical or SDR-based transceiver(s).

According to an embodiment, the present system senses and analyzes audio frequencies across clusters to adjust and control audio output and perceived sound at a given locale. In order to achieve high-quality sound and sound equalization of a sonic presentation, a sound system's audio output levels are autonomously adjusted via a central audio mixing source using intelligent tell-tale frequency characteristics gathered from clusters comprised of smart devices and/or wearable computers.

According to an embodiment, the audio signal data obtained within clusters enables a system integrated mixing console to manage audio output based on detailed frequency descriptions of acoustic properties and characteristics across a venue, room, or vehicle.

According to an embodiment, the present system incorporates a modular structure so that components can be added and expand as consumer needs grow.

According to an embodiment, the present system provides for an apparatus that is configured to adjust and control audio output signal levels across multiple cluster locales using computing devices such as smartphones and/or wearable computers; a wireless transmission platform; transceivers - software-defined, cognitive-defined and/or hardware- defined; wireless microphones; in-ear monitors - software-defined, cognitive-defined and/or hardware-defined; and a central audio mixing source.

According to an embodiment, the apparatus of the present invention may include, but is not limited to, the following functions:

- Balancing the volume between sensed audio. For example, isolating instruments based on frequency and manipulating the signal amplitude of each instrument using a mixing console/audio source.
- Controlling the dynamic range of the sensed audio (compress or limiting) by sending
5 audio data to a mixing console/audio source or cloud-based system that can identify and mitigate sudden peaks in a sensed audio stream to help sounds sit consistently in an audio mix (accomplished by removing sudden peaks).
- Panning.
- Adding effects that add depth and texture to audio outputs.
- 10 - Equalization using subtractive/additive equalization techniques.
- Automation that 1) predicts environmental conditions based on sensed data (like echoes and audio wind steers) and 2) autonomously programs volume changes and audio effects accordingly.

Referring to Figs. 7A-7C, various embodiments of the present invention implemented in
15 an automobile, an indoor theatre, and an outdoor stadium, respectively, are shown. While these venues are particularly suited for the present invention to be implemented in any venue in which there are multiple listeners.

In a preferred embodiment, the sound sensing mechanisms (preferably, transducers) used within each “sensing” computer/device outputs an output signal that is fed into the input of an
20 ADC. In the configurations described in Figure 7A, 7B and 7C, a single-ended ADC interface can be used effectively since ADCs and the transducer source are both located on the same integrated circuit board. However, since fully differential interfaces have performance gains over

single-ended inputs due to its inherent noise rejection characteristics, using a fully-directional interface instead of a single-ended interface may be desirable.

FIG. 8 shows a flow chart outlining an embodiment of the method of the present invention. Here, method 400 is comprised of a number of steps. According to an embodiment, the method as shown and described in FIG. 8 showcases the method steps of a system that measures the intensity of phenomena and its purpose is to sense, analyze, report, and, in some cases, control invisible phenomena. These invisible phenomena can include, e.g., ultrasonic waves, audio waves, infrasonic waves, mm waves etc. (using ultrasonic transducers, infrasonic transducers, microwave transducers, among others, and associated software for these applications).

As in method 200 of FIG. 4, initially, both desired and undesired audio output signals are sensed and subsequently analyzed. It is then determined whether or not the input signals match a set of predefined thresholds. If there is only negligible output audio, that is, if the audio within an environment is outside of a specified frequency range, the devices in each cluster operate in sleep mode, step 402. If there is indeed sensible audio output, the method proceeds to step 401 where the present invention determines if the predefined threshold or EQ setting is breached. If this threshold is not breached, the device operates in sleep mode 402. If this threshold is breached, the method moves on to step 403, where it is determined whether the device has a navigation unit. According to an embodiment, devices in the system can auto-awaken out of sleep mode based on the location of the device (e.g. when a user walks into a concert venue, the system will begin measuring surrounding signal energy).

If the device does not have a navigation unit, the method moves to step 404, where a breach severity measurement is determined. Once the breach severity measurement is

determined, the method moves to step 405, where it is determined whether there is an onset issue.

If there is an onset issue, the method moves to step 406, in which any data and/or findings are reported and/or displayed. Once the data and/or findings are reported and/or
5 displayed, the device returns to sleep mode, step 402.

If there is not an onset issue, the method moves to step 407, wherein a time window is calculated at which any sensed data was determined to be unacceptable. Once this time window is calculated, the method moves to step 408, wherein breaches within the calculated time window are collected and/or analyzed. Once the breaches within the calculated time window are
10 collected and/or analyzed, the method moves to step 409, wherein it is determined whether there were consistent breaches during the time window. If there were consistent breaches during the time window, the method moves to step 406. If there were not consistent breaches during the time window, the device goes back to sleep mode, step 402.

If the device has a navigation unit, the method moves to step 410, wherein breach
15 severity measurements with the device's location are determined. Once the breach severity measurements with the device's location are determined, the method moves to step 411, wherein it is determined whether the device's location at the time of the breach lessened the severity of the breach. If the device's location at the time of the breach did not lessen the severity, the method moves to step 405, wherein it is determined whether there is an onset issue. If the
20 device's location at the time of the breach did lessen the severity, the method moves to step 412, wherein an analysis takes place in which location and machine learning insights are factored into the threshold breach calculations. The method then moves to step 413, where it is determined if the breach is still an issue. If the breach is still an issue, the method moves to step 405, wherein

it is determined whether there is an onset issue. If the breach is not still an issue, the device goes back to sleep mode, step 402.

According to an embodiment, environmental measurements may be skewed depending on the device's location (e.g., in a bag, in a pocket, etc.). According to an embodiment, the location of the device is detected, and, in these cases, the system will either account for signal degradation in the measurement or disable environmental measurements based on predefined thresholds. According to an embodiment, smart devices (e.g., smartphones, etc.) will use an accelerometer and/or light sensor and/or a temperature sensor to detect whether or not the smart device is directly exposed to phenomena (i.e. whether or not the device is in a bag or pocket).

When introducing elements of the present disclosure or the embodiment(s) thereof, the articles "a," "an," and "the" are intended to mean that there are one or more of the elements. Similarly, the adjective "another," when used to introduce an element, is intended to mean one or more elements. The terms "including" and "having" are intended to be inclusive such that there may be additional elements other than the listed elements.

While the disclosure refers to exemplary embodiments, it will be understood by those skilled in the art that various changes may be made, and equivalents may be substituted for elements thereof without departing from the scope of the disclosure. In addition, many modifications will be appreciated by those skilled in the art to adapt a particular instrument, situation or material to the teachings of the disclosure without departing from the spirit thereof.

Therefore, it is intended that the disclosure not be limited to the particular embodiments disclosed.

CLAIMS

What is claimed is:

- 5
1. A system comprising:
 - an audio control source;
 - at least one cluster of at least one computing device,
 - the at least one computing device including:
 - 10 a sound sensing mechanism, configured to sense a noise; and
 - a wireless transceiver, configured to wirelessly transmit and receive data from the audio control source;
 - at least one output device, including:
 - a power source for operating the output device;
 - 15 a speaker for outputting sound; and
 - a communication mechanism, for receiving electronic information from the audio control source; and
 - the audio control source, in electronic communication the at least one cluster and the at least one output device, the audio control source including:
 - 20 a memory, containing computer-executable instructions for connecting to the at least one cluster, and varying an output of the at least one output device, providing an interface; and
 - a processor, for executing the computer-executable instructions,
 - wherein the computer-executable instructions include:
 - 25 identifying one or more sounds within the noise;
 - isolating the one or more sounds;

determining is one or more of the one or more sounds includes a frequency outside of a predetermined threshold;

if one or more of the one or more sounds includes the frequency outside of the predetermined threshold, altering the one or more of the one or more sounds so that the frequency does not fall outside of the predetermined threshold; and

outputting the one or more sounds on the at least one output device.

10 2. The system as recited in claim 1, further comprising:

an interfacing mechanism, the interfacing mechanism including:

a network adapter, configured to transmit and receive electronic information through both wired and wireless communication; and

at least one input mechanism, configured to:

15 manipulate the interfacing mechanism; and

vary the output of the at least one output device.

3. The system as recited in claim 1, wherein the sound-sensing mechanism is an omnidirectional transducer.

20

4. The system as recited in claim 1, wherein the sound-sensing mechanism is selected from the group consisting of: an ultrasonic transducer; an infrasonic transducer; and a microwave transducer.

5. The system as recited in claim 4, wherein the sensed noise includes infrasonic or ultrasonic soundwaves.
6. The system as recited in claim 1, wherein the predetermined threshold equates to a frequency determined to pose a risk of harm to a user's hearing capabilities.
7. The system as recited in claim 1, wherein the computer-executable instructions further include:
if one or more of the one or more sounds includes the frequency outside of the predetermined threshold, notifying a user, via a notification, that one or more of the one or more sounds includes the frequency outside of the predetermined threshold.
8. The system as recited in claim 1, wherein the computer-executable instructions further include steps selected from the group consisting of: panning the sensed noise; and equalizing the sensed noise.
9. The system as recited in claim 1, further comprising:
an in-ear device, wherein an audio output of the in-ear device auto-adjusts based on signal energy sensed within a cluster or surrounding clusters.
10. The system as recited in claim 1, wherein the altering the one or more of the one or more sounds so that the frequency does not fall outside of the predetermined threshold is performed automatically.

11. A method of altering sensed noise prior to outputting the sensed noise, comprising:
providing at least one audio control source;
providing at least one cluster of at least one computing device, the at least one computing
5 device including:
a sound sensing mechanism, configured to sense a noise;
a wireless transceiver, configured to wirelessly transmit and receive data from the
audio control source;
at least one output device, including:
10 a power source for operating the output device;
a speaker for outputting sound; and
a communication mechanism, for receiving electronic information from
the audio control source; and
the audio control source, in electronic communication the at least one cluster and
15 the at least one output device, the audio control source including:
a memory, containing computer-executable instructions for connecting to
the at least one cluster, and varying an output of the at least one output device,
providing an interface; and
a processor, for executing the computer-executable instructions;
20 identifying one or more sounds within the noise;
isolating the one or more sounds;
determining if one or more of the one or more sounds includes a frequency outside of a
predetermined threshold;

if one or more of the one or more sounds includes the frequency outside of the predetermined threshold, altering the one or more of the one or more sounds so that the frequency does not fall outside of the predetermined threshold; and
outputting the one or more sounds on the at least one output device.

5

12. The method as recited in claim 11, wherein the at least one computing device further includes:

an interfacing mechanism, the interfacing mechanism including:

a network adapter, configured to transmit and receive electronic information

10

through both wired and wireless communication; and

at least one input mechanism, configured to:

manipulate the interfacing mechanism; and

vary the output of the at least one output device.

15

13. The method as recited in claim 11, wherein the sound-sensing mechanism is selected from the group consisting of: an omnidirectional transducer; an ultrasonic transducer; an infrasonic transducer; an electro-optical transducer; and a microwave transducer.

20

14. The method as recited in claim 13, wherein the sensed noise includes infrasonic, ultrasonic, visible, or radio waves.

15. The method as recited in claim 11, wherein the predetermined threshold equates to a frequency determined to pose a risk of harm to a user's hearing capabilities.

16. The method as recited in claim 11, further comprising:
if one or more of the one or more sounds includes the frequency outside of the
predetermined threshold, notifying a user, via a notification, that one or more of the one or more
sounds includes the frequency outside of the predetermined threshold.

5

17. The method as recited in claim 11, further comprising:
panning the sensed noise.

18. The method as recited in claim 11, further comprising:
10 adding one or more audio effects to the sensed noise.

19. The method as recited in claim 11, further comprising:
equalizing the sensed noise.

15 20. The method as recited in claim 11, wherein the altering the one or more of the one or
more sounds so that the frequency does not fall outside of the predetermined threshold is
performed automatically.

ABSTRACT

The systems and methods described relate to the concept that smart devices can be used to 1) sense various types of phenomena like sound, blue light exposure, RF and microwave radiation, and 2) in real-time analyze, report and/or control outputs (e.g., displays or speakers).

- 5 The systems are configurable and use standard computing devices, such as wearable electronics, tablet computers, and mobile phones to measure various frequency bands across multiple points, allowing a single user to visualize and/or adjust environmental conditions.

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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.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters
-------------------------------	---

As the below named inventor, I hereby declare that:

This declaration is directed to: ☒ The attached application, or
☐ United States application or PCT international application number _____
filed on _____.

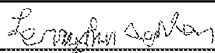
The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR	
Inventor: <u>Levaughn Denton</u>	Date (Optional): <u>10/5/2018</u>
Signature: <u></u>	

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute 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.

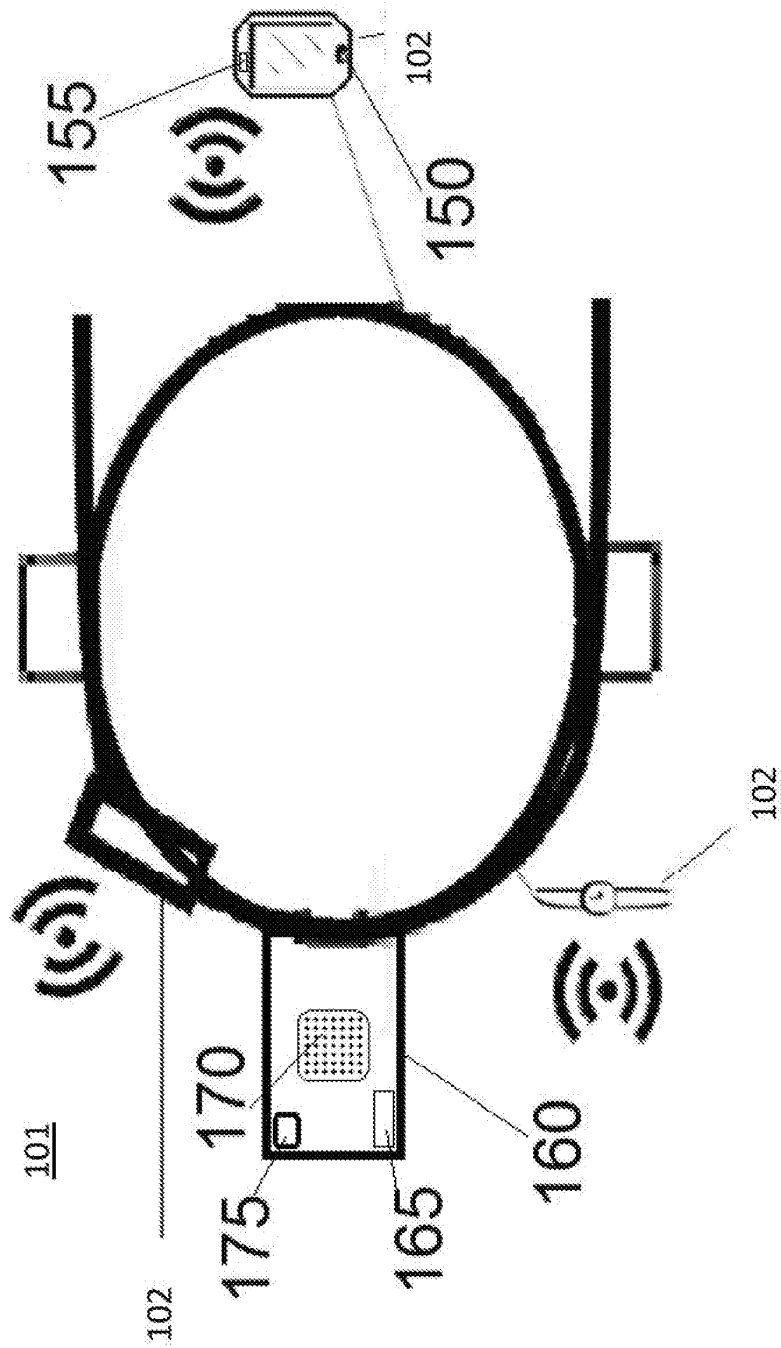


FIG. 1

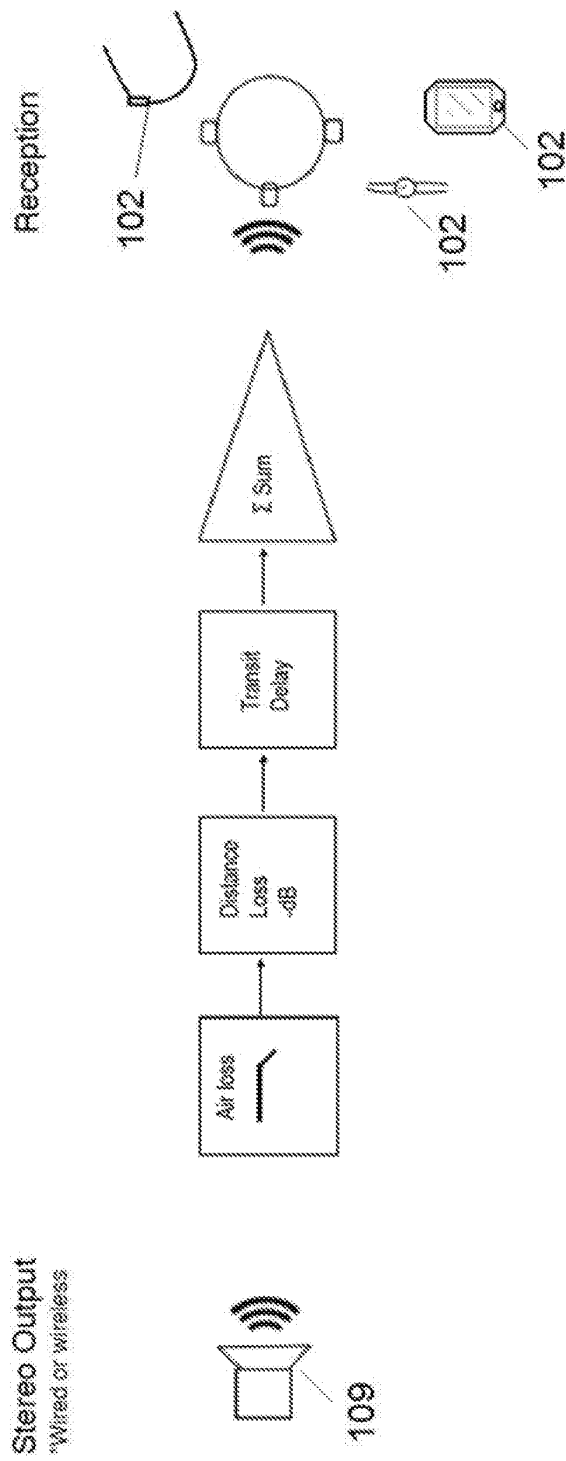


FIG. 2

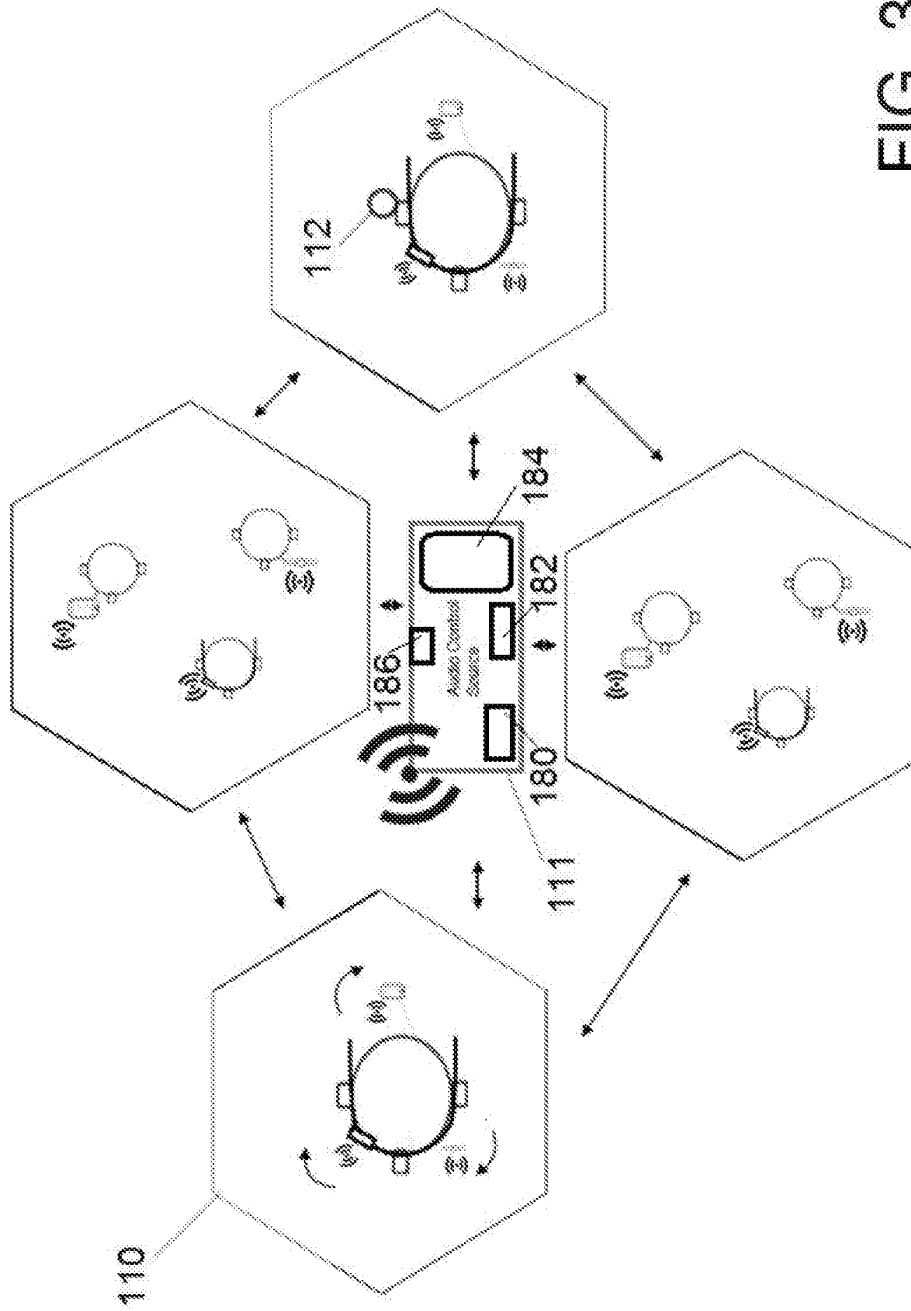


FIG. 3

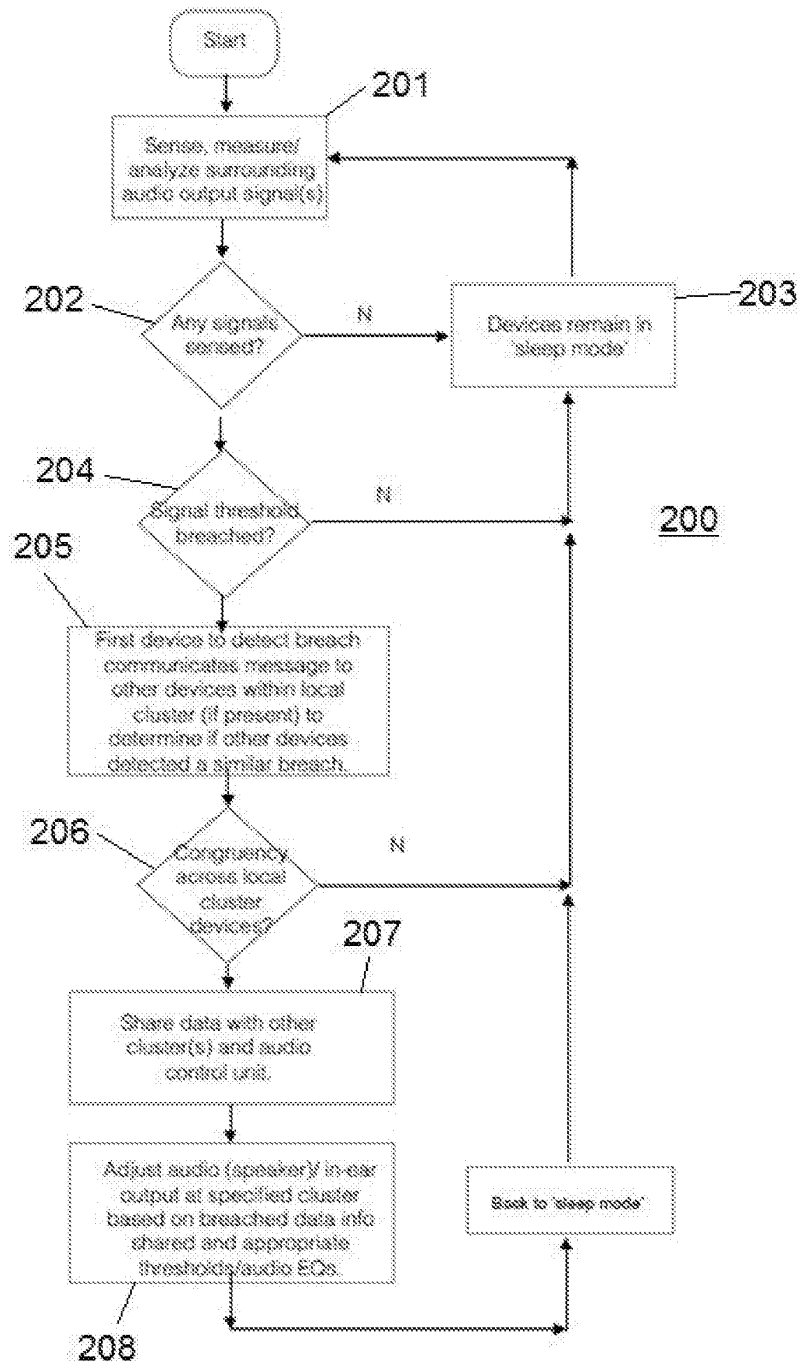


FIG. 4

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300

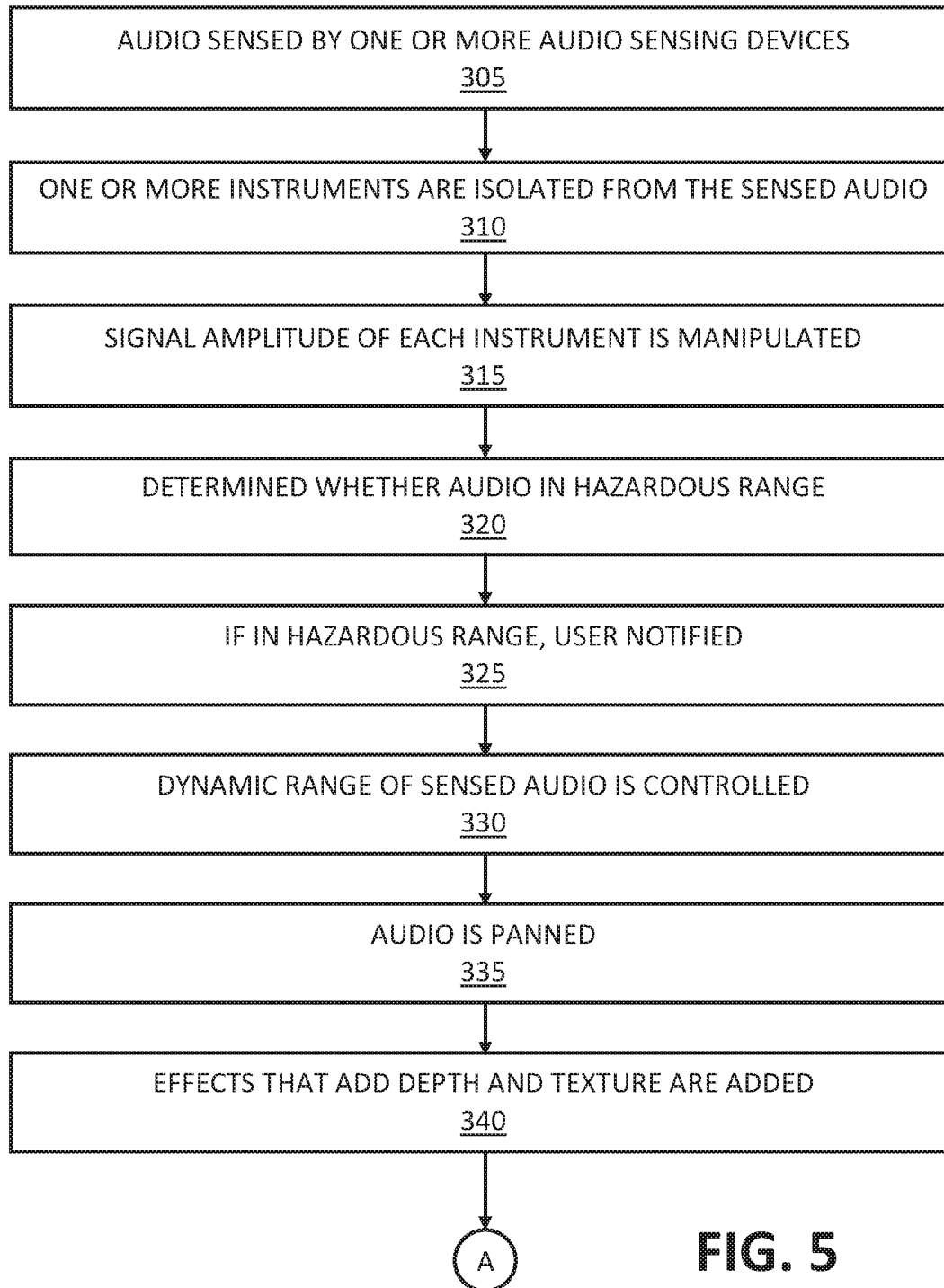


FIG. 5

6/10

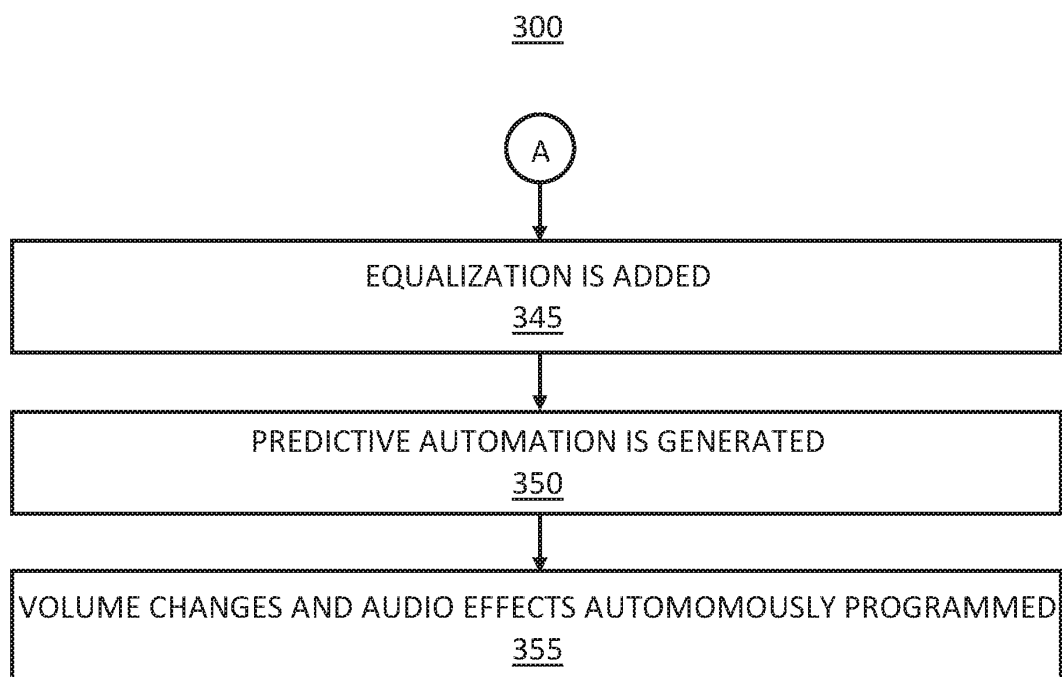


FIG. 6

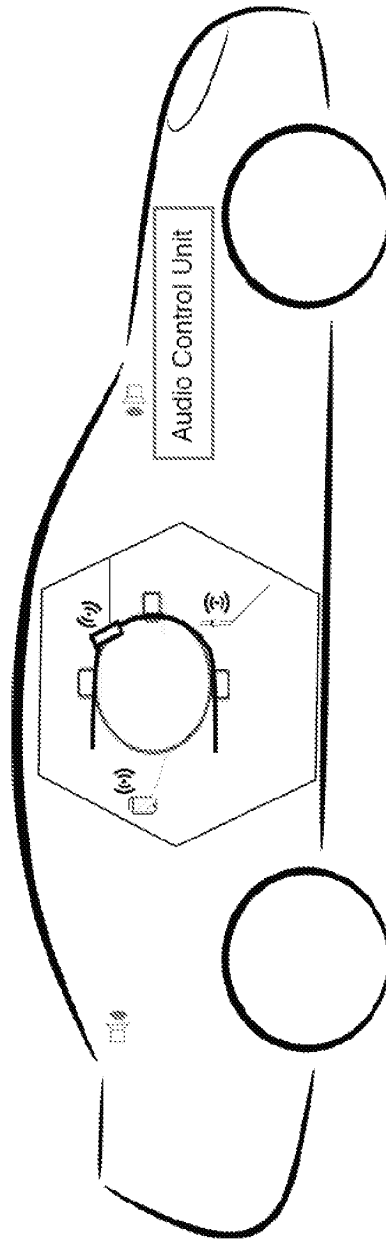
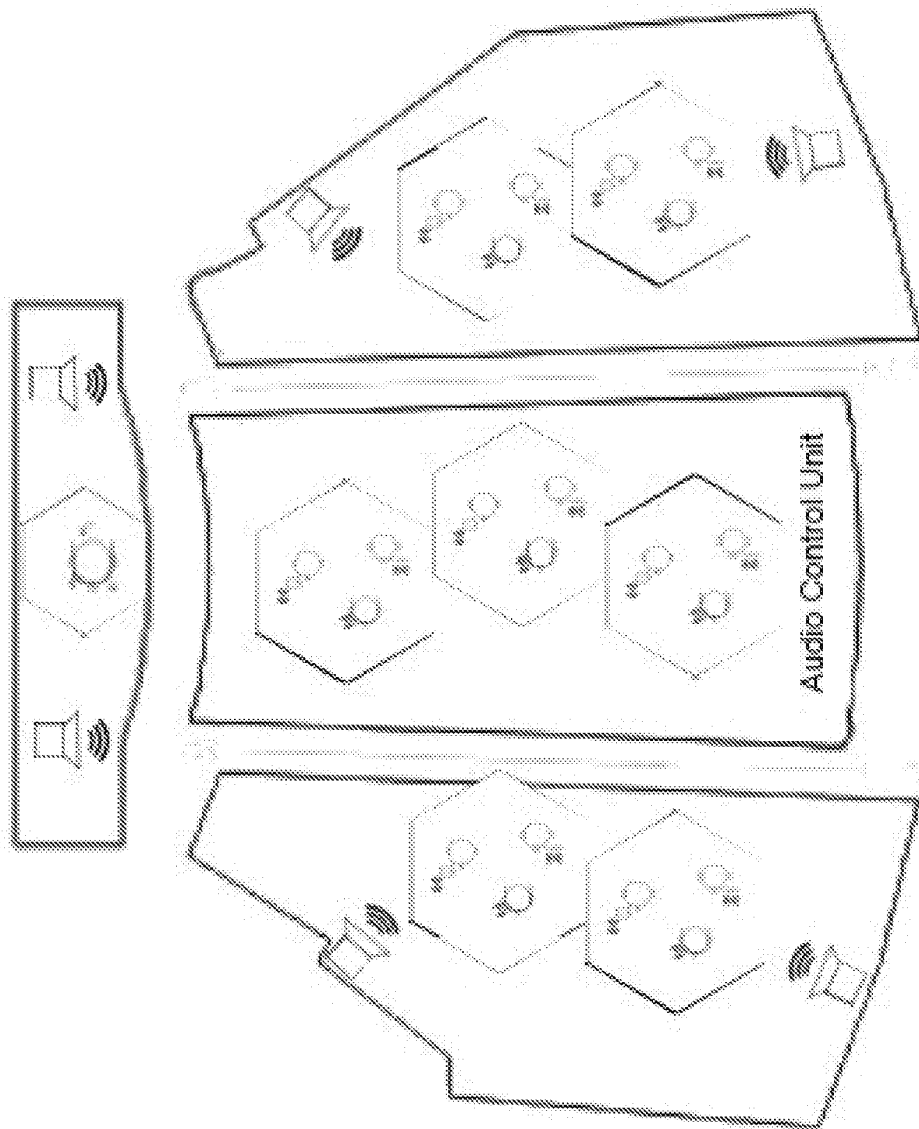


