

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 11,080,001 B2
APPLICATION NO. : 13/864249
DATED : August 3, 2021
INVENTOR(S) : Nicholas A. J. Millington

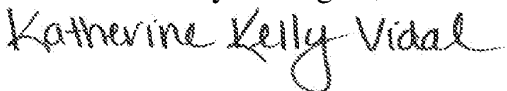
Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

In Claim 1, at Column 37, Lines 66-67, please delete “after receiving the request to enter into the synchrony group” and replace it with -- after receiving the request to engage in synchronous playback of audio content as part of the synchrony group --

In Claim 23, at Column 42, Lines 20-21, please delete “after receiving the request to enter into the synchrony group” and replace it with -- after receiving the request to engage in synchronous playback of audio content as part of the synchrony group --

Signed and Sealed this
Thirteenth Day of August, 2024


Katherine Kelly Vidal
Director of the United States Patent and Trademark Office



UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (0383842)	9806
107361	7590	08/13/2024	EXAMINER	
Akerman LLP / Sonos, Inc. 777 S. Flagler Drive, Suite 1100 West Tower West Palm Beach, FL 33401			SURVILLO, OLEG	
			ART UNIT	PAPER NUMBER
			2442	
			NOTIFICATION DATE	DELIVERY MODE
			08/13/2024	ELECTRONIC

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

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

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ip@akerman.com
sonos_docketing@cardinal-ip.com

APPLICATION NO.	ISSUE DATE	PATENT NO.
13/864,249	13-Aug-2024	11080001

Akerman LLP / Sonos, Inc.
777 S. Flagler Drive, Suite 1100 West Tower
West Palm Beach, FL 33401

ELECTRONIC CERTIFICATE OF CORRECTION NOTIFICATION

Your electronic certificate of correction is now available, and can be accessed via Patent Center at <https://patentcenter.uspto.gov>.

The electronic certificate of correction is the official certificate of correction under 35 U.S.C. 254 or 255. For more information, please visit <https://www.uspto.gov/electronicgrants>.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (0383842)	9806
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ip@akerman.com
sonos_docketing@cardinal-ip.com



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Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
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Patent No.: 11080001
Issue Date: 08/03/2021
Appl. No.: 13/864,249
Filed: 04/17/2013

PART (A) RESPONSE FOR CERTIFICATES OF CORRECTION

This is a decision on the Certificate of Correction request filed 19 December 2023.

The request for issuance of Certificate of Correction for the above-identified correction(s) under the provisions of 37 CFR 1.322 and/or 1.323 is hereby:

(Check one)

☒ Approved

☐ Approved in Part

☐ Denied

Comments: _____

PART (B) PETITION UNDER 37 CFR 1.324 OR 37 CFR 1.48

☐ This is a decision on the petition filed _____ to correct inventorship under 37 CFR 1.324.

☐ This is a decision on the request under 37 CFR 1.48, petition filed _____. In view of the fact that the patent has already issued, the request under 37 CFR 1.48 has been treated as a petition to correct inventorship under 37 CFR 1.324.

The petition is hereby:

☐ Granted

☐ Dismissed

Comment: _____

The patented filed is being forwarded to Certificate of Corrections Branch for issuance of a certificate naming only the actual inventor or inventors.

/WILLIAM G TROST IV/
Supervisory Patent Examiner, Art Unit 2442
Technology Center 2400
Phone: (571)272-7872

Certificates of Correction Branch email: CustomerServiceCoC@uspto.gov CoC Central Phone Number: (703) 756-1814

UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No. 13-0402 (0383842)

In the Application of:	)	
	)	
Nicholas A. J. Millington	)	Examiner: Oleg Survillo
	)	
Ser. No.: 13/864,249	)	Art Unit: 2442
Filed: April 17, 2013	)	
	)	Conf. No.: 9806
Patent No.: 11,080,001	)	
Issued: August 3, 2021	)	
	)	
Title: Concurrent transmission and playback of	)	
audio information	)	

Commissioner for Patents
Office of Data Management Attention: Certificates of Correction Branch
P.O. Box 1450
Alexandria, Virginia 22313-1450

REQUEST FOR CERTIFICATE OF CORRECTION
PURSUANT TO 35 U.S.C. § 255 AND 37 C.F.R. § 1.323

This is a request for issuance of a Certificate of Correction for U.S. Patent No. 11,080,001 (“the ‘001 patent”), which was issued on August 3, 2021.

Pursuant to 35 U.S.C. § 255 and 37 C.F.R. § 1.323, Sonos, Inc., Assignee of Record (Reel/Frame 030384/0675), seeks to correct a good-faith mistake of a clerical and/or typographical nature in the ‘001 patent where a drafting error during prosecution resulted in independent claims 1 and 23 issuing with the phrase “after receiving the request to enter into the synchrony group” in the second clause of the claim rather than the phrase “after receiving the request to engage in synchronous playback of audio content as part of the synchrony group.”

Accordingly, Assignee seeks to make the following corrections:

In claim 1, at column 37, lines 66-67, please delete “after receiving the request to enter into the synchrony group” and replace it with -- after receiving the request to engage in synchronous playback of audio content as part of the synchrony group --

In claim 23, at column 42, line 20-21, please delete “after receiving the request to enter into the synchrony group” and replace it with -- after receiving the request to engage in synchronous playback of audio content as part of the synchrony group --

These errors are correctable via a Certificate of Correction because (i) the errors are of a clerical or typographical nature, or of minor character, resulting from an error made in good faith by Assignee during prosecution, and (ii) correcting the errors would not constitute new matter or require re-examination. 35 U.S.C. § 255; 37 C.F.R. § 1.323.

First, the error is minor and of a clerical nature that was made in good faith. When preparing the claim amendments during prosecution, the phrase at issue (i.e., “after receiving the request to enter into the synchrony group”) in the second clause of claims 1 and 23 should have been drafted for consistency with its antecedent phrase (i.e., “receiving ... a request to engage in synchronous playback of audio content as part of a synchrony group...”) in the immediately-preceding clause of claims 1 and 23 in the same way that the corresponding phrase in claim 12 (i.e., “after receiving the request to engage in synchronous playback of audio content as part of the synchrony group”) is consistent with its antecedent phrase (i.e., “receiving... a request to engage in synchronous playback of audio content as part of a synchrony group...”) in the immediately-preceding clause of claim 12. However, the failure to make the phrases consistent in claims 1 and 23 in the same manner as claim 12 was an error during prosecution that was made in good faith.

Second, the requested correction would not constitute new matter or require re-examination for at least the reason that correcting claims 1 and 23 in the manner requested would merely make the corrected phrases in claims 1 and 23 consistent with the corresponding phrases appearing in issued claim 12.

Please charge any underpayment or credit any overpayment of fees to Deposit Account No. 50-0951.

Assignee submits herewith a completed Certificate of Correction Form (PTO/SB/44). Please contact the undersigned at 312-634-5738 with any questions or comments regarding this Request.

Respectfully submitted,

Date: December 19, 2023

By: /Jeffrey P. Armstrong/
Jeffrey P. Armstrong
Registration No. 54,967

Telephone: 312-634-5738
Facsimile: 312-424-1900

Akerman LLP
71 South Wacker Drive, 47th Floor
Chicago, IL 60606

UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

Page 1 of 1

PATENT NO. : 11,080,001

APPLICATION NO.: 13/864,249

ISSUE DATE : August 3, 2021

INVENTOR(S) : Nicholas A. J. Millington

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In claim 1, at column 37, lines 66-67, please delete "after receiving the request to enter into the synchrony group" and replace it with -- after receiving the request to engage in synchronous playback of audio content as part of the synchrony group --

In claim 23, at column 42, line 20-21, please delete "after receiving the request to enter into the synchrony group" and replace it with -- after receiving the request to engage in synchronous playback of audio content as part of the synchrony group --

MAILING ADDRESS OF SENDER (Please do not use Customer Number below):

Akerman LLP
71 S. Wacker Dr., 47th Floor, Chicago, IL 60606
Attn: Jeffrey P. Armstrong

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. 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 1.0 hour 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: Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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



ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
13/864,249

RECEIPT DATE / TIME
12/19/2023 04:12:31 PM Z ET

ATTORNEY DOCKET #
13-0402 (0383842)

Title of Invention

CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # 11080001

CONFIRMATION # 9806

FILED BY Jeffrey Armstrong

PATENT CENTER # 63674736

FILING DATE 04/17/2013

CUSTOMER # 107361

FIRST NAMED INVENTOR Nicholas A. J. Millington

CORRESPONDENCE ADDRESS -

AUTHORIZED BY -

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
13-0402_Req_for_Cert_of_Correction_with_SB44_1021923.pdf	4	Request for Certificate of Correction	4980 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
13-0402_Req_for_Cert_of_Correction_with_SB44_1021923.pdf	1973ABAFFC980DDE3591A92EF7E1DD6DAEE945F15B809F5B6270BF7FADFA35686880A4E3614ABB7DAEA4C94E890307648E72021862704C0C9FE41F5C06A4BFAC

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized

by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for 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.



ELECTRONIC PAYMENT RECEIPT

APPLICATION # 13/864,249	RECEIPT DATE / TIME 12/19/2023 04:12:31 PM Z ET	ATTORNEY DOCKET # 13-0402 (0383842)
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Title of Invention

CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	11080001
CONFIRMATION #	9806	FILED BY	Jeffrey Armstrong
PATENT CENTER #	63674736	AUTHORIZED BY	-
CUSTOMER #	107361	FILING DATE	04/17/2013
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Nicholas A. J. Millington

Payment Information

PAYMENT METHOD DA / 500951	PAYMENT TRANSACTION ID E2023BIG13047817	PAYMENT AUTHORIZED BY Jeffrey Armstrong
PRE-AUTHORIZED ACCOUNT 500951	PRE-AUTHORIZED CATEGORY 37 CFR 1.16 (National application filing, search, and examination fees); 37 CFR 1.17 (Patent application and reexamination processing fees); 37 CFR 1.19 (Document supply fees); 37 CFR 1.20 (Post Issuance fees); 37 CFR 1.21 (Miscellaneous fees and charges)	

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1811	CERTIFICATE OF CORRECTION	160.00	1	160.00
TOTAL AMOUNT:				\$160.00

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	08/03/2021	11080001	13-0402 (0383842)	9806

107361 7590 07/14/2021
Akerman LLP / Sonos, Inc.
777 S. Flagler Drive, Suite 1100 West Tower
West Palm Beach, FL 33401

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 708 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):

Nicholas A. J. Millington, Santa Barbara, CA;
SONOS, INC., Santa Barbara, CA

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IR103 (Rev. 10/09)

Change(s) applied
to document,
/C.C.B./
9/23/2019

USD354751S	TV remote control for the manually handicapped	Hersh et al.	01/1995	12/31/1992	
USD350962S	Hand held television controller	Reardon et al.	09/1994	12/14/1992	
USD354059S	Remote control unit	Hendricks	01/1995	12/3/1992	
US20150365987	Wireless Speaker For Receiving From A Mobile Phone Directions To Receive And Render A Playlist From A Content Server On The Internet	Weel		02/26/2015 12/2015	
US20110316768	SYSTEM, METHOD AND APPARATUS FOR SPEAKER CONFIGURATION	McRae		6/26/2010	12/2011
US20100087089	Wall Mounted Docking Station	Struthers et al.		10/2/2009	04/2010
US20110001632	Method and System for Changing an Input Source for an Electronic Device	Hohorst		7/1/2009	01/2011
US8411883	LOUDSPEAKER APPARATUS AND SPEAKER SYSTEM	Matsumoto	04/2013	6/19/2009	
US8374595	HANDHELD ELECTRONIC DEVICE AND OPERATING METHOD THEREOF	Chien et al.		4/30/2009	02/2013
US7945708	Apparatus and method of receiving data from audio/video equipment	Ohkita	05/2011	1/9/2009	
US8565455	Multiple Display Systems with Enhanced Acoustics Experience	Worrell et al.	10/2013	12/31/2009	
US20090124289	Audio apparatus and external adapter used for the audio apparatus	Nishida		11/10/2008	05/2009
US8861739	Apparatus and method for generating a multichannel signal	Ojanpera	10/2014	11/10/2008	
US20090070434	SYSTEM AND METHOD FOR EFFICIENTLY ACCESSING INTERNET RESOURCES		03/2009	6/6/2008	Himmelstein
US8170222	AUGMENTED REALITY ENHANCED AUDIO	Dunko	05/2012	4/18/2008	
US8311226	METHOD FOR ASSIGNING A PLURALITY OF AUDIO CHANNELS TO A PLURALITY OF SPEAKERS, CORRESPONDING COMPUTER PROGRAM PRODUCT, STORAGE MEANS AND MANAGER NODE	Loergeux et al.		3/25/2008 11/2012	
US20080205070	CRADLE	Osada	08/2008	1/26/2008	
US7987294	UNIFICATION OF MULTIMEDIA DEVICES	Bryce et al.	07/2011	10/16/2007	
US7995732	Managing Audio in a Multi-Source Audio Environment	Koch et al.	08/2011	10/14/2007	
US7721032	METHOD AND APPARATUS FOR MEDIATING AMONG MEDIA APPLICATIONS		05/2010	8/20/2007	Bushell et al.
US8654995	Audio control system for a vehicle	Silber et al.	02/2014	4/19/2007	
US8942395	Pointing element enhanced speaker system	Lissaman et al.	01/2015	2/12/2007	
US20090011798	MOBILE PHONE	Yamada	01/2009	3/8/2007	
US8233029	Reproduction Apparatus and System	Yoshida et al.	07/2012	7/14/2006	
US8041062	Personal Sound System Including Multi-Mode Ear Level Module with Priority Logic		10/2011	3/28/2006	Cohen et al.
US20080075295	Media playing from a docked handheld media device	Mayman et al.	03/2008	6/31/2006	
US7746906	DATA COMMUNICATIONS SYSTEM	Jinzaki et al.	06/2010	7/10/2006	
US20060227985	Information processing apparatus, information processing method, recording medium, and program	Kawanami		3/27/2006 10/2006	
US20060259649	INTERFACE SWITCHING APPARATUS AND METHOD	Hsieh et al.	11/2006	4/27/2006	
US20080303947	Audio Processing Apparatus and Display Apparatus with Same	Ohnishi et al.		6/25/2006	12/2008
US7933418	Sound reproducing apparatus and method of identifying positions of speakers	Morishima		2/16/2005	04/2011
US7882234	Wireless communication system, wireless communication device, and control method for establishing a one-to-one relationship	Watanabe et al.		9/29/2005 02/2011	
US8050203	Multi-channel digital wireless audio system	Jacobsen et al.	11/2011	12/20/2005	
US8150079	Personal digital assistant and stereo reproduction method	Maeda et al.	04/2012	12/14/2005	
US20070087686	Audio playback device and method of its operation	Holm et al.	04/2007	10/18/2005	
US7831054	Volume control	Ball et al.	11/2010	6/28/2005	
US20060270395	Personal shared playback	Dhawan et al.	11/2006	5/25/2005	
US20060222186	Multi-channel audio switch	Paige et al.	10/2006	4/5/2005	
US20050197725	Music management system	Alexander et al.	09/2005	2/16/2005	
US7653344	Wireless digital audio/video playback system	Feldman et al.	01/2010	1/5/2005	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

Change(s) applied
to document,
/C.C.B./
9/23/2019

USD260764S	Control unit for a combined automobile cassette player and radio	Castagna et al.	10/15/1970
TW439027	Power-saving device of audio-frequency processing circuit and its control method		7/24/1998
WO1999023560	SCALABLE NETWORKED MULTIMEDIA SYSTEM AND APPLICATIONS		11/4/1998
WO2008082350A1	DEVICE AND METHOD FOR PRIORITIZING AUDIO IN A VEHICLE		12/20/2007
JP63269633	Unknown		4/28/1987
JP2000149391A	DISK REPRODUCING DEVICE		11/4/1998
GB2379533A	Multimedia synchronisation method and system		6/14/2002
EP1517464A2	Digital audio distribution system		8/31/2004
EP1416687B1	Communication protocol for controlling transfer of temporal data over a bus between devices in synchronization with a periodic reference signal		10/29/2003
EP1410686	AUDIO CHANNEL TRANSLATION		2/7/2002
EP1312188A1	AUDIO DATA PROCESSING		8/9/2001
EP0742674B1	Video encoding method and system using a rate-quantizer model		5/6/1996
CN1598767A	Method and system for synchronous playing audio-video at BREW platform		9/15/2004
CA2320451A1	TRANSMISSION OF POWER AND/OR SIGNALLING BETWEEN AN AUDIO DISTRIBUTION UNIT AND A PLURALITY OF REMOTE AUDIO TRANSDUCERS		9/22/2000
	AKYILDIZ et al., "Multimedia Group Synchronization Protocols for Integrated Services Networks," IEEE Journal on Selected Areas in Communications, 1996, pp. 162-173, Vol. 14, No. 1		
	Integra Audio Network Server NAS 2.3 Instruction Manual, pp. 1-32		
	Integra Audio Network Receiver NAC 2.3 Instruction Manual, 68 pages		
	"884+ Automatic Matrix Mixer Control System," Ivie Technologies, Inc., 2000, pp. 1-4		
	"NexSys Software v. 3 Manual," Crest Audio, Inc., 1997, 76 pages		
	"Model MRC44 Four Zone - Four Source Audio/Video Controller/Amplifier System," Xantech Corporation, 2002, 52 pages		
	"ZX135: Installation Manual, LA Audio, April 2003, 44 pages		
	"A/V System Controller, Owner's Manual," B&K Components, Ltd., 1998, 52 pages		
	"Systemline Modular Installation Guide, Multiroom System," Systemline, 2003, pp. 1-22		
	DAY, Rebecca, "Going Elan!" Primedia Inc., 2003, 4 pages		
	"A/V Surround Receiver AVR-5800," Denon Electronics, 2000, 2 pages		
	"DP-0206 Digital Signal Processor," TOA Electronics, Inc., 2001, pp. 1-12		
	"Home Theater Control Systems," Cinema Source, 2002, 19 pages		
	TAYLOR, Marilou, "Long Island Sound," Audio Video Interiors, April 2000, 8 pages		
	LIU et al., "A synchronization control scheme for real-time streaming multimedia applications" Packet Video. 2003, 10 pages, Vol. 2003		
	ROTHERMEL et al., "An Adaptive Stream Synchronization Protocol," 5th International Workshop on Network and Operating System Support for Digital Audio and Video, April 18-21, 1995, 12 pages		
	LIU et al., "Adaptive Delay Concealment for Internet Voice Applications with Packet-Based Time-Scale Modification." Information Technologies 2000, pp. 91-102		
	FOBER et al., "Clock Skew Compensation over a High Latency Network," Proceedings of the ICMC, 2002, pp. 548-552		
	"ZR-8630AV MultiZone Audio/Video Receiver, Installation and Operation Guide," Niles Audio Corporation, 2003, 86 pages		
	"Residential Distributed Audio Wiring Practices," Leviton Network Solutions, 2001, 13 pages		
	"RVL-6 Modular Multi-Room Controller, Installation & Operation Guide," Nile Audio Corporations, 1999, 46 pages		