FIG. 7A

FIG. 7B



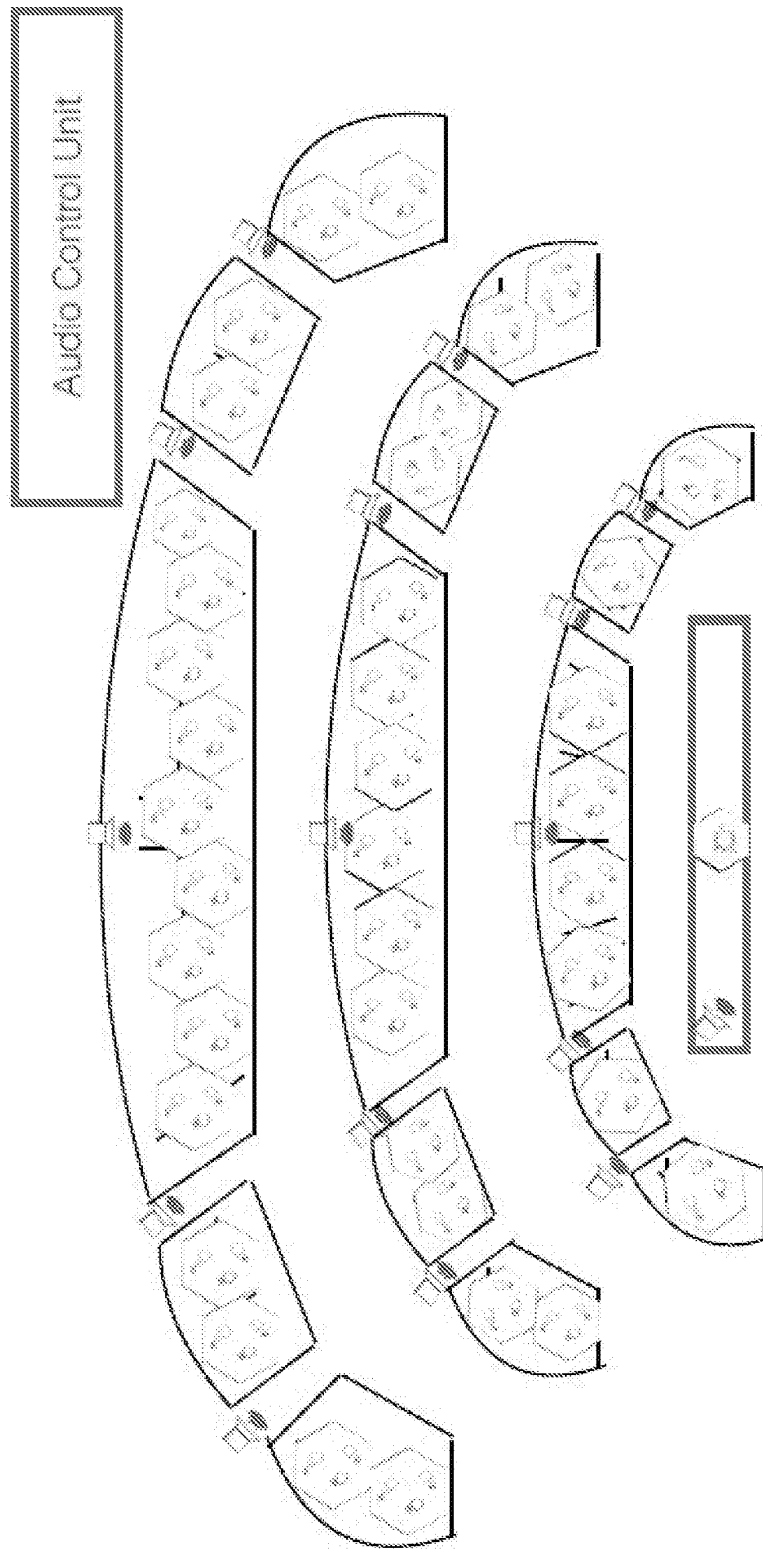
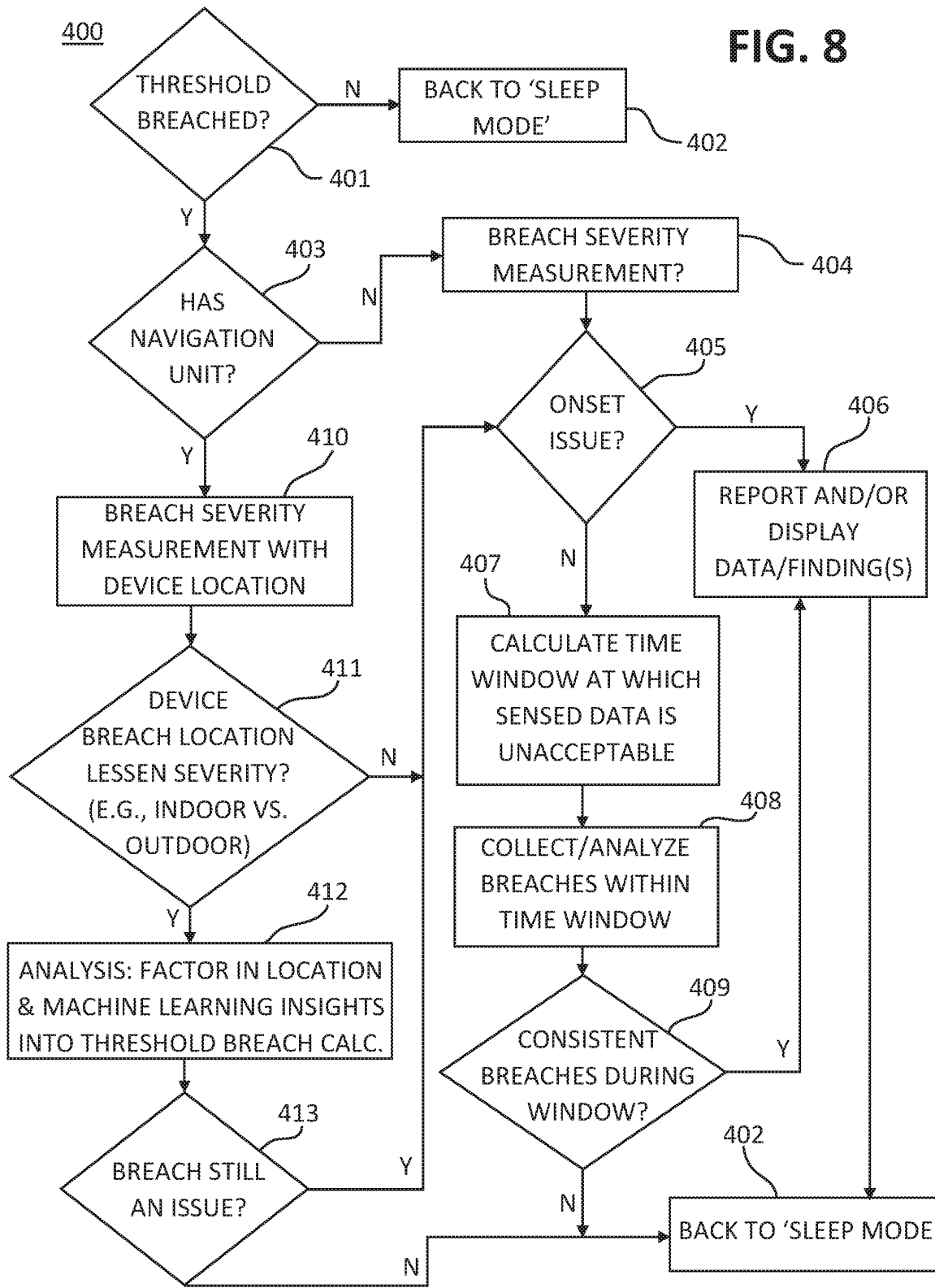


FIG. 7C

FIG. 8

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 16/421,141			
APPLICATION AS FILED - PART I									
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY			
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)	OR	RATE(\$)	FEE(\$)		
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	75		
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	165		
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	190		
TOTAL CLAIMS (37 CFR 1.16(i))	20	minus 20 = *			OR	x 25 =	0.00		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2	minus 3 = *				x 115 =	0.00		
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 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).						0.00		
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00		
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	430		
APPLICATION AS AMENDED - PART II									
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	OR	RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=		x	=	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x	=	
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
			TOTAL ADD'L FEE			OR	TOTAL ADD'L FEE		
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	OR	RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=		x	=	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x	=	
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
			TOTAL ADD'L FEE			OR	TOTAL ADD'L FEE		
<p>* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.</p> <p>** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".</p> <p>*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".</p> <p>The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.</p>									



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/421,141	05/23/2019	Levaughn Denton	2305LD01UTL1USCIP

CONFIRMATION NO. 7908

FORMALITIES LETTER



75207
Gearhart Law LLC
41 River Road
Suite 1A
Summit, NJ 07901

Date Mailed: 06/13/2019

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Filing Date Granted

An application number and filing date have been accorded to this application. The application is informal since it does not comply with the regulations for the reason(s) indicated below. Applicant is given **TWO MONTHS** from the date of this Notice within which to correct the informalities indicated below. 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 required item(s) identified below must be timely submitted to avoid abandonment:

- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) are required. The drawings submitted are not acceptable because:
 - The drawings must be reasonably free from erasures and must be free from alterations, overwriting, interlineations, folds, and copy marks. See Figure(s) 1 & 4.
 - The drawings submitted to the Office are not electronically reproducible because portions of figures 2-4, 7B, & 7C are missing and/or blurry.

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice".
<https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at <http://www.uspto.gov/ebc>.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/megga/



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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/421,141	05/23/2019	2654	430	2305LD01UTL1USCIP	20	2

CONFIRMATION NO. 7908

FILING RECEIPT



0000000108875329

75207
Gearhart Law LLC
41 River Road
Suite 1A
Summit, NJ 07901

Date Mailed: 06/13/2019

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Levaughn Denton, Baisley Park, NY;

Applicant(s)

Levaughn Denton, Baisley Park, NY;

Power of Attorney: The patent practitioners associated with Customer Number 75207

Domestic Priority data as claimed by applicant

This application is a CIP of 14/862,304 09/23/2015 PAT 10127005
which claims benefit of 62/054,286 09/23/2014
This application 16/421,141
is a CIP of 16/155,919 10/10/2018

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 06/12/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/421,141**

Projected Publication Date: To Be Determined - pending completion of Corrected Papers

Non-Publication Request: No

Early Publication Request: No

**** MICRO ENTITY ****

Title

Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters

Preliminary Class

381

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

page 2 of 4

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

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 U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Patent Application of:	:	
Levaughn Denton	:	
	:	
Conf. No.: 7908	:	Group Art Unit: 2654
	:	
Appln. No.: 16/421,141	:	Examiner: To Be Assigned
	:	
Filing Date: May 23, 2019	:	Attorney Docket No.: 2305LD01UTL1USCIP
	:	
Title:		
MULTI-FREQUENCY SENSING METHOD AND APPARATUS USING MOBILE-BASED CLUSTERS		

RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

This is in response to the Notice to File Corrected Application Papers dated June 13, 2019, giving a two-month period for reply. This reply is timely as submitted. No fees are deemed necessary in connection with the filing of this Response. However, if any additional fee is required or has been overpaid, authorization is hereby given to charge/credit the amount of such fee to Deposit Account No. 60-1818. The Applicant respectfully requests that the Examiner enter the following amendments, without prejudice, to the above-identified application:

Remarks begin on page 2.

REMARKS

Please find attached replacement drawings 1-8 on 10 drawing sheets properly marked as “Replacement Sheet”. The replacement drawings do not include any new matter. Please replace the original figures 1-8 with the attached replacement sheets. Applicant believes that the drawings submitted herewith overcome the issues raised in the Notice to Correct Application Papers dated June 13, 2019.

Respectfully Submitted,

/David D. Postolski/

David D. Postolski, Esq.
Attorney for Applicants
Reg. No. 67,547

Gearhart Law, LLC
Innovation Plaza, Suite 1A
41 River Road, Summit NJ 07901
T (908) 273 0700 F (908) 273 0711

Electronic Acknowledgement Receipt	
EFS ID:	36861344
Application Number:	16421141
International Application Number:	
Confirmation Number:	7908
Title of Invention:	Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters
First Named Inventor/Applicant Name:	Levaughn Denton
Customer Number:	75207
Filer:	David D. Postolski/Miriam Moore
Filer Authorized By:	David D. Postolski
Attorney Docket Number:	2305LD01UTL1USCIP
Receipt Date:	13-AUG-2019
Filing Date:	23-MAY-2019
Time Stamp:	16:28:24
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	Drawings-only black and white line drawings	Replacement_Sheets_Final.pdf	1913877	no	10
			3c13b97bd3647d1a902bc4ac4dae75dfa5235c4a		

Warnings:

Information:					
2	Transmittal Letter accompanying New/ Add'l Drawings	Response_To_Notice.pdf	461299	no	3
			03ab9a0646ee08b6fedfbaca180b46c5dc6c406b		
Warnings:					
Information:					
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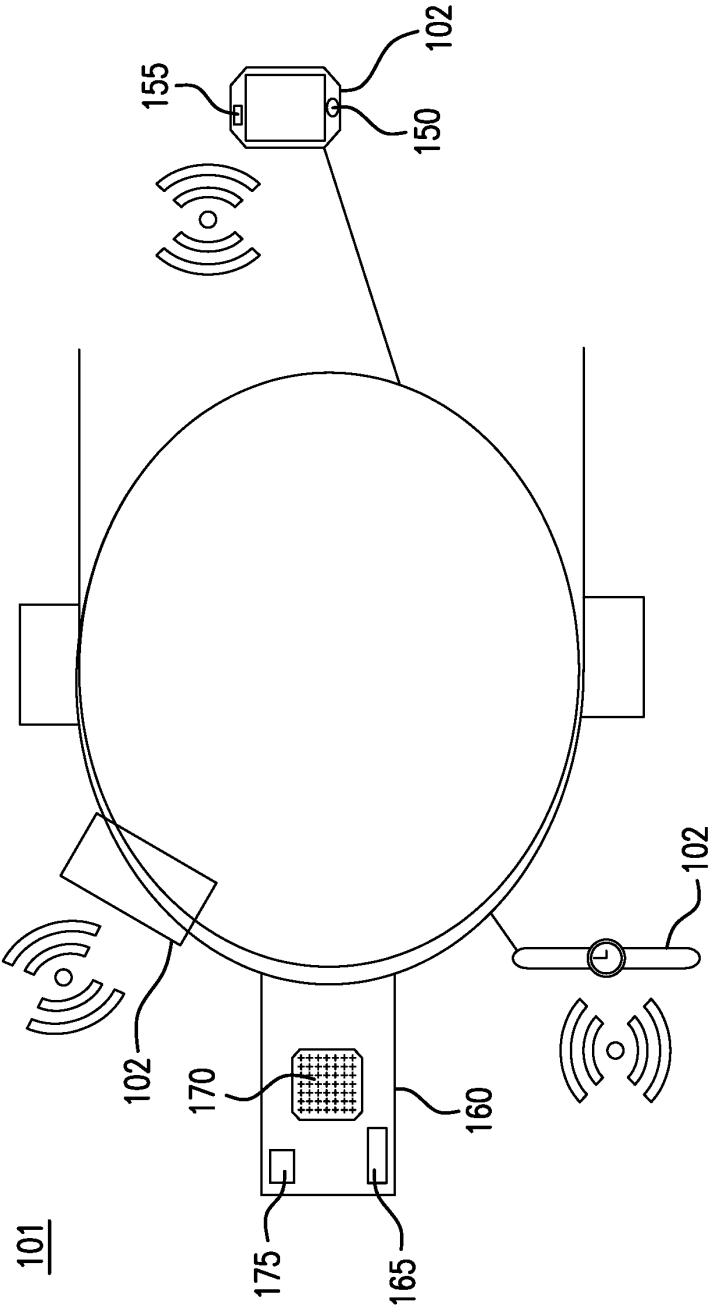


FIG.1

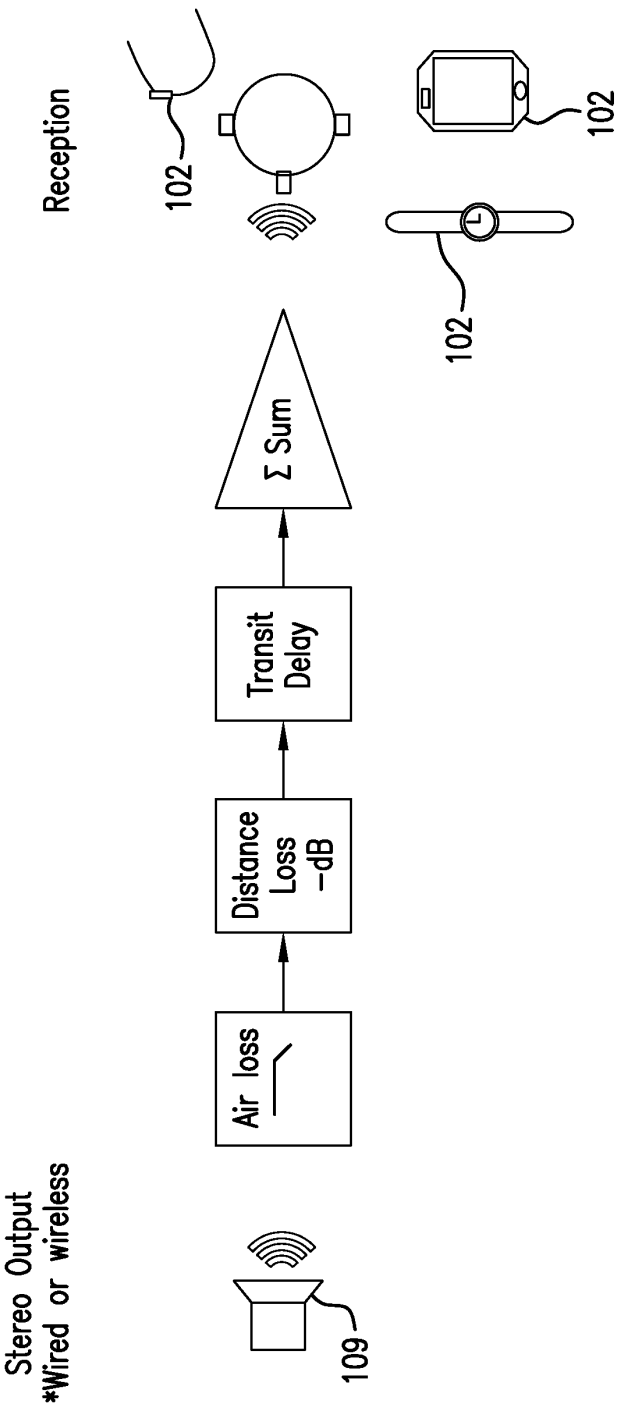
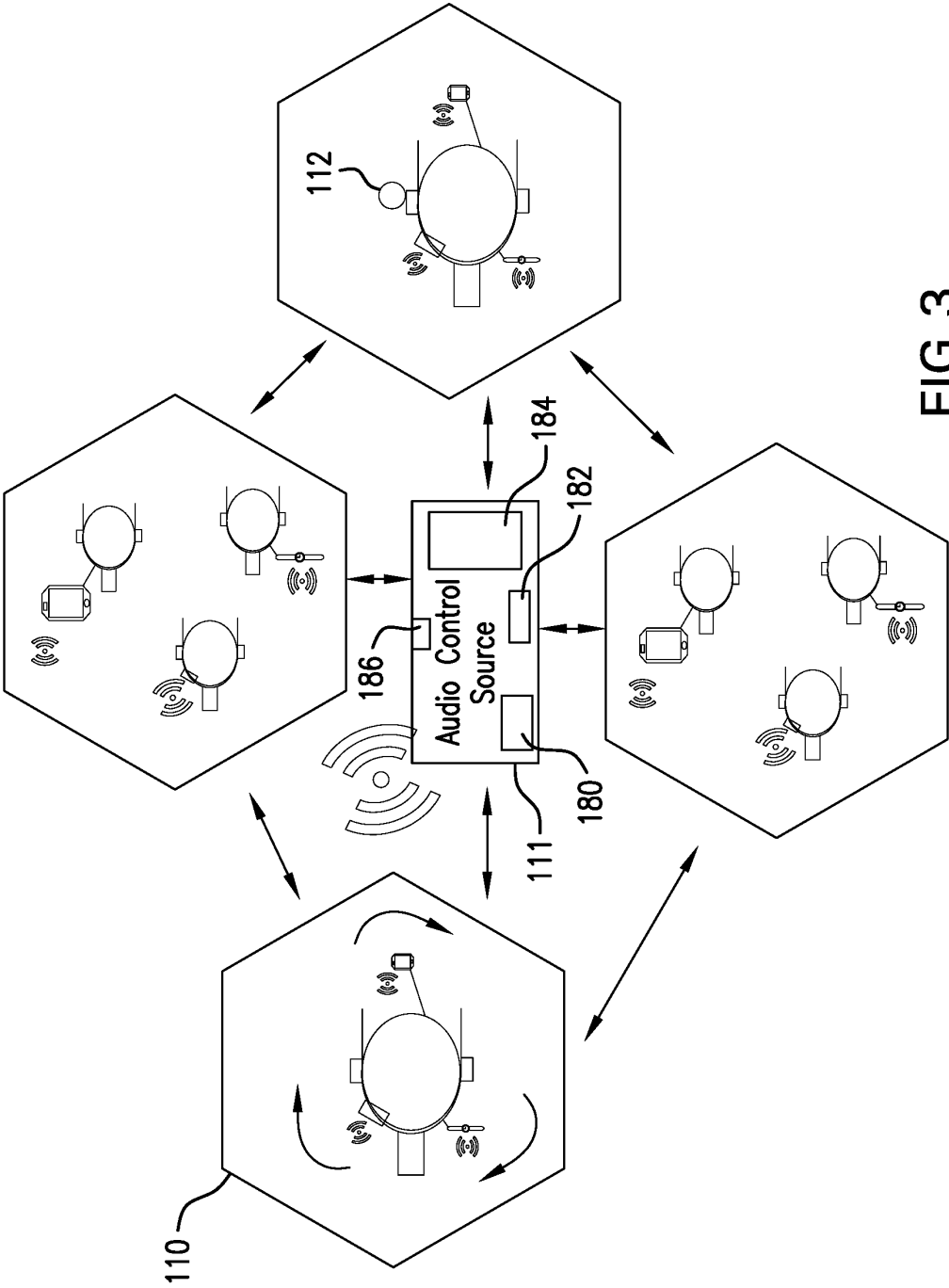
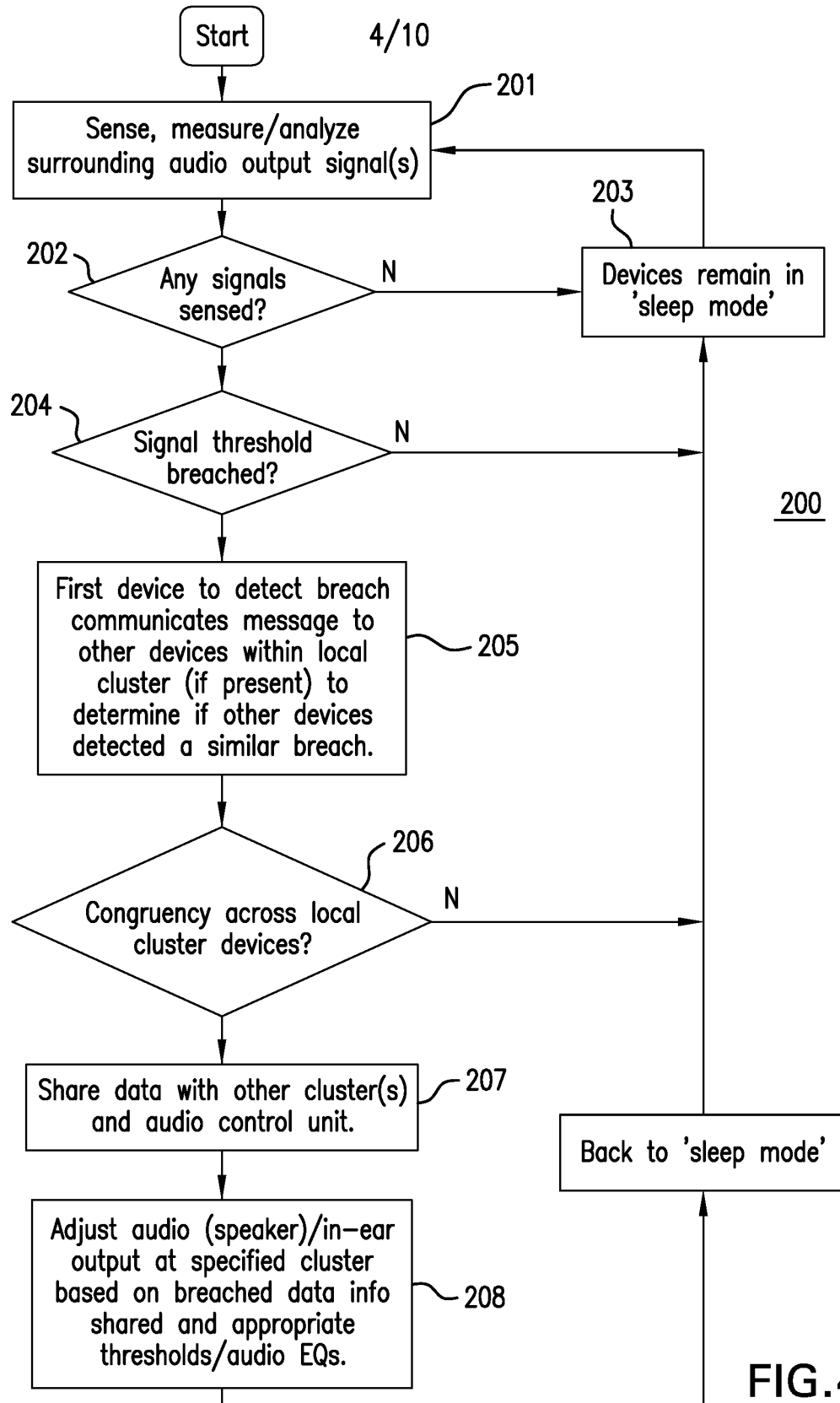


FIG.2





5/10

300

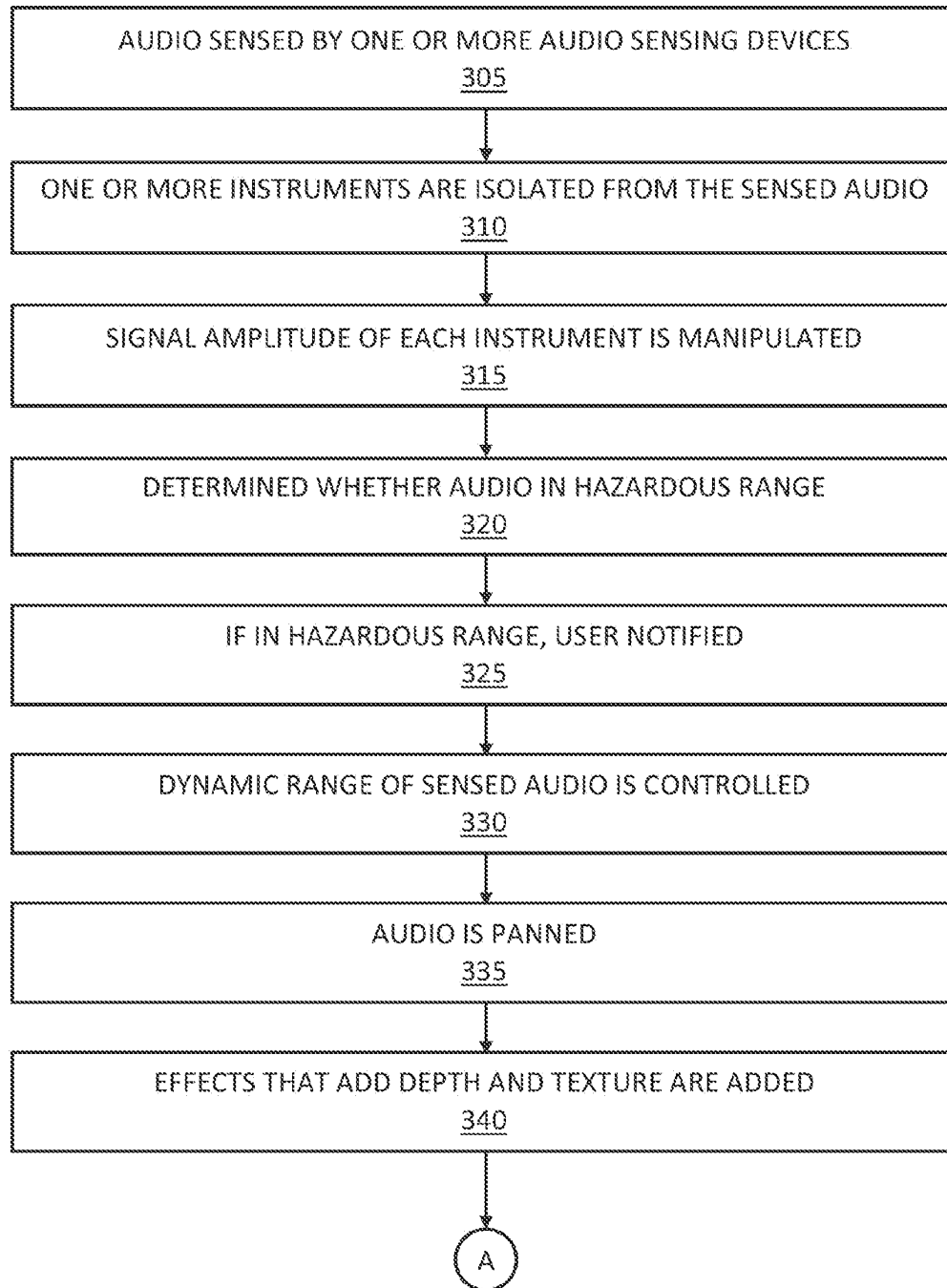


FIG.5

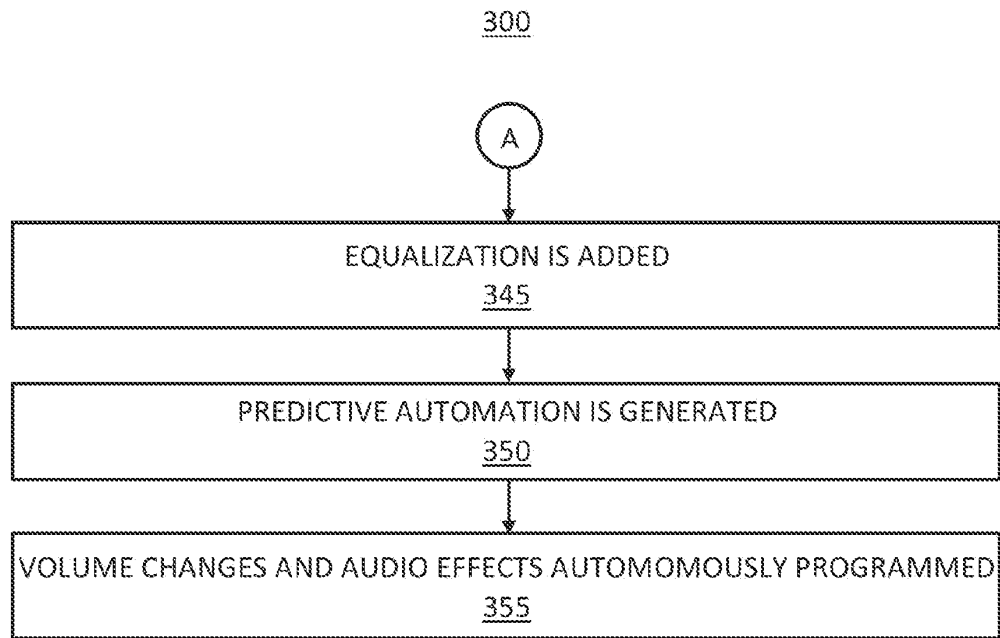


FIG.6

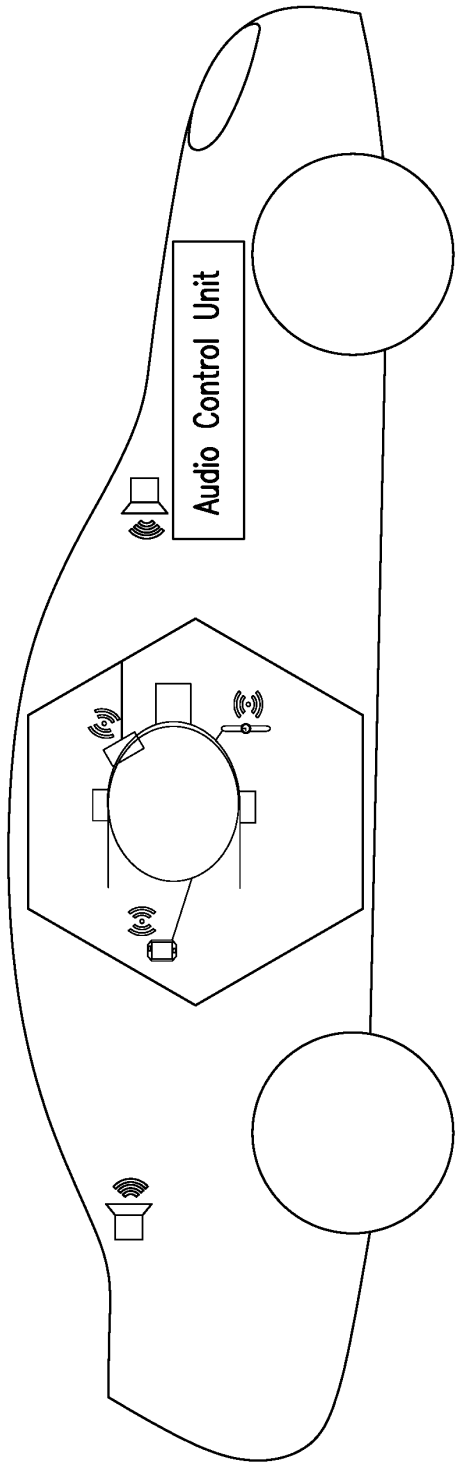


FIG.7A

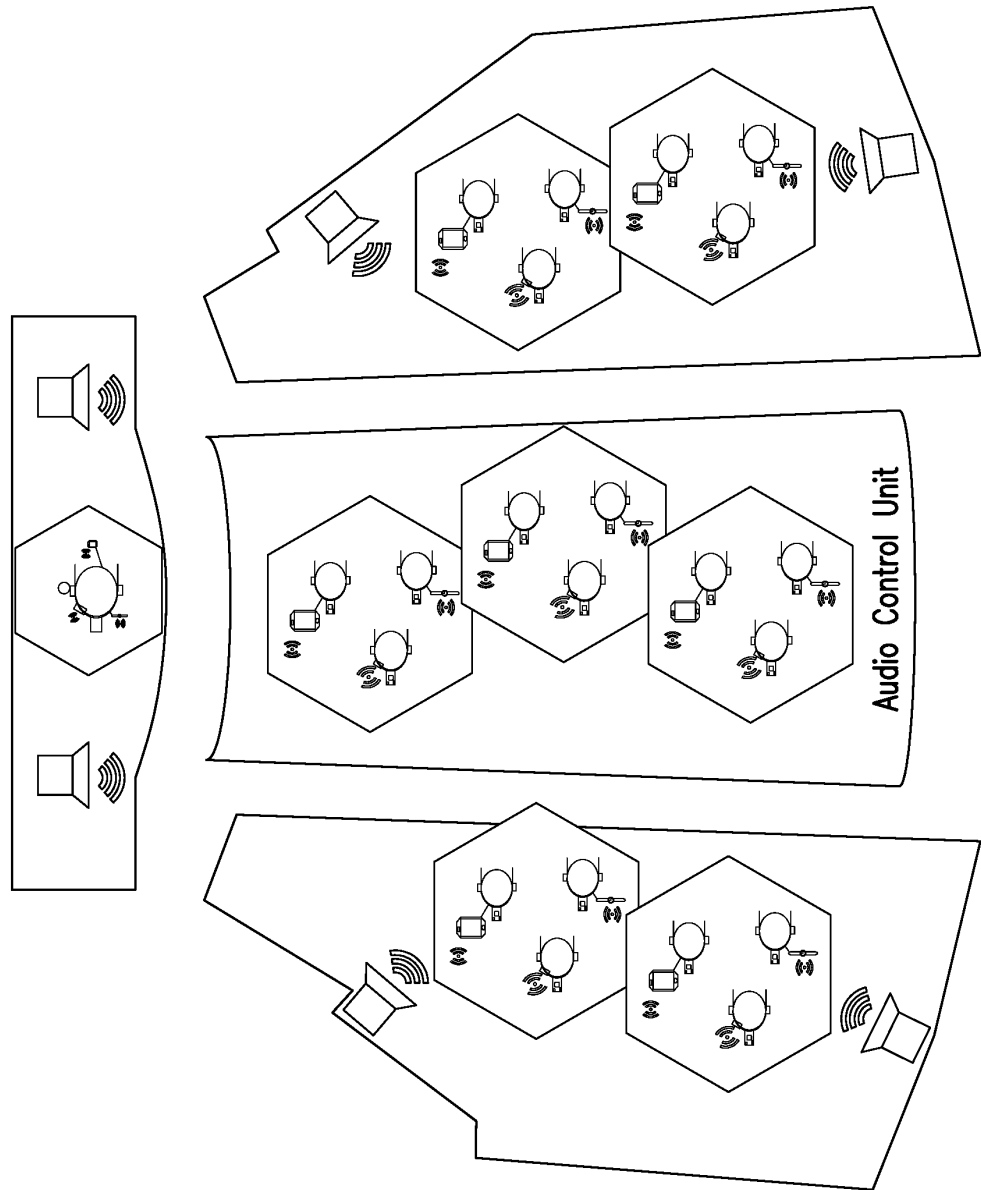


FIG.7B

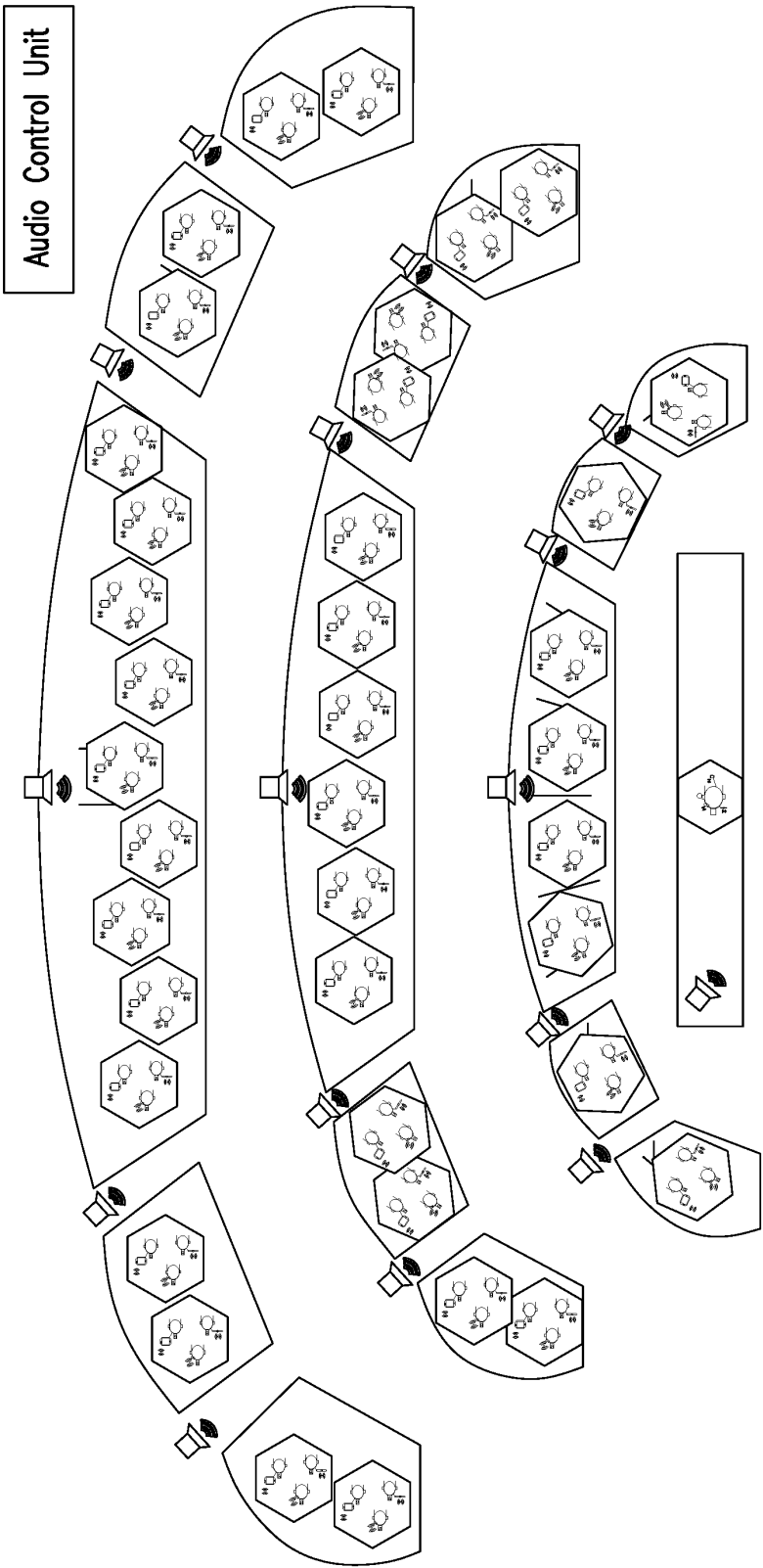
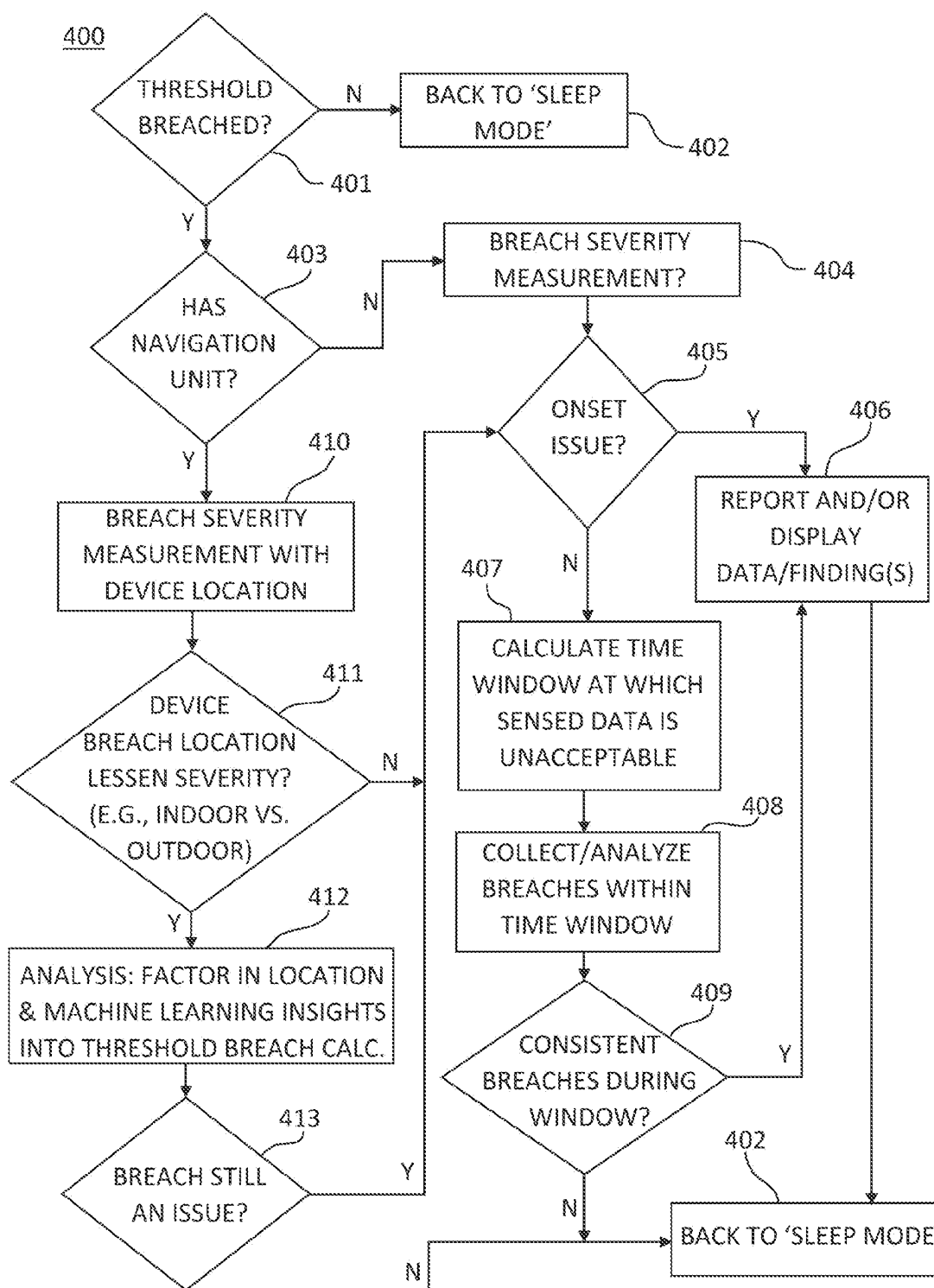


FIG.7C



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	3	8452432	B2	2013-05-28	Brian Transeau	
	4	7991171	B1	2011-08-02	Gary C. Snow	
	5	8594319	B2	2013-11-26	Dolby International, AB	
	6	8315398	B2	2012-11-10	Themis Katsianos	
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	1	20040076305	A1	2004-04-22	Shure, Inc.	
	2	20040240676	A1	2004-12-02	Panasonic Intellectual Property Corp.	
	3	20050160270	A1	2005-07-21	Black Hills Media, LLC	
	4	20060067550	A1	2006-03-30	Sivantos GmbH	
	5	20060082458	A1	2006-04-20	Symbol Technologies, LLC	
	6	20070217623	A1	2007-09-20	Panasonic Corp.	
	7	20090003620	A1	2009-01-01	Apple, Inc.	
	8	20090076825	A1	2009-03-19	Bionica Corp.	
	9	20090058611	A1	2009-03-05	Panasonic Corp.	
	10	20100329471	A1	2010-12-30	Manufacturing Resources International Inc.	

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	11	20110134278	A1	2011-06-09	Alcor Micro Corp.	
	12	20120189140	A1	2012-07-26	Apple Inc.	
	13	20130044131	A1	2013-02-21	Moheb Milad	
	14	20130064380	A1	2013-03-14	Apple, Inc.	
	15	20130294618	A1	2013-11-07	Mikhail Lyubachev	
	16	20110134278	A1	2011-07-09	Alcor Micro Corp.	
	17	20070217623	A1	2007-09-20	Noriyuki Harada	
	18	20130044131	A1	2013-02-21	Moheb Milad	

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	1	2016/049130	WO	A1	2016-03-31	DENTON LEVAUGHN		

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	Filing Date		2019-05-23	
	First Named Inventor	Levaughn Denton		
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	Examiner Name	N/A		
	Attorney Docket Number	2305LD01UTL1USCIP		

	2	1971035	EP	B2	2014-08-20	Harman International Industries	
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	2	International Preliminary Report on Patentability, dated March 28, 2017, for PCT Application Number PCT/US15/51638, International Filing Date September 23, 2015, consisting of 7 pages.	
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	Filing Date	2019-05-23
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	Attorney Docket Number	2305LD01UTL1USCIP

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

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Name/Print	David D. Postolski	Registration Number	67547

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14/862,304 23 September 2015 (23.09.2015) US

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118th Rd, Baisley Park, New York 11434 (US).

(74) Agent: GEARHART, Richard; Gearhart Law LLC, 41
River Road, Summit, New Jersey 07901 (US).

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Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments (Rule 48.2(h))

(54) Title: MOBILE CLUSTER-BASED AUDIO ADJUSTING METHOD AND APPARATUS

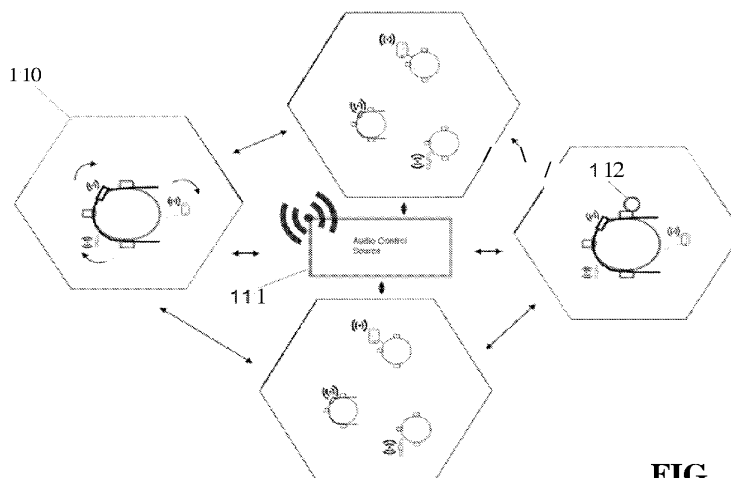


FIG. 3

(57) Abstract: The mobile cluster-based audio adjusting method and apparatus provides for a highly configurable sound management apparatus and process that combines standard computing devices such as laptops, tablets, and mobile phones to measure various aspects of sound waves across multiple points, allowing a single user to visualize and adjust sound output accordingly.

"MOBILE CLUSTER-BASED AUDIO ADJUSTING METHOD AND APPARATUS"

INVENTOR

Levaughn Denton

CLAIM OF PRIORITY

This application claims priority of the U.S. utility application number 14/862,304 filed on September 23, 2015 and U.S. provisional patent application number 62/054,286 filed on September 23, 2014, the contents of both of which are fully incorporated herein by reference.

FIELD OF THE EMBODIMENTS

The invention and its embodiments relate to audio manipulation and sound management systems, particularly for home audio systems, public address systems, sound reinforcement systems, vehicle audio systems, and associated software for these applications.

BACKGROUND OF THE EMBODIMENTS

Each year sound companies spend billions of dollars on audio technologies and audio research to find new ways to improve audio quality in performance settings. Very often sound systems are designed to be used in a specific environment. For example, in a vehicle or private room setting, audio manipulation and output quality techniques and technologies are either prescriptive or adaptive - neither of which require the need for audio engineering professionals. However, in other situations such as at a concert venue, a wide array of audio professionals must be employed. This can include monitor engineers, system technicians, and front-of-house

engineers. These professionals operate mixing consoles and audio control units to produce desirable, high-quality audio output.

Whether prescriptive or adaptive, manned or unmanned, perceived sound quality is a function of complex transducer-based technologies and acoustic treatment that are typically controlled, managed and manipulated by humans, and/or audio software and hardware. As such, both human and physical capital are required to produce first-rate sound quality. However, even when the necessary human and capital has been spent, it can still be very difficult to effectively manage audio outputs in real-time. This is due to improper calibrations of signal propagation and signal degradation, as well as unwanted harmonics and soundwave reflections.

Particularly in an outdoor settings, single-source sound systems typically produce an intermittent mix of unintelligible sounds and echoes due to a given venue's size and openness. A popular solution for addressing the echo issue is to utilize distributed sound systems. Traditional distributed sound systems are less susceptible to sound variance than single source systems. However, even when these distributed systems are used, temperature gradients and wind can still steer sound in undesirable ways.

Another issue related to the size of a performance venue is when audio and video fall out of sync. As live musical performances become more and more elaborate by including digital art and screens on-stage, it is becoming increasingly difficult to reliably sync audio and video in large venues, due to highly reverberant surfaces and long decay times.

Also impacting audio intelligibility during a live performance is crowd noise. At a live event, it is not uncommon for crowds to generate noise approaching 105dB. When this occurs, audio engineers must manipulate the supporting sound system output so that the performance audio remains 5-8 decibels higher than the noise generated by crowd. This action results in

performance sound being broadcast above 110 dB, the range where the volume of sound begins to pose danger to human listeners. Frequently, audio system operators find it difficult to granularly control the loud perception of a given individual listener while managing loudness perception for the remainder of the audience. In a case where an audio quality trade-off decision has to be made, a common industry practice is to execute a remediation plan that favors the majority of listeners while the minority of listeners are forced to suffer through it.

A myriad of audio functions are necessary to provide a dynamic range of audio playback and fidelity. To meet the increasing needs and address new challenges, the devices of today will not only have to handle traditional telephony voice communication and low-fidelity voice recording, but also, these devices must be capable of incorporating new hardware and software to create new functions and applications. Further, such demands create the need to process signals using 'low-loss' methods by moving much of the processing function away from hardware and into software optimized to do so.

In other instances, when various pieces of audio equipment are slightly, or completely out-of-phase, it can be difficult for audio system operators to correct these out-of-phase issues in a short period of time.

Review of related technology:

Line6, Inc. has created a 'smart mixing system' for non-wearable ubiquitous computing devices that enables wireless and touchscreen control of live sound system components. This is accomplished via a wired connection between standard audio hardware and a proprietary physical interface. While this system integrates and controls live sound system components via touchscreen devices, it unfortunately relies on audio engineers to operate it, and does not

incorporate a listener-centric way to autonomously solve audio issues experienced by an audience.

United States Patent No.: 5,668,884 pertains to an audio enhancement system and method of use with a sound system for producing primary sound from at least one main loudspeaker located at a main position. The audio enhancement system comprises at least one wireless transmitter, time delay circuitry, and plural augmented sound producing subsystems. Each sound subsystem is a portable unit arranged to be carried by a person located remote from the main loudspeaker and includes a wireless receiver and an associated transducer device, e.g., a pair of stereo headphones. The transmitter broadcasts an electrical signal which is representative of the electrical input signal provided to the main loudspeaker. The broadcast signal is received by the receiver and is demodulated and amplified to drive the transducer so that it produces augmented sound substantially in synchronism with the sound arriving from the main loudspeaker. To achieve that end the time delay circuitry delays the electrical signal which is provided to the transducer for a predetermined period of time corresponding generally to the time period it takes for the primary sound to propagate through the air from the main loudspeaker to the remote location at which the person is located.

United States Patent No.: 7,991,171 pertains to a method and apparatus for processing an audio signal in multiple audio frequency bands while minimizing undesirable changes in tonal qualities of the audio signal by determining an initial gain adjustment factor for each audio frequency band resulting from the application of an audio processing technique. A final gain adjustment factor for each band is selected from a corresponding set of weighted or unweighted initial gain adjustment factors. The set of initial gain adjustment factors from which the final gain adjustment factor for a specified audio frequency band is obtained is derived from other audio

frequency bands that have the frequency of the specified band as a harmonic frequency. Changes in audio signal level within one audio frequency band thereby affect the signal level of harmonic frequencies to decrease relative changes in volume between a fundamental frequency and its harmonics.

United States Patent No.: 8,315,398 pertains to a method of adjusting a loudness of an audio signal may include receiving an electronic audio signal and using one or more processors to process at least one channel of the audio signal to determine a loudness of a portion of the audio signal. This processing may include processing the channel with a plurality of approximation filters that can approximate a plurality of auditory filters that further approximate a human hearing system. In addition, the method may include computing at least one gain based at least in part on the determined loudness to cause a loudness of the audio signal to remain substantially constant for a period of time. Moreover, the method may include applying the gain to the electronic audio signal.

United States Patent No.: 8,452,432 pertains to a user-friendly system for real time performance and user modification of one or more previously recorded musical compositions facilitates user involvement in the creative process of a new composition that reflects the user's personal style and musical tastes. Such a system may be implemented in a small portable electronic device such as a handheld smartphone that includes a stored library of musical material including original and alternative versions of each of several different components of a common original musical composition, and a graphic user interface that allows the user to select at different times while that original composition is being performed, which versions of which components are to be incorporated to thereby create in real time a new performance that includes elements of the original performance, preferably enhanced at various times with user selected

digital sound effects including stuttering and filtering. The system may also optionally comprise a visualizer module that renders a visual animation that is responsive to at least the rhythm and amplitude of the system's audio output, not only for entertainment value but also to provide visual feedback for the user.

United States Patent No.: 8,594,319 pertains to methods and apparatuses for adjusting audio content when more multiple audio objects are directed toward a single audio output device. The amplitude, white noise content, and frequencies can be adjusted to enhance overall sound quality or make content of certain audio objects more intelligible. Audio objects are classified by a class category, by which they are can be assigned class specific processing. Audio objects classes can also have a rank. The rank of an audio objects class is used to give priority to or apply specific processing to audio objects sin the presence of other audio objects of different classes.

United States Patent Publication No.: 2007/0217623 pertains to a real-time processing apparatus capable of controlling power consumption without performing complex arithmetic processing and requiring a special memory resource. The real-time processing apparatus includes an audio encoder that performs a signal processing in real time on an audio signal, a second audio encoder that performs the signal processing With a smaller throughput in real time on the audio, an audio execution step number notification unit that measures step number showing a level of the throughput in the signal processing by operating the 1st audio encoder or second audio encoder, and an audio visual system control unit that executes control so that the first audio encoder operates When the measured step number is less than a threshold value provided beforehand and the second audio encoder operates when the step number is equal to or greater than the threshold value.

United States Patent Publication No.: 2011/0134278 pertains to an image/audio data sensing module incorporated in a case of an electronic apparatus. The image/audio data sensing module comprises: at least one image sensor, for sensing an image datum; a plurality of audio sensors, for sensing at least one audio datum; a processor, for processing the image datum and the audio datum according to a control instruction set to generate a processed image data stream and at least one processed audio data stream, and combining the processed image data stream and the processed audio data stream to generate an output data stream following a transceiver interface standard; a transceiver interface, for receiving the control instruction set and transmitting the output data stream via a multiplexing process; and a circuit board, wherein the image sensor, the audio sensors and the transceiver interface are coupled to the circuit board, and the processor is provided on the circuit board.

United States Patent Publication No.: 2013/0044131 pertains to a method for revealing changes in settings of an analogue control console, the method comprising: receiving a captured image of the analogue control console; creating a composite image by superimposing the captured image and a live image of the analogue control console; and displaying the composite image.

United States Patent Publication No.: 2013/0294618 pertains to a method and devices of sound volume management and control in the attended areas. According to the proposed method and system variants the sound reproducing system comprises: sounding mode appointment device, central station for audio signal transmittance; one or more peripheral stations for audio signal reception and playback; appliance for listener's location recognition; computing device for performing calculation concerning sounding parameters at the points of each listener's location

and for performing calculation of controlling parameters for system tuning. The system can be operated wirelessly and can compose a local network.

Various devices are known in the art. However, their structure and means of operation are substantially different from the present invention. Such devices fail to provide a device that can help develop a participant's knowledge in a multitude of different subject areas, while simultaneously engaging the participant physically. At least one embodiment of this invention is presented in the drawings below, and will be described in more detail herein.

SUMMARY OF THE EMBODIMENTS

The present invention provides for a system comprising: at least one cluster of at least one computing device, said at least one computing device being equipped with: a sound sensing mechanism, capable of monitoring the amplitude and frequency of desirable and undesirable signals, a wireless transceiver, capable of wirelessly transmitting and receiving data from a audio control source, said data comprising at least one characteristic of at least one sound fingerprint; at least one output device, comprising: a power source for operating the device, a speaker for outputting sound, a communication mechanism, for receiving electronic information from said audio control source; said audio control source, in electronic communication said at least one cluster and said at least one output device, said audio control source comprising: a memory, containing computer-executable instructions for connecting to said at least one cluster, processing said at least one characteristic of at least sound fingerprint, visualizing said at least one sound fingerprint, varying the output of said at least one output device, providing an interface, a processor, for executing said computer-executable instruction, a interfacing mechanism, comprising: a network adapter, capable of transmitting and receiving electronic

information through both wired and wireless communication; a display, for showing said interface and said at least one visualized sound fingerprint, at least one input mechanism, for manipulating said interface, and varying said output of said at least one output device.

The present invention also contemplates embodiments where said sound-sensing mechanism is an omnidirectional transducer, as well as embodiments where said display and said at least one input mechanism are one-in-the-same. The present invention may utilize short-range wireless technologies selected from the group consisting of: ANT+, Bluetooth®, cellular, IEEE 802.15.4, IEEE 802.22, ISA 100A, infrared, ISM, NFC, RFID, WPAN, UWS, Wi-Fi®, Wireless HART, Wireless HD/USB, ZigBee® and Z-wave®, and may employ an analog-to-digital converter, said analog-to-digital converter featuring an input structure selected from the group consisting of: fully-differential, pseudo-differential, wide input common mode, and single-ended. The present invention may also employ at least one audio codec, at least one application processor, and at least one baseband processor, software-defined radios, superheterodyne architecture radios, direct conversion architecture, or some combination thereof.

In yet another embodiment, the present invention uses a software-based radio, wherein said software-based radio isolates RF frequencies, said at least one computing device relays those frequencies to said audio control unit, wherein said audio control unit ensures that predetermined frequency thresholds are not breached. Further, the present invention may operate where electronic communications between said at least one computing device, said at least one cluster, said at least one output device, and said audio control unit are sent and received using an ambient backscatter techniques. The audio control source may employ a touch-sensitized screen as its input device, and when said at least one output device is located within said at least one

cluster, such that said audio control source may alter the power supplied to said speaker in real-time.

Additionally, the present invention provides for a method of maintaining consistent sound across, comprising the steps of: providing at least one cluster of at least one computing device, said at least one computing device being equipped with: a sound sensing mechanism, capable of monitoring the amplitude and frequency of ambient noise, a desired signal, and an undesired signal, a wireless transceiver, capable of wirelessly transmitting and receiving data from an audio control source, said data comprising at least one characteristic of at least one sound fingerprint; at least one output device, comprising: a power source for operating the device, a speaker for outputting sound, a communication mechanism, for receiving electronic information from said audio control source; said audio control source, in electronic communication said at least one cluster and said at least one output device, said audio control source comprising: a memory, containing computer-executable instructions for connecting to said at least one cluster, processing said at least one characteristic of at least sound fingerprint, visualizing said at least one sound fingerprint, varying the output of said at least one output device, providing an interface, a processor, for executing said computer-executable instruction, a interfacing mechanism, comprising: a network adapter, capable of transmitting and receiving electronic information through both wired and wireless communication; a display, for showing said interface and said at least one visualized sound fingerprint, at least one input mechanism, for manipulating said interface, and varying said output of said at least one output device; sensing, measuring, and analyzing, by said at least one computing device, surrounding audio output signals; determining, by said at least one computing device, whether a qualifying signal has been sensed; identifying and categorizing said measurements, by said at least one computing device;

determining, by said at least one computing device, whether said measurements breach a predetermined threshold; communicating, to other clusters, if present, and said audio control source, said breach; determining, by said other clusters, if present, and said audio control source if a second breach has occurred; adjusting, by said audio control source, based on said communicated measurements. In some embodiments, the method adjusts the at least one output device automatically based on predetermined values.

In an alternative embodiment, the present invention is capable of providing a visualized interface for user and/or listener-based sound management and control. It provides for a scalable platform that is future-proofed in the sense that it can incorporate devices that have yet-to-be invented as it uses standard protocols to seamlessly integrate additional components. This integration is supported with a dynamic software companion that mediates the system. A sound fingerprint, for the purposes of this disclosure comprises at least a frequency, intensity, and amplitude, but may also contain special-purpose sound information, salient to that specific application.

For example, the present invention can utilize a "sound preference" application. In one embodiment, this application sets user-based sound perception settings on a mobile device or wearable computer. There, the software can integrate with existing audio hardware and software, such as, but not limited to in-ear systems, mixer boards and other related audio mixing consoles. When the present invention integrates a device that is equipped with a microphone, the system is capable of autonomous audio sensing. That is, the microphone-equipped device will "listen" to sound and when sound of appropriate qualities are "heard", the system will begin providing metrics as to the nature of that sound. Preferably, the present invention will employ standardized protocols, allowing it to be industry-agnostic.

The present invention can be used to create sound fingerprints and used in conjunction with music publishing/performance applications. One way in which the present invention can be used in conjunction with a separate system is that it could relay fingerprint data directly to a music publishing entity in real-time. In an alternative embodiment, the present invention can relay information via various communication offerings such as e-mail, SMS, and visual screens. In another preferred embodiment, the present invention can have devices interface with it randomly, or can be configured to accept a predetermined number of "sensing" units.

Preferably, the present invention will incorporate commercial ubiquitous devices and wearable computers from a listening audience, and as such, does not need intervention from listeners or audio professionals such as a front-of-house engineer to operate. In short, each listening device (i.e. smartphone, tablet, wearable, laptop, etc.) that has interfaced with the system is able to 1) serve as a reasonable approximation of a human ear (audio) response 2) "sense" (measure) sounds within a frequency response range of: 20Hz to 20kHz, and 3) provide visualized metrics based on these measurements.

In an alternative embodiment, the present invention interfaces with a cluster of ubiquitous computing devices and wearable computers, all used to collaboratively sense and analyze the signal characteristics of undesired sound(s). These devices can then wirelessly transmit their findings to a central audio mixing source where acoustic-fingerprint observations can be visualized and audio output is controlled. This embodiment can ultimately reduce the amount of audio professionals needed in a live performance environment, improve the music-listening experience for an audience at a micro-level; and create additional opportunities in the acoustic-fingerprint commercial landscape.

In yet another preferred embodiment, various in-ear systems may be integrated into the present invention, software-defined and/or cognitive-defined based in-ear transceivers can be used to wirelessly communicate with a audio control source and thus, the output of such an in-ear monitor can be autonomously adjusted after sensing audio output. A given output can be adjusted according to what is sensed within specified location or what is sensed at external clusters. Similarly to a software-defined and/or cognitive-defined based in-ear transceivers, an in-ear monitor system for use with the present invention will preferably comprise hardware such as, earphones, at least one body pack receiver, at least one mixer and at least one transmitter. These functions can also be adjusted and controlled via the audio control source of the present invention.

Not only does the use of system wide software-defined and/or cognitive-defined radios create the opportunity to reduce the physical footprint of 'front-end RF circuits' on a smart device and wearable computer, but this reduced physical footprint allows for more devices to be interfaced with the present invention simultaneously. Also, incorporating software-defined radios will enable these devices to filter and isolate specific frequencies, allowing and that may have an unnecessary amount of signal energy associated with it, highlight this face, and communicate specific measurements back to a audio control source. For adjustment by a user, or by logic contained in the system of the present invention.

In yet another preferred embodiment, system components and preferably the interfaced devices can send wireless signals to each other using ambient backscatter techniques. Incorporating backscatter techniques into the system allows for the appropriation of wireless signals that are reflected or scattered within the confines of a space; allowing system components

and compatible interfaced devices to communicate continuously, near-continuously, or on some predetermined interval while sustaining their charge for an optimal amount of time.

It is an object of the present invention to provide a system that can interface with various microphone-equipped devices to create sound fingerprints.

It is an object of the present invention to provide a system that can create these fingerprints in real-time.

It is an object of the present invention to provide a means to autonomously manage audio outputs.

It is an object of the present invention to provide a means to maintaining high power efficiency amongst interfaced devices and system components.

It is an object of the present invention to provide a means to use a cluster of sound recording devices to report perceived sound information.

It is an object of the present invention to provide a means to incorporate existing internet-enabled, microphone-equipped devices to create a sound-sensing network.

It is an object of the present invention to provide a means to obtain and visualize recorded sound information in real-time.

It is an object of the present invention to provide a means to provide a means to balance sound levels to reduce or cancel out unwanted noise in a performance venue.

It is an object of the present invention to provide a means to reduce the physical footprint of 'front-end RF circuits' on an electronic device equipped with a wireless transceiver or similar technology.

It is an object of the present invention to provide a means to filter and isolate specific frequencies.

It is an object of the present invention to provide for a way to maintain a high power efficiency among the devices that have interfaced with the present invention.

It is an object of the present invention that the audio mixing source includes a central mixing source.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a schematic view of an embodiment of one cluster of the present invention with some interfaced devices.

Fig. 2 shows a schematic view of how interfaced devices create a sound fingerprint.

Fig. 3 shows an illustration of an embodiment of the system of the present invention engaging in inter-cluster, cluster-to-audio control source; and cluster-to-cluster data sharing.

Fig. 4 shows a flow chart outlining an embodiment of the method of the present invention.

Fig. 5A shows an illustration showing an embodiment of the present invention located in an automobile.

Fig. 5B shows an illustration showing an embodiment of the present invention located in an indoor theatre.

Fig. 5C shows an illustration showing an embodiment of the present invention located in an outdoor stadium.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiments of the present invention will now be described with reference to the drawings. Identical elements in the various figures are identified with the same reference numerals.

Reference will now be made in detail to each embodiment of the present invention. Such embodiments are provided by way of explanation of the present invention, which is not intended to be limited thereto. In fact, those of ordinary skill in the art may appreciate upon reading the present specification and viewing the present drawings that various modifications and variations can be made thereto.