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

Change(s) applied
to document,
/C.C.B./
9/23/2019

US5984512	Method for storing video information	Jones et al.	11/1999	6/7/1995	
US5625350	Audio/video communication system and method	Fukatsu et al.	04/1997	12/27/1994	
US5515345	Control unit for automobile audio system	Barreira et al.	05/1996	8/23/1994	
US5553314	Method of configuring a communication unit using a wireless portable configuration device	Grube et al.	09/1996	4/12/1994	
US5740235	User-programmable paging system controller having priority-based, multiple input paging access capability for selectively activating one or more audio/visual paging output devices	Lester et al.	04/1998	2/9/1994	
US5361381	Dynamic equalizing of powered loudspeaker systems	Short	11/1994	12/17/1993	
US5481251	Minimal function remote control without digit keys and with a power toggle program and with a channel rotation program	Buys et al.	01/1996	11/29/1993	
US5430485	Audio/video synchronization in a digital transmission system	Lankford et al.	07/1995	9/30/1993	
US5457448	Self-standing mini remote commander	Totsuka et al.	10/1995	8/3/1993	
US5372441	Ergonomic keyboard apparatus with left and right key section separated by an irregularly shaped space	Louis	12/1994	7/13/1993	
US5440644	Audio distribution system having programmable zoning features	Farinelli et al.	08/1995	4/15/1993	
US5406634	Intelligent speaker unit for speaker system network	Anderson et al.	11/1995	3/16/1993	
US5272757	Multi-dimensional reproduction system	Scofield et al.	12/1993	1/9/1992	
US5237327	Remote commander	Saitoh et al.	08/1993	11/14/1991	
US5182552	Multiple zone audio system	Paynting	01/1993	12/7/1990	
US5151922	VARIABLE SPEAKER MUTING BASED ON RECEIVED DATA	Weiss	09/1992	9/24/1990	
US4994908	Interactive room status/time information system	Kuban et al.	02/1991	4/20/1989	
US5086385	Expandable home automation system	Launey et al.	02/1992	1/31/1989	
US4845751	WIRELESS STEREO HEADPHONE	Schwab	07/1989	3/10/1988	
US4824059	Cushioning device for remote control television equipment, and assembly thereof	Butler	04/1989	2/11/1988	04/1989
US4701629	Switch control unit for motor vehicle	Citroen	10/1987	4/3/1986	
US4731814	Computer-controlled cordless telephone	Becker et al.	03/1988	2/21/1986	
US4530091	Synchronization of real-time clocks in a packet switching system	Crockett	07/1985	7/8/1983	
US4509211	Infrared extension system	Robbins	04/1985	5/16/1983	
US4306114	Automatic audio mixing selector device	Callahan	12/1981	1/21/1980	
US4105974	Priority interrupt circuit	Rogers	08/1978	10/14/1975	
US3956591	Two-input automatic source selector for stereo entertainment center	Gates, Jr.	05/1976	12/18/1974	
USD333135S	Combined remote control and cordless telephone	Wachob et al.	02/1993	6/13/1991	
USD326450S	Automotive telephone control unit	Watanabe	05/1992	1/7/1991	
USD327060S	Combined remote control and cordless telephone handset and its base with an antenna	Wachob et al.	06/1992	1/7/1991	Wachob et al.
USD331388S	Electrical control panel for mobile storage units	Dahnert et al.	12/1992	2/12/1990	
USD320598S	Portable keyboard for remote controller	Auerbach et al.	10/1991	11/2/1989	
USD322609S	Remote controller	Patton	12/1991	5/5/1989	
USD313600S	Telephone control module	Weber	01/1991	6/23/1988	
USD313023S	Front control panel for a vehicular compact disc player	Kolenda et al.	12/1990	6/6/1988	
USD313398S	Electronic window remote-control	Gilchrist	05/1989	3/3/1988	
USD301037S	Hand-held remote control	Matsuda	01/1991	4/28/1986	
USD304443S	Front control panel for a vehicular combined tape player and radio or the like	Gringer et al.	01/1989	4/17/1986	11/1989
USD293671S	Radio control unit or similar article	Beaumont	01/1988	9/26/1985	
USD279779S	Control unit for a two-way radio or similar article	Taylor	07/1985	3/21/1983	

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US6321252	System and method for data streaming and synchronization in multimedia groupware applications	Bhola et al.	11/2001	7/17/1998	11/2004
US6442443	Information processing apparatus and power saving apparatus	Fujii et al.	08/2002	7/17/1998	
US6148205	Method and apparatus for secure registration within an in-home wireless network	Cotton		6/30/1998	
US6195435	Method and system for channel balancing and room tuning for a multichannel audio surround sound speaker system	Kitamura	02/2001	5/11/1998	
US5946343	Digital wireless speaker system	Schotz et al.	08/1999	4/24/1998	
US6301012	Automatic configuration of a network printer	White et al.	10/2001	4/24/1998	
US5999906	Sample accurate audio state update	Mercs et al.	12/1999	3/4/1998	
US6418150	Method and apparatus for calibrating an IEEE-1394 cycle master	Staats	07/2002	2/20/1998	
US6127941	Remote control device with a graphical user interface	Van Ryzin	10/2000	2/3/1998	
US6246701	Reference time clock locking in a remultiplexer for video program bearing transport streams	Slattery	06/2001	4/14/1998	
US6469633	Remote control of electronic devices	Wachter	10/2002	1/5/1998	12/1998
US6038614	Active volume control with hot key	Chan et al.	03/2000	1/5/1998	
US5852722	System and method for automatic configuration of home network computers	Hamilton		12/8/1997	
US6212282	Wireless speaker system	Mershon	04/2001	10/31/1997	
US6018376	Synchronous reproduction apparatus	Nakatani	01/2000	8/18/1997	
US6704421	Automatic multichannel equalization control system for a multimedia computer	Kitamura		7/24/1997	
US6029196	Automatic client configuration system	Lenz	02/2000	6/18/1997	
US5956025	Remote with 3D organized GUI for a home entertainment system	Goulden et al.	09/1999	6/9/1997	
US6101195	Timing correction method and apparatus	Lyons et al.	08/2000	5/28/1997	
US6181383	Method and apparatus for preserving synchronization of audio and video presentation when splicing transport streams	Fox et al.	01/2001	5/28/1997	
US5987611	System and methodology for managing internet access on a per application basis for client computers connected to the internet	Freund	11/1999	5/6/1997	03/2004
US6310652	Fine-grained synchronization of a decompressed audio stream by skipping or repeating a variable number of samples from a frame	Li et al.	10/2001	5/24/1997	
US5990884	Control of multimedia information with interface specification stored on multimedia component	Douma et al.	11/1999	5/2/1997	
US6081266	Interactive control of audio outputs on a display screen	Sciammarella	06/2000	4/21/1997	
US5991307	Method and apparatus for packet transmission	Komuro et al.	11/1999	3/28/1997	
US5832024	Digital wireless speaker system	Schotz et al.	11/1998	3/26/1997	
US5875233	Audio record and playback through a standard telephone in a computer system	Cox		2/18/1997	
US6088063	Data encoding method and apparatus for outputting encoded data at a designated time	Shiba		4/29/1997	
US5905768	MPEG audio synchronization system using subframe skip and repeat	Maturi et al.		12/20/1996	
US5848152	Communication device having interchangeable faceplates and active keypad cover	Slip4 et al.		12/4/1996	
US5818948	Architecture for a universal serial bus-based PC speaker controller	Gulick	10/1998	10/23/1996	04/1998
US5960006	MPEG decoding system adjusting the presentation in a predetermined manner based on the actual and requested decoding time	Maturi et al.	09/1999	9/23/1996	
US5742623	Error detection and recovery for high rate isochronous data in MPEG-2 data streams	Nuber et al.		7/11/1996	
US5661665	Multi-media synchronization	Glass et al.	08/1997	6/26/1996	
US5774016	Amplifier system having prioritized connections between inputs and outputs	Ketterer		4/9/1996	
US5812201	Data synchronizing apparatus and method thereof	Yoo	09/1998	12/27/1995	
US5640388	Method and apparatus for removing jitter and correcting timestamps in a packet stream		06/1997	12/21/1995	
US5790543	Apparatus and method for correcting jitter in data packets	Cloutier	08/1998	9/25/1995	
US5761320	Audio distribution system having programmable zoning features	Farinelli et al.		6/26/1995	

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USD452520	Remote control for a vertical digital projector	Gotham et al.	12/2001	3/13/2001	
USD462340	Remote control	Allen et al.	09/2002	4/10/2001	
US20020124097	Methods, systems and computer program products for zone based distribution of audio signals	Isely et al.	09/2002	12/29/2000	
US20020072817	System and method for request, delivery and use of multimedia files for audiovisual entertainment in the home environment	Champion	06/2002	12/11/2000	
US6915347	Associating multiple display units in a grouped server environment	Hanko et al.	07/2003	12/6/2000	
US20020072816	Audio system	Shdema et al.	06/2002	12/7/2000	
US7548851	Digital multimedia jukebox	Lau et al.	06/2009	10/11/2000	
US7457948	Automated authentication handling system	Bilicksa et al.	11/2008	9/29/2000	
US6826283	Method and system for allowing multiple nodes in a small environment to play audio signals independent of other nodes	Wheeler et al.	11/2004	7/27/2000	
US6859460	System and method for providing multimedia jitter buffer adjustment for packet-switched networks	Chen	02/2005	5/31/2000	
US6654720	Method and system for voice control enabling device in a service discovery network		11/2003	5/9/2000	Graham et al.
US6684060	Digital wireless premises audio system and method of operation thereof	Curtin		4/11/2000	01/2004
US6654956	Method, apparatus and computer program product for synchronizing presentation of digital video data with serving of digital video data	Trinh et al.	11/2003	4/10/2000	
US6535121	Fire department station zoned alerting control system	Matheny	03/2003	4/6/2000	
US6816510	Method for clock synchronization between nodes in a packet network	Banerjee	11/2004	2/9/2000	
US6901439	Method of adding a device to a network	Bonasia et al.	05/2005	1/20/2000	
USD462339	Remote control	Allen et al.	09/2002	12/22/2000	
USD478069	Communication interface with external controls	Beck et al.	08/2003	11/1/2000	
US7558635	Control device and control method for fixing an information output order for several information sources, especially audio sources	Thiel et al.	07/2009	9/5/2000	
US7966388	Network management system and graphical user interface	Pugaczewski et al.	06/2011	12/21/1999	
US6636269	Video timing system and method	Baldwin	10/2003	6/10/1999	
US6463474	Local authentication of a client at a network device	Fuh et al.	10/2002	7/2/1999	
US6046550	Multi-zone lighting control system	Ference et al.	04/2000	6/16/1999	
US6356871	Methods and circuits for synchronizing streaming data and systems using the same		03/2002	6/14/1999	Hemkumar et al.
US6931557	INFORMATION PROCESSING APPARATUS, POWER CONTROL METHOD AND RECORDING MEDIUM TO CONTROL A PLURALITY OF DRIVING UNITS ACCORDING TO THE TYPE OF DATA TO BE PROCESSED	Togawa	08/2005	4/7/1999	
US6493832	Communication apparatus which handles a time stamp	Itakura et al.	12/2002	3/29/1999	
US6859538	Plug and play compatible speakers	Voltz	02/2005	3/17/1999	
US6061457	Waterproof microphone and speaker	Stockhamer	05/2000	2/22/1999	
US6353172	Music event timing and delivery in a non-realtime environment	Fay et al.	03/2002	2/2/1999	
USD444475	Set of keys for a computer keyboard	Levey et al.	07/2001	8/23/1999	
USD444475	Set of keys for a computer keyboard	Levey et al.	07/2001	8/23/1999	
US6169725	Apparatus and method for restoration of internal connections in a home audio/video system	Gibbs et al.	01/2001	10/30/1998	
US6269406	User group synchronization to manage capabilities in heterogeneous networks	Dutcher et al.		10/19/1998	07/2001
US6487296	Wireless surround sound speaker system	Allen et al.	11/2002	9/30/1998	
US6449642	METHOD AND SYSTEM FOR INTEGRATING A CLIENT COMPUTER INTO A COMPUTER NETWORK	Bourke-Dunphy et al.	09/2002	9/15/1998	
US6313879	Synchronization method and decoder	Kubo et al.	11/2001	9/11/1998	
US6466832	High quality wireless audio speakers	Zugert et al.	10/2002	8/24/1998	