As a threshold matter, it should be noted that whenever the phrases "microphone" or "microphone-equipped" are used, it is intended to refer to any device that is capable of detecting sound, not merely microphones. For example, a high-performance low frequency antenna connected to a software-defined radio may be used to input sound observations into the system, or a piezo-electric diaphragm may be used to measure the vibrations that correspond to a given sound. These examples are provided to give greater clarity as to what the term "microphone" should be interpreted as, and not construed as a limiting example.

The system of the present invention operates by integrating clusters of various computing devices and wearable computers with sound management techniques and methods so that various sound "fingerprints" can be developed and used to visualize how sound is being perceived in micro-areas within a larger venue. In various embodiments, the system of the present invention can be integrated into an individual's home, vehicle audio system, concert venues, and other locations where sound is played. In addition, the system's components allow for the present invention to be scaled to accommodate sound management and monitoring control within the largest of venues such as stadiums and other sports arenas.

Due to the devices that are integrated into the system having the ability to sense the frequency and magnitude of audio signals, a sound fingerprint (summary) can be generated from deterministic methods. These fingerprints are then communicated to an audio control source and can subsequently be processed and used to communicate with external applications and things such as third party sound databases. However, the purpose of this system is not to be confused. In addition to the sound fingerprinting ability of the present invention, it is also capable of utilizing a series of methods to sense and control audio output in various venues.

In an alternative embodiment, the present invention is located in a train or airport station that has an intercom system that functions poorly when noisy crowds are present. If an audio control source within these facilities is able to autonomously collect audio data via a series of integrated devices, then with the present invention, the same audio control source can adjust system outputs accordingly in order to make important intercom announcements intelligible. In yet another embodiment, a user can enter in EQ parameters in their integrated computing device to ensure that both the audio perceived by them, and the audio perceived by their device is in accordance with some predetermined parameters/settings. While many short-range wireless technologies can be used with the present invention, preferably one or more of the following technologies will be used: ANT+, Bluetooth, cellular, IEEE 802.15.4, IEEE 802.22, ISA 100a, Infrared, ISM (band), NFC, RFID, WPAN, UWS, WI-FI, Wireless HART, Wireless HD/USB, ZigBee, or Z-wave.

Referring to FIG. 1, an embodiment of one cluster 101 of the present invention with some interfaced devices. Specifically, three embodiments of at least one computing device 102 are shown; wearable glasses, wearable watch, and a smartphone. It should be noted that while these three devices are listed as exemplary examples, any device with a sound sensing mechanism and

a way to transmit any recorded data is suitable for use as one of said at least one computing devices 102. Preferably, the sound sensing apparatus will be an omnidirectional transducer. The sound sensing mechanisms of at least one computing device 102 will be able convert perceived sounds into electronic signals so that the recorded information may be transmitted to neighboring clusters 101, or a audio control source (See FIG. 3), as desired. This data will be transmitted using either one or a combination of short-range wireless technologies, namely, ANT+, Bluetooth, cellular, IEEE 802.15.4, IEEE 802.22, ISA 100a, Infrared, ISM (band), NFC, RFID, WPAN, UWS, WI-FI, Wireless HART, Wireless HD/USB, ZigBee, or Z-wave. Preferably, transducers integrated into these computing devices have an output signal that is fed into the input of an analog-to-digital converter ("ADC") and can incorporate software and cognitive-defined radios to broaden the selection of compatible wireless communication interfaces and limit radio component footprints.

Fig. 2 shows a schematic view of how interfaced devices create a sound fingerprint. The sound transmission of the audio energy 109 sensed by the at least one computing device 102 propagates through air and is received by at least one computing device 102 using the transmission path outlined in Figure 2.

Assuming that Figure 2 depicts audio transmission in an indoor setting, at specified time intervals, each computing device measures the sound pressure level (SPL) and sound power level (SWL):

$$SPL = SWL + 10 \log \left[\frac{Q}{4\pi r^2} + \frac{4}{R_c} \right]$$

Where:

SPL = Sound pressure level dB

SWL = Sound power level = $10 \log_{10}(W/W_{ref})$

W is the total sound power radiated from a source with respect to a reference power (W_{ref}) dBW re 10^{-12} Watts.

r = distance from source m

Q_{θ} = directivity factor of the source in the direction of r

S = total surface area of a room m^2

α_{av} = average absorption coefficient in a room

$$R_c = \text{room constant} = \frac{S\alpha_{av}}{1-\alpha_{av}} m^2$$

Over time, each computing device in Figure 2 detects differences in pressure (i.e. change in pressure vs. time) and converts the differences into an electrical signal. A Fast Fourier Transform is implemented (locally or in a cloud) to measure the relative amplitudes of the frequencies 'sensed' and to perform other frequency domain analyses.

It is important to note that in any given indoor environment, R_c , α_{av} , and S can be predetermined and made available to each computing device, approximated or deemed negligible. Also note that each computing device in Figure 2 has a microphone. Computing devices may also obtain sound observations via a high-performance low frequency antenna.

Turning to Fig. 3 an illustration of an embodiment of the system of the present invention engaging in intra-cluster, cluster-to-audio control source; and cluster-to-cluster data sharing. Here, each cluster has a given location 110 (i.e. specified location) to accurately isolate and associate the sensed data. In one embodiment, the present invention is able to adjust a given output device based on its proximity to a given location 110 of a cluster. In alternative embodiments, output devices can be adjusted based on their proximity to more than one cluster. Devices in each cluster can either communicate directly to each other or an audio control source 111, devices within a cluster can communicate to a single device within that cluster which can

serve as a gateway to other clusters and/or audio control source 111. In some embodiments, the present invention further comprising an in-ear monitoring device 112.

The embodiment depicted here shows devices that sense audio signal energy within the confines of a single cluster and then sends data directly to an audio control unit and other clusters. Therefore, not only can these computing devices wirelessly share sensed data with each other, but data can be shared with audio control source 111 (for audio output management purposes) and other devices in other clusters. Depending on the audio signal energy sensed within a specific cluster(s), audio control source 111 adjusts any connected output devices in either a single cluster, or multiple clusters to ensure high quality/fidelity output.

Fig. 4 shows a flow chart outlining an embodiment of the method of the present invention. Here, method 200 is comprised of a number of steps. In step 201, initially, both desired and undesired audio output signals are sensed and subsequently analyzed. In step 202, the method proceeds to determine whether or not the input signals match a set of predefined thresholds. If there is only negligible output audio, that is, if the audio within an environment is outside of a specified frequency range, the method proceeds to step 203 where the devices in each cluster operate in sleep mode. If there is indeed sensible audio output, the method proceeds to step 204 where the present invention determines if the predefined threshold or EQ setting is breached. If this threshold had been breaches, the method moves to step 205 where the first device that sensed the breach will (preferably, wirelessly) communicate its signal measurements to other devices within its cluster and the receiving device will conduct the same audio measurements to confirm the threshold breach. Preferably, step 205 is repeated amongst all of the devices within a single cluster, to provide more robust data sets. Once the breach confirmation stage is completed, in step 206, the present invention moved to step 207 where at

least one computing device is chosen to communicate the breach to. Finally, in step 208, when the present invention, via the audio control source, adjusts audio levels at the at least one output device to transform undesired audio outputs to desired audio outputs.

Referring to Figs. 5A-5C, various embodiments of the present invention implemented in an automobile, an indoor theatre, and an outdoor stadium, respectively, are shown. While these venues are particularly suited for the present invention to be implemented in, any venue in which there are multiple listeners.

In a preferred embodiment, the sound sensing mechanisms (preferably, transducers) used within each "sensing" computer/device outputs an output signal that is fed into the input of an ADC. In the configurations described in Figure 5A, 5B and 5C, a single-ended ADC interface can be used effectively since ADCs and the transducer source are both located on the same integrated circuit board. However, since fully differential interfaces have performance gains over single-ended inputs due to its inherent noise rejection characteristics, using a fully-directional interface instead of a single-ended interface may be desirable.

When introducing elements of the present disclosure or the embodiment(s) thereof, the articles "a," "an," and "the" are intended to mean that there are one or more of the elements. Similarly, the adjective "another," when used to introduce an element, is intended to mean one or more elements. The terms "including" and "having" are intended to be inclusive such that there may be additional elements other than the listed elements.

While the disclosure refers to exemplary embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the disclosure. In addition, many modifications will be appreciated by those skilled in the art to adapt a particular instrument,

situation or material to the teachings of the disclosure without departing from the spirit thereof.

Therefore, it is intended that the disclosure not be limited to the particular embodiments disclosed.

CLAIMS

What is claimed is:

1. A system comprising:

at least one cluster of at least one computing device,

said at least one computing device comprising:

a sound sensing mechanism, capable of monitoring the amplitude and frequency of both a desired and an undesired frequency,

a wireless transceiver, capable of wirelessly transmitting and receiving data from an audio control source,

said data comprising at least one characteristic of at least one sound fingerprint;

at least one output device, comprising:

a power source for operating the device,

a speaker for outputting sound,

a communication mechanism, for receiving electronic information from said audio control source;

said audio control source, in electronic communication said at least one cluster and said at least one output device, said audio control source comprising:

a memory, containing computer-executable instructions for connecting to said at least one cluster, processing said at least one characteristic of at least sound fingerprint, visualizing said at least one sound fingerprint, varying the output of said at least one output device, providing an interface,

a processor, for executing said computer-executable instruction,

a interfacing mechanism, comprising:

a network adapter, capable of transmitting and receiving electronic information through both wired and wireless communication;

a display, for showing said interface and said at least one visualized sound fingerprint,

at least one input mechanism, for manipulating said interface, and varying said output of said at least one output device.

2. The system of claim 1, wherein said sound-sensing mechanism is an omnidirectional transducer.
3. The system of claim 1, wherein said display and said at least one input mechanism are one-in-the-same.
4. The system of claim 1, wherein said wireless transceiver utilizes short-range wireless technologies.
5. The system of claim 2, said at least one computing device further comprising:

an analog-to-digital converter, said analog-to-digital converter featuring an input structure selected from the group consisting of: fully-differential, pseudo-differential, wide input common mode, and single-ended.
6. The system of claim 5, said at least one computing device further comprising:

at least one audio codec,

at least one application processor, and

at least one baseband processor.

7. The system of claim 6, said at least one computing device further comprising:
 - software-defined radios,
 - superheterodyne architecture radios,
 - direct conversion architecture,
 - or some combination thereof.
8. The system of claim 1, said at least one computing device further comprising a software-based radio,
 - wherein said software-based radio isolates RF frequencies, said at least one computing device relays those frequencies to said audio control unit,
 - wherein said audio control unit ensures that predetermined frequency thresholds maintained.
9. The system of claim 1, wherein electronic communications between said at least one computing device, said at least one cluster, said at least one output device, and said audio control unit are sent and received using an ambient backscatter techniques.
10. The system of claim 1, wherein said input device is a touch-sensitized screen.
11. The system of claim 1, wherein said at least one output device is located within said at least one cluster, such that said audio control source may alter the power supplied to said speaker in real-time.

12. A method of maintaining consistent sound across, comprising the steps of:

a) providing at least one cluster of at least one computing device,

said at least one computing device comprising:

a sound sensing mechanism, capable of monitoring the amplitude and

frequency of ambient noise,

a wireless transceiver, capable of wirelessly transmitting and receiving

data from a audio control source,

said data comprising at least one characteristic of at least one sound

fingerprint;

at least one output device, comprising:

a power source for operating the device,

a speaker for outputting sound,

a communication mechanism, for receiving electronic information from

said audio control source;

said audio control source, in electronic communication said at least one cluster

and said at least one output device, said audio control source comprising:

a memory, containing computer-executable instructions for connecting to

said at least one cluster, processing said at least one characteristic of at

least sound fingerprint, visualizing said at least one sound fingerprint,

varying the output of said at least one output device, providing an

interface,

a processor, for executing said computer-executable instruction,

a interfacing mechanism, comprising:

a network adapter, capable of transmitting and receiving electronic information through both wired and wireless communication;
a display, for showing said interface and said at least one visualized sound fingerprint,
at least one input mechanism, for manipulating said interface, and varying said output of said at least one output device;

- b) sensing, measuring, and analyzing, by said at least one computing device, surrounding audio output signals;
- c) determining, by said at least one computing device, whether a qualifying signal has been sensed;
- d) identifying and categorizing said measurements, by said at least one computing device;
- e) determining, by said at least one computing device, whether said measurements breach a predetermined threshold;
- f) communicating, to other clusters, if present, and said audio control source, said breach;
- g) determining, by said other clusters, if present, and said audio control source if a second breach has occurred;
- h) adjusting said at least one output device, by said audio control source, based on said communicated measurements.

13. The method of claim 12, wherein step h) is done automatically based on predetermined values.

14. The method of claim 12, further comprising the step of:
- i) entering, by said at least one computing device, sleep mode.
15. The method of claim 12, wherein said wireless transceiver utilizes short-range wireless technologies.
16. The method of claim 12, said at least one computing device further comprising:
- an analog-to-digital converter, said analog-to-digital converter featuring an input structure selected from the group consisting of: fully-differential, pseudo-differential, wide input common mode, and single-ended.
17. The method of claim 16, said at least one computing device further comprising:
- at least one audio codec,
 - at least one application processor, and
 - at least one baseband processor.
18. The method of claim 17, said at least one computing device further comprising:
- software-defined radios,
 - superheterodyne architecture radios,
 - direct conversion architecture,
 - or some combination thereof.

19. The method of claim 12, wherein electronic communications between said at least one computing device, said at least one cluster, said at least one output device, and said audio control unit are sent and received using an ambient backscatter techniques.
20. The system of claim 1, said at least one computing device further comprising a software-based radio and a low-frequency antenna,
wherein said software-based radio and said low-frequency antenna isolate sound frequencies, said at least one computing device relays those frequencies to said audio control unit,
wherein said audio control unit ensures that predetermined frequency thresholds are not breached

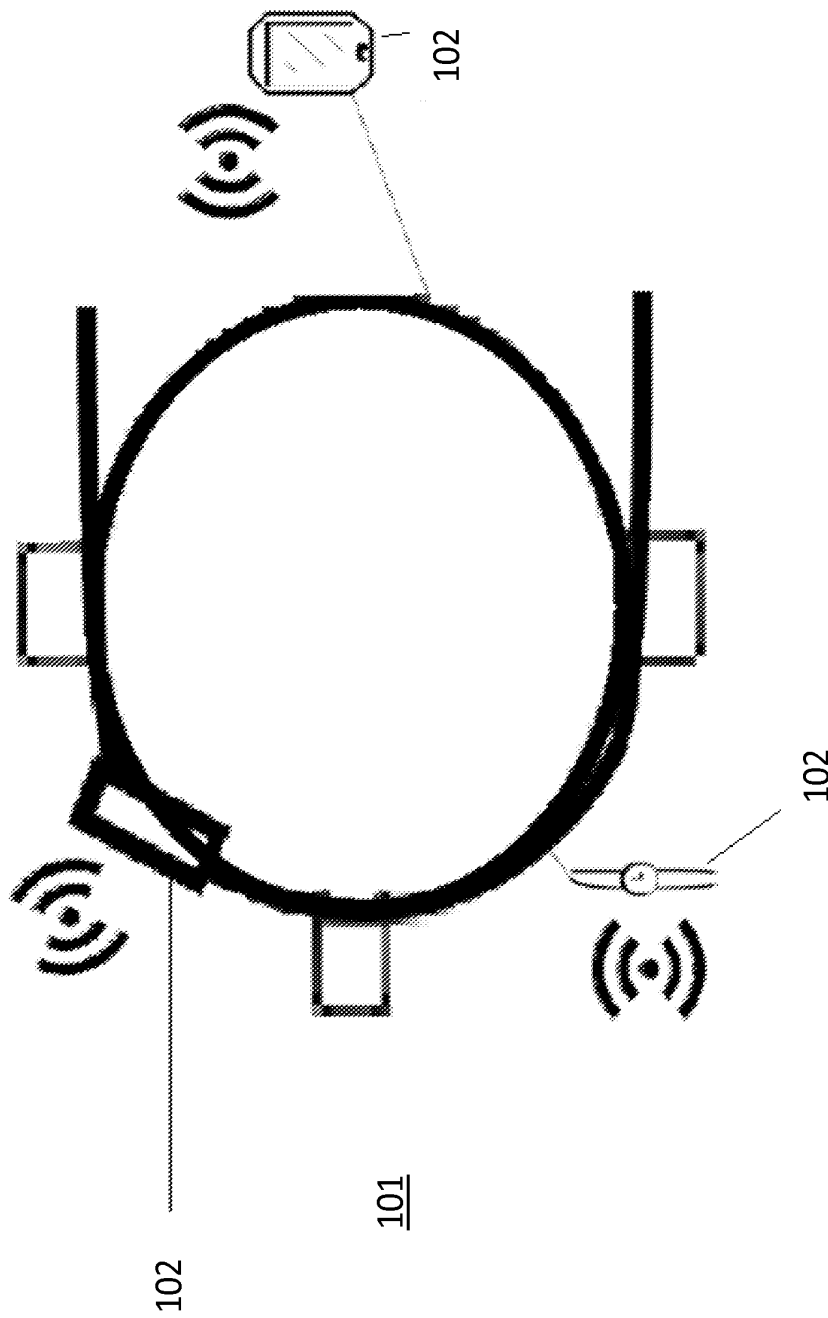


FIG. 1

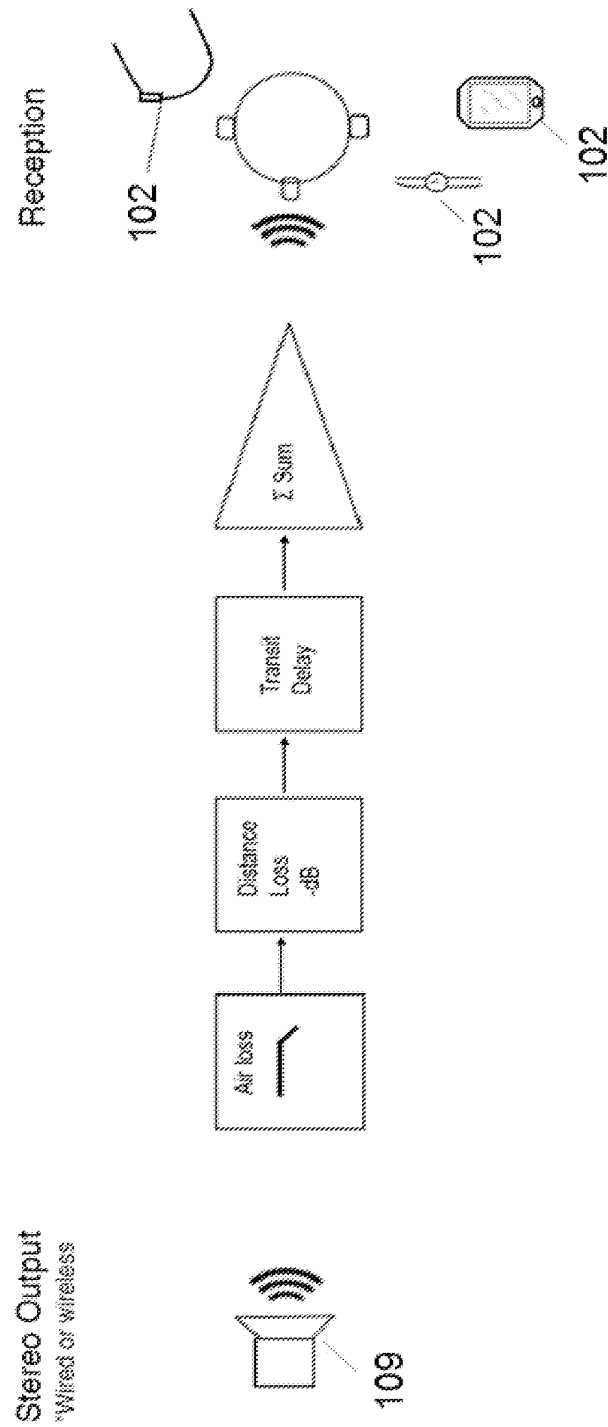


FIG. 2

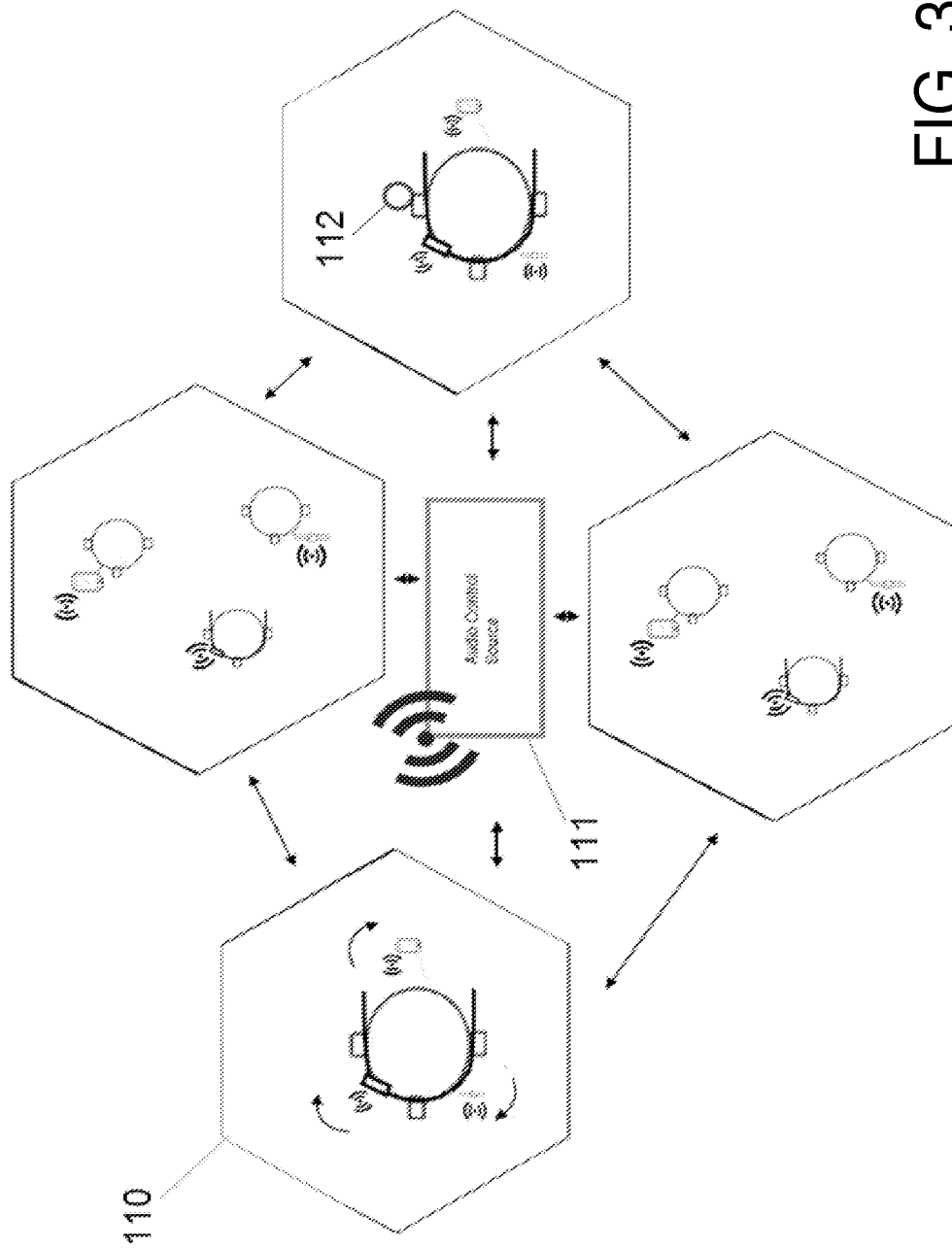


FIG. 3

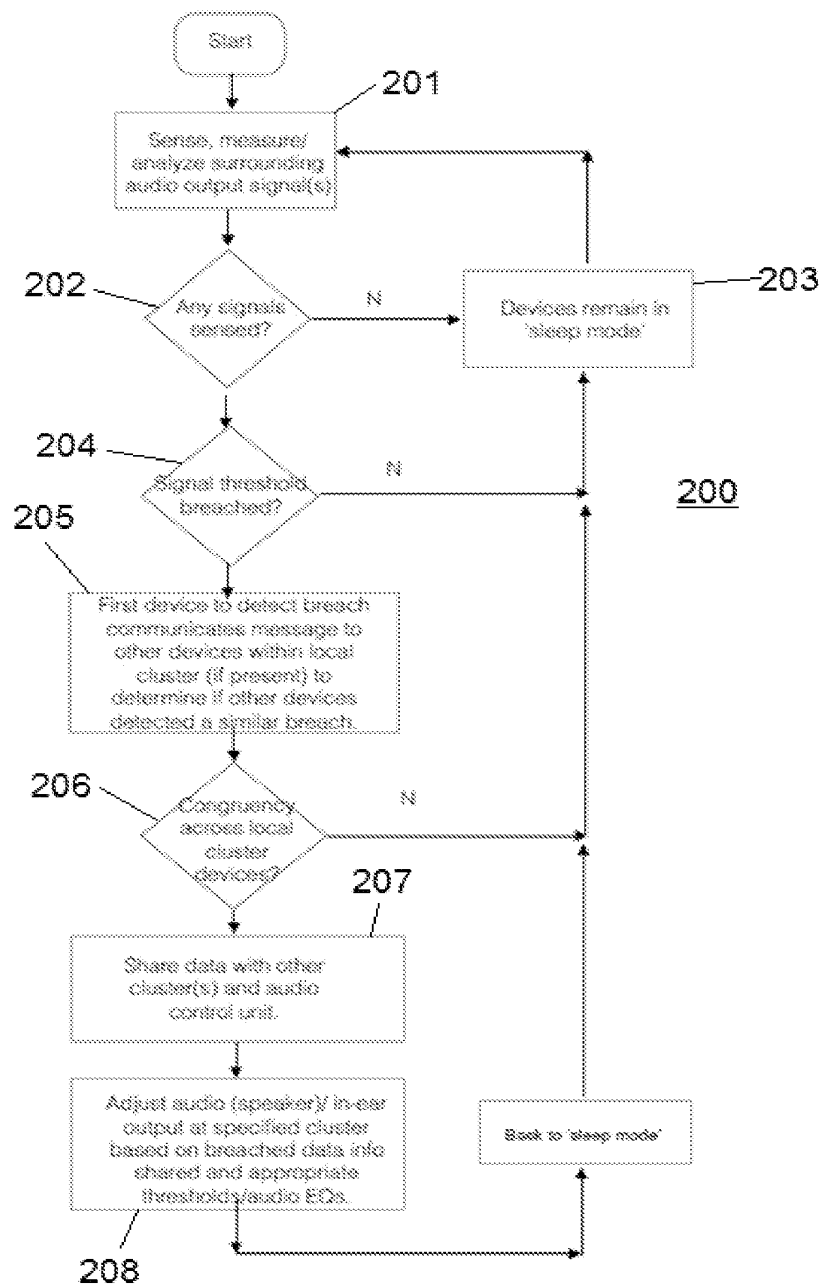


FIG. 4

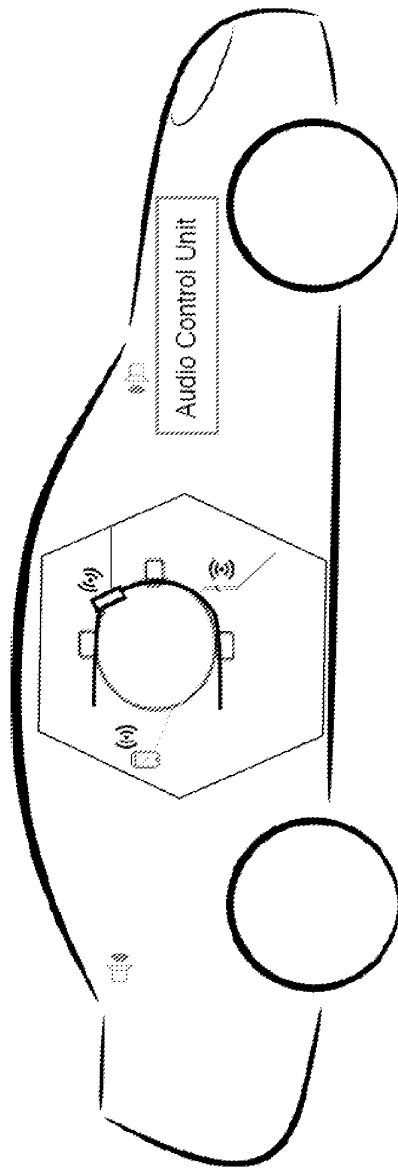
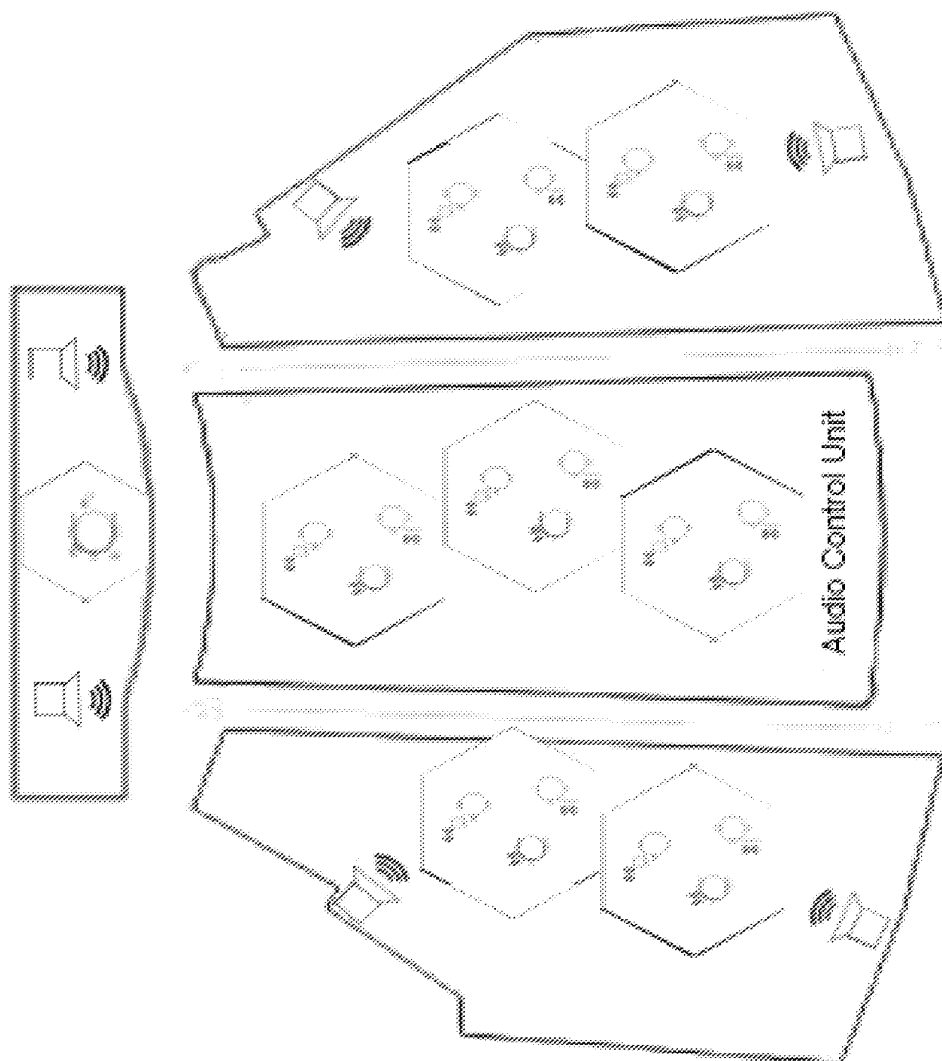


FIG. 5A

FIG. 5B



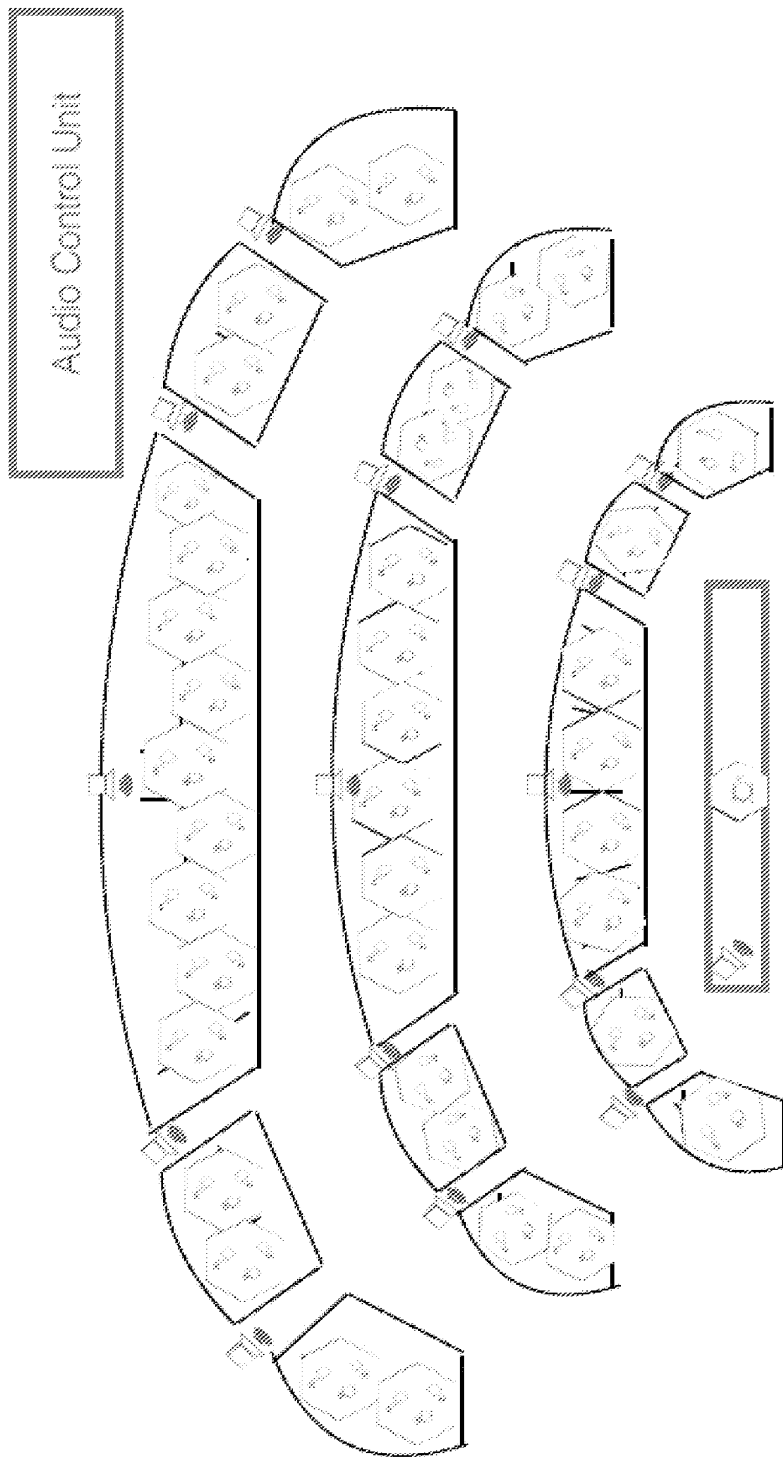


FIG. 5C

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 15/51638

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H03G 3/20 (2016.01)

CPC - H03G 3/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC (8) - H03G 3/20 (2016.01)

CPC - H03G 3/32

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

CPC - H03G 3/24; H04R 27/00 (See keywords Below)

USPC - 381/57, 381/104, 381/107

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 Thomsoninnovation.com; Patbase; Google Scholar; Google Patents; Gogole.com; Freepatentsonline; ProQuest Dialog
 Search Terms: Audio, sound, adapt, dynamic, adjust, modify, setting, parameter, frequency, amplitude, threshold, sensor, microphone, measure, sample, reading, compare, process, wireless, network, cluster, etc.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2010/0329471 A1 (DUNN et al.), 30 December 2010 (30.12.2010), entire document, especially Abstract; Para [0018], [0020], [0025], [0026]	1-20
Y	US 2013/0294618 A1 (LYUBACHEV), 07 November 2013 (07.11.2013), entire document, especially Abstract; Para [0018], [0021], [0028]-[0029], [0030], [0068]	1-20
Y	US 8,073,160 B1 (CLASSEN), 06 December 2011 (06.12.2011), col 3, ln 60 to col 4, ln 15; col 7, ln 3-45	1-20
Y	US 2004/0076305 A1 (SANTIAGO), 22 April 2004 (22.04.2004), entire document, especially Abstract; Para [0032]-[0037]	2 and 5-7
Y	US 2006/0082458 A1 (SHANKS et al.), 20 April 2006 (20.04.2006), entire document, especially Abstract; Para [0015]-[0016]	9 and 19
A	US 2013/0064380 A1 (MAHOWALD), 14 March 2013 (14.03.2013), entire document	1-20
A	US 2004/0240676 A1 (HASHIMOTO et al.), 02 December 2004 (02.12.2004), entire document	1-20



Further documents are listed in the continuation of Box C.



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(54) **Audio control system for a vehicle**

Audio-Steuerungssystem für ein Fahrzeug

Système de contrôle audio pour véhicule

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(56) References cited:

EP-A- 1 460 769 DE-A1- 10 065 772
DE-A1- 10 065 826 US-A1- 2003 133 582
US-B1- 6 920 086

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EP 1 971 035 B1

Description

[0001] This disclosure relates to an audio control system. In particular, this disclosure relates to an audio control system for a vehicle.

[0002] Users may wish to upgrade factory-installed audio systems. Users may replace or upgrade the amplifiers associated with the factory-installed radios and CD players rather than replacing an original radio or CD player. Users sometimes attach additional devices or "sources" to the vehicle's audio system. Such sources may include navigation systems, cellular or wireless telephones, AM-FM radios, satellite radios, MP3-based players, DVD players and other devices.

[0003] It may be expensive and difficult to remove and replace existing factory-installed equipment. Dashboard modification and/or cosmetic changes may be required to accommodate new devices. Replacement devices may not fit in an existing dashboard resulting in less than a perfect appearance. Decorative face plates configured to hide poor fitting devices may not provide a professional or factory-installed look. Therefore, a need exists for an audio control system that can manage and control multiple audio sources without impacting the appearance of the vehicle's dashboard.

[0004] DE 100 65 826 A1 discloses an apparatus for selecting sound sources in a vehicle, which comprises a selecting unit for selecting at least one sound source from a plurality of sound sources for output. The apparatus further comprises a control unit, to which a priority rule for the sound sources can be input, and which controls the selecting unit depending on the priority rule set for the sound sources.

[0005] An object of the present invention is to provide an audio control system and a method of managing a plurality of audio sources, which allow to prevent information coming from several sound channels from being lost in the switching operation.

[0006] The object of the invention is solved by the subject matter of the independent claims 1 and 7. Preferred embodiments are subject matter to the dependent claims.

[0007] An audio control system may receive a plurality of audio input signals. A switch or multiplexer may switch one of the plurality of audio input signals from respective audio sources to a power amplifier. A controller in communication with the multiplexer may control switching of the multiplexer. A display may provide the user with information regarding the switching of the audio signal inputs. A user interface may permit the user to manually switch the audio source. A signal detector in communication with an audio input signal may detect a signal from a priority source. When the signal from the priority source is detected, the controller may direct the multiplexer to route the signal from the priority source to the power amplifier.

[0008] Other systems, methods, features and advantages will be, or will become, apparent to one with skill

in the art upon examination of the following figures and detailed description. It is intended that all such additional systems, methods, features and advantages be included within this description, be within the scope of the invention, and be protected by the following claims.

[0009] The system may be better understood with reference to the following drawings and description. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention. Moreover, in the figures, like-referenced numerals designate corresponding parts throughout the different views.

Figure 1 shows a block diagram of the audio control system.

Figure 2 shows an input/multiplexer portion of the audio control system.

Figure 3 shows a logic and control portion of the audio control system.

Figure 4 shows an output circuit of the audio control system.

Figure 5 shows a three-way amplifier configuration.

Figure 6 shows a five-way amplifier configuration.

Figure 7 shows a bi-amplified amplifier configuration.

Figure 8 shows a display module of the audio control system.

Figure 9 shows additional features of the audio control system.

Figure 10 is a flow diagram showing operation of the audio control system.

[0010] Figure 1 is a block diagram of an audio control system 110. The audio control system 110 may be installed in a vehicle environment 112. The audio control system 110 may include a display module 122 and an input module 124. The display module 122 may include an LCD display 128, a volume control 130 and an input control 132. The display module 122 may be mounted or integrated within a dashboard or cluster of the vehicle 112 and may provide a user interface 134. The display module 122 may be used in addition to original equipment manufacturer (OEM) devices, and may provide all of the user controls and visual output to the user. Accordingly, removal and/or modification of the existing OEM devices may not be necessary.

[0011] The LCD display 128 may include backlighting and dimming capability. However, any suitable display device may be used, such as a flat panel display or an electro-luminescent display. The display module 122

may have a body formed of molded plastic to present an aesthetically pleasing appearance. The volume control 130 may provide user-adjustable volume settings and power on/off functions. The input control 132 may provide system set-up functions, input labeling and input switching functions for each of a plurality of audio signal sources 136 through a command line interface, menu driven interface, and/or graphical user interface.

[0012] The display module 122 may communicate with the input module 122. The input module 124 may be mounted in an enclosed area of the vehicle 112, such as in the trunk, kick panel, behind the dashboard, below a seat, etc. The input module 124 may receive analog audio signals from the various source devices 136. Such source devices 136 may include a navigation system 140, a cellular or wireless telephone 142, an AM-FM radio 144, a satellite radio 146, an MP3-based player 148, DVD player 150 and CD player 152.

Other source devices may also be selected by the user.

[0013] The input module 124 may control switching of the various source devices 136 through commands from the display module 122. A wiring harness 154, which may be a unitary multi-wire cable, having connector hardware, may interface the display module 122 with the input module 124. Because a wiring harness 154 may be used, the display module 122 may be mounted near or on the dashboard of the vehicle 112 without diminishing its appearance. The display module 122 may control setting the input voltage levels and gain parameters for the audio control system 110 during installation, or through a user-selectable calibration process. The process may ensure compatibility between the various source devices 136 and the input module 124. The input module 124 may further include a volume processor 160 and a control processor 162. The input module 124 may provide audio output signals 166 to multiple power amplifiers 170 through an output connector block 172. The power amplifiers 170 may drive a plurality of vehicle loudspeakers 176.

[0014] Figure 2 shows an input/multiplexer circuit 210 of the input module 124. The input/multiplexer circuit 210 may include multiple analog input sources, six of which are shown. However, the audio control system 110 may be configured to handle more or fewer inputs. A first input 212 ("navigation input") may be dedicated to the navigation device 140, while a second input 214 ("telephone input") may be dedicated to a wireless or cellular telephone 142. A third input ("radio input") may include two separate inputs corresponding to a front radio input 216 and a rear radio input 218. A fourth input 220 ("DVD input") may receive audio signals from the DVD player 150, a fifth input 222 ("CD input") may receive audio signals from the CD player 152, and a sixth input 224 ("satellite radio input") may receive audio signals from the satellite radio 146.

[0015] A buffer amplifier 228 or pre-amplifier may receive the input from each of the inputs, respectively. Each buffer amplifier 228 may be an operational amplifier. A

gain adjustment circuit 236 may receive output from some or all of the respective buffer amplifiers 228, and is thus shown in dashed lines. Note that each of the radio inputs 216 and 218 may be differential inputs. Accordingly, the corresponding buffer amplifier 230 for the radio inputs 216 and 218 may be arranged with a differential input. The differential inputs may reduce noise and increase signal quality. Some or all of the inputs and corresponding buffer amplifiers 228 and 230 may be arranged in a differential configuration.

[0016] The volume processor 160 may be programmed to control the respective gain adjustment circuits 236 to establish an appropriate input level for each corresponding audio source device 136. For example, the gain adjustment circuit 236 for the navigation input may be programmed to receive a signal in the range of about 100 millivolts to about 16 volts. The gain corresponding to each input may be individually programmed depending on the expected output levels of the various audio source devices 136.

[0017] A right channel multiplexer 240 and a left channel multiplexer 242 may receive the output from each gain adjustment circuit 236 respectively, or from the corresponding buffer amplifier 228 and 230 if no gain adjustment circuit is present. The right and left channel multiplexers 240 and 242 may be linear or analog multiplexers. The output of certain buffer amplifiers 228 or gain adjustment circuits 236 may be routed through additional pre-conditioning circuitry prior to routing to the multiplexers 240 and 242. The volume processor 160 may receive a right channel audio output signal 250 from the right channel multiplexer 240, and may receive a left channel audio output signal 252 from the left channel multiplexer 242. The volume processor 160 may control switching of the multiplexers 240 and 242 through a multiplexer control signal 244.

[0018] Some of the inputs corresponding to the respective audio source devices 136 may be prioritized. For example, the navigation input 212 and the telephone input 214 may have a higher priority than the other inputs. If the audio control system 110 detects an audio signal originating from the navigation input 212, the navigation input may receive priority over all of the other inputs. Accordingly, if the radio 144 or CD player 152 is operating, and a signal from the navigation system 140 becomes active, the audio control system 110 may control the right and left channel multiplexers 240 and 242 to immediately switch the navigation system input 212 through the multiplexers and to the volume processor. The navigation input 212 may be assigned a highest priority so that the user will not fail to hear an audio navigation prompt. Thus, the navigation input 212 may "interrupt" or deselect all other inputs, regardless of which input is in use at the time.

[0019] A navigation signal detection circuit 260 may receive an output 254 from the amplifier 228 or the gain adjustment circuit 236 corresponding to the navigation input 212 to determine if a navigation device signal is

present. The navigation signal detection circuit 260 may issue a navigation detection signal 262 to inform the control processor 162 if a navigation signal is present on the navigation input 212. The user may also select the navigation source 140 manually or through voice-command or other telemetric-based device linked to the display module 122.

[0020] If a signal on the navigation input 212 caused de-selection of another audio signal, the navigation detection circuit 260 may also detect when the navigation signal has terminated, and may restore the deselected audio signal. The navigation detection circuit 260 may delay restoration of the interrupted signal so as to make a smooth transition during switching. Such a delay may be, for example, about one to about two seconds.

[0021] The wireless telephone input 214 may be assigned to a second highest priority. Accordingly, receipt of a cellular or wireless telephone audio signal on the telephone input 214 may deselect all other sources in use, except for the navigation source 140. In this way, the radio 144, the CD player 152 or other audio source devices 136 may be deselected when the user receives a telephone call.

[0022] A telephone detection circuit 166 may receive a telephone output signal 264 from the respective buffer amplifier 228 (or gain adjustment circuit 236) corresponding to the telephone input 214, and determine if a wireless telephone signal is present. The telephone detection circuit 266 may issue a telephone detection signal 268 to inform the control processor 162 that the telephone signal is present on the telephone input 214. The user may also select the telephone source 142 manually or automatically through voice-command or through a telemetric-based device linked to the display module 122.

[0023] A short-range wireless decoder 270, such as a Bluetooth® decoder, may couple the telephone input 214 to the multiplexers 240 and 242 to link the telephone 142. The decoder 270 may include an antenna 272 and wireless transceiver circuit 274 configured to receive short-range radio signals. Various wireless telephone devices may be used, such as a Bluetooth® enabled cellular telephone. Other short-range cable-free decoders may be in communication with certain unallocated input sources to accommodate high-fidelity audio signals. Some of the decoders may be Bluetooth® decoders, such as an A2DP (advanced audio distribution protocol) decoder.

[0024] In some systems, the connections between the navigation input 212 and the telephone input 214 may be manually switched so that the telephone 142 may receive the highest priority, and the navigation system 140 may receive the second highest priority. The user may also select the wireless telephone source 214 manually using the input control 132 on the display module 122 to control the input source.

[0025] Alternatively, priority levels between some of the inputs may be reassigned under software control. The user may reprogram the priority levels by selecting the appropriate function using the volume control 130 or

input control 132. Additional signal detection circuits similar to the navigation detection circuit 260 may be provided. Signals provided to and from the additional signal detection circuits may be re-routed using transmission gates or mechanical relays, such as a reed relay, when the priority levels are modified under software control so as to maintain a correspondence with the priority input to which it is associated. Accordingly, the user may have complete control over which input source device 136 is selected via the input control 132 located on the display module 122. Thus, the user may choose between the various input sources.

[0026] A signal summing circuit 280 may combine the telephone audio output signal 264 and the navigation audio output signal 254 to provide a summed signal. The signal summing circuit 280 may be an operational amplifier arranged in a summing configuration. This may permit the user to hear both audio signals so that the user does not miss the navigation information or a telephone call.

[0027] Figure 3 shows a logic and control portion 310 of the input module 124. The volume processor 160 may receive the right channel audio signal 250 and the left channel audio signal 252 from the respective multiplexers 240 and 242. The volume processor 160 may process the left and right channel audio signals 250 and 252 and route conditioned output signals 312 to a plurality of output buffer amplifiers 314. The conditioned output signals 312 may include a right channel output signal 316 and a left channel output signal 318. The output buffer amplifiers 314 may be operational amplifiers arranged in a unity gain configuration, or may provide a predetermined amount of gain. The output buffer amplifiers 314 may be configured to isolate and prevent damage to the circuitry should the output signals 166 to the power amplifiers 170 become short-circuited.

[0028] A connector arrangement or jack 319 may couple the control processor 162 to the display module 122 using a minimal number of wires. A standard DIN type connector may be used. A serial communication format may be used to minimize the number of wires.

[0029] The volume processor 160 may provide volume control 320 for all audio devices 136. The user may adjust the volume using the volume control 130 located on the display module 122. The volume processor 160 may also provide basic pre-amplification functions, such as tone control 322 (bass, treble, midrange), balance control 324, as well as fader control 326. The volume processor 160 may perform digital signal processing or may include a separate digital signal processor 330 to filter or provide graphic or band-specific equalization of the audio signals. The volume processor 160 may provide "phantom" imaging to shift the perceived audio "image" to the right or to the left. The inputs from the various audio source devices 136 may be controlled by the audio control system 110 to effect selection of a particular input and the corresponding audio volume level.

[0030] The control processor 162 may communicate

with the volume processor 160 and may also receive the navigation detection signal 262 and the telephone detection signal 268. The control processor 162 may effect control of the navigation input 212 and the telephone input 214 to interrupt other source devices 136 in a priority-mode state. The control processor 162 may also provide a mute control signal 340 to the output buffer amplifiers 314.

[0031] Figure 4 shows additional details of an output circuit 410, which may include the output buffer amplifiers 314 and the output connector blocks 172. The output connector blocks 172 may include dual output jack configurations in the form of RCA-type connectors 420 and JR45-type connectors 422. Multiple output jacks 420 and 422 may provide universal connectivity. Any number of connectors may be used in alternative systems. The output jacks 420 and 422 may route the audio output signals 166 to the multiple power amplifiers 170. The multiple power amplifiers 170 may be located remote from the controller (e.g., in the trunk of the vehicle).

[0032] A sub-woofer summing circuit 426 may combine or sum the right channel audio output signal 316 and the left channel audio output signal 318 from the volume processor 360 to generate a monaural subwoofer audio signal 428. The sub-woofer summing circuit 426 may be an operational amplifier arranged in a summing configuration.

[0033] The multiple RCA-type connectors 420 may include front speaker connectors 430, rear speaker connectors 432 and a subwoofer connector 434. Corresponding signals are provided to the JR45-type connectors 422, which may include front speaker connectors 436, rear speaker connectors 438 and a subwoofer connector 440. The RCA-type connectors 420 and the JR45-type connectors 422 may be functionally equivalent.

[0034] The output circuit 410 and connectors 420 and 422 may be configured in several different ways and may interface multiple power amplifier 170 and speaker 176 configurations. Figure 5 shows a three-channel amplifier configuration. Only the RCA-type connectors 420 are shown to avoid duplication. A three-channel configuration may include a first power stereo amplifier 510 that may drive front speakers 512, a second power stereo amplifier 514 that may drive rear speakers 516, and a third power amplifier 518 that may drive a subwoofer speaker 520.

[0035] Figure 6 shows a five-channel amplifier configuration. Only the RCA-type connectors 420 are shown to avoid duplication. A five channel configuration may include a first power amplifier 610 that may drive a front left-side speaker 612, a second power amplifier 614 that may drive a front right-side speaker 616, and a third power amplifier 618, that may drive a subwoofer speaker 620. Additionally, a fourth power amplifier 630 may drive a rear left-side speaker 632, and a fifth power amplifier 634 may drive a rear right-side speaker 636.

[0036] Figure 7 shows an alternative bi-amplified five-channel configuration. The front speakers may be bi-am-

plified such that there may be separate amplifiers for tweeters 710, mid-range speakers 712 and a subwoofer speaker 714. The bi-amplified configuration may include a first stereo power amplifier 720 that may drive the tweeters 710. Because no crossover circuitry is provided in the loud speakers, a high-pass filter or crossover circuit 722 may connect the front input connectors 430 to the first stereo power amplifier 720 to provide the high-frequency audio signals. Similarly, a band-pass filter or crossover circuit 724 may connect the rear input connectors 432 to a second stereo power amplifier 728 to provide the midrange audio signals. Finally, a low-pass filter or crossover circuit 732 may connect the rear input connectors 434 to a third power amplifier 734 to provide the subwoofer audio signals. The amplifiers may be configured to provide LOGIC7 Surround Sound (trademark of Lexicon Corp., a division of Harman Specialty Group of Massachusetts). The power amplifiers may be Class-D power amplifiers.

[0037] Figure 8 shows the display module 122. The display module 122 may include an auxiliary or "convenience" input connector 820. An auxiliary circuit 822 may include a buffer amplifier or pre-amplifier 824 that receives the input from the auxiliary connector 820. The buffer amplifier 824 may be an operational amplifier. A gain adjustment circuit 826 may receive output from the buffer amplifier 824, and may be optionally included. The user or a passenger may connect an MP3 player or similar portable audio device to the auxiliary input 820. An output signal 828 corresponding to the auxiliary input 820 may connect to the input module 124 via the connector arrangement or jack 319. An auxiliary output signal 840 may be routed to the multiplexers 240 and 242 of the input module 124.

[0038] A single harness, such as the DIN-type cable or connector 319, may connect the display module 122 and the input module 124. The display module 122 and the input module 124 may communicate using various command and control signals 830 transmitted through the connector 319. The display module 122 may include a separate microprocessor 832 and a backlighting circuit 834. The display module 122, including the LCD display 128, may receive power from the power supply located in the input module. Alternatively, the display module 122 may connect to the input module 124 wirelessly so as to eliminate the DIN-type cable and connector 319. In such a configuration, the input module 122 may receive power from an internal battery, or vehicle power bus, or another source.

[0039] A first rotary encoder 842 may receive input from the volume control 130 of the display module 122. A second rotary encoder 844 may receive input from the input control 132 of the display module 122. The encoded information may be transmitted to the control processor 162 of the input module 124 via serial lines through the connector 319. The rotary encoders 842 and 844 may additionally provide push and pushhold notification corresponding to depression and holding of the correspond-

ing controls 130 and 132.

[0040] Figure 9 shows an alternate arrangement that may include an eighth input 910 ("digital input"), which may receive digital audio signals from a digital device, such as from a DVD player. Again, although a single line may be shown in Figure 9, the digital signal may be a stereo signal, including left and right channel signals. The configuration of Figure 9 may include the components shown in Figures 2 and 3, where and like-referenced numbers are used to denote the same or similar components. For clarity, other components of Figures 2 and 3 are not duplicated.

[0041] In this configuration, the DVD player, for example, may provide a direct digital output. A digital attenuator 920 may receive the digital signals and scale the signals in accordance with user-selected volume parameters. The digital signal processor 330 may provide tone modification (bass, treble, midrange) in accordance with user-selected tone parameters. A digital-to-analog converter 930 may convert the signal to analog form, and provide the analog signals to the power amplifiers, such as the power amplifiers shown in Figure 5. When the user selects the digital input 910, the volume processor may control a disconnect switch 940 via control signal 970, which may disconnect the output of the multiplexers 240 and 242 from the volume processor.

[0042] Figure 10 is a flow diagram showing acts 1000 that may be taken during operation of the audio control system 110. The user may depress or push in the volume control 130 to turn-on (Act 1010) the audio control system 110. The user may depress or push in the volume control 130 a second time (Act 1020) to access the tone, balance, and fader parameters. Turning the volume control in a clockwise or counter-clockwise direction (Act 1030) may change the selected parameter. If additional parameters require changing (Act 1040), the user may push the volume control and modify the selected parameter. After a predetermined period of time, for example about three seconds (Act 1050), if the volume control 130 is not depressed, the audio control system 110 may revert back to a volume control mode (Act 1060).

[0043] The logic, circuitry, and processing described above may be encoded in a computer-readable medium such as a CDROM, disk, flash memory, RAM or ROM, an electromagnetic signal, or other machine-readable medium as instructions for execution by a processor or controller. Alternatively or additionally, the logic may be implemented as analog or digital logic using hardware, such as one or more integrated circuits (including amplifiers, adders, delays, and filters), or one or more processors executing amplification, adding, delaying, and filtering instructions; or in software in an application programming interface (API) or in a Dynamic Link Library (DLL), functions available in a shared memory, or defined as local or remote procedure calls; or as a combination of hardware and software.

[0044] The logic may be represented in (e.g., stored on or in) a computer-readable medium, machine-reada-

ble medium, propagated-signal medium, and/or signal-bearing medium. The media may comprise any device that contains, stores, communicates, propagates, or transports executable instructions for use by or in connection with an instruction executable system, apparatus, or device. The machine-readable medium may selectively be, but is not limited to, an electronic, magnetic, optical, electromagnetic, or infrared signal or a semiconductor system, apparatus, device, or propagation medium. A non-exhaustive list of examples of a machine-readable medium includes: a magnetic or optical disk, a volatile memory such as a Random Access Memory "RAM," a Read-Only Memory "ROM," an Erasable Programmable Read-Only Memory (i.e., EPROM) or Flash memory, or an optical fiber. A machine-readable medium may also include a tangible medium upon which executable instructions are printed, as the logic may be electronically stored as an image or in another format (e.g., through an optical scan), then compiled, and/or interpreted or otherwise processed. The processed medium may then be stored in a computer and/or machine memory.

[0045] The systems may include additional or different logic and may be implemented in many different ways. A controller may be implemented as a microprocessor, microcontroller, application specific integrated circuit (ASIC), discrete logic, or a combination of other types of circuits or logic. Similarly, memories may be DRAM, SRAM, Flash, or other types of memory. Parameters (e.g., conditions and thresholds), and other data structures may be separately stored and managed, may be incorporated into a single memory or database, or may be logically and physically organized in many different ways. Programs and instruction sets may be parts of a single program, separate programs, or distributed across several memories and processors. The systems may be included in a wide variety of electronic devices, including a cellular or wireless phone, a headset, a hands-free set, a speakerphone, communication interface, or an infotainment system.

[0046] The audio control system 110 may manage and switch multiple audio sources. The control system may receive audio source input from existing OEM provided devices 136, such as the radio and CD player. The control system 110 may also receive audio source input from additional audio sources, such as navigation systems 140, cellular or wireless telephones 142, satellite radios 146, MP3-based players 148, DVD players 150 etc. The control system 110 may be an aftermarket or "add-on" system. Accordingly, removal or replacement of the OEM provided devices may be obviated, which may preserve the cosmetic appearance of the dashboard. Certain audio input sources may be prioritized such that audio signals from a high priority device, such as a navigation system or wireless telephone, may interrupt audio signals from lower priority devices.

[0047] While various embodiments of the invention have been described, it will be apparent to those of ordinary skill in the art that many more embodiments and

implementations are possible within the scope of the invention. Accordingly, the invention is not to be restricted except in light of the attached claims.

Claims

1. An audio control system for managing a plurality of audio source devices (140, 142, 144, 146, 150, 152), the system comprising:

an input module (124) configured to receive a plurality of audio input signals (212, 214, 216, 218, 220, 222, 224), at least one of the audio input signals corresponding to a priority audio source device;

a switching circuit (240, 242) configured to select one of the plurality of audio input signals and switch the selected signal from the respective audio source devices through the switching circuit (240, 242);

a controller (162) in communication with the switching circuit (240, 242) to control switching of the switching circuit (240, 242);

a signal detector (260) in communication with at least one of the audio input signals and configured to detect a presence of a signal from the priority audio source device, wherein the controller (162) directs the switching circuit (240, 242) to deselect an existing input and select an audio input signal corresponding to the priority audio source device when the signal from the priority audio source device is detected; and a second signal detector configured to detect presence of a signal from a second priority audio source device, wherein the controller directs the switching circuit (240, 242) to deselect an existing audio input and select an audio input signal corresponding to the second priority audio source device, when a signal from the second priority audio source device is detected; wherein if a selected audio input signal corresponds to the priority audio source device, the controller (162) is adapted not to deselect the selected input when a signal from the second priority audio source device is detected,

characterized by

a summing circuit (280) configured to combine audio signals from the priority audio source device and the second priority audio source device for providing a summed signal in input to the switching circuit (240, 242).

2. The system according to claim 1, wherein the controller changes a relative priority level of the priority audio source device and the second priority audio source device.

3. The system according to claim 1 or claim 2, comprising a display in communication with the controller, configured to provide information regarding switching of the audio input signals.

4. The system according to any one of claims 1 to 3, comprising a user interface in communication with the controller and configured to permit manual selection and switching of the audio input source through the switching circuit.

5. The system according to any one of claims 1 to 4, comprising a wireless decoder circuit configured to transmit audio signals to the switching circuit.

6. The system according to any one of claims 1 to 5, wherein the switching circuit is a multiplexer.

7. A method of managing a plurality of audio sources (140, 142, 144, 146, 150, 152), comprising:

receiving a plurality of audio input signals (212, 214, 216, 218, 220, 222, 224), at least one of the audio input signals corresponding to a priority audio source device;

selecting one of the plurality of audio input signals from respective audio sources and switching the selected signal into communication with an amplifier;

detecting a presence of a priority audio input signal;

deselecting an existing audio input signal, reselecting the priority audio input signal, and switching the reselected signal into communication with the amplifier, when the priority audio signal is detected; and

detecting the presence of a second priority audio input signal; wherein when the signal from the second priority audio source device is detected then

deselecting an existing audio input signal; reselecting the second priority audio input signal; and switching the reselected signal into communication with the amplifier,

wherein, if the priority audio input signal is selected, the priority audio input signal is not deselected when a second priority audio signal is detected,

characterized by

combining the priority audio input signal with the second priority audio input signal to provide a summed signal in input for switching.

8. The method according to claim 7, further comprising displaying information regarding switching of the au-

dio signal inputs.

Patentansprüche

1. Audiosteuerungssystem zum Verwalten einer Mehrzahl von Audioquellvorrichtungen (140, 142, 144, 146, 150, 152), wobei das System Folgendes umfasst:

ein Eingangsmodul (124), das dazu konfiguriert ist, eine Mehrzahl von Audioeingangssignalen (212, 214, 216, 218, 220, 222, 224) zu empfangen, wobei wenigstens eins der Audioeingangssignale einer Prioritätsaudioquellvorrichtung entspricht;

ein Schaltstromkreis (240, 242), der dazu konfiguriert ist, eins der Mehrzahl von Audioeingangssignalen auszuwählen und das ausgewählte Signal von den jeweiligen Audioquellvorrichtungen durch den Schaltstromkreis (240, 242) zu schalten;

eine Steuereinrichtung (162) in Kommunikation mit dem Schaltstromkreis (240, 242), um das Schalten des Schaltstromkreises (240, 242) zu steuern;

einen Signaldetektor (260) in Kommunikation mit wenigstens einem der Audioeingangssignale, der dazu konfiguriert ist, ein Vorhandensein eines Signals von der Prioritätsaudioquellvorrichtung zu erkennen, wobei die Steuereinrichtung (162) den Schaltstromkreis (240, 242) anweist, die Auswahl eines existierenden Eingangs aufzuheben und ein Audioeingangssignal auszuwählen, das der Prioritätsaudioquellvorrichtung entspricht, wenn das Signal von der Prioritätsaudioquellvorrichtung erkannt wird; und

einen zweiten Signaldetektor, der dazu konfiguriert ist, das Vorhandensein eines Signals von einer zweiten Prioritätsaudioquellvorrichtung zu erkennen, wobei die Steuereinrichtung den Schaltstromkreis (240, 242) anweist, die Auswahl eines existierenden Audioeingangs aufzuheben und ein Audioeingangssignal auszuwählen, das der zweiten Prioritätsaudioquellvorrichtung entspricht, wenn ein Signal von der zweiten Prioritätsaudioquellvorrichtung erkannt wird; wobei dann, wenn ein ausgewähltes Audioeingangssignal der Prioritätsaudioquellvorrichtung entspricht, die Steuereinrichtung (162) dazu angepasst ist, die Auswahl des ausgewählten Eingangs nicht aufzuheben, wenn ein Signal von der zweiten Prioritätsaudioquellvorrichtung erkannt wird,

gekennzeichnet durch

einen Summierungsschaltkreis (280), der dazu konfiguriert ist, Audiosignale von der Prioritäts-

audioquellvorrichtung und der zweiten Prioritätsaudioquellvorrichtung zu kombinieren, um ein summiertes Signal im Eingang des Schaltstromkreises (240, 242) bereitzustellen.

2. System nach Anspruch 1, wobei die Steuereinrichtung eine relative Prioritätsstufe der Prioritätsaudioquellvorrichtung und der zweiten Prioritätsaudioquellvorrichtung ändert.

3. System nach Anspruch 1 oder Anspruch 2, umfassend eine Anzeige in Kommunikation mit der Steuereinrichtung, die dazu konfiguriert ist, Informationen bezüglich des Schaltens der Audioeingangssignale bereitzustellen.

4. System nach einem der Ansprüche 1 bis 3, umfassend eine Benutzerschnittstelle in Kommunikation mit der Steuereinrichtung, die Benutzerschnittstelle dazu konfiguriert ist, eine manuelle Auswahl und Schaltung der Audioeingangsquelle durch den Schaltstromkreis zuzulassen.

5. System nach einem der Ansprüche 1 bis 4, umfassend einen drahtlosen Dekodierschaltkreis, der dazu konfiguriert ist, Audiosignale an den Schaltstromkreis zu übertragen.

6. System nach einem der Ansprüche 1 bis 5, wobei der Schaltstromkreis ein Multiplexer ist.

7. Verfahren zum Verwalten einer Mehrzahl von Audioquellen (140, 142, 144, 146, 150, 152), umfassend:

Empfangen einer Mehrzahl von Audioeingangssignalen (212, 214, 216, 218, 220, 222, 224), wobei wenigstens eins der Audioeingangssignale einer Prioritätsaudioquellvorrichtung entspricht;

Auswählen von einem der Mehrzahl von Audioeingangssignalen von jeweiligen Audioquellen und Schalten des ausgewählten Signals in Kommunikation mit einem Verstärker;

Erkennen eines Vorhandenseins eines Prioritätsaudioeingangssignals;

Aufheben der Auswahl eines existierenden Audioeingangssignals, erneutes Auswählen des Prioritätsaudioeingangssignals und Schalten des erneut ausgewählten Signals in Kommunikation mit dem Verstärker, wenn das Prioritätsaudioeingangssignal erkannt wird; und

Erkennen des Vorhandenseins eines zweiten Prioritätsaudioeingangssignals; wobei wenn das Signal von der zweiten Prioritätsaudioquellvorrichtung erkannt wird, dann

Aufheben der Auswahl eines existierenden Audioeingangssignals;

erneutes Auswählen des zweiten Prioritäts-
audioeingangssignals; und
Schalten des erneut ausgewählten Signals
in Kommunikation mit dem Verstärker,

wobei, wenn das Prioritätsaudioeingangssignal
ausgewählt wird, die Auswahl des Prioritätsau-
dioeingangssignals nicht aufgehoben wird,
wenn ein zweites Prioritätsaudioeingangssignal
erkannt wird,

gekennzeichnet durch

Kombinieren des Prioritätsaudioeingangssig-
nals mit dem zweiten Prioritätsaudioeingangs-
signal, um ein summiertes Signal im Eingang
zum Schalten bereitzustellen.

8. Verfahren nach Anspruch 7, ferner umfassend An-
zeigen von Informationen bezüglich des Schaltens
der Audiosignaleingänge.

Revendications

1. Système de commande audio pour gérer une plura-
lité de dispositifs de source audio (140, 142, 144,
146, 150, 152), le système comprenant :

un module d'entrée (124) configuré pour rece-
voir une pluralité de signaux d'entrée audio (212,
214, 216, 218, 220, 222, 224), au moins l'un des
signaux d'entrée audio correspondant à un dis-
positif prioritaire de source audio ;

un circuit de commutation (240, 242) configuré
pour sélectionner un des signaux d'entrée audio
parmi la pluralité de signaux d'entrée audio et
pour commuter le signal sélectionné à partir des
dispositifs de source audio respectifs à travers
le circuit de commutation (240, 242) ;

un contrôleur (162) en communication avec le
circuit de commutation (240, 242), afin de régu-
ler la commutation du circuit de commutation
(240, 242) ;

un détecteur de signal (260) en communication
avec au moins un des signaux d'entrée audio et
configuré pour détecter la présence d'un signal
provenant du dispositif prioritaire de source
audio, le contrôleur (162) amenant le circuit de
commutation (240, 242) à désélectionner une
entrée existante et à sélectionner un signal d'en-
trée audio correspondant au dispositif prioritaire
de source audio lorsque le signal provenant du
dispositif prioritaire de source audio est détecté ;
et

un deuxième détecteur de signal, configuré pour
détecter la présence d'un signal provenant d'un
deuxième dispositif prioritaire de source audio,
le contrôleur amenant le circuit de commutation
(240, 242) à désélectionner une entrée audio

existante et à sélectionner un signal d'entrée
audio correspondant au deuxième dispositif
prioritaire de source audio, lorsqu'un signal pro-
venant du deuxième dispositif de source audio
est détecté ;

dans lequel, si un signal sélectionné d'entrée
audio correspond au dispositif prioritaire de
source audio, le contrôleur (162) est adapté pour
ne pas désélectionner l'entrée sélectionnée
lorsqu'un signal provenant du deuxième dispo-
sitif prioritaire de source audio est détecté,

caractérisé par

un circuit de sommation (280) configuré pour
combiner des signaux audio à partir du dispositif
prioritaire de source audio et le deuxième dis-
positif prioritaire de source audio en apportant
un signal sommé en entrée au circuit de com-
mutation (240, 242).