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USD474763	Handheld remote control	Tozaki et al.	05/2003	5/30/2002	
USD475993	TV remote control	Meyer et al.		3/24/2002	06/2003
US20030219007	Reusable multi-protocol meta-architecture for Voice-over-IP playback	Barrack et al.		5/23/2002	11/2003
US7096169	Virtual speaker demonstration system and virtual noise simulation	Crutchfield, Jr.		5/16/2002	08/2006
US7945636	Providing a multi-tier enterprise level application	Nelson et al.	05/2011	5/15/2002	
US20030212802	Proximity network encryption and setup	Rector et al.	11/2003	5/9/2002	
US20030198257	Method of manually fine tuning audio synchronization of a home network	Sullivan et al.		4/23/2002	10/2003
US20020165921	Method of multiple computers synchronization and control for guiding spatially dispersed live music/multimedia performances and guiding simultaneous multi-content presentations and system therefor	Sapiejevski	11/2002	4/24/2002	
US7324857	Method to synchronize playback of multicast audio streams on a local network	Goddard		4/19/2002	01/2008
US20030179780	Method of detecting drift between two clocks	Walker et al.	09/2003	5/20/2002	
US20040037433	Multi-channel wireless professional audio system	Chen	02/2004	8/24/2002	
US20020131761	Information recording medium, apparatus and method for recording/reproducing information to/from the medium	Kawasaki et al.	09/2002	4/16/2002	
US7206618	Removable customizable inserts and faceplate for electronic devices	Latto et al.		1/11/2002	04/2007
US20020101357	System for transmitting control commands to electronic devices	Gharapetian	08/2002	1/4/2002	
US7092528	Apparatus and methods for reducing noise audible from a speaker	Patrick et al.		11/6/2001	08/2006
US7120168	System and method for effectively performing an audio/video synchronization procedure		10/2006	11/20/2001	Zimmermann
US20020078293	Method and system for selecting and controlling devices in a home network	Kou et al.		10/12/2001	06/2002
US20060072489	Home network using wireless module	Toyoshima	04/2006	10/11/2001	
US7260616	Communication hub with automatic device registration	Cook	08/2007	8/13/2001	
US6937988	Methods and systems for prefilling a buffer in streaming data applications	Hemkumar et al.		8/10/2001	08/2005
US6873862	Wireless headphones with selective connection to auxiliary audio devices and a cellular telephone	Reshefsky	03/2005	7/24/2001	
US20030014486	Distributed audio network using networked computing devices	May	01/2003	7/16/2001	
US7161939	Method and system for switching among independent packetized audio streams	Israel et al.		6/29/2001	01/2007
US6987767	Multiplexer, multimedia communication apparatus and time stamp generation method		01/2006	6/28/2001	Saito
US6778073	Method and apparatus for managing audio devices	Lutter et al.	08/2004	6/26/2001	
US7136934	Multimedia synchronization method and device	Carter et al.	11/2006	6/19/2001	
US6653899	Audio amplifier power and temperature controller having network detecting and associated methods	Organvitez et al.	11/2003	6/15/2001	
US20020137505	Audio detection for hands-free wireless	Eiche et al.	09/2002	5/24/2001	
US20010050991	Portable audio devices	Eves	12/2001	5/18/2001	
US7146260	Method and apparatus for dynamic configuration of multiprocessor system	Preston et al.		4/24/2001	12/2006
US7130316	System for frame based audio synchronization and method thereof	Kovacevic		4/11/2001	10/2006
US6741961	Low power audio processor that multiplexes component distribution signals	Lim		3/14/2001	05/2004
US20010043456	Portable computer with low power audio CD-player	Atkinson	11/2001	3/8/2001	
US8477958	Networked sound masking system	Moeller et al.	07/2013	2/26/2001	
US6456783	Data structure of stream data, and recording and playback method thereof	Ando et al.		1/8/2001	09/2002
US20040223622	Digital wireless loudspeaker system	Lindemann et al.	11/2004	4/6/2001	
USD462945	Volume control for a communications headset	Skulley	09/2002	11/13/2001	
USD479520	Audiovisual control device	De Saulles	09/2003	9/15/2001	
USD468297	Karaoke controller with microphone	Ikedo	01/2003	7/27/2001	
USD466108	Remote control	Glodava et al.	11/2002	6/15/2001	

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US20030167335	System and method for network-based communication	Alexander	09/2003	3/3/2003	
US20040168081	Apparatus and method simplifying an encrypted network	Ladas et al.	08/2004	2/20/2003	
US20030185400	Sound processing unit, sound processing system, audio output unit and display device		10/2003	1/15/2003	Yoshizawa et al.
US7366206	Multi-media jitter removal in an asynchronous digital home network	Lockridge et al.		4/16/2003	04/2008
US20040019807	System And Methodology For Providing Community-Based Security Policies	Freund		5/14/2003	01/2004
USD496003	Hand-held remote control	Spira	09/2004	12/16/2003	
USD499086	Inline control module for communications headset adapter	Polito	11/2004	12/10/2003	
USD518475	Remote controller	Yang et al.	04/2006	12/2/2003	
USD504872	Remote controller	Uehara et al.	05/2003	11/24/2003	
USD496335	Remote control	Spira	09/2004	11/10/2003	
USD527375	Remote control device	Flora et al.	08/2006	9/30/2003	
USD497363	Liquid crystal display	Olson et al.	10/2004	9/22/2003	
USD500015	Remote control device	Gubbe	12/2004	9/19/2003	
USD515557	Remote control	Okuley	02/2006	9/16/2003	
USD501477	Keyboard control device	Hall	02/2005	8/11/2003	
USD491925	Remote control	Griesau et al.	06/2004	7/2/2003	
USD504885	Remote control	Zhang et al.	05/2005	6/11/2003	
USD493148	Remote controller for air conditioner	Shibata et al.	07/2004	5/28/2003	
USD486145	Remote control keypad	Kaminski et al.	02/2004	2/28/2003	
US7356011	Simplified configuration and security for networked wireless devices	Waters et al.		12/18/2002	04/2008
US20040117462	Client device configuration with user entry of configuration parameters	Bodin et al.		12/12/2002	06/2004
US7505889	Transcoding media system	Salmonsens et al.	03/2009	12/5/2002	
US7295548	Method and system for disaggregating audio/visual components	Blank et al.	11/2007	11/27/2002	
US20030103088	User interface for a remote control application	Dresti et al.	06/2003	11/6/2002	
US7277547	Method for automated security configuration in a wireless network	Delker et al.		10/23/2002	10/2007
US7308188	Audio reproducing apparatus	Namatame	12/2007	9/30/2002	
US20040059842	Network device installation	Hanson et al.	03/2004	9/19/2002	
US20040203590	Set-up of wireless consumer electronics device using a learning remote control	Shteyn		9/11/2002	10/2004
US7197148	System for controlling remote speakers using centralized amplifiers, centralized monitoring and master/slave communication protocol	Nourse et al.		9/9/2002	
US20030063755	System for controlling remote speakers using centralized amplifiers, centralized monitoring and master/slave communication protocol	Nourse et al.		9/9/2002	
US20040042629	Automatic earpiece sensing	Mellone et al.	03/2004	8/30/2002	
US20040014426	Portable audio playback device with bass enhancement	Moore	01/2004	7/19/2002	
US20030043856	Method and apparatus for reducing synchronization delay in packet-based voice terminals by resynchronizing during talk spurts	Lakaniemi et al.		7/2/2002	
US20040001591	Robust method for achieving audio/video synchronization in MPEG decoders in personal video recording applications	Mani et al.		6/27/2002	
US7092694	Wireless communication system having a guest transmitter and a host receiver	Griep et al.		6/19/2002	08/2006
US7139981	Media management system	Mayer, III et al.	11/2006	6/13/2002	
USD477310	Remote control	Moransais	07/2003	10/7/2002	
USD481056	Control panel for projector	Kawasaki et al.	10/2003	9/12/2002	
USD478051	Remote controller for household electric/electronic appliances	Sagawa	08/2003	7/11/2002	
USD478896	Remote control	Summers	08/2003	6/28/2002	
USD476643	Remote controller	Yamagishi	07/2003	6/11/2002	