2. Système selon la revendication 1, dans lequel le con-
trôleur modifie un niveau relatif de priorité du dispo-
sitif prioritaire de source audio et du deuxième dis-
positif prioritaire de source audio.

3. Système selon la revendication 1 ou 2, comprenant
un affichage en communication avec le contrôleur,
configuré pour fournir des informations concernant
la commutation des signaux d'entrée audio.

4. Système selon l'une quelconque des revendication
1 à 3, comprenant une interface d'utilisateur en com-
munication avec le contrôleur et configurée pour per-
mettre une sélection manuelle et une commutation
de la source d'entrée audio à travers le circuit de
commutation.

5. Système selon l'une quelconque des revendications
1 à 4, comprenant un circuit décodeur sans fil con-
figuré pour transmettre des signaux audio au circuit
de commutation.

6. Système selon l'une quelconque des revendications
1 à 5, dans lequel le circuit de commutation est un
multiplexeur.

7. Procédé de gestion d'une pluralité de sources audio
(140, 142, 144, 146 150, 152), comprenant :

la réception d'une pluralité de signaux d'entrée
audio (212, 214, 216, 218, 220, 222, 224), au
moins l'un des signaux d'entrée audio corres-
pondant à un dispositif prioritaire de source
audio ;

la sélection d'un des signaux d'entrée audio par-
mi la pluralité de signaux d'entrée audio à partir
de sources audio respectives, et la commutation
du signal choisi en communication avec un
amplificateur ;

la détection de la présence d'un signal prioritaire d'entrée audio ;
 la désélection d'un signal d'entrée audio existant, la resélection du signal prioritaire d'entrée audio et la commutation du signal resélectionné en communication avec l'amplificateur, lorsque le signal audio prioritaire est détecté ; et
 la détection de la présence d'un deuxième signal prioritaire d'entrée audio ; dans lequel lorsque le signal provenant du deuxième dispositif prioritaire de source audio est détecté, alors

la désélection d'un signal d'entrée audio existant ;
 la resélection du deuxième signal prioritaire d'entrée audio ; et
 la commutation du signal resélectionné en communication avec l'amplificateur,

dans lequel, si le signal prioritaire d'entrée audio est sélectionné, le signal prioritaire d'entrée audio n'est pas désélectionné lorsqu'un deuxième signal prioritaire d'entrée audio est détecté, **caractérisé par**
 la combinaison du signal prioritaire d'entrée audio avec le deuxième signal prioritaire d'entrée audio pour donner un signal sommé en entrée pour commutation.

8. Procédé selon la revendication 7, comprenant en outre l'affichage d'informations concernant la commutation des entrées de signaux audio.

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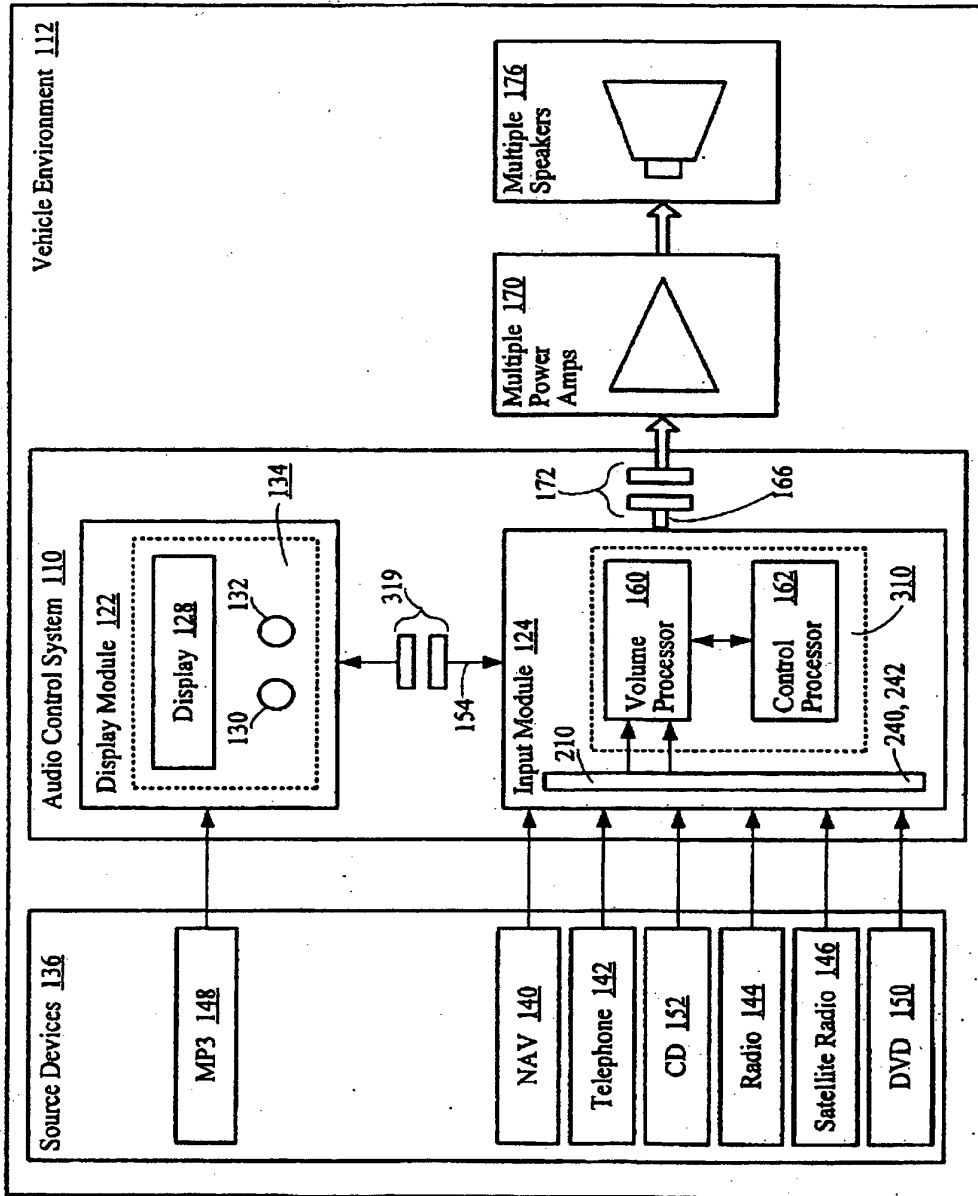


Figure 1

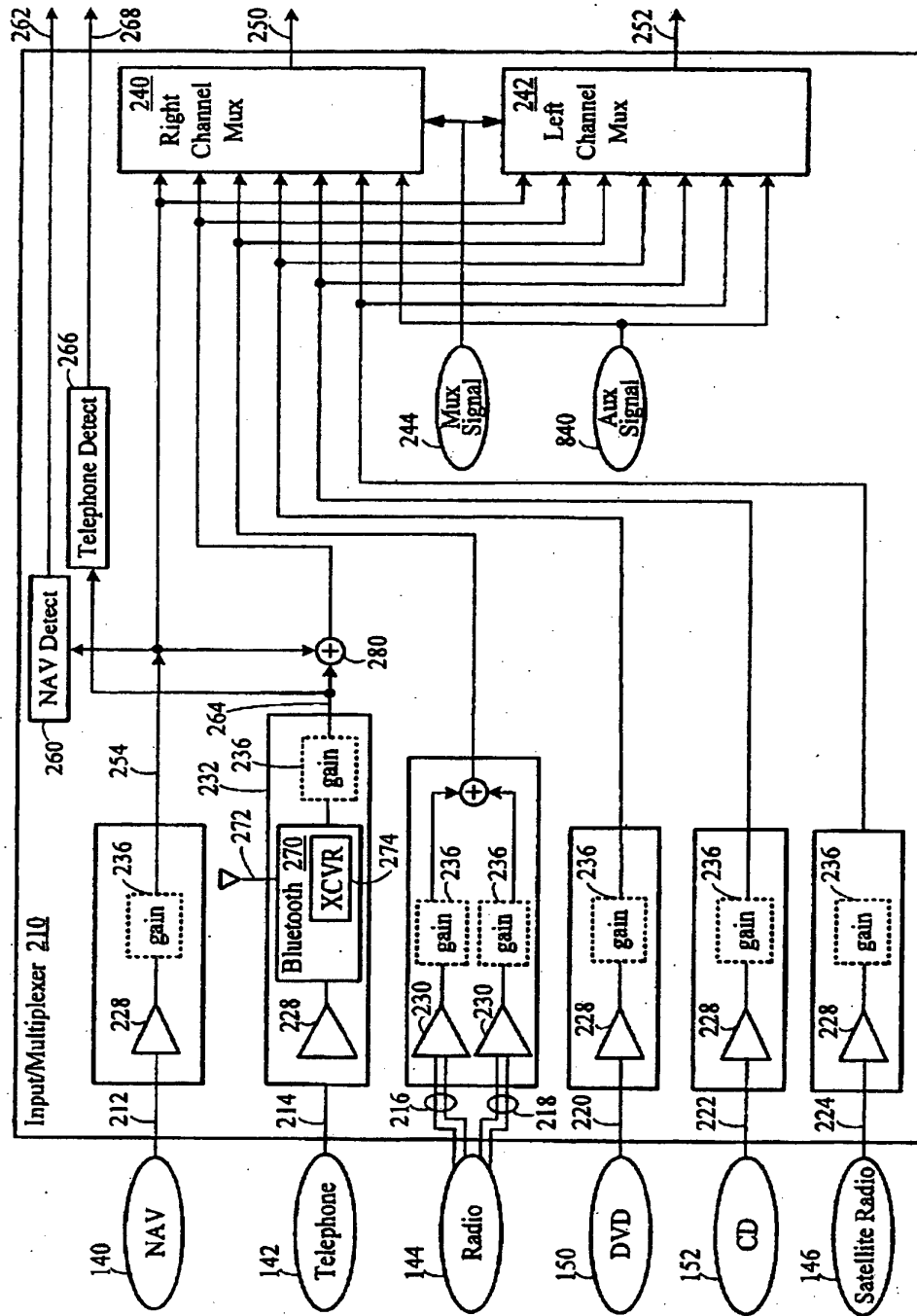


Figure 2

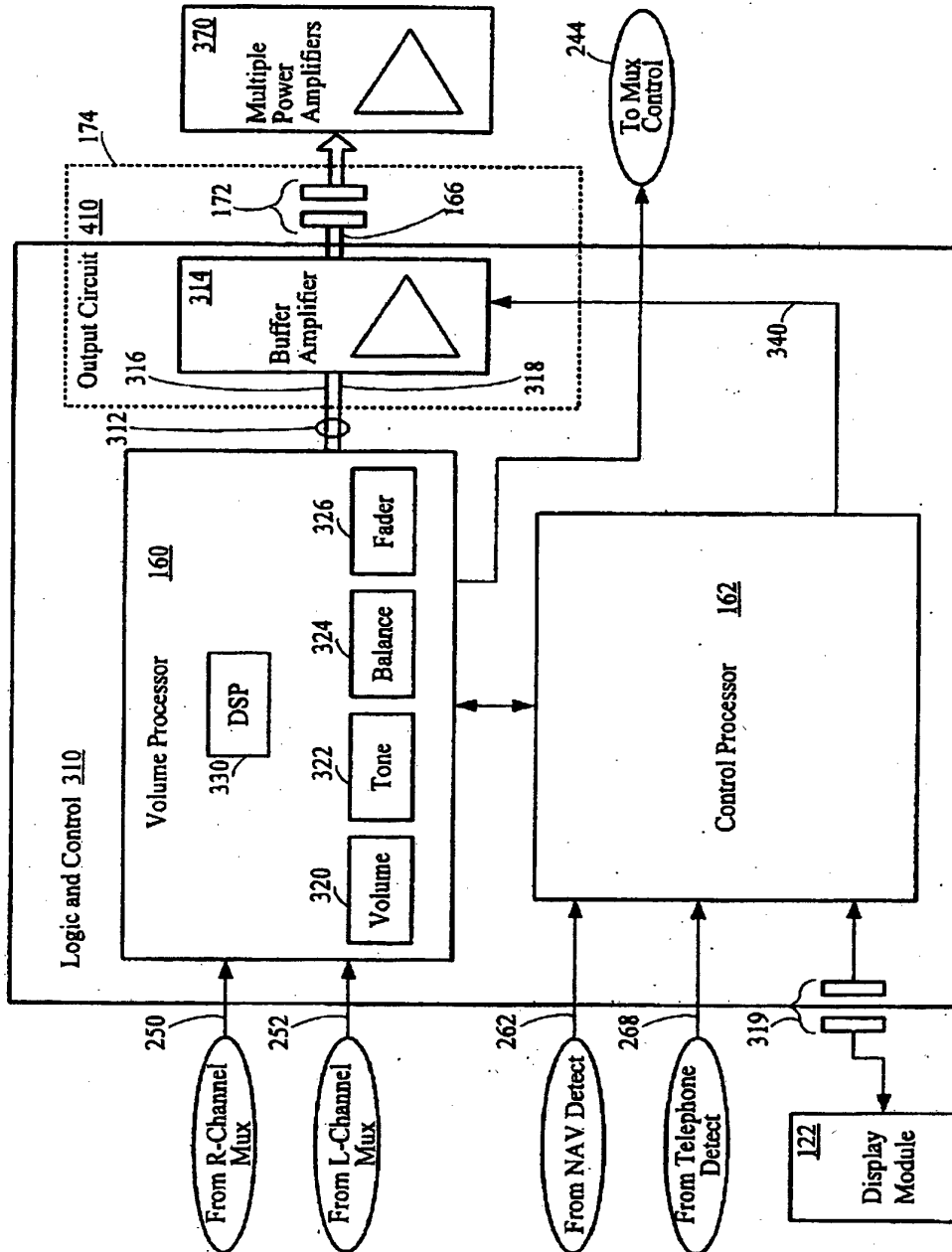


Figure 3

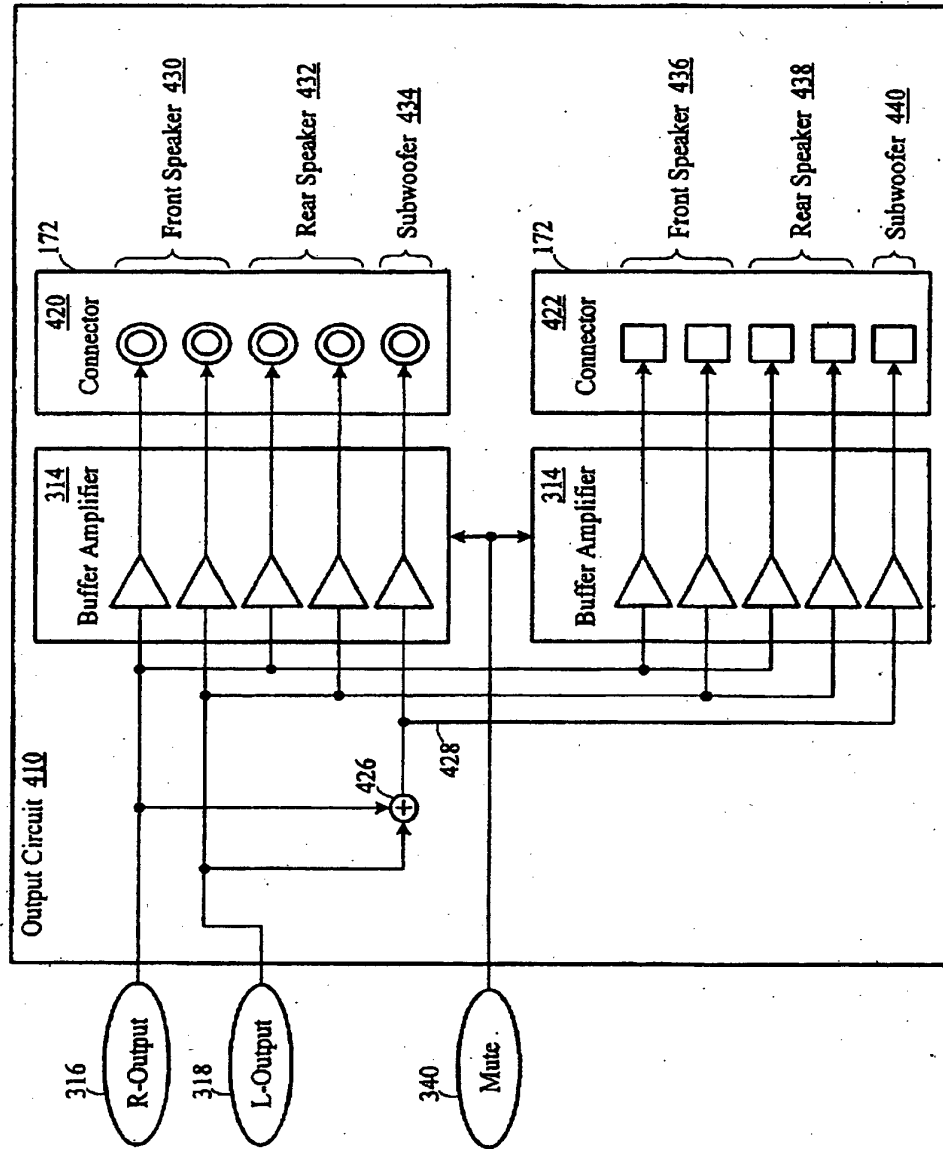


Figure 4

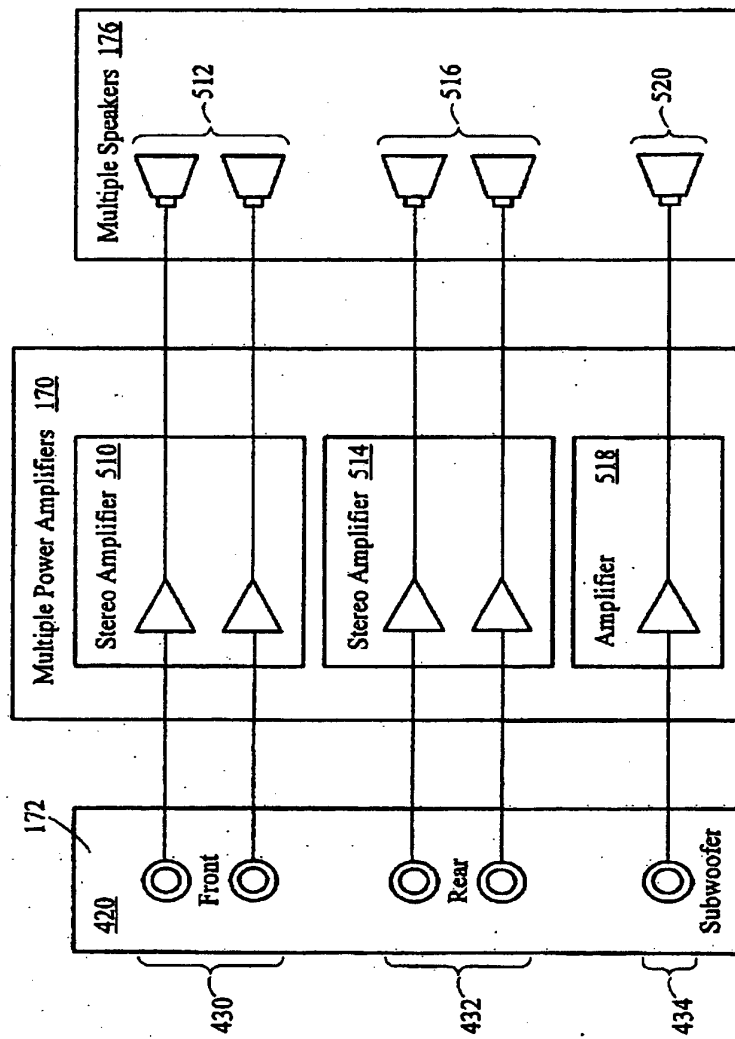


Figure 5

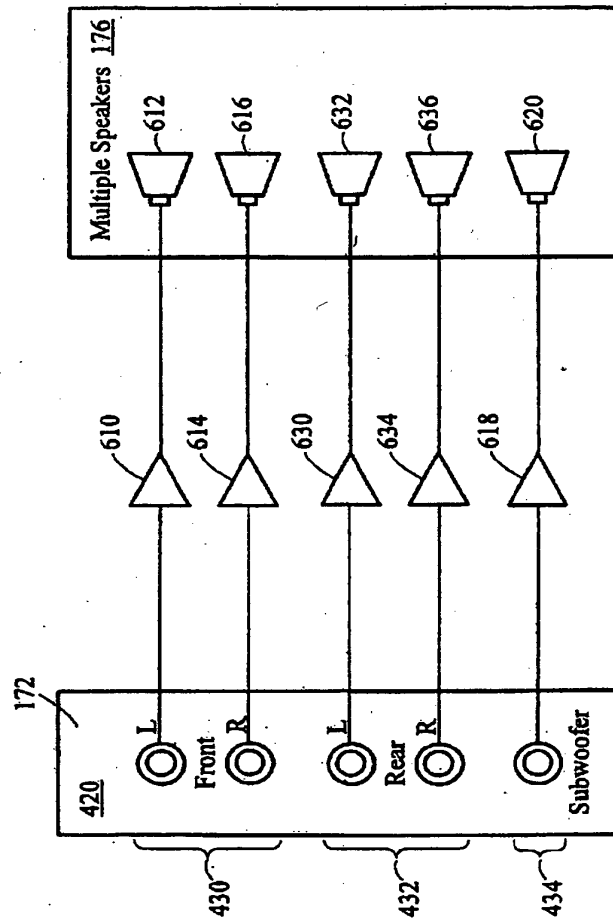


Figure 6

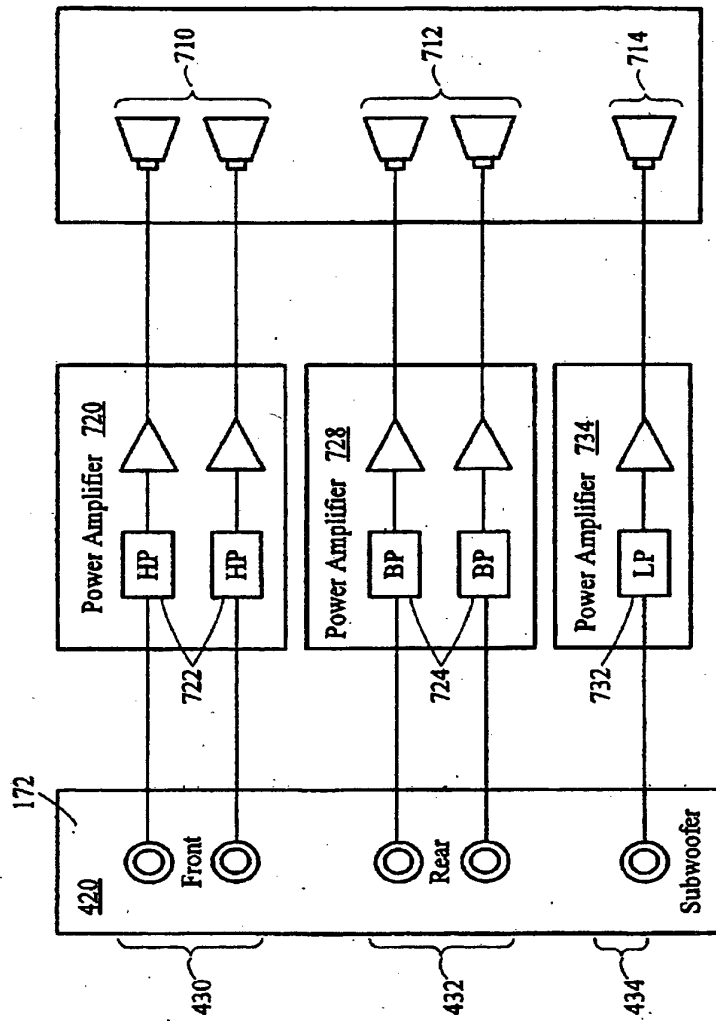


Figure 7

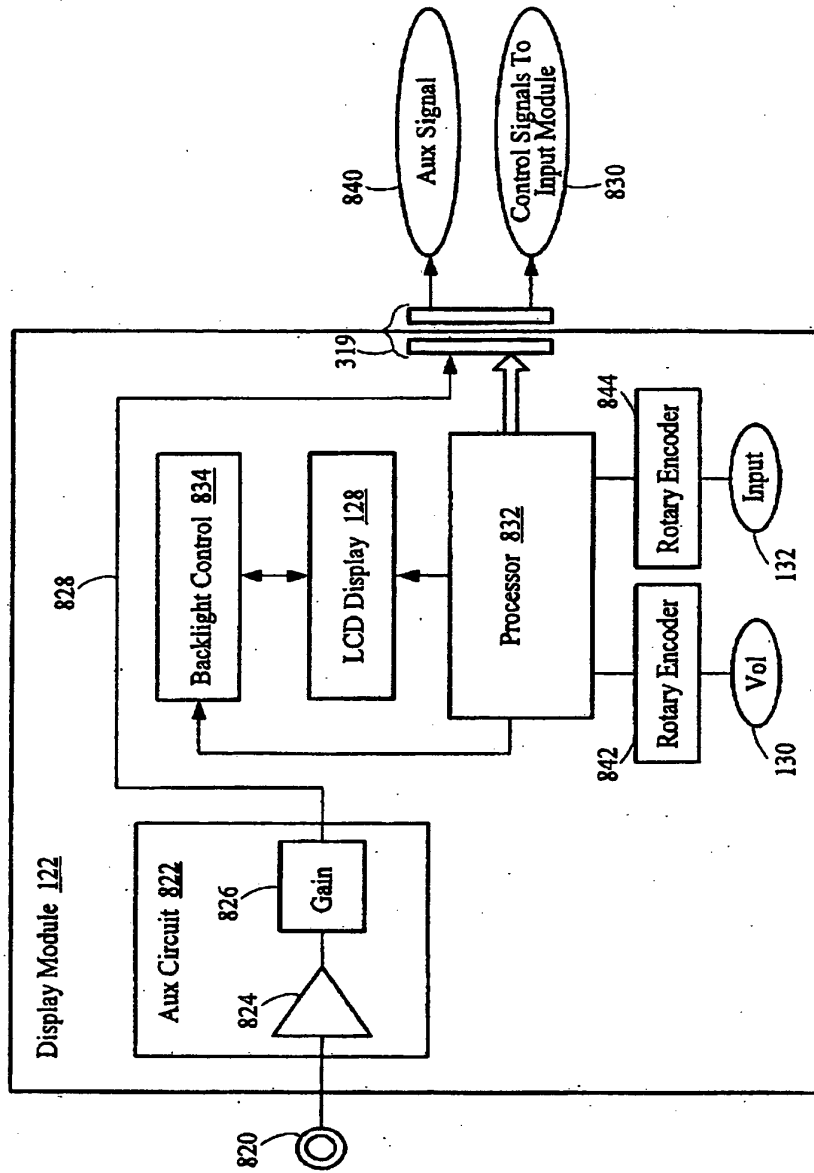


Figure 8

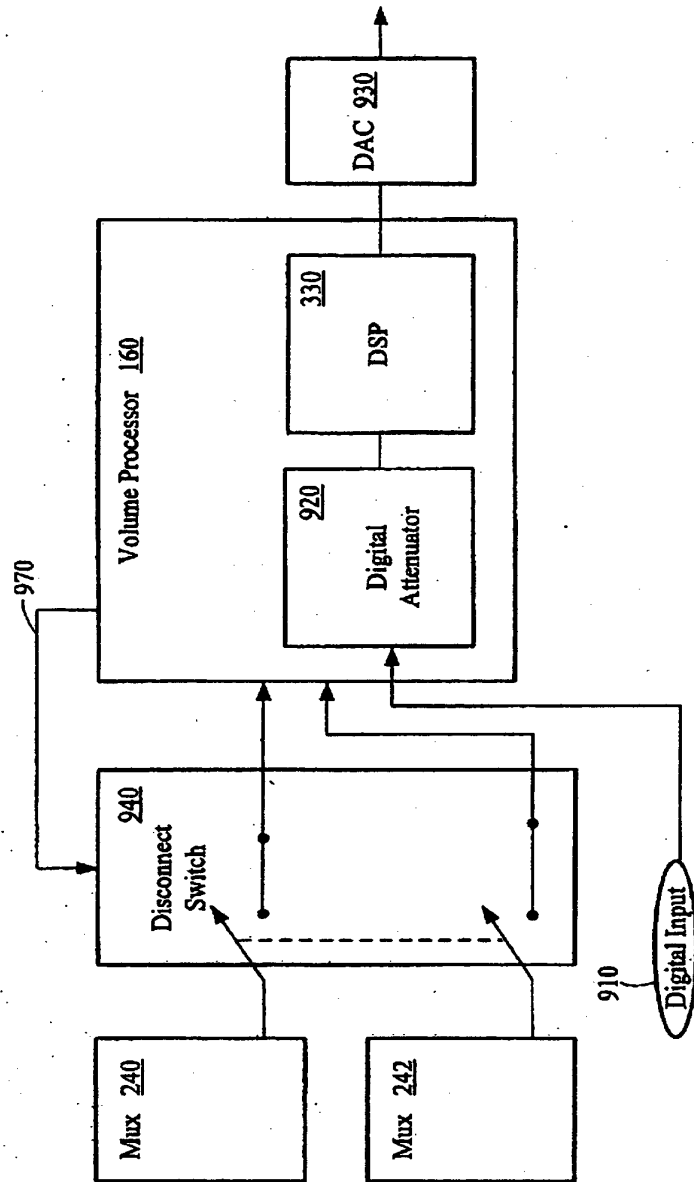


Figure 9

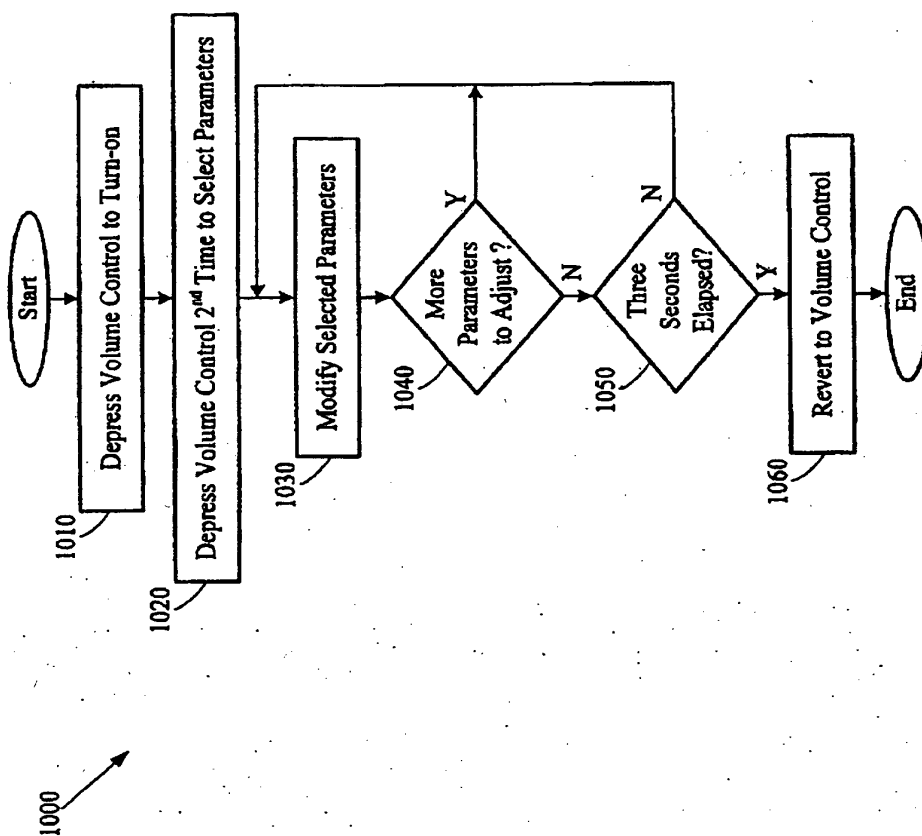


Figure 10

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- DE 10065826 A1 [0004]

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: RICHARD GEARHART
GEARHART LAW LLC
41 RIVER ROAD
SUMMIT, NJ 07901

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year)

29 JAN 2016

Applicant's or agent's file reference
2305LD01PCT

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US 15/51638

International filing date (day/month/year)

23 September 2015 (23.09.2015)

Priority date (day/month/year)

23 September 2014 (23.09.2014)

International Patent Classification (IPC) or both national classification and IPC

IPC(8) - H03G 3/20 (2016.01)

CPC - H03G 3/32

Applicant DENTON, LEVAUGHN

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-8300

Date of completion of this opinion

16 January 2016 (16.01.2016)

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (January 2015)

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 15/51638

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a)).
3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. ☐ forming part of the international application as filed:
 - ☐ in the form of an Annex C/ST.25 text file.
 - ☐ on paper or in the form of an image file.
 - b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
 - ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).
 - ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 15/51638

Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement																										
<p>1. Statement</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; vertical-align: top;">Novelty (N)</td> <td style="width: 10%; vertical-align: top;">Claims</td> <td style="width: 50%; border-bottom: 1px solid black;">1-20</td> <td style="width: 10%; text-align: right; vertical-align: bottom;">YES</td> </tr> <tr> <td></td> <td style="vertical-align: top;">Claims</td> <td style="border-bottom: 1px solid black;">None</td> <td style="text-align: right; vertical-align: bottom;">NO</td> </tr> <tr> <td style="vertical-align: top;">Inventive step (IS)</td> <td style="vertical-align: top;">Claims</td> <td style="border-bottom: 1px solid black;">None</td> <td style="text-align: right; vertical-align: bottom;">YES</td> </tr> <tr> <td></td> <td style="vertical-align: top;">Claims</td> <td style="border-bottom: 1px solid black;">1-20</td> <td style="text-align: right; vertical-align: bottom;">NO</td> </tr> <tr> <td style="vertical-align: top;">Industrial applicability (IA)</td> <td style="vertical-align: top;">Claims</td> <td style="border-bottom: 1px solid black;">1-20</td> <td style="text-align: right; vertical-align: bottom;">YES</td> </tr> <tr> <td></td> <td style="vertical-align: top;">Claims</td> <td style="border-bottom: 1px solid black;">None</td> <td style="text-align: right; vertical-align: bottom;">NO</td> </tr> </table>				Novelty (N)	Claims	1-20	YES		Claims	None	NO	Inventive step (IS)	Claims	None	YES		Claims	1-20	NO	Industrial applicability (IA)	Claims	1-20	YES		Claims	None	NO
Novelty (N)	Claims	1-20	YES																								
	Claims	None	NO																								
Inventive step (IS)	Claims	None	YES																								
	Claims	1-20	NO																								
Industrial applicability (IA)	Claims	1-20	YES																								
	Claims	None	NO																								
<p>2. Citations and explanations:</p> <p>Claims 1, 3-4, 8, 10-18 and 20 lack an inventive step under PCT Article 33(3) as being obvious over US 2010/0329471 A1 to Dunn et al. (hereinafter 'Dunn') in view of US 2013/0294618 A1 (LYUBACHEV) and further in view of US 8,073,160 B1 (CLASSEN).</p> <p>Regarding claim 1, Dunn teaches a system comprising: at least one cluster of at least one computing device, said at least one computing device comprising (Para [0018], [0026]- sound system that may be used with exemplary embodiments may be a digital audio system); a sound sensing mechanism, capable of monitoring the amplitude and frequency of both a desired and an undesired frequency (Abstract; Para [0020]-A sound pick-up may be placed in the listening area to capture the sound level, including both the desired sound and ambient noise; the sound pick-up 24 is positioned in the listening area, so as to receive the sound produced by the speaker 22, ambient noise in the listening area is also received by the sound pick-up 24); transmitting and receiving data from an audio control source (Para [0021]- the sound pick-up 24 is positioned in the listening area, so as to receive the sound produced by the speaker 22, ambient noise in the listening area is also received by the sound pick-up 24); said data comprising at least one characteristic of at least one sound fingerprint (Para [0021]- it may then be run through a numerical process having a time window 28. The resultant value is the measured value 30); at least one output device, comprising (Para [0019]- After the signal has been converted to analog, the signal is transmitted to at least one speaker 22. The speaker 22 then converts the analog signal to audible sound); a speaker for outputting sound (Para [0019]- After the signal has been converted to analog, the signal is transmitted to at least one speaker 22. The speaker 22 then converts the analog signal to audible sound); varying the output of said at least one output device (Para [0025]- If the volume of the desired sound needs to be adjusted to be within the acceptable range a signal may be sent to the gain control 32. The gain control 32 may then automatically adjust the volume of the desired sound). Dunn does not teach a wireless transceiver capable of wirelessly transmitting and receiving data from an audio control source; at least one output device, comprising: a power source for operating the device, a communication mechanism, for receiving electronic information from said audio control source; said audio control source, in electronic communication said at least one cluster and said at least one output device, said audio control source comprising: a memory, containing computer-executable instructions for connecting to said at least one cluster, processing said at least one characteristic of at least sound fingerprint, visualizing said at least one sound fingerprint, providing an interface, a processor, for executing said computer-executable instruction, a interfacing mechanism, comprising: a network adapter, capable of transmitting and receiving electronic information through both wired and wireless communication; a display, for showing said interface and said at least one visualized sound fingerprint, at least one input mechanism, for manipulating said interface, and varying said output of said at least one output device. However, LYUBACHEV teaches wireless transceiver capable of wirelessly transmitting and receiving data from an audio control source (Para [0067]- Data transmission between devices within the system can be performed by means of wired or wireless communication); at least one output device, comprising a power source for operating the device (Para [0019], [0028]-[0029] - peripheral station, sound reproducing device (loudspeaker) for audio signal reception and playback; controlling tool for loudspeaker power control, power supply unit); a communication mechanism, for receiving electronic information from said audio control source (Para [0018], [0021], [0030], [0068] - network data exchange unit, All separately realized devices can be joined into local area network, central station, control device); said audio control source, in electronic communication said at least one cluster and said at least one output device, said audio control source comprising (Para [0018], [0021], [0030], [0068] - network data exchange unit, All separately realized devices can be joined into local area network, central station, control device); a memory, containing computer-executable instructions for connecting to said at least one cluster, processing said at least one characteristic of at least sound fingerprint (Para [0044], [0141] - All calculating devices can be realized on the base of processor with RAM and ROM, input and output devices, corresponding software, or on the base of hardwired logic; Computing device 9 for performing calculation and controlling data generation for system tuning for assigned sounding mode provision), a processor, for executing said computer-executable instruction (Para [0229]- controlling data generation is mainly realized on the base of computer device with embedded programmable processor), a network adapter, capable of transmitting and receiving electronic information through both wired and wireless communication (Abstract; Para [0122]- Mainly network data exchange unit 13 for data exchange with other devices within the network 14; system can be operated wirelessly and can compose a local network); at least one input mechanism (Para [0228]- input and output devices). It would have been obvious to one of ordinary skill in the art to combine the teachings of Dunn with those of LYUBACHEV since doing so would adaptively manage the audio settings thereby enhance the experience of the listeners.</p> <p>--- (See Continuation in Supplemental Box) ---</p>																											

Form PCT/ISA/237 (Box No. V) (January 2015)

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 15/51638

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box V.2. Citations and Explanations.

Neither Dunn nor LYUBACHEV teaches visualizing said at least one sound fingerprint, providing an interface, a interfacing mechanism, comprising: a display, for showing said interface and said at least one visualized sound fingerprint, at least one input mechanism, for manipulating said interface, and varying said output of said at least one output device. However, Classen teaches visualizing said at least one sound fingerprint (col 3, ln 60 to col 4, ln 15; col 7, ln 3-45 - audio properties by viewing displayed visual properties of objects), providing an interface, a interfacing mechanism (col 4, ln 50-65; col 5, ln 20-45 - The user interface 100 provides for the visualization of audio properties of signals of audio sources.), comprising: a display, for showing said interface (col 15, ln 1-15 - one or more display devices 1404) and said at least one visualized sound fingerprint, at least one input mechanism, for manipulating said interface (Fig. 4; col 3, ln 2-55 - Editing the audio data further includes receiving a first user input selecting an audio object; receiving a second user input modifying a position of the selected audio object Within the region; and automatically modifying the audio properties associated With the audio object according to the new location Within the region; Adjusting one or more audio properties associated With the audio object further includes adjusting a compressor associated With the audio data represented by the audio object), and varying said output of said at least one output device (col 3, ln 35-65 - updating the control parameters of the audio mixer according to the adjusted properties of the audio signals). It would have been obvious to one of ordinary skill in the art to combine the teachings of Dunn with those of LYUBACHEV and Classen since doing so would provide a user friendly interface for visualizing controlling audio properties.

Regarding claim 3, Classen teaches said display and said at least one input mechanism are one in-the-same (col 5, ln 20-67).

Regarding claim 4, LYUBACHEV teaches said wireless transceiver utilizes short-range wireless technologies (Para [0233] - radio channel).

Regarding claim 8, LYUBACHEV teaches at least one computing device further comprising a software-based radio, wherein said software-based radio isolates RF frequencies, said at least one computing device relays those frequencies to said audio control unit, wherein said audio control unit ensures that predetermined frequency thresholds maintained (Para [0225]-[0228], [0231]-[0234], [0244]-[0246]).

Regarding claim 10, Classen teaches said input device is a touch-sensitized screen (col 2, ln 5-35).

Regarding claim 11, LYUBACHEV teaches said at least one output device is located within said at least one cluster, such that said audio control source may alter the power supplied to said speaker in real-time (Para [02019]-[0222]).

Regarding claim 12, Dunn teaches a method of maintaining consistent sound across, comprising the steps of (Abstract): providing at least one cluster of at least one computing device, said at least one computing device comprising (Para [0018], [0026] - sound system that may be used with exemplary embodiments may be a digital audio system); a sound sensing mechanism, capable of monitoring the amplitude and frequency of ambient noise (Abstract; Para [0020]-A sound pick-up may be placed in the listening area to capture the sound level, including both the desired sound and ambient noise; the sound pick-up 24 is positioned in the listening area, so as to receive the sound produced by the speaker 22, ambient noise in the listening area is also received by the sound pick-up 24); transmitting and receiving data from an audio control source (Para [0021]- the sound pick-up 24 is positioned in the listening area, so as to receive the sound produced by the speaker 22, ambient noise in the listening area is also received by the sound pick-up 24); said data comprising at least one characteristic of at least one sound fingerprint (Para [0021]- it may then be run through a numerical process having a time window 28. The resultant value is the measured value 30); at least one output device, comprising (Para [0019]- After the signal has been converted to analog, the signal is transmitted to at least one speaker 22. The speaker 22 then converts the analog signal to audible sound); a speaker for outputting sound (Para [0019]- After the signal has been converted to analog, the signal is transmitted to at least one speaker 22. The speaker 22 then converts the analog signal to audible sound); varying the output of said at least one output device (Para [0025]- If the volume of the desired sound needs to be adjusted to be within the acceptable range a signal may be sent to the gain control 32. The gain control 32 may then automatically adjust the volume of the desired sound); sensing, measuring, and analyzing, by said at least one computing device, surrounding audio output signals (Para [0020]-[0022] - sound pick-up 24 may be any device capable of receiving sound waves; run through a numerical process having a time window 28. The resultant value is the measured value 30; It is this mutuality between the reference value 16 and the measured value 30 that is important ambient noise compensation. The complexity of this analysis may be affected mostly by the analog portion of the system, specifically, the characteristics of the sound pick-up and its physical environment for sensing); determining, by said at least one computing device, whether a qualifying signal has been sensed (Para [0020]- As the sound pick-up 24 is positioned in the listening area, so as to receive the sound produced by the speaker 22, ambient noise in the listening area is also received by the sound pick-up 24); identifying and categorizing said measurements, by said at least one computing device (Para [0021]-[0025]- C is positive and above D, the ambient noise may be presumed to be sufficient to interfere with the desired sound in the listening area); determining, by said at least one computing device, whether said measurements breach a predetermined threshold (Para [0009], [0024] - The measure value is the combination of the desired sound and ambient noise present in the listening area allowing the system to distinguish between the desired sound and the ambient noise by comparing the reference and measured values; Although C may have a definite value, in actual implementation, C may be given an acceptable range. By using a range of values for C, the ambient noise compensation may be able to compensate for variations between sound systems and audio sound data's randomness); adjusting said at least one output device, by said audio control source, based on said communicated measurements (Para [0010], [0025]- If a change in volume is required the ambient noise compensation system may adjust the gain of the sound system output automatically; If the volume of the desired sound needs to be adjusted to be within the acceptable range a signal may be sent to the gain control 32. The gain control 32 may then automatically adjust the volume of the desired sound.)

--- (See Continuation in Supplemental Box) ---

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US 15/51638

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:
Box V.2. Citations and Explanations.

Dunn does not teach a wireless transceiver capable of wirelessly transmitting and receiving data from an audio control source; at least one output device, comprising a power source for operating the device, a communication mechanism, for receiving electronic information from said audio control source; said audio control source, in electronic communication said at least one cluster and said at least one output device, said audio control source comprising: a memory, containing computer-executable instructions for connecting to said at least one cluster, processing said at least one characteristic of at least sound fingerprint, visualizing said at least one sound fingerprint, providing an interface, a processor, for executing said computer-executable instruction, a interfacing mechanism, comprising: a network adapter, capable of transmitting and receiving electronic information through both wired and wireless communication; a display, for showing said interface and said at least one visualized sound fingerprint, at least one input mechanism, for manipulating said interface, and varying said output of said at least one output device; communicating, to other clusters, if present, and said audio control source, said breach; determining, by said other clusters, if present, and said audio control source if a second breach has occurred. However, LYUBACHEV teaches wireless transceiver capable of wirelessly transmitting and receiving data from an audio control source (Para [0067]- Data transmission between devices within the system can be performed by means of wired or wireless communication); at least one output device, comprising a power source for operating the device (Para [0019], [0028]-[0029] - peripheral station, sound reproducing device (loudspeaker) for audio signal reception and playback; controlling tool for loudspeaker power control, power supply unit); a communication mechanism, for receiving electronic information from said audio control source (Para [0018], [0021], [0030], [0068] - network data exchange unit, All separately realized devices can be joined into local area network, central station, control device); said audio control source, in electronic communication said at least one cluster and said at least one output device, said audio control source comprising (Para [0018], [0021], [0030], [0068] - network data exchange unit, All separately realized devices can be joined into local area network, central station, control device); a memory, containing computer-executable instructions for connecting to said at least one cluster, processing said at least one characteristic of at least sound fingerprint (Para [0044], [0141] - All calculating devices can be realized on the base of processor with RAM and ROM, input and output devices, corresponding software, or on the base of hardwired logic; Computing device 9 for performing calculation and controlling data generation for system tuning for assigned sounding mode provision), a processor, for executing said computer-executable instruction (Para [0229]- controlling data generation is mainly realized on the base of computer device with embedded programmable processor), a network adapter, capable of transmitting and receiving electronic information through both wired and wireless communication (Abstract; Para [0122]- Mainly network data exchange unit 13 for data exchange with other devices within the network 14; system can be operated wirelessly and can compose a local network); at least one input mechanism (Para [0228]- input and output devices); communicating, to other clusters, if present, and said audio control source, said breach (Para [0243]- A joint operation of the system comprising devices described as variant 1 and/or variant 2, and/or variant 3 on the neighboring or adjacent areas under control is also feasible); determining, by said other clusters, if present, and said audio control source if a second breach has occurred (Para [0243]- A joint operation of the system comprising devices described as variant 1 and/or variant 2, and/or variant 3 on the neighboring or adjacent areas under control is also feasible). It would have been obvious to one of ordinary skill in the art to combine the teachings of Dunn with those of LYUBACHEV since doing so would adaptively manage the audio settings thereby enhance the experience of the listeners. Neither Dunn nor LYUBACHEV teaches visualizing said at least one sound fingerprint, providing an interface, a interfacing mechanism, comprising: a display, for showing said interface and said at least one visualized sound fingerprint, at least one input mechanism, for manipulating said interface, and varying said output of said at least one output device. However, Classen teaches visualizing said at least one sound fingerprint (col 3, In 60 to col 4, In 15; col 7, In 3-45 - audio properties by viewing displayed visual properties of objects), providing an interface, a interfacing mechanism (col 4, In 50-65; col 5, In 20-45 - The user interface 100 provides for the visualization of audio properties of signals of audio sources.), comprising: a display, for showing said interface (col 15, In 1-15 - one or more display devices 1404) and said at least one visualized sound fingerprint, at least one input mechanism, for manipulating said interface (Fig. 4; col 3, In 2-55 - Editing the audio data further includes receiving a first user input selecting an audio object; receiving a second user input modifying a position of the selected audio object Within the region; and automatically modifying the audio properties associated With the audio object according to the new location Within the region; Adjusting one or more audio properties associated With the audio object further includes adjusting a compressor associated With the audio data represented by the audio object), and varying said output of said at least one output device (col 3, In 35-65 - updating the control parameters of the audio mixer according to the adjusted properties of the audio signals). It would have been obvious to one of ordinary skill in the art to combine the teachings of Dunn with those of LYUBACHEV and Classen since doing so would provide a user friendly interface for visualizing controlling audio properties.

Regarding claim 13, Dunn teaches the step of adjusting said at least one output device is done automatically based on predetermined values (Para [0010], [0023]-[0026]).

Regarding claim 14, LYUBACHEV teaches entering, by said at least one computing device, sleep mode (Para [0194]-[0198]).

Regarding claim 15, LYUBACHEV teaches said wireless transceiver utilizes short-range wireless technologies (Para [0233] - radio channel).

Regarding claim 16, Dunn teaches at least one computing device further comprising: an analog-to-digital converter, said analog-to-digital converter featuring an input structure selected from the group consisting of: fully-differential, pseudo-differential, wide input common mode, and single-ended (Para [0019]-[0023]).

Regarding claim 17, LYUBACHEV teaches at least one computing device further comprising: at least one audio codec, at least one application processor, and at least one baseband processor (Para [0171]-[0172], [0225]-[0228], [0236]).

Regarding claim 18, LYUBACHEV teaches at least one computing device further comprising: software-defined radios, Super heterodyne architecture radios, direct conversion architecture, or some combination thereof (Para [0225]-[0228], [0231]-[0234], [0244]-[0246]- software -defined radios).

--- (See Continuation in Supplemental Box) ---

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US 15/51638

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:
Box V.2. Citations and Explanations.

Regarding claim 20, LYUBACHEV teaches at least one computing device further comprising a software-based radio, wherein said software-based radio isolates RF frequencies, said at least one computing device relays those frequencies to said audio control unit, wherein said audio control unit ensures that predetermined frequency thresholds maintained (Para [0225]-[0228], [0231]-[0234], [0244]-[0246]).

Claims 2 and 5-7 lack an inventive step under PCT Article 33(3) as being obvious over Dunn in view of LYUBACHEV and Classen and further in view of US 2004/0076305 A1 (SANTIAGO).

Regarding claim 2, neither Dunn nor LYUBACHEV or Classen teaches said sound-sensing mechanism is an omni-directional transducer. However, Santiago teaches a sound-sensing mechanism that is an omni-directional transducer (Para [0032]-[0037]). It would have been obvious to one of ordinary skill in the art to combine the teachings of Dunn and LYUBACHEV with those of Santiago and Classen since doing so would efficiently sense audio signals.

Regarding claim 5, Dunn teaches at least one computing device further comprising: an analog-to-digital converter, said analog-to-digital converter featuring an input structure selected from the group consisting of: fully-differential, pseudo-differential, wide input common mode, and single-ended (Para [0019]-[0023]).

Regarding claim 6, LYUBACHEV teaches at least one computing device further comprising: at least one audio codec, at least one application processor, and at least one baseband processor (Para [0171]-[0172], [0225]-[0228], [0236]).

Regarding claim 7, LYUBACHEV teaches at least one computing device further comprising: software-defined radios, Super heterodyne architecture radios, direct conversion architecture, or some combination thereof (Para [0225]-[0228], [0231]-[0234], [0244]-[0246]- software-defined radios).

Claims 9 and 19 lack an inventive step under PCT Article 33(3) as being obvious over Dunn in view of LYUBACHEV and Classen and further in view of US 2006/0082458 A1 to Shanks et al. (hereinafter 'Shanks').

Regarding claim 9, neither Dunn nor LYUBACHEV or Classen teaches electronic communications between said at least one computing device, said at least one cluster, said at least one output device, and said audio control unit are sent and received using an ambient backscatter techniques. However, Shanks teaches electronic communications between said at least one computing device, said at least one cluster, said at least one output device, and said audio control unit are sent and received using an ambient backscatter techniques (Para [0015]-[0016]). It would have been obvious to one of ordinary skill in the art to combine the teachings of Dunn and LYUBACHEV with those of Shanks and Classen since doing so would enhance the power efficiency of the devices.

Regarding claim 19, neither Dunn nor LYUBACHEV or Classen teaches electronic communications between said at least one computing device, said at least one cluster, said at least one output device, and said audio control unit are sent and received using an ambient backscatter techniques. However, Shanks teaches electronic communications between said at least one computing device, said at least one cluster, said at least one output device, and said audio control unit are sent and received using an ambient backscatter techniques (Para [0015]-[0016]). It would have been obvious to one of ordinary skill in the art to combine the teachings of Dunn and LYUBACHEV with those of Shanks and Classen since doing so would enhance the power efficiency of the devices.

Claims 1-20 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 2305LD01PCT	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/US 15/51638	International filing date (day/month/year) 23 September 2015 (23.09.2015)	(Earliest) Priority Date (day/month/year) 23 September 2014 (23.09.2014)
Applicant DENTON, LEVAUGHN		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed.
☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.

2. ☐ Certain claims were found unsearchable (see Box No. II).

3. ☐ Unity of invention is lacking (see Box No. III).

4. With regard to the title,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

- a. the figure of the drawings to be published with the abstract is Figure No. 3
☐ as suggested by the applicant.
☒ as selected by this Authority, because the applicant failed to suggest a figure.
☐ as selected by this Authority, because this figure better characterizes the invention.
- b. ☐ none of the figures is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 15/51638

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - H03G 3/20 (2016.01) CPC - H03G 3/32 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC (8) - H03G 3/20 (2016.01) CPC - H03G 3/32 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched CPC - H03G 3/24; H04R 27/00 (See keywords Below) USPC - 381/57, 381/104, 381/107 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Thomsoninnovation.com; Patbase; Google Scholar; Google Patents; Gogole.com; Freepatentonline; ProQuest Dialog Search Terms: Audio, sound, adapt, dynamic, adjust, modify, setting, parameter, frequency, amplitude, threshold, sensor, microphone, measure, sample, reading, compare, process, wireless, network, cluster, etc.		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2010/0329471 A1 (DUNN et al.), 30 December 2010 (30.12.2010), entire document, especially Abstract; Para [0018], [0020], [0025], [0026]	1-20
Y	US 2013/0294618 A1 (LYUBACHEV), 07 November 2013 (07.11.2013), entire document, especially Abstract; Para [0018], [0021], [0028]-[0029], [0030], [0068]	1-20
Y	US 8,073,160 B1 (CLASSEN), 06 December 2011 (06.12.2011), col 3, ln 60 to col 4, ln 15; col 7, ln 3-45	1-20
Y	US 2004/0076305 A1 (SANTIAGO), 22 April 2004 (22.04.2004), entire document, especially Abstract; Para [0032]-[0037]	2 and 5-7
Y	US 2006/0082458 A1 (SHANKS et al.), 20 April 2006 (20.04.2006), entire document, especially Abstract; Para [0015]-[0016]	9 and 19
A	US 2013/0064380 A1 (MAHOWALD), 14 March 2013 (14.03.2013), entire document	1-20
A	US 2004/0240676 A1 (HASHIMOTO et al.), 02 December 2004 (02.12.2004), entire document	1-20
☐ Further documents are listed in the continuation of Box C. ☐		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 16 January 2016 (16.01.2016)		Date of mailing of the international search report 29 JAN 2016
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300		Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 2305LD01PCT	FOR FURTHER ACTION	See item 4 below
International application No. PCT/US2015/051638	International filing date (<i>day/month/year</i>) 23 September 2015 (23.09.2015)	Priority date (<i>day/month/year</i>) 23 September 2014 (23.09.2014)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant DENTON, Levaughn		

1.	This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).																								
2.	<p>This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p>In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.</p>																								
3.	<p>This report contains indications relating to the following items:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 5%; text-align: center;">☒</td> <td style="width: 30%;">Box No. I</td> <td style="width: 65%;">Basis of the report</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td style="text-align: center;">☒</td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table>	☒	Box No. I	Basis of the report	☐	Box No. II	Priority	☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	☐	Box No. IV	Lack of unity of invention	☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	☐	Box No. VI	Certain documents cited	☐	Box No. VII	Certain defects in the international application	☐	Box No. VIII	Certain observations on the international application
☒	Box No. I	Basis of the report																							
☐	Box No. II	Priority																							
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability																							
☐	Box No. IV	Lack of unity of invention																							
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement																							
☐	Box No. VI	Certain documents cited																							
☐	Box No. VII	Certain defects in the international application																							
☐	Box No. VIII	Certain observations on the international application																							
4.	The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).																								

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Date of issuance of this report 28 March 2017 (28.03.2017)</td> </tr> <tr> <td style="padding: 2px;"> Authorized officer <div style="text-align: center; font-weight: bold;">Agnès Wittmann-Regis</div> e-mail: pct.team6@wipo.int </td> </tr> </table>	Date of issuance of this report 28 March 2017 (28.03.2017)	Authorized officer <div style="text-align: center; font-weight: bold;">Agnès Wittmann-Regis</div> e-mail: pct.team6@wipo.int
Date of issuance of this report 28 March 2017 (28.03.2017)			
Authorized officer <div style="text-align: center; font-weight: bold;">Agnès Wittmann-Regis</div> e-mail: pct.team6@wipo.int			

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: RICHARD GEARHART
GEARHART LAW LLC
41 RIVER ROAD
SUMMIT, NJ 07901

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year)

29 JAN 2016

Applicant's or agent's file reference
2305LD01PCT

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US 15/51638

International filing date (day/month/year)

23 September 2015 (23.09.2015)

Priority date (day/month/year)

23 September 2014 (23.09.2014)

International Patent Classification (IPC) or both national classification and IPC

IPC(8) - H03G 3/20 (2016.01)

CPC - H03G 3/32

Applicant DENTON, LEVAUGHN

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-8300

Date of completion of this opinion

16 January 2016 (16.01.2016)

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (January 2015)

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 15/51638

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a)).
3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. ☐ forming part of the international application as filed:
 - ☐ in the form of an Annex C/ST.25 text file.
 - ☐ on paper or in the form of an image file.
 - b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
 - ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).
 - ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 15/51638

Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement																										
<p>1. Statement</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; vertical-align: top;">Novelty (N)</td> <td style="width: 10%; vertical-align: top;">Claims</td> <td style="width: 40%; border-bottom: 1px solid black;">1-20</td> <td style="width: 20%; text-align: right; vertical-align: bottom;">YES</td> </tr> <tr> <td></td> <td style="vertical-align: top;">Claims</td> <td style="border-bottom: 1px solid black;">None</td> <td style="text-align: right; vertical-align: bottom;">NO</td> </tr> <tr> <td style="vertical-align: top;">Inventive step (IS)</td> <td style="vertical-align: top;">Claims</td> <td style="border-bottom: 1px solid black;">None</td> <td style="text-align: right; vertical-align: bottom;">YES</td> </tr> <tr> <td></td> <td style="vertical-align: top;">Claims</td> <td style="border-bottom: 1px solid black;">1-20</td> <td style="text-align: right; vertical-align: bottom;">NO</td> </tr> <tr> <td style="vertical-align: top;">Industrial applicability (IA)</td> <td style="vertical-align: top;">Claims</td> <td style="border-bottom: 1px solid black;">1-20</td> <td style="text-align: right; vertical-align: bottom;">YES</td> </tr> <tr> <td></td> <td style="vertical-align: top;">Claims</td> <td style="border-bottom: 1px solid black;">None</td> <td style="text-align: right; vertical-align: bottom;">NO</td> </tr> </table>				Novelty (N)	Claims	1-20	YES		Claims	None	NO	Inventive step (IS)	Claims	None	YES		Claims	1-20	NO	Industrial applicability (IA)	Claims	1-20	YES		Claims	None	NO
Novelty (N)	Claims	1-20	YES																								
	Claims	None	NO																								
Inventive step (IS)	Claims	None	YES																								
	Claims	1-20	NO																								
Industrial applicability (IA)	Claims	1-20	YES																								
	Claims	None	NO																								
<p>2. Citations and explanations:</p> <p>Claims 1, 3-4, 8, 10-18 and 20 lack an inventive step under PCT Article 33(3) as being obvious over US 2010/0329471 A1 to Dunn et al. (hereinafter 'Dunn') in view of US 2013/0294618 A1 (LYUBACHEV) and further in view of US 8,073,160 B1 (CLASSEN).</p> <p>Regarding claim 1, Dunn teaches a system comprising: at least one cluster of at least one computing device, said at least one computing device comprising (Para [0018], [0026]- sound system that may be used with exemplary embodiments may be a digital audio system); a sound sensing mechanism, capable of monitoring the amplitude and frequency of both a desired and an undesired frequency (Abstract; Para [0020]-A sound pick-up may be placed in the listening area to capture the sound level, including both the desired sound and ambient noise; the sound pick-up 24 is positioned in the listening area, so as to receive the sound produced by the speaker 22, ambient noise in the listening area is also received by the sound pick-up 24); transmitting and receiving data from an audio control source (Para [0021]- the sound pick-up 24 is positioned in the listening area, so as to receive the sound produced by the speaker 22, ambient noise in the listening area is also received by the sound pick-up 24); said data comprising at least one characteristic of at least one sound fingerprint (Para [0021]- it may then be run through a numerical process having a time window 28. The resultant value is the measured value 30); at least one output device, comprising (Para [0019]- After the signal has been converted to analog, the signal is transmitted to at least one speaker 22. The speaker 22 then converts the analog signal to audible sound); a speaker for outputting sound (Para [0019]- After the signal has been converted to analog, the signal is transmitted to at least one speaker 22. The speaker 22 then converts the analog signal to audible sound); varying the output of said at least one output device (Para [0025]- If the volume of the desired sound needs to be adjusted to be within the acceptable range a signal may be sent to the gain control 32. The gain control 32 may then automatically adjust the volume of the desired sound). Dunn does not teach a wireless transceiver capable of wirelessly transmitting and receiving data from an audio control source; at least one output device, comprising: a power source for operating the device, a communication mechanism, for receiving electronic information from said audio control source; said audio control source, in electronic communication said at least one cluster and said at least one output device, said audio control source comprising: a memory, containing computer-executable instructions for connecting to said at least one cluster, processing said at least one characteristic of at least sound fingerprint, visualizing said at least one sound fingerprint, providing an interface, a processor, for executing said computer-executable instruction, a interfacing mechanism, comprising: a network adapter, capable of transmitting and receiving electronic information through both wired and wireless communication; a display, for showing said interface and said at least one visualized sound fingerprint, at least one input mechanism, for manipulating said interface, and varying said output of said at least one output device. However, LYUBACHEV teaches wireless transceiver capable of wirelessly transmitting and receiving data from an audio control source (Para [0067]- Data transmission between devices within the system can be performed by means of wired or wireless communication); at least one output device, comprising a power source for operating the device (Para [0019], [0028]-[0029] - peripheral station, sound reproducing device (loudspeaker) for audio signal reception and playback; controlling tool for loudspeaker power control, power supply unit); a communication mechanism, for receiving electronic information from said audio control source (Para [0018], [0021], [0030], [0068] - network data exchange unit, All separately realized devices can be joined into local area network, central station, control device); said audio control source, in electronic communication said at least one cluster and said at least one output device, said audio control source comprising (Para [0018], [0021], [0030], [0068] - network data exchange unit, All separately realized devices can be joined into local area network, central station, control device); a memory, containing computer-executable instructions for connecting to said at least one cluster, processing said at least one characteristic of at least sound fingerprint (Para [0044], [0141] - All calculating devices can be realized on the base of processor with RAM and ROM, input and output devices, corresponding software, or on the base of hardwired logic; Computing device 9 for performing calculation and controlling data generation for system tuning for assigned sounding mode provision), a processor, for executing said computer-executable instruction (Para [0229]- controlling data generation is mainly realized on the base of computer device with embedded programmable processor), a network adapter, capable of transmitting and receiving electronic information through both wired and wireless communication (Abstract; Para [0122]- Mainly network data exchange unit 13 for data exchange with other devices within the network 14; system can be operated wirelessly and can compose a local network); at least one input mechanism (Para [0228]- input and output devices). It would have been obvious to one of ordinary skill in the art to combine the teachings of Dunn with those of LYUBACHEV since doing so would adaptively manage the audio settings thereby enhance the experience of the listeners.</p> <p>--- (See Continuation in Supplemental Box) ---</p>																											

Form PCT/ISA/237 (Box No. V) (January 2015)

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 15/51638

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box V.2. Citations and Explanations.

Neither Dunn nor LYUBACHEV teaches visualizing said at least one sound fingerprint, providing an interface, a interfacing mechanism, comprising: a display, for showing said interface and said at least one visualized sound fingerprint, at least one input mechanism, for manipulating said interface, and varying said output of said at least one output device. However, Classen teaches visualizing said at least one sound fingerprint (col 3, ln 60 to col 4, ln 15; col 7, ln 3-45 - audio properties by viewing displayed visual properties of objects), providing an interface, a interfacing mechanism (col 4, ln 50-65; col 5, ln 20-45 - The user interface 100 provides for the visualization of audio properties of signals of audio sources.), comprising: a display, for showing said interface (col 15, ln 1-15 - one or more display devices 1404) and said at least one visualized sound fingerprint, at least one input mechanism, for manipulating said interface (Fig. 4; col 3, ln 2-55 - Editing the audio data further includes receiving a first user input selecting an audio object; receiving a second user input modifying a position of the selected audio object Within the region; and automatically modifying the audio properties associated With the audio object according to the new location Within the region; Adjusting one or more audio properties associated With the audio object further includes adjusting a compressor associated With the audio data represented by the audio object), and varying said output of said at least one output device (col 3, ln 35-65 - updating the control parameters of the audio mixer according to the adjusted properties of the audio signals). It would have been obvious to one of ordinary skill in the art to combine the teachings of Dunn with those of LYUBACHEV and Classen since doing so would provide a user friendly interface for visualizing controlling audio properties.

Regarding claim 3, Classen teaches said display and said at least one input mechanism are one in-the-same (col 5, ln 20-67).

Regarding claim 4, LYUBACHEV teaches said wireless transceiver utilizes short-range wireless technologies (Para [0233] - radio channel).

Regarding claim 8, LYUBACHEV teaches at least one computing device further comprising a software-based radio, wherein said software-based radio isolates RF frequencies, said at least one computing device relays those frequencies to said audio control unit, wherein said audio control unit ensures that predetermined frequency thresholds maintained (Para [0225]-[0228], [0231]-[0234], [0244]-[0246]).

Regarding claim 10, Classen teaches said input device is a touch-sensitized screen (col 2, ln 5-35).

Regarding claim 11, LYUBACHEV teaches said at least one output device is located within said at least one cluster, such that said audio control source may alter the power supplied to said speaker in real-time (Para [02019]-[0222]).

Regarding claim 12, Dunn teaches a method of maintaining consistent sound across, comprising the steps of (Abstract): providing at least one cluster of at least one computing device, said at least one computing device comprising (Para [0018], [0026] - sound system that may be used with exemplary embodiments may be a digital audio system); a sound sensing mechanism, capable of monitoring the amplitude and frequency of ambient noise (Abstract; Para [0020]-A sound pick-up may be placed in the listening area to capture the sound level, including both the desired sound and ambient noise; the sound pick-up 24 is positioned in the listening area, so as to receive the sound produced by the speaker 22, ambient noise in the listening area is also received by the sound pick-up 24); transmitting and receiving data from an audio control source (Para [0021]- the sound pick-up 24 is positioned in the listening area, so as to receive the sound produced by the speaker 22, ambient noise in the listening area is also received by the sound pick-up 24); said data comprising at least one characteristic of at least one sound fingerprint (Para [0021]- it may then be run through a numerical process having a time window 28. The resultant value is the measured value 30); at least one output device, comprising (Para [0019]- After the signal has been converted to analog, the signal is transmitted to at least one speaker 22. The speaker 22 then converts the analog signal to audible sound); a speaker for outputting sound (Para [0019]- After the signal has been converted to analog, the signal is transmitted to at least one speaker 22. The speaker 22 then converts the analog signal to audible sound); varying the output of said at least one output device (Para [0025]- If the volume of the desired sound needs to be adjusted to be within the acceptable range a signal may be sent to the gain control 32. The gain control 32 may then automatically adjust the volume of the desired sound); sensing, measuring, and analyzing, by said at least one computing device, surrounding audio output signals (Para [0020]-[0022] - sound pick-up 24 may be any device capable of receiving sound waves; run through a numerical process having a time window 28. The resultant value is the measured value 30; It is this mutuality between the reference value 16 and the measured value 30 that is important ambient noise compensation. The complexity of this analysis may be affected mostly by the analog portion of the system, specifically, the characteristics of the sound pick-up and its physical environment for sensing); determining, by said at least one computing device, whether a qualifying signal has been sensed (Para [0020]- As the sound pick-up 24 is positioned in the listening area, so as to receive the sound produced by the speaker 22, ambient noise in the listening area is also received by the sound pick-up 24); identifying and categorizing said measurements, by said at least one computing device (Para [0021]-[0025]- C is positive and above D, the ambient noise may be presumed to be sufficient to interfere with the desired sound in the listening area); determining, by said at least one computing device, whether said measurements breach a predetermined threshold (Para [0009], [0024] - The measure value is the combination of the desired sound and ambient noise present in the listening area allowing the system to distinguish between the desired sound and the ambient noise by comparing the reference and measured values; Although C may have a definite value, in actual implementation, C may be given an acceptable range. By using a range of values for C, the ambient noise compensation may be able to compensate for variations between sound systems and audio sound data's randomness); adjusting said at least one output device, by said audio control source, based on said communicated measurements (Para [0010], [0025]- If a change in volume is required the ambient noise compensation system may adjust the gain of the sound system output automatically; If the volume of the desired sound needs to be adjusted to be within the acceptable range a signal may be sent to the gain control 32. The gain control 32 may then automatically adjust the volume of the desired sound.)

--- (See Continuation in Supplemental Box) ---

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US 15/51638

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:
Box V.2. Citations and Explanations.