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US7688306	Methods and apparatuses for operating a portable device based on an accelerometer		03/2010	11/12/2004	Wehrenberg et al
US8600084	Methods and systems for altering the speaker orientation of a portable system	Garrett		11/09/2004	12/2013
US7305694	Method and apparatus for remotely controlling a receiver according to content and user selection	Commons et al.		9/7/2004 12/2007	
US7472058	AUTOMATIC AUDIO SOURCE DETECTION FOR CAPTURE DEVICES	Tseng et al.		12/28/2004	12/2008
US7630501	System and method for calibration of an acoustic system	Blank et al.	12/2009	5/14/2004	
US20040249490	Multichannel audio system, and head unit and slave unit used for the same	Sakai		4/28/2004	12/2004
US7853341	Wired, wireless, infrared, and powerline audio entertainment systems	McCarty et al.		2/20/2004	12/2010
US20040171346	Method of Adding Wireless Remote Control to Audio Playback Devices Equipped for Wired Remote Control	Lin		1/5/2004 09/2004	
US7492912	Multi-channel speaker system and a connection system thereof	Chung et al.	02/2009	3/18/2004	
US20060173844	Automatic configuration of client terminal in public hot spot	Zhang et al.	08/2006	3/12/2004	
US20050131558	Audio network distribution system	Braithwaite et al.	06/2005	11/4/2004	
US20050160270	Localized audio networks and associated digital accessories	Goldberg et al.	07/2005	11/08/2004	
US7627825	Control device and method, information processing device and method, recording medium, and program	Kakuda		9/29/2004 12/2009	
USD524296	Remote controller for television set	Kita	07/2006	6/14/2004	
USD515072	Remote control unit	Lee	02/2006	5/27/2004	
USD506463	Remote control unit	Daniels	06/2005	4/0/2004	
USD499718	Remote control	Chen	12/2004	2/2/2004	
USD496005	Remote control	Wang	09/2004	1/21/2004	
USD495333	Liquid crystal display	Borsboom	08/2004	1/13/2004	
USD499395	Remote control		12/2004	1/5/2004	
US20050154766	Multimedia processing system capable of auto-detecting multimedia signals to facilitate selecting and method of the same	Huang et al.		12/23/2004 07/2005	
US7676044	Multi-speaker audio system and automatic control method	Sasaki et al.	03/2010	12/10/2004	
US7548744	WIFI authentication method	Oesterling et al.	06/2009	12/19/2003	
US7428310	Audio output adjusting device of home theater system and method thereof	Park		12/22/2003	09/2008
US7046677	Method and apparatus for time-multiplexed processing of multiple digital video programs		05/2006	11/26/2003	Monta et al.
US7430181	Method and apparatus for automatically configuring devices on a wireless network	Hong		11/26/2003	09/2008
US6919771	Digital amplifier	Nakajima	07/2005	8/25/2003	
US20050060435	Middleware filter agent between server and PDA	Xue et al.	03/2005	8/17/2003	
US7263110	Synchronizing clock signals of server and client devices in a network system based on power source synchronous pulse signal	Fujishiro		9/10/2003 08/2007	
US7675943	Synchronous play-out of media data packets	Mosig	03/2010	9/4/2003	
US7558224	Management of packet-based audio devices within acoustic spaces	Surazski et al.		7/29/2003	07/2009
US7289631	Encryption key setting system, access point, encryption key setting method, and authentication code setting system	Ishidoshiro		7/7/2003 10/2007	
US8442239	Audio system with balance setting based on information addresses	Bruelle-Drews		1/23/2003	05/2013
US20030231208	Multimode interface	Hanon et al.	12/2003	6/13/2003	
US7676142	Systems and methods for multimedia time stretching	Hung	03/2010	6/9/2003	
US20040253969	Technique for discovery using a wireless network	Nguyen et al.	12/2004	6/6/2003	
US20040185773	Mobile transceiver and electronic module for controlling the transceiver	Gerber et al.		3/18/2003	09/2004
US20040183827	Methods and apparatus for implementing a remote application over a network	Putterman et al.		3/17/2003	09/2004
US20040177167	Network audio systems	Iwamura et al.	09/2004	3/4/2003	

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Appendix

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to document,
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Patent/Pub. No.	Title	Filing Date
WO2007135581A2	A DEVICE FOR AND A METHOD OF PROCESSING AUDIO DATA	5/2/2007
WO0019693A1	METHOD AND SYSTEM OF TELECONFERENCING	9/24/1999
USD431552S	Remote control Backs et al. 10/2000	3/3/2000
USD432525S	Handheld remote control Beecroft 10/2000	12/23/1999
USD412337S	Controller for a monitor camera Hamano 07/1999	6/27/1998
USD416021S	Remote controller Godette et al. 11/1999	7/27/1998
USD415496S	Remote control Gerba et al. 10/1999	3/12/1999
USD407071S	4-in-1 remote control unit Keating 03/1999	3/9/1998
USD430143S	Remote control Renk 08/2000	3/5/1998
USD410927S	Remote controller Yamagishi 06/1999	1/27/1998
USD404741S	Control panel for an automotive audio system and climate control Schumaker et al. 01/1999	1/20/1998
USD405071S	Cursor control--data entry device Gambaro 02/1999	10/17/1997
USD429246S	Arm support with control panel Holma 08/2000	10/8/1997
USD420006S	Remote control unit Tonino 02/2000	4/10/1997
USD395889S	Remote control Gerba et al. 07/1998	3/25/1997
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USD389143S	Interactive display controller and telephone handset unit Wicks 01/1998	4/25/1996
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USD372716S	Remote control Thorne, III 08/1996	4/24/1995
USD379816S	Multimedia remote control Laituri et al. 06/1997	2/8/1995
USD377651S	Remote controller Biasotti et al. 01/1997	10/26/1994
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USD364878S	Control panel for a combined vehicular radio receiver, cassette player and digital clock 12/1995	8/30/1994
USD363933S	Remote control Starck 11/1995	8/2/1994
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USD364877S	Control head for a mobile radio Tokiyama et al. 12/1995	3/21/1994
USD356312S	Remote control unit Althans 03/1995	12/27/1993
USD350531S	Remote control for a ceiling fan Tsuji 09/1994	10/29/1993
USD356093S	Control Panel for a combined vehicular radio receiver, cassette player, compact disc player and digital clock McCauley et al. 03/1995	7/26/1993
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01/1999

Green et al.

Gasiorek et al.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (0383842)	9806
107361	7590	06/10/2021	EXAMINER	
Akerman LLP / Sonos, Inc.			SURVILLO, OLEG	
777 S. Flagler Drive, Suite 1100 West Tower			ART UNIT	PAPER NUMBER
West Palm Beach, FL 33401			2442	
			NOTIFICATION DATE	DELIVERY MODE
			06/10/2021	ELECTRONIC

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

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

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR/ PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
13/864,249	04/17/2013	Millington, Nicholas A. J.	13-0402 (0383842)

Akerman LLP / Sonos, Inc. 777 S. Flagler Drive, Suite 1100 West Tower West Palm Beach, FL 33401		EXAMINER	
		OLEG SURVILLO	
		ART UNIT	PAPER
		2442	20210605

DATE MAILED: _____

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Commissioner for Patents

To Whom This May Concern:

Two Information Disclosure Statements dated June 1, 2021 have been considered by the Examiner.

NO SEPARATE RESPONSE TO THIS COMMUNICATION IS REQUIRED

/OLEG SURVILLO/
Primary Examiner, Art Unit 2442

Response to Rule 312 Communication	Application No. 13/864,249	Applicant(s) Millington, Nicholas A. J.	
	Examiner OLEG SURVILLO	Art Unit 2442	AIA (FITF) Status No
<p align="center">-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --</p> <p>1. ☒ The amendment filed on <u>01 June 2021</u> under 37 CFR 1.312 has been considered, and has been:</p> <p>a) ☒ entered.</p> <p>b) ☐ entered as directed to matters of form not affecting the scope of the invention.</p> <p>c) ☐ disapproved because the amendment was filed after the payment of the issue fee. Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.</p> <p>d) ☐ disapproved. See explanation below.</p> <p>e) ☐ entered in part. See explanation below.</p> <p>_____</p>			
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442			

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No. 13-0402 (0383842)

In the Application of:	)	
Nicholas A. J. Millington	)	Examiner: Survillo, Oleg
	)	
Application No.: 13/864,249	)	Group Art Unit: 2442
	)	
Filed: April 17, 2013	)	Confirmation No. 9806
	)	
Title: Concurrent Transmission and	)	
Playback of Audio Information	)	
	)	
	)	

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

37 C.F.R. § 1.312 AMENDMENT

Please enter the following claim amendments pursuant to 37 C.F.R. § 1.312.

A listing of **CLAIM AMENDMENTS** begins on page 2.

REMARKS begin on page 16.

Please charge any underpayment or credit any overpayment of fees in connection with the prosecution of the above-captioned application to Deposit Account 50-0951.

dated 06/01/2021

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

U.S.PATENTS						
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	None				

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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
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Examiner Initial*	Cite No	Foreign Document Number	Country Code ²	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	None						☐

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	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

/O.S/	1	Final Office Action mailed on 30 March 2021, issued in connection with U.S. Patent Application No. 16/383910, filed on 15 April 2019, 15 pages.	☐
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Examiner Signature	/OLEG SURVILLO/	Date Considered	06/05/2021
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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	13864249
Filing Date	2013-04-17
First Named Inventor	MILLINGTON; Nicholas A. J.
Art Unit	2442
Examiner Name	SURVILLO, Oleg
Attorney Docket Number	13-0402

CERTIFICATION STATEMENT

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

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☐ See attached certification statement.

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

☐ A certification statement is not submitted herewith.

SIGNATURE

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	/Jeffrey P. Armstrong/	Date (YYYY-MM-DD)	2021-06-01
Name/Print	Jeffrey P. Armstrong	Registration Number	54,967

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.**

dated 06/01/2021

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

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	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

/O.S/	1	JAPANESE PATENT OFFICE, Decision of Refusal and Translation mailed on 30 March 2021, issued in connection with Japanese Patent Application No. 2019-104398, 5 pages.	☐
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<small> ¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached. </small>			

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Examiner Name	SURVILLO, Oleg
Attorney Docket Number	13-0402

CERTIFICATION STATEMENT

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- ☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
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Signature	/Jeffrey P. Armstrong/	Date (YYYY-MM-DD)	2021-06-01
Name/Print	Jeffrey P. Armstrong	Registration Number	54,967

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U.S. PATENTS								
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		
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1	Final Office Action mailed on 30 March 2021, issued in connection with U.S. Patent Application No. 16/383910, filed on 15 April 2019, 15 pages.	☐
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<small> ¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached. </small>		

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Signature	/Jeffrey P. Armstrong/	Date (YYYY-MM-DD)	2021-06-01
Name/Print	Jeffrey P. Armstrong	Registration Number	54,967

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No. 13-0402 (0383842)

In the Application of:	)	
Nicholas A. J. Millington	)	Examiner: Survillo, Oleg
	)	
Application No.: 13/864,249	)	Group Art Unit: 2442
	)	
Filed: April 17, 2013	)	Confirmation No. 9806
	)	
Title: Concurrent Transmission and	)	
Playback of Audio Information	)	
	)	
	)	

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37 C.F.R. § 1.312 AMENDMENT

Please enter the following claim amendments pursuant to 37 C.F.R. § 1.312.

A listing of **CLAIM AMENDMENTS** begins on page 2.

REMARKS begin on page 16.

Please charge any underpayment or credit any overpayment of fees in connection with the prosecution of the above-captioned application to Deposit Account 50-0951.

CLAIM AMENDMENTS

1-46. (Canceled)

47. (Previously Presented) A first zone player comprising:

a network interface that is configured to communicatively couple the first zone player to at least one data network;

at least one processor;

a tangible, non-transitory computer-readable medium; and

program instructions stored on the tangible, non-transitory computer-readable medium that are executable by the at least one processor such that the first zone player is configured to perform functions comprising:

receiving, via the network interface, a request to engage in synchronous playback of audio content as part of a synchrony group that includes at least a second zone player that is communicatively coupled to the first zone player via the at least one data network;

after receiving the request to engage in synchronous playback of audio content as part of the synchrony group:

detecting an indication that the first zone player is to operate in (a) one of

a control-master mode or a control-slave mode for the synchrony group and (b)

one of an audio-master mode or an audio-slave mode for the synchrony group;

and

beginning to operate in the synchrony group in accordance with the indication;

wherein, while operating in the control-master mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, first control information for the synchrony group from a network device that is communicatively coupled to the first zone player; and

based on the first control information, cause, via the network interface, at least one playback action to be applied in the synchrony group;

wherein, while operating in the control-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, second control information from another zone player; and

perform one or more playback actions in accordance with the second control information;

wherein, while operating in the audio-master mode for the synchrony group, the first zone player is configured to:

obtain audio information that is representative of the audio content;

generate playback timing information associated with the obtained audio information that is indicative of at least one future time that is relative to a reference clock time and denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information; and

transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player; and

wherein, while operating in the audio-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, audio information and playback timing information associated with the received audio information from another zone player; and

engage in synchronous playback of the received audio information with at least the second zone player based on the received playback timing information associated with the received audio information while a local clock time of the first zone player differs from a local clock time of the second zone player.

48. (Previously Presented) The first zone player of claim 47, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-master mode for the synchrony group and (b) the audio-master mode for the synchrony group.

49. (Previously Presented) The first zone player of claim 47, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-slave mode for the synchrony group and (b) the audio-master mode for the synchrony group.

50. (Previously Presented) The first zone player of claim 47, wherein beginning to operate in the synchrony group in accordance with the indication comprises either (a) transitioning from operating in the audio-master mode to operating in the audio-slave mode or (b) transitioning from operating in the audio-slave mode to operating in the audio-master mode.

51. (Previously Presented) The first zone player of claim 47, wherein the first control information identifies particular audio content to be played back by the synchrony group that is available at an audio source outside of the at least one data network, and wherein causing the at least one playback action to be applied in the synchrony group comprises causing a zone player operating in the audio-master mode to obtain audio information that is representative of the particular audio content.

52. (Previously Presented) The first zone player of claim 47, wherein the at least one future time relative to the reference clock time comprise at least one first future time that is determined based on a local clock of a zone player other than the first zone player.

53. (Currently Amended) The first zone player of claim 47, wherein at least one future time relative to the reference clock time comprises at least one first future time that is determined based on [[the]] a local clock of the first zone player.

54. (Previously Presented) The first zone player of claim 47, wherein the second control information comprises information indicative of a volume adjustment, and wherein performing one or more playback actions in accordance with the second control information comprises adjusting a playback volume of the first zone player.

55. (Previously Presented) The first zone player of claim 47, wherein the playback timing information that is received while operating in the audio-slave mode comprises at least one future time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the received audio information, and wherein being configured while operating in the audio-slave mode to engage in synchronous playback of the received audio information with at least the second zone player comprises being configured to:

update the at least one future time to account for a differential between the local clock time of the first zone player and a local clock time of another zone player; and

when the local clock time of the first zone player reaches the updated at least one future time, engage in synchronous playback of the corresponding portion of the received audio information with at least the second zone player.

56. (Previously Presented) A method performed by a first zone player, the method comprising:

receiving, via a network interface at the first zone player, a request to engage in synchronous playback of audio content as part of a synchrony group that includes at least a second zone player that is communicatively coupled to the first zone player via at least one data network;

after receiving the request to enter into the synchrony group:

detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group; and

beginning to operate in the synchrony group in accordance with the indication;

wherein, while operating in the control-master mode for the synchrony group, the first zone player is configured to:

- receive, via the network interface, first control information for the synchrony group from a network device that is communicatively coupled to the first zone player;
- and

- based on the first control information, cause, via the network interface, at least one playback action to be applied in the synchrony group;

wherein, while operating in the control-slave mode for the synchrony group, the first zone player is configured to:

- receive, via the network interface, second control information from another zone player; and

- perform one or more playback actions in accordance with the second control information;

wherein, while operating in the audio-master mode for the synchrony group, the first zone player is configured to:

- obtain audio information that is representative of the audio content;

- generate playback timing information associated with the obtained audio information that is indicative of at least one future time relative to a reference clock time that denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information; and

- transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player; and

wherein, while operating in the audio-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, audio information and playback timing information associated with the received audio information from another zone player; and engage in synchronous playback of the received audio information with at least the second zone player based on the received playback timing information associated with the received audio information while a local clock time of the first zone player differs from a local clock time of the second zone player.

57. (Previously Presented) The method of claim 56, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-master mode for the synchrony group and (b) the audio-master mode for the synchrony group.

58. (Previously Presented) The method of claim 56, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-slave mode for the synchrony group and (b) the audio-master mode for the synchrony group.

59. (Previously Presented) The method of claim 56, wherein beginning to operate in the synchrony group in accordance with the indication comprises either (a) transitioning from

operating in the audio-master mode to operating in the audio-slave mode or (b) transitioning from operating in the audio-slave mode to operating in the audio-master mode.

60. (Previously Presented) The method of claim 56, wherein the first control information identifies particular audio content to be played back by the synchrony group that is available at an audio source outside of the at least one data network, and wherein causing the at least one playback action to be applied in the synchrony group comprises causing a zone player operating in the audio-master mode to obtain audio information that is representative of the particular audio content.

61. (Previously Presented) The method of claim 56, wherein the at least one future time relative to the reference clock time comprise at least one first future time that is determined based on a local clock of a zone player other than the first zone player.

62. (Currently Amended) The method of claim 56, wherein the at least one future time relative to the reference clock time comprise at least one first future time that is determined based on [[the]] a local clock of the first zone player.

63. (Previously Presented) The method of claim 56, wherein the second control information comprises information indicative of a volume adjustment, and wherein performing one or more playback actions in accordance with the second control information comprises adjusting a playback volume of the first zone player.

64. (Previously Presented) The method of claim 56, wherein the playback timing information that is received while operating in the audio-slave mode comprises at least one future time at which at least the first and second zone players are to engage in synchronous

playback of a corresponding portion of the received audio information, and wherein operating in the audio-slave mode to engage in synchronous playback of the received audio information with at least the second zone player comprises:

- updating the at least one future time to account for a differential between the local clock time of the first zone player and a local clock time of another zone player; and

- when the local clock time of the first zone player reaches the updated at least one future time, engaging in synchronous playback of the corresponding portion of the received audio information with at least the second zone player.

65. (Previously Presented) Tangible, non-transitory computer-readable media having instructions stored therein, wherein the instructions, when executed, cause a first zone player to perform functions comprising:

- receiving, via a network interface at the first zone player, a request to engage in synchronous playback of audio content as part of a synchrony group that includes at least a second zone player that is communicatively coupled to the first zone player via at least one data network;

- after receiving the request to enter into the synchrony group:

- detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group; and

- beginning to operate in the synchrony group in accordance with the indication;

- wherein, while operating in the control-master mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, first control information for the synchrony group from a network device that is communicatively coupled to the first zone player; and

based on the first control information, cause, via the network interface, at least one playback action to be applied in the synchrony group;

wherein, while operating in the control-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, second control information from another zone player; and

perform one or more playback actions in accordance with the second control information;

wherein, while operating in the audio-master mode for the synchrony group, the first zone player is configured to:

obtain audio information that is representative of the audio content;

generate playback timing information associated with the obtained audio information that is indicative of one or more future times relative to a reference clock time, wherein an individual future time denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information; and

transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player; and

wherein, while operating in the audio-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, audio information and playback timing information associated with the received audio information from another zone player; and engage in synchronous playback of the received audio information with at least the second zone player based on the received playback timing information associated with the received audio information while a local clock time of the first zone player differs from a local clock time of the second zone player.

66. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-master mode for the synchrony group and (b) the audio-master mode for the synchrony group.

67. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-slave mode for the synchrony group and (b) the audio-master mode for the synchrony group.

68. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein beginning to operate in the synchrony group in accordance with the indication comprises either (a) transitioning from operating in the audio-master mode to operating in the

audio-slave mode or (b) transitioning from operating in the audio-slave mode to operating in the audio-master mode.

69. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein the first control information identifies particular audio content to be played back by the synchrony group that is available at an audio source outside of the at least one data network, and wherein causing the at least one playback action to be applied in the synchrony group comprises causing a zone player operating in the audio-master mode to obtain audio information that is representative of the particular audio content.

70. (Currently Amended) The tangible, non-transitory computer-readable media of claim 65, wherein ~~the at least one~~ an individual future time relative to the reference clock time comprise at least one first future time that is determined based on a local clock of a zone player other than the first zone player.

71. (Currently Amended) The tangible, non-transitory computer-readable media of claim 65, wherein ~~the at least one~~ an individual future time relative to the reference clock time comprise at least one first future time that is determined based on ~~[[the]]~~ a local clock of the first zone player.

72. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein the second control information comprises information indicative of a volume adjustment, and wherein performing one or more playback actions in accordance with the second control information comprises adjusting a playback volume of the first zone player.

73. (Currently Amended) The tangible, non-transitory computer-readable media of claim 65, wherein the playback timing information that is received while operating in the audio-slave mode comprises at least one future time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the received audio information, and wherein operating in the audio-slave mode to engage in synchronous playback of the received audio information with at least the second zone player comprises:

updating the at least one future time to account for a differential between the local clock time of the first zone player and a local clock time of another zone player; and

when the local clock time of the first zone player reaches the updated at least one future time, engaging in synchronous playback of the corresponding portion of the received audio information with at least the second zone player.

74. (Currently Amended) The first zone player of claim 48, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock time that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

75. (Currently Amended) The first zone player of claim 49, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock time that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

76. (Currently Amended) The method of claim 57, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock time that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

77. (Currently Amended) The method of claim 58, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock time that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

78. (Currently Amended) The tangible, non-transitory computer-readable media of claim 66, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock time that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

79. (Currently Amended) The tangible, non-transitory computer-readable media of claim 67, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock time that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

REMARKS

Claims 47-79 are pending; claims 47, 56, and 65 are independent. Applicant has amended claims 53, 62, 70-71, and 73-79 to correct claim language formalities, provide proper antecedent basis for claim terms, and to generally put the claims in better condition for issuance. No new matter has been added. Because the amendments are ministerial in nature and/or do not change the scope of the allowed claims, Applicant requests that the Office enter the amendments pursuant to 37 C.F.R. § 1.312. If further dialog would advance consideration and entry of the present amendments, Applicant invites the Office to telephone the undersigned at 312-634-5738.

Respectfully submitted,
Akerman LLP

Date: June 1, 2021

By: /Jeffrey P. Armstrong/
Jeffrey P. Armstrong
Reg. No. 54,967

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

U.S. PATENTS								
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		
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

1	JAPANESE PATENT OFFICE, Decision of Refusal and Translation mailed on 30 March 2021, issued in connection with Japanese Patent Application No. 2019-104398, 5 pages.	☐
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EXAMINER SIGNATURE

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

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

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

Application Number	13864249
Filing Date	2013-04-17
First Named Inventor	MILLINGTON; Nicholas A. J.
Art Unit	2442
Examiner Name	SURVILLO, Oleg
Attorney Docket Number	13-0402

CERTIFICATION STATEMENT

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

- ☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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.
- ☐ A certification statement is not submitted herewith.

SIGNATURE

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	/Jeffrey P. Armstrong/	Date (YYYY-MM-DD)	2021-06-01
Name/Print	Jeffrey P. Armstrong	Registration Number	54,967

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Commissioner for Patents
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Alexandria, VA 22313-1450

By fax, send to: (571) 273-2885

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Akerman LLP / Sonos, Inc.
777 S. Flagler Drive, Suite 1100 West Tower
West Palm Beach FL 33401

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Jeffrey P. Armstrong	(Typed or printed name)
/Jeffrey P. Armstrong/	(Signature)
01-Jun-2021	(Date)

APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
13/864,249	04/17/2013	Nicholas A.J. Millington	13-0402 (0383842)	9806

TITLE OF INVENTION:

APPL. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAT. ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	06/02/2021

EXAMINER	ART UNIT	CLASS/SUBCLASS
Survillo, Oleg	2442	709-219000

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-43; 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. **Akerman LLP**

2.
3.

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

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(A) NAME OF ASSIGNEE

Sonos, Inc.

(B) RESIDENCE (CITY and STATE or COUNTRY)

Santa Barbara, CA

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

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5. Change of 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.

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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 **/Jeffrey P. Armstrong/**

Date **01-Jun-2021**

Typed or printed name **Jeffrey P. Armstrong**

Registration No. **54,967**

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Jeffrey Armstrong		
Attorney Docket Number:		13-0402 (0383842)		
Filed as Large 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:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
UTILITY APPL ISSUE FEE	1501	1	1200	1200
Extension-of-Time:				
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	260	260
Total in USD (\$)				1460

Electronic Acknowledgement Receipt	
EFS ID:	42869963
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Jeffrey Armstrong
Filer Authorized By:	
Attorney Docket Number:	13-0402 (0383842)
Receipt Date:	01-JUN-2021
Filing Date:	17-APR-2013
Time Stamp:	19:27:27
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$ 1460
RAM confirmation Number	E202161J27484005
Deposit Account	500951
Authorized User	Jeffrey Armstrong
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37 CFR 1.19 (Document supply fees)					
37 CFR 1.20 (Post Issuance fees)					
37 CFR 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		13-0402_312_Amendment.PDF	125198	yes	16
			5f31f0efc2c632763a404bebe2edeaaa61b27186		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Amendment after Notice of Allowance (Rule 312)		1	1	
	Claims		2	15	
	Applicant Arguments/Remarks Made in an Amendment		16	16	
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	13-0402_0_IDS_20210601180706_01.PDF	300589	no	3
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Information:					
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4	Non Patent Literature	16383910_FOA_14-0204-CON0419_03-30-2021_15pages.pdf	715515	no	15
			1a064eb52cdfdd89cb5805c1373f9c8f9fd4fc08		
Warnings:					
Information:					

5	Non Patent Literature	2019104398_JP_Decision_of_R efusal_04-0401-JP- DIV5_03-30-2021_5pages.pdf	3045766 4f4a247cf747aa507b4f857159df95b3cd69a679	no	5
Warnings:					
Information:					
6	Issue Fee Payment (PTO-85B)	13-0402_Issue_Fee_Transmittal .PDF	187052 85ff122fe3ba52122038b927570dfc9bdfbca321	no	1
Warnings:					
Information:					
7	Fee Worksheet (SB06)	fee-info.pdf	33879 d1b04585881dc63d4cc24b8160553244ba97cff	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			4709617		
<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>					



UNITED STATES PATENT AND TRADEMARK OFFICE

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NOTICE OF ALLOWANCE AND FEE(S) DUE

107361 7590 03/02/2021
McDonnell Boehnen Hulbert & Berghoff LLP
Sonos, Inc.
300 South Wacker Drive
Chicago, IL 60606

EXAMINER	
SURVILLO, OLEG	
ART UNIT	PAPER NUMBER
2442	

DATE MAILED: 03/02/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806

TITLE OF INVENTION: CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	06/02/2021

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)

107361 7590 03/02/2021
McDonnell Boehnen Hulbert & Berghoff LLP
Sonos, Inc.
300 South Wacker Drive
Chicago, IL 60606

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.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806

TITLE OF INVENTION: CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	06/02/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
SURVILLO, OLEG	2442	709-219000

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 _____
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. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518 CON)	9806
107361 7590 03/02/2021 McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606			EXAMINER SURVILLO, OLEG	
			ART UNIT 2442	PAPER NUMBER

DATE MAILED: 03/02/2021

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. 13/864,249	Applicant(s) Millington, Nicholas A. J.	
	Examiner OLEG SURVILLO	Art Unit 2442	AIA (FITF) Status No

-- 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 Request for Continued Examination, response dated 02/14/2021.
☐ 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 47-79. 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 <u>02/14/21</u> .	6. ☐ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☒ Other <u>DETAILED ACTION</u> .
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	
--	--

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on February 14, 2021 has been entered.

Response to Arguments

With regard to the Applicants' Remarks dated February 14, 2021:

No new issues are noted. No previously noted issues exist.

Information Disclosure Statement dated 02/14/2021 has been considered by Examiner. No reference(s) was/were found that affect patentability of the pending claims.

As to any arguments not specifically addressed, they are the same as those discussed above.

Allowed Claims

Claims 47-79 are allowed.

Allowable Subject Matter

The examiner's statement of reasons for allowance was previously presented and is unchanged.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to OLEG SURVILLO whose telephone number is (571)272-9691. The examiner can normally be reached on 9:00am - 5:00pm.

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, William Trost can be reached on 571-272-7872. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/OLEG SURVILLO/
Primary Examiner, Art Unit 2442

Issue Classification 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.	
	Examiner OLEG SURVILLO	Art Unit 2442	

CPC						
Symbol					Type	Version
G06F	/	3	/	165	F	2013-01-01
H04N	/	21	/	4307	I	2013-01-01
H04N	/	21	/	43615	I	2013-01-01
H04L	/	65	/	4076	I	2013-01-01
H04L	/	65	/	80	I	2013-01-01
H04L	/	69	/	28	I	2013-01-01
G06F	/	16	/	60	I	2019-01-01
G06F	/	16	/	63	I	2019-01-01
G06F	/	16	/	638	I	2019-01-01
G06F	/	16	/	68	I	2019-01-01
G06F	/	16	/	2322	I	2019-01-01
G06F	/	16	/	635	I	2019-01-01
G06F	/	16	/	639	I	2019-01-01
G05B	/	15	/	02	I	2013-01-01
G06F	/	1	/	00	I	2013-01-01
G06F	/	1	/	12	I	2013-01-01
G06F	/	3	/	048	I	2013-01-01
G06F	/	3	/	0482	I	2013-01-01
G06F	/	3	/	0484	I	2013-01-01
G06F	/	3	/	04842	I	2013-01-01
G06F	/	3	/	04847	I	2013-01-01
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G06F	/	3	/	162	I	2013-01-01
G06F	/	3	/	167	I	2013-01-01
G06F	/	17	/	00	I	2013-01-01
H03G	/	3	/	00	I	2013-01-01
H03G	/	3	/	20	I	2013-01-01
H04L	/	12	/	2854	I	2013-01-01
H04L	/	65	/	1069	I	2013-01-01
H04L	/	65	/	4069	I	2013-01-01
H04L	/	65	/	4084	I	2013-01-01

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	33	
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	26 February 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	56	2

U.S. Patent and Trademark Office

Part of Paper No.: 20210226

Issue Classification 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.	
	Examiner OLEG SURVILLO	Art Unit 2442	

CPC						
Symbol					Type	Version
H04L	/	65	/	4092	I	2013-01-01
H04L	/	65	/	601	I	2013-01-01
H04L	/	67	/	12	I	2013-01-01
H04W	/	84	/	20	I	2013-01-01
H05K	/	999	/	99	I	2013-01-01
H04J	/	3	/	0644	I	2013-01-01
H04J	/	3	/	0664	I	2013-01-01
H04R	/	27	/	00	I	2013-01-01
H04L	/	65	/	60	I	2013-01-01
H04L	/	67	/	1095	I	2013-01-01
H04R	/	3	/	12	I	2013-01-01
H04L	/	67	/	26	I	2013-01-01
H04H	/	20	/	103	I	2013-01-01
H04H	/	20	/	26	I	2013-01-01
G11B	/	20	/	10527	I	2013-01-01
H04N	/	5	/	04	I	2013-01-01
H04N	/	9	/	7904	I	2013-01-01
H04W	/	56	/	0015	I	2013-01-01
H04R	/	2227	/	005	A	2013-01-01
H04H	/	2201	/	20	A	2013-01-01
H04R	/	2227	/	003	A	2013-01-01
G11B	/	2020	/	10592	A	2013-01-01

CPC Combination Sets					
Symbol				Type	Set

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 33	
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442 (Primary Examiner) _____ (Date) 26 February 2021		O.G. Print Claim(s) 56	O.G. Print Figure 2

U.S. Patent and Trademark Office

Part of Paper No.: 20210226

Issue Classification 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

INTERNATIONAL CLASSIFICATION			
CLAIMED			
G06F	/	15	/ 16
NON-CLAIMED			
	/		/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	33	
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	26 February 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	56	2

Issue Classification 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

☐ 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	Final
	1		11		21		31		41	18	51	8	61	31	71	
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	4		14		24		34		44	21	54	11	64	14	74	
	5		15		25		35		45	22	55	23	65	16	75	
	6		16		26		36		46	1	56	24	66	3	76	
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	8		18		28		38	13	48	4	58	28	68	25	78	
	9		19		29		39	15	49	6	59	29	69	27	79	
	10		20		30		40	17	50	7	60	30	70			

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	33	
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	26 February 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	56	2

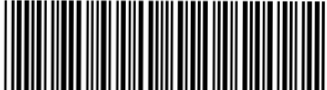
U.S. Patent and Trademark Office

Part of Paper No.: 20210226

<i>Index of Claims</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	11/08/2017	07/09/2018	01/05/2019	05/13/2019	09/25/2019	02/26/2021			
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	40	✓	✓	✓	=	-	-			
	41		✓	✓	=	-	-			
	42		✓	✓	=	-	-			

<i>Index of Claims</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CLAIM		DATE									
Final	Original	11/08/2017	07/09/2018	01/05/2019	05/13/2019	09/25/2019	02/26/2021				
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16	75						=				
3	76						=				
5	77						=				
25	78						=				
27	79						=				

<i>Search Notes</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CPC - Searched*		
Symbol	Date	Examiner
G06F 3/167, 17/00, 17/3074, 3/048, 3/0482, 3/0484, 3/126, 3/16	02/26/2021	OS
H04L 65/60, 12/2812	02/26/2021	OS

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
709	219, 220, 231	02/26/2021	OS

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Updated Inventor search	02/26/2021	OS
Updated Assignee search	02/26/2021	OS
Updated EAST search in USPAT, US-PGPUB, EPO, JPO, and FPRS databases	02/26/2021	OS

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	Text search in US-PGPUB database - See Interference search history printout	02/26/2021	OS

/OLEG SURVILLO/ Primary Examiner.Art Unit 2442	
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 www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 9806

SERIAL NUMBER 13/864,249	FILING or 371(c) DATE 04/17/2013 RULE	CLASS 709	GROUP ART UNIT 2442	ATTORNEY DOCKET NO. 13-0402 (MBHB 15-518-CON)		
APPLICANTS SONOS, INC., Santa Barbara, CA INVENTORS Nicholas A. J. Millington, Santa Barbara, CA; ** CONTINUING DATA ***** This application is a CON of 13/297,000 11/15/2011 PAT 9182777 which is a CON of 10/816,217 04/01/2004 PAT 8234395 which claims benefit of 60/490,768 07/28/2003 ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 05/21/2013						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and /OLEG SURVILLO/ Acknowledged Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY CA	SHEETS DRAWINGS 5	TOTAL CLAIMS 33	INDEPENDENT CLAIMS 3
ADDRESS McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606 UNITED STATES						
TITLE CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION						
FILING FEE RECEIVED 2800	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			☐ All Fees		
				☐ 1.16 Fees (Filing)		
				☐ 1.17 Fees (Processing Ext. of time)		
				☐ 1.18 Fees (Issue)		
				☐ Other _____		
			☐ Credit			

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S124	1	"4310922".pn.	US-PGPUB; USPAT	OR	ON	2021/02/26 14:31
S125	1	"8417827".pn.	US-PGPUB; USPAT	OR	ON	2021/02/26 14:31
S126	2	"20050021811"	US-PGPUB; USPAT	OR	ON	2021/02/26 14:32
S127	2	"20060002681"	US-PGPUB; USPAT	OR	ON	2021/02/26 14:33
S128	3	"20060149850"	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2021/02/26 14:35
S129	13,176	G06F3/167.CPC.	US-PGPUB; USPAT	OR	ON	2021/02/26 14:35
S130	8,886	G06F17/00.CPC.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2021/02/26 14:35
S131	19	G06F17/3074.CPC.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2021/02/26 14:35
S132	16,933	G06F3/048.CPC.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2021/02/26 14:36
S133	86,950	G06F3/0482.CPC.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2021/02/26 14:36
S134	33,133	G06F3/0484.CPC.	US-PGPUB;	OR	ON	2021/02/26 14:36

			USPAT; FPRS; EPO; JPO			
S135	5,508	G06F3/126.CPC.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2021/02/26 14:36
S136	12,053	G06F3/16.CPC.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2021/02/26 14:36
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EAST Search History (Interference)

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dated 02/14/2021

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	4310922		1982-01-12	LICHTENBERGER; W. Wayne et al.		
	2	8417827		2013-04-09	ANTTILA; Akseli et al.		
	3	10185541		2019-01-22	MILLINGTON; Nicholas A. J.		
	4	10303432		2019-05-28	MILLINGTON; Nicholas A. J.		
If you wish to add additional U.S. Patent citation information please click the Add button.							Add
U.S.PATENT APPLICATION PUBLICATIONS							Remove
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	20050021811		2005-01-27	ROELEN; Frederic		
	2	20060002681		2006-01-05	SPILO; Michael et al.		

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

EFS Web 2.1.18

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
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	Art Unit	2442	
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	Attorney Docket Number	13-0402	

3	20060149850	2006-07-06	BOWMAN; Timothy D.
4	20190324713	2019-10-24	MILLINGTON; Nicholas A.J.
5	20190339934	2019-11-07	MILLINGTON; Nicholas A.J.
6	20190369954	2019-12-05	MILLINGTON; Nicholas A.J.

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	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	None						

If you wish to add additional Foreign Patent Document citation information please click the Add button.

NON-PATENT LITERATURE DOCUMENTS

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	Final Office Action mailed on 28 October 2020, issued in connection with U.S. Patent Application No. 16/459605, filed on 1 July 2019, 14 pages.	
	2	Non-Final Office Action mailed on 20 October 2020, issued in connection with U.S. Patent Application No. 16/459661, filed on 2 July 2019, 9 pages.	

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3	Notice of Allowance mailed on 15 December 2020, issued in connection with U.S. Patent Application No. 15/946660, filed on 5 April 2018, 5 pages.
4	Notice of Allowance mailed on 25 November 2020, issued in connection with U.S. Patent Application No. 16/999048, filed on 20 August 2020, 9 pages.
5	Sonos, Inc. v. Google LLC, Complainant Sonos, Inc.'s Pre-Hearing Brief [Redacted 29 January 2021] dated 22 January 2021, 513 pages.
6	Sonos, Inc. v. Google LLC, Direct Witness Statement of Dan Schonfeld, PH.D. [Redacted 29 January 2021] dated 18 December 2020, 390 pages.
7	Sonos, Inc. v. Google LLC, Rebuttal Expert Report of Kevin C. Almeroth [Redacted 29 January 2021] dated 13 November 2020, 547 pages.
8	Sonos, Inc. v. Google LLC, Rebuttal Witness Statement of Kevin C. Almeroth [Redacted 29 January 2021] dated 8 January 2021, 735 pages.
9	Sonos, Inc. v. Google LLC, Respondent Google's Pre-Trial Brief [Redacted 29 January 2021] dated 22 January 2021, 516 pages.

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/OLEG SURVILLO/	Date Considered	02/26/2021
--------------------	-----------------	-----------------	------------

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

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
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	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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.

A certification statement is not submitted herewith.

SIGNATURE

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	/Jeffrey P. Armstrong/	Date (YYYY-MM-DD)	2021-02-14
Name/Print	Jeffrey P. Armstrong	Registration Number	54,967

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The information provided by you in this form will be subject to the following routine uses:

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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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	4310922		1982-01-12	LICHTENBERGER; W. Wayne et al.	
	2	8417827		2013-04-09	ANTTILA; Akseli et al.	
	3	10185541		2019-01-22	MILLINGTON; Nicholas A. J.	
	4	10303432		2019-05-28	MILLINGTON; Nicholas A. J.	
If you wish to add additional U.S. Patent citation information please click the Add button.						Add
U.S.PATENT APPLICATION PUBLICATIONS						Remove
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	20050021811		2005-01-27	ROELEN; Frederic	
	2	20060002681		2006-01-05	SPILO; Michael et al.	

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	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

3	20060149850	2006-07-06	BOWMAN; Timothy D.
4	20190324713	2019-10-24	MILLINGTON; Nicholas A.J.
5	20190339934	2019-11-07	MILLINGTON; Nicholas A.J.
6	20190369954	2019-12-05	MILLINGTON; Nicholas A.J.

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

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	None						

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NON-PATENT LITERATURE DOCUMENTS

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	Final Office Action mailed on 28 October 2020, issued in connection with U.S. Patent Application No. 16/459605, filed on 1 July 2019, 14 pages.	
	2	Non-Final Office Action mailed on 20 October 2020, issued in connection with U.S. Patent Application No. 16/459661, filed on 2 July 2019, 9 pages.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

3	Notice of Allowance mailed on 15 December 2020, issued in connection with U.S. Patent Application No. 15/946660, filed on 5 April 2018, 5 pages.
4	Notice of Allowance mailed on 25 November 2020, issued in connection with U.S. Patent Application No. 16/999048, filed on 20 August 2020, 9 pages.
5	Sonos, Inc. v. Google LLC, Complainant Sonos, Inc.'s Pre-Hearing Brief [Redacted 29 January 2021] dated 22 January 2021, 513 pages.
6	Sonos, Inc. v. Google LLC, Direct Witness Statement of Dan Schonfeld, PH.D. [Redacted 29 January 2021] dated 18 December 2020, 390 pages.
7	Sonos, Inc. v. Google LLC, Rebuttal Expert Report of Kevin C. Almeroth [Redacted 29 January 2021] dated 13 November 2020, 547 pages.
8	Sonos, Inc. v. Google LLC, Rebuttal Witness Statement of Kevin C. Almeroth [Redacted 29 January 2021] dated 8 January 2021, 735 pages.
9	Sonos, Inc. v. Google LLC, Respondent Google's Pre-Trial Brief [Redacted 29 January 2021] dated 22 January 2021, 516 pages.

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EXAMINER SIGNATURE

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

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
<p>That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).</p>			
OR			
<p>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).</p>			
☒			
See attached certification statement.			
The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.			
A certification statement is not submitted herewith.			
SIGNATURE			
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	/Jeffrey P. Armstrong/	Date (YYYY-MM-DD)	2021-02-14
Name/Print	Jeffrey P. Armstrong	Registration Number	54,967
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Jeffrey Armstrong		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	1820	1	2000	2000
Total in USD (\$)				2000

Electronic