Dunn does not teach a wireless transceiver capable of wirelessly transmitting and receiving data from an audio control source; at least one output device, comprising a power source for operating the device, a communication mechanism, for receiving electronic information from said audio control source; said audio control source, in electronic communication said at least one cluster and said at least one output device, said audio control source comprising: a memory, containing computer-executable instructions for connecting to said at least one cluster, processing said at least one characteristic of at least sound fingerprint, visualizing said at least one sound fingerprint, providing an interface, a processor, for executing said computer-executable instruction, a interfacing mechanism, comprising: a network adapter, capable of transmitting and receiving electronic information through both wired and wireless communication; a display, for showing said interface and said at least one visualized sound fingerprint, at least one input mechanism, for manipulating said interface, and varying said output of said at least one output device; communicating, to other clusters, if present, and said audio control source, said breach; determining, by said other clusters, if present, and said audio control source if a second breach has occurred. However, LYUBACHEV teaches wireless transceiver capable of wirelessly transmitting and receiving data from an audio control source (Para [0067]- Data transmission between devices within the system can be performed by means of wired or wireless communication); at least one output device, comprising a power source for operating the device (Para [0019], [0028]-[0029] - peripheral station, sound reproducing device (loudspeaker) for audio signal reception and playback; controlling tool for loudspeaker power control, power supply unit); a communication mechanism, for receiving electronic information from said audio control source (Para [0018], [0021], [0030], [0068] - network data exchange unit, All separately realized devices can be joined into local area network, central station, control device); said audio control source, in electronic communication said at least one cluster and said at least one output device, said audio control source comprising (Para [0018], [0021], [0030], [0068] - network data exchange unit, All separately realized devices can be joined into local area network, central station, control device); a memory, containing computer-executable instructions for connecting to said at least one cluster, processing said at least one characteristic of at least sound fingerprint (Para [0044], [0141] - All calculating devices can be realized on the base of processor with RAM and ROM, input and output devices, corresponding software, or on the base of hardwired logic; Computing device 9 for performing calculation and controlling data generation for system tuning for assigned sounding mode provision), a processor, for executing said computer-executable instruction (Para [0229]- controlling data generation is mainly realized on the base of computer device with embedded programmable processor), a network adapter, capable of transmitting and receiving electronic information through both wired and wireless communication (Abstract; Para [0122]- Mainly network data exchange unit 13 for data exchange with other devices within the network 14; system can be operated wirelessly and can compose a local network); at least one input mechanism (Para [0228]- input and output devices); communicating, to other clusters, if present, and said audio control source, said breach (Para [0243]- A joint operation of the system comprising devices described as variant 1 and/or variant 2, and/or variant 3 on the neighboring or adjacent areas under control is also feasible); determining, by said other clusters, if present, and said audio control source if a second breach has occurred (Para [0243]- A joint operation of the system comprising devices described as variant 1 and/or variant 2, and/or variant 3 on the neighboring or adjacent areas under control is also feasible). It would have been obvious to one of ordinary skill in the art to combine the teachings of Dunn with those of LYUBACHEV since doing so would adaptively manage the audio settings thereby enhance the experience of the listeners. Neither Dunn nor LYUBACHEV teaches visualizing said at least one sound fingerprint, providing an interface, a interfacing mechanism, comprising: a display, for showing said interface and said at least one visualized sound fingerprint, at least one input mechanism, for manipulating said interface, and varying said output of said at least one output device. However, Classen teaches visualizing said at least one sound fingerprint (col 3, In 60 to col 4, In 15; col 7, In 3-45 - audio properties by viewing displayed visual properties of objects), providing an interface, a interfacing mechanism (col 4, In 50-65; col 5, In 20-45 - The user interface 100 provides for the visualization of audio properties of signals of audio sources.), comprising: a display, for showing said interface (col 15, In 1-15 - one or more display devices 1404) and said at least one visualized sound fingerprint, at least one input mechanism, for manipulating said interface (Fig. 4; col 3, In 2-55 - Editing the audio data further includes receiving a first user input selecting an audio object; receiving a second user input modifying a position of the selected audio object Within the region; and automatically modifying the audio properties associated With the audio object according to the new location Within the region; Adjusting one or more audio properties associated With the audio object further includes adjusting a compressor associated With the audio data represented by the audio object), and varying said output of said at least one output device (col 3, In 35-65 - updating the control parameters of the audio mixer according to the adjusted properties of the audio signals). It would have been obvious to one of ordinary skill in the art to combine the teachings of Dunn with those of LYUBACHEV and Classen since doing so would provide a user friendly interface for visualizing controlling audio properties.

Regarding claim 13, Dunn teaches the step of adjusting said at least one output device is done automatically based on predetermined values (Para [0010], [0023]-[0026]).

Regarding claim 14, LYUBACHEV teaches entering, by said at least one computing device, sleep mode (Para [0194]-[0198]).

Regarding claim 15, LYUBACHEV teaches said wireless transceiver utilizes short-range wireless technologies (Para [0233] - radio channel).

Regarding claim 16, Dunn teaches at least one computing device further comprising: an analog-to-digital converter, said analog-to-digital converter featuring an input structure selected from the group consisting of: fully-differential, pseudo-differential, wide input common mode, and single-ended (Para [0019]-[0023]).

Regarding claim 17, LYUBACHEV teaches at least one computing device further comprising: at least one audio codec, at least one application processor, and at least one baseband processor (Para [0171]-[0172], [0225]-[0228], [0236]).

Regarding claim 18, LYUBACHEV teaches at least one computing device further comprising: software-defined radios, Super heterodyne architecture radios, direct conversion architecture, or some combination thereof (Para [0225]-[0228], [0231]-[0234], [0244]-[0246]- software -defined radios).

--- (See Continuation in Supplemental Box) ---

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:
Box V.2. Citations and Explanations.

Regarding claim 20, LYUBACHEV teaches at least one computing device further comprising a software-based radio, wherein said software-based radio isolates RF frequencies, said at least one computing device relays those frequencies to said audio control unit, wherein said audio control unit ensures that predetermined frequency thresholds maintained (Para [0225]-[0228], [0231]-[0234], [0244]-[0246]).

Claims 2 and 5-7 lack an inventive step under PCT Article 33(3) as being obvious over Dunn in view of LYUBACHEV and Classen and further in view of US 2004/0076305 A1 (SANTIAGO).

Regarding claim 2, neither Dunn nor LYUBACHEV or Classen teaches said sound-sensing mechanism is an omni-directional transducer. However, Santiago teaches a sound-sensing mechanism that is an omni-directional transducer (Para [0032]-[0037]). It would have been obvious to one of ordinary skill in the art to combine the teachings of Dunn and LYUBACHEV with those of Santiago and Classen since doing so would efficiently sense audio signals.

Regarding claim 5, Dunn teaches at least one computing device further comprising: an analog-to-digital converter, said analog-to-digital converter featuring an input structure selected from the group consisting of: fully-differential, pseudo-differential, wide input common mode, and single-ended (Para [0019]-[0023]).

Regarding claim 6, LYUBACHEV teaches at least one computing device further comprising: at least one audio codec, at least one application processor, and at least one baseband processor (Para [0171]-[0172], [0225]-[0228], [0236]).

Regarding claim 7, LYUBACHEV teaches at least one computing device further comprising: software-defined radios, Super heterodyne architecture radios, direct conversion architecture, or some combination thereof (Para [0225]-[0228], [0231]-[0234], [0244]-[0246]- software-defined radios).

Claims 9 and 19 lack an inventive step under PCT Article 33(3) as being obvious over Dunn in view of LYUBACHEV and Classen and further in view of US 2006/0082458 A1 to Shanks et al. (hereinafter 'Shanks').

Regarding claim 9, neither Dunn nor LYUBACHEV or Classen teaches electronic communications between said at least one computing device, said at least one cluster, said at least one output device, and said audio control unit are sent and received using an ambient backscatter techniques. However, Shanks teaches electronic communications between said at least one computing device, said at least one cluster, said at least one output device, and said audio control unit are sent and received using an ambient backscatter techniques (Para [0015]-[0016]). It would have been obvious to one of ordinary skill in the art to combine the teachings of Dunn and LYUBACHEV with those of Shanks and Classen since doing so would enhance the power efficiency of the devices.

Regarding claim 19, neither Dunn nor LYUBACHEV or Classen teaches electronic communications between said at least one computing device, said at least one cluster, said at least one output device, and said audio control unit are sent and received using an ambient backscatter techniques. However, Shanks teaches electronic communications between said at least one computing device, said at least one cluster, said at least one output device, and said audio control unit are sent and received using an ambient backscatter techniques (Para [0015]-[0016]). It would have been obvious to one of ordinary skill in the art to combine the teachings of Dunn and LYUBACHEV with those of Shanks and Classen since doing so would enhance the power efficiency of the devices.

Claims 1-20 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

Electronic Acknowledgement Receipt	
EFS ID:	37534144
Application Number:	16421141
International Application Number:	
Confirmation Number:	7908
Title of Invention:	Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters
First Named Inventor/Applicant Name:	Levaughn Denton
Customer Number:	75207
Filer:	David D. Postolski/Ashley Sperbeck
Filer Authorized By:	David D. Postolski
Attorney Docket Number:	2305LD01UTL1USCIP
Receipt Date:	23-OCT-2019
Filing Date:	23-MAY-2019
Time Stamp:	10:12:22
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	2305LD01UTL1USCIP_IDS.pdf	613370	no	6
			c3a7d0d173d1188ea3e4bcf90c80970c3a74425a		

Warnings:

Information:					
2	Foreign Reference	FR1.pdf	456504	no	38
			d5b424e071dc99642a5b5ff3886837a7ddf630d4		
Warnings:					
Information:					
3	Foreign Reference	FR2.pdf	344311	no	21
			be82bf1bf05ca2d51ee87cfb9b213ef61135a83d		
Warnings:					
Information:					
4	Non Patent Literature	NPL1.pdf	459394	no	6
			d3a231079669e5cf965a18675de196a5e9bbe1b9		
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5	Non Patent Literature	NPL2.pdf	106603	no	2
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Warnings:					
Information:					
6	Non Patent Literature	NPL3.pdf	496639	no	7
			3a288a9e0c92053d0a07c25a83a4427e67f56de4		
Warnings:					
Information:					
Total Files Size (in bytes):			2476821		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/421,141	05/23/2019	2654	430	2305LD01UTL1USCIP	20	2

CONFIRMATION NO. 7908
UPDATED FILING RECEIPT



0000000112933353

75207
Gearhart Law LLC
41 River Road
Suite 1A
Summit, NJ 07901

Date Mailed: 11/27/2019

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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Inventor(s)

Levaughn Denton, Baisley Park, NY;

Applicant(s)

Levaughn Denton, Baisley Park, NY;

Power of Attorney: The patent practitioners associated with Customer Number 75207

Domestic Priority data as claimed by applicant

This application is a CIP of 14/862,304 09/23/2015 PAT 10127005
which claims benefit of 62/054,286 09/23/2014
This application 16/421,141
is a CIP of 16/155,919 10/10/2018 ABN

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 06/12/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/421,141**

Projected Publication Date: 03/05/2020

Non-Publication Request: No

Early Publication Request: No

**** MICRO ENTITY ****

Title

Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters

Preliminary Class

381

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

page 2 of 4

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

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 U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD						Application or Docket Number 16/421,141	
Substitute for Form PTO-875							
APPLICATION AS FILED - PART I							
(Column 1)		(Column 2)		SMALL ENTITY		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	75
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	165
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	190
TOTAL CLAIMS (37 CFR 1.16(i))	20	minus 20 = *			OR	x 25 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2	minus 3 = *			OR	x 115 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 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).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	430
APPLICATION AS AMENDED - PART II							
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x	=	OR
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	OR
	Application Size Fee (37 CFR 1.16(s))					OR	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR	
TOTAL ADD'L FEE					OR	TOTAL ADD'L FEE	
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x	=	OR
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	OR
	Application Size Fee (37 CFR 1.16(s))					OR	
	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 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 FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

75207 7590 01/15/2020
Gearhart Law LLC
41 River Road
Suite 1A
Summit, NJ 07901

EXAMINER

TRAN, THANG V

ART UNIT

PAPER NUMBER

2688

DATE MAILED: 01/15/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/421,141	05/23/2019	Levaughn Denton	2305LD01UTL1USCIP	7908

TITLE OF INVENTION: Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	MICRO	\$250	\$0.00	\$0.00	\$250	04/15/2020

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 ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

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: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (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)

75207 7590 01/15/2020
Gearhart Law LLC
41 River Road
Suite 1A
Summit, NJ 07901

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 transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/421,141	05/23/2019	Levaughn Denton	2305LD01UTL1USCIP	7908

TITLE OF INVENTION: Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	MICRO	\$250	\$0.00	\$0.00	\$250	04/15/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
TRAN, THANG V	2688	381-056000

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 03-09 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,

1 _____

(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.

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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). 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. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/421,141	05/23/2019	Levaughn Denton	2305LD01UTL1USCIP	7908
75207	7590	01/15/2020	EXAMINER	
Gearhart Law LLC			TRAN, THANG V	
41 River Road			ART UNIT	
Suite 1A			PAPER NUMBER	
Summit, NJ 07901			2688	
DATE MAILED: 01/15/2020				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

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.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B 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 30 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.

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. 16/421,141	Applicant(s) Denton, Levaughn	
	Examiner THANG V TRAN	Art Unit 2688	AIA (FITF) Status Yes

-- 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 a communication dated 10/23/2019.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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 1-20 . 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).

Certified copies:

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)	5. ☒ Examiner's Amendment/Comment
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/THANG V TRAN/ Primary Examiner, Art Unit 2688	
---	--

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

EXAMINER'S AMENDMENT

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Claims 1 and 11 in this application have been amended as follows in order to better define the claimed invention.

IN THE CLAIMS:

In claim 1, line 22, after "determining" replace "is" with --if--.

In claim 11, line 21, after "determining" replace "is" with --if--.

Reasons for Allowance

3. The following is an examiner's statement of reasons for allowance: claims 1-20 are allowed over the prior art of record because the prior art of record including US 20150358730; US 20160150338; US 20120189140; and US 20100329471, found as the most relevant art and considered alone or in combination, fails to suggest or fairly teach the following claimed limitations.

Claimed limitations including a combination of: least one computing device including: a sound sensing mechanism, configured to sense a noise; and a wireless transceiver, configured to wirelessly transmit and receive data from the audio control source; at least one output device, including: a power source for operating the output device; a speaker for outputting sound; and a communication mechanism, for receiving electronic information from the audio control source; and the audio control source, in electronic communication the at least one cluster and the at least one output device, the audio control source including: a memory, containing computer-executable instructions for connecting to the at least one cluster, and varying an output of the at least one output device, providing an interface; and a processor, for executing the computer-executable instructions, wherein the computer-executable instructions include: identifying one or more sounds within the noise; isolating the one or more sounds; determining is one or more of the one or more sounds includes a frequency outside of a predetermined threshold; if one or more of the one or more sounds includes the frequency outside of the predetermined threshold, altering the one or more of the one or more sounds so that the frequency does not fall outside of the predetermined threshold; and outputting the one or more sounds on the at least one output device, as recited in claim 1, and similarly recited in a corresponding method claim 11.

Claims 2-10 and 12-20 are allowed over the prior art of record with their respective base claim.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Cited References

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The references cited herewith are directed to a sound system having a microphone, a detection unit to detect and compare a frequency of a sound signal captured by a microphone and issue an alter signal to a user.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to THANG V TRAN whose telephone number is (571)272-7595. The examiner can normally be reached on Mon-Fri: 7:00 AM -7:00 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wayne Young can be reached on 571-272-7582. 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 <https://ppair-my.uspto.gov/pair/PrivatePair>. 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.

/THANG V TRAN/
Primary Examiner, Art Unit 2688

<i>Notice of References Cited</i>	Application/Control No. 16/421,141	Applicant(s)/Patent Under Reexamination Denton, Levaughn	
	Examiner THANG V TRAN	Art Unit 2688	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20160150338-A1	05-2016	KIM; Jin-sung	G08B1/08	381/58
*	B	US-20150358730-A1	12-2015	Kirsch; James M.	H04R3/002	381/71.1
*	C	US-20110313555-A1	12-2011	Shoham; Avishai P.	G10L25/48	700/94
*	D	US-20110087079-A1	04-2011	Aarts; Ronald M.	A61B7/003	600/300
	E					
	F					
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	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

Issue Classification 	Application/Control No. 16/421,141	Applicant(s)/Patent Under Reexamination Denton, Levaughn
	Examiner THANG V TRAN	Art Unit 2688

CPC						
Symbol					Type	Version
G06F	/	3	/	165	F	2013-01-01
H04B	/	1	/	0003	I	2013-01-01
H04S	/	7	/	40	I	2013-01-01
H04R	/	27	/	00	I	2013-01-01
H04L	/	67	/	12	I	2013-01-01
H04S	/	2400	/	15	A	2013-01-01
H04R	/	2227	/	003	A	2013-01-01

CPC Combination Sets				
Symbol	Type	Set	Ranking	Version

NONE (Assistant Examiner)		Total Claims Allowed: 20	
/THANG V TRAN/ Primary Examiner, Art Unit 2688 (Primary Examiner)		21 December 2019 (Date)	O.G. Print Claim(s) 1
			O.G. Print Figure 2

Issue Classification 	Application/Control No. 16/421,141	Applicant(s)/Patent Under Reexamination Denton, Levaughn
	Examiner THANG V TRAN	Art Unit 2688

INTERNATIONAL CLASSIFICATION			
CLAIMED			
H04R		3	00
H04R		29	00
G06F		3	16
NON-CLAIMED			

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
/THANG V TRAN/ Primary Examiner, Art Unit 2688 (Primary Examiner) _____ (Date) _____		21 December 2019 O.G. Print Claim(s) 1	O.G. Print Figure 2

Issue Classification 	Application/Control No. 16/421,141	Applicant(s)/Patent Under Reexamination Denton, Levaughn
	Examiner THANG V TRAN	Art Unit 2688

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		10		19										
	2		11		20										
	3		12												
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	7		16												
	8		17												
	9		18												

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
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Part of Paper No.: 20191220

<i>Search Notes</i> 	Application/Control No. 16/421,141	Applicant(s)/Patent Under Reexamination Denton, Levaughn
	Examiner THANG V TRAN	Art Unit 2688

CPC - Searched*		
Symbol	Date	Examiner
H04R3/00, 04, 12; H04R25/35, 48, 356; H04R27/00, 003; H04R29/00, 001, 002, 003, 004, 007; H04R2227/003; H04S7/40; H04S2400/15; H04R2430/01; G06F3/165; H04L67/12; H04B1/0003	12/21/2019	Tran

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

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Search Notes		
Search Notes	Date	Examiner
CPC: Text Search in Class/Subclass Only (See WEST Search History Printout)	12/21/2019	Tran
USPC: Text Search Only (See WEST Search History Printout)	12/21/2019	Tran
IP.com Search (See IP.com Search History Printout)	12/21/2019	Tran

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	See Interference Search in WEST Search History Printout	12/21/2019	Tran

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Bibliographic Data

Application No: 16/421,141

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☒ No ☐ Met After Allowance

Verified and Acknowledged:

Examiner's Signature

Initials

Title:

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
05/23/2019	381	2688	2305LD01UTL1USCIP
RULE			

APPLICANTS

INVENTORS

Levaughn Denton Baisley Park, NY, UNITED STATES

CONTINUING DATA

This application is a CIP of 16155919 10/10/2018ABN

This application is a CIP of 14862304 09/23/2015 PAT 10127005

14862304 has PRO of 62054286 09/23/2014

FOREIGN APPLICATIONS

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Gearhart Law LLC

41 River Road

Suite 1A

Summit, NJ 07901

UNITED STATES

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WEST Search History

DATE: Saturday, December 21, 2019

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<i>Prior Art</i>			
		<i>DB=PGPB,USPT; PLUR=YES; OP=OR</i>	
☐	L38	Denton near2 Levaughn	3
		<i>DB=PGPB,USPT,USOC; PLUR=YES; OP=OR</i>	
☐	L31	(L1 same L6 same L23) and ((H04R\$ H04S\$ H04W\$ H04L\$ H04N\$ G06F\$ G10L\$ H04B\$).CPC.)	24
☐	L30	L25 and ((H04R\$ H04S\$ H04W\$ H04L\$ H04N\$ G06F\$ G10L\$ H04B\$).CPC.)	21
☐	L29	L24 and ((H04R\$ H04S\$ H04W\$ H04L\$ H04N\$ G06F\$ G10L\$ H04B\$).CPC.)	40
☐	L28	L16 and ((H04R\$ H04S\$ H04W\$ H04L\$ H04N\$ G06F\$ G10L\$ H04B\$).CPC.)	71
☐	L27	L13 and ((H04R\$ H04S\$ H04W\$ H04L\$ H04N\$ G06F\$ G10L\$ H04B\$).CPC.)	24
☐	L26	L12 and ((H04R\$ H04S\$ H04W\$ H04L\$ H04N\$ G06F\$ G10L\$ H04B\$).CPC.)	4
		<i>DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD,FPRS; PLUR=YES; OP=OR</i>	
☐	L25	L7 same L23	44
☐	L24	L23 and L22	62
☐	L23	(L18 or L19) near15 (alert\$4 or notification or notify\$3 or notifies or indicat\$4 or warn\$4 or inform\$4)	6791
☐	L22	L21 and L20	535
☐	L21	L6 same L19	1695
☐	L20	L6 same L18	1841
☐	L19	L4 near9 (smaller or lower or below or inside or lesser)	64302
☐	L18	L4 near9 (larger or greater or higher or outside)	66360
		<i>DB=USPT,PGPB; PLUR=YES; OP=OR</i>	
☐	L17	('20070189544' '20100119055' '20100211199' '20150215701')![pn]	4
		<i>DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD,FPRS; PLUR=YES; OP=OR</i>	
☐	L16	L15 and (L8 or L9 or L10)	130
☐	L15	L14 same L7	184
☐	L14	L6 near15 (alert\$4 or notification or notify\$3 or notifies or indicat\$4 or warn\$4 or inform\$4)	968
☐	L13	L9 and L7	41
☐	L12	L11 and L7	9
☐	L11	L10 same L9	725
☐	L10	(speaker or loudspeaker or transducer) same (power or battery)	423330
☐	L9	L8 same 47	9075
☐	L8	(receiv\$4 or transmit\$5 or transmission or transceiv\$4 or antenna or wifi or Bluetooth) near5 (audio or sound or voice or acoustic)	1172896
☐	L7	L6 same L3	2434

Search History Transcript

☐	L6	L5 near9 L4	17172
☐	L5	frequency near3 (audio or sound or voice or acoustic)	354545
☐	L4	(predetermined or reference or preset or threshold) near5 frequency	674165
☐	L3	L2 same L1	346141
☐	L2	(identif\$7 or determin\$6 or detect\$5 or discriminat\$5 or extract\$4) near5 (audio or sound or voice or acoustic)	714017
☐	L1	(audio or sound or voice or acoustic) near3 (sensor or sensing or detect\$4 or collect\$4 or captur\$4 or microphone or transducer)	828796

Interference

DB=PGPB,USPT; PLUR=YES; OP=OR

☐	L37	(L1 same L6 same L23).clm.	13
☐	L36	L25.clm.	11
☐	L35	(L20 and L21 and L23).clm.	15
☐	L34	(L15 and (L8 or L9 or L10)).clm.	23
☐	L33	(L9 and L7).clm.	1
☐	L32	(L11 and L7).clm.	0

END OF SEARCH HISTORY

Main Concept Text

=====

determining is one or more of the one or more sounds includes a frequency outside of a predetermined threshold; if one or more of the one or more sounds includes the frequency outside of the predetermined threshold, altering the one or more of the one or more sounds so that the frequency does not fall outside of the predetermined threshold; and outputting the one or more sounds on the at least one output device.

(No Concept Modifiers)

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(No Filters)

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Options

De-dup: Extended Family Numbers
Cut-off: None
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Content: Patent Publications (164)

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Cuba Applications
Dominican Republic Applications
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Ecuador Applications
El Salvador Applications

Guatemala Applications
Honduras Applications
Mexico Patents
Mexico Applications
Nicaragua Patents
Panama Applications
Peru Applications
Trinidad & Tobago Patents
Uruguay Applications
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Austria Applications
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Czech Republic Patents
Czech Republic Applications
Czechoslovakia Patents
Czechoslovakia Applications
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Denmark Applications
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Estonia Applications
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Finland Applications
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France Applications
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Germany Applications
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Hungary Applications
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Yugoslavia/Serbia and Montenegro Applications
Armenia Patents
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India Applications
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Indonesia Applications
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Tajikistan Applications
Thailand Applications
Uzbekistan Patents
Vietnam Patents
Algeria Patents
ARIPO Patents
ARIPO Applications
Egypt Patents
Kenya Patents
Malawi Patents
Morocco Patents
Morocco Applications
OAPI Patents
South Africa Patents
Tunisia Applications
Zambia Patents
Zimbabwe Patents
EAPO Patents
EAPO Applications
Georgia Patents
Georgia Applications
Kazakhstan Patents
Kazakhstan Applications
Russia Patents
Russia Applications
Turkey Patents
Turkey Applications

Receipt date: 10/23/2019

16/421,141 - GAU: 2688

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)

Approved for use through 07/31/2012. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	16421141
	Filing Date	2019-05-23
	First Named Inventor	Levaughn Denton
	Art Unit	2654
	Examiner Name	N/A
	Attorney Docket Number	2305LD01UTL1USCIP

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	10127005	B2	2018-11-13	Levaughn Denton	
	2	8073160	B1	2011-12-06	Adobe Systems Incorporated	
	3	8452432	B2	2013-05-28	Brian Transeau	
	4	7991171	B1	2011-08-02	Gary C. Snow	
	5	8594319	B2	2013-11-26	Dolby International, AB	
	6	8315398	B2	2012-11-10	Themis Katsianos	
	7	5668884	A	1997-09-16	Clair Bros. Audio Enterprises, Inc.	
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STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16421141
Filing Date	2019-05-23
First Named Inventor	Levaughn Denton
Art Unit	2654
Examiner Name	N/A
Attorney Docket Number	2305LD01UTL1USCIP

Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	20040076305	A1	2004-04-22	Shure, Inc.	
	2	20040240676	A1	2004-12-02	Panasonic Intellectual Property Corp.	
	3	20050160270	A1	2005-07-21	Black Hills Media, LLC	
	4	20060067550	A1	2006-03-30	Sivantos GmbH	
	5	20060082458	A1	2006-04-20	Symbol Technologies, LLC	
	6	20070217623	A1	2007-09-20	Panasonic Corp.	
	7	20090003620	A1	2009-01-01	Apple, Inc.	
	8	20090076825	A1	2009-03-19	Bionica Corp.	
	9	20090058611	A1	2009-03-05	Panasonic Corp.	
	10	20100329471	A1	2010-12-30	Manufacturing Resources International Inc.	

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

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Filing Date	2019-05-23
First Named Inventor	Levaughn Denton
Art Unit	2654
Examiner Name	N/A
Attorney Docket Number	2305LD01UTL1USCIP

11	20110134278	A1	2011-06-09	Alcor Micro Corp.
12	20120189140	A1	2012-07-26	Apple Inc.
13	20130044131	A1	2013-02-21	Moheb Milad
14	20130064380	A1	2013-03-14	Apple, Inc.
15	20130294618	A1	2013-11-07	Mikhail Lyubachev
16	20110134278	A1	2011-07-09	Alcor Micro Corp.
17	20070217623	A1	2007-09-20	Noriyuki Harada
18	20130044131	A1	2013-02-21	Moheb Milad

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	1	2016/049130	WO	A1	2016-03-31	DENTON LEVAUGHN		

**INFORMATION DISCLOSURE
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(Not for submission under 37 CFR 1.99)

Application Number	16421141
Filing Date	2019-05-23
First Named Inventor	Levaughn Denton
Art Unit	2654
Examiner Name	N/A
Attorney Docket Number	2305LD01UTL1USCIP

	2	1971035	EP	B2	2014-08-20	Harman International Industries	
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Examiner Initials*	Cite No	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, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	International Search Report, dated January 29, 2019, for PCT Application Number PCT/US15/51638, International Filing Date September 23, 2015, consisting of 2 pages.	
	2	International Preliminary Report on Patentability, dated March 28, 2017, for PCT Application Number PCT/US15/51638, International Filing Date September 23, 2015, consisting of 7 pages.	
	3	Written Opinion of the International Searching Authority, dated January 29, 2016, for PCT Application Number PCT/US15/51638, International Filing Date September 23, 2015, consisting of 6 pages.	

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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16421141
Filing Date	2019-05-23
First Named Inventor	Levaughn Denton
Art Unit	2654
Examiner Name	N/A
Attorney Docket Number	2305LD01UTL1USCIP

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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OR

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/David D. Postolski/	Date (YYYY-MM-DD)	2019-10-23
Name/Print	David D. Postolski	Registration Number	67547

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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.
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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.

~~ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.V.T/~~



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/421,141	05/23/2019	Levaughn Denton	2305LD01UTL1USCIP

CONFIRMATION NO. 7908

PUBLICATION NOTICE

75207
Gearhart Law LLC
41 River Road
Suite 1A
Summit, NJ 07901



Title:Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters

Publication No.US-2020-0073623-A1

Publication Date:03/05/2020

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <https://portal.uspto.gov/pair/PublicPair>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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

By fax, send to: (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)

75207 7590 01/15/2020
Gearhart Law LLC
41 River Road
Suite 1A
Summit, NJ 07901

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.

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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 transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/421,141	05/23/2019	Levaughn Denton	2305LD01UTL1USCIP	7908

TITLE OF INVENTION: Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	MICRO	\$250	\$0.00	\$0.00	\$250	04/15/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
TRAN, THANG V	2688	381-056000

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 03-09 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 Gearhart Law, LLC

2 _____

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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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). 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. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

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☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 601818

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /David Postolski/

Date 04/15/2020

Typed or printed name David Postolski

Registration No. 67547

Electronic Patent Application Fee Transmittal				
Application Number:		16421141		
Filing Date:		23-May-2019		
Title of Invention:		Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters		
First Named Inventor/Applicant Name:		Levaughn Denton		
Filer:		David D. Postolski/Emily Townsend		
Attorney Docket Number:		2305LD01UTL1USCIP		
Filed as Micro Entity				
Filing Fees for Utility under 35 USC 111(a)				
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 ISSUE FEE	3501	1	250	250

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				250

Electronic Acknowledgement Receipt	
EFS ID:	39164505
Application Number:	16421141
International Application Number:	
Confirmation Number:	7908
Title of Invention:	Multi-Frequency Sensing Method and Apparatus Using Mobile-Based Clusters
First Named Inventor/Applicant Name:	Levaughn Denton
Customer Number:	75207
Filer:	David D. Postolski/Emily Townsend
Filer Authorized By:	David D. Postolski
Attorney Docket Number:	2305LD01UTL1USCIP
Receipt Date:	15-APR-2020
Filing Date:	23-MAY-2019
Time Stamp:	14:46:14
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$250
RAM confirmation Number	E20204EE47154374
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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)	2305LD01UTL1USCIP_Part_B. pdf	1001087	no	1
			82d4cfcda43bda2b72ba510a3d36ec9c4081496e		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30437	no	2
			f6fc9b94207f1ad11b3f2e8e602c72886aec585		
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Information:					
Total Files Size (in bytes):			1031524		
<p>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.</p> <p><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.</p> <p><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.</p> <p><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.</p>					

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16421141
Filing Date	2019-05-23
First Named Inventor	Levaughn Denton
Art Unit	2654
Examiner Name	N/A
Attorney Docket Number	2305LD01UTL1USCIP

Change(s) applied to document, /D.M./ 3/2/2020	11	20110134278	A1	2011-06-09	Chang, et al. Aloor Micro Corp.	
	12	20120189140	A1	2012-07-26	Hughes Apple Inc.	
	13	20130044131	A1	2013-02-21	Moheb Milad	
	14	20130064380	A1	2013-03-14	Mahowald Apple, Inc.	
	15	20130294618	A1	2013-11-07	Mikhail Lyubachev	
	16	20110134278	A1	06 2011-07-09	Chang, et al. Aloor Micro Corp.	
	17	20070217623	A1	2007-09-20	Noriyuki Harada	
	18	20130044131	A1	2013-02-21	Moheb Milad	

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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ² i	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	2016/049130	WO	A1	2016-03-31	DENTON LEVAUGHN		

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16421141
Filing Date	2019-05-23
First Named Inventor	Levaughn Denton
Art Unit	2654
Examiner Name	N/A
Attorney Docket Number	2305LD01UTL1USCIP

Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
Change(s) applied to document, /D.M./ 3/2/2020	1	20040076305	A1	2004-04-22	Santiago Shuro, Inc.	
	2	20040240676	A1	2004-12-02	Hashimoto, et al. Panasonic Intellectual Property Corp.	
	3	20050160270	A1	2005-07-21	Goldberg, et al. Black Hills Media, LLC	
	4	20060067550	A1	2006-03-30	Puder, et al. Sivantes GmbH	
	5	20060082458	A1	2006-04-20	Shanks, et al. Symbol Technologies, LLC	
	6	20070217623	A1	2007-09-20	Harada Panasonic Corp.	
	7	20090003620	A1	2009-01-01	McKillop, et al. Apple, Inc.	
	8	20090076825	A1	2009-03-19	Bradford, et al. Bionica Corp.	
	9	20090058611	A1	2009-03-05	Kawamura, et al. Panasonic Corp.	
	10	20100329471	A1	2010-12-30	Dunn, et al. Manufacturing Resources International Inc.	

Receipt date: 10/23/2019

16/421,141 - GAU: 2688

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)

Approved for use through 07/31/2012. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	16421141
	Filing Date	2019-05-23
	First Named Inventor	Levaughn Denton
	Art Unit	2654
	Examiner Name	N/A
	Attorney Docket Number	2305LD01UTL1USCIP

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Change(s) applied
to document,
/D.M./
3/2/2020

Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	10127005	B2	2018-11-13	Levaughn Denton	
	2	8073160	B1	2011-12-06	Classen Adobe Systems Incorporated	
	3	8452432	B2	2013-05-28	Brian Transeau	
	4	7991171	B1	2011-08-02	Gary C. Snow	
	5	8594319	B2	2013-11-26	Ho, et al. Dolby International, AB	
	6	8315398	B2	2012-11-10	Themis Katsianos	
	7	5668884	A	1997-09-16	Clair, Jr., et al. Clair Bros. Audio Enterprises, Inc.	

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/421,141	05/19/2020	10656906	2305LD01UTL1USCIP	7908

75207 7590 04/29/2020
Gearhart Law LLC
41 River Road
Suite 1A
Summit, NJ 07901

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 0 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.

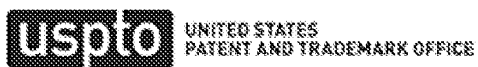
Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

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):

Levaughn Denton, Baisley Park, NY;

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Acknowledgement of Loss of Entitlement to Micro Entity Status

APPLICATION #	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET #	REQUEST ID
16/421,141	05/23/2019	Levaughn Denton	2305LD01UTL1USCIP	202263

The entity status change request below filed through Patent Center on 04/18/2024 has been accepted.

Certifications

APPLICANT ASSERTING SMALL ENTITY STATUS. See 37CFR 1.27.

Signature

I certify, in accordance with 37 CFR 1.4(d)(4), that I am one of the signatories making the entity status change.

Signature	Name	Registration #
/David Postolski/	David Postolski	67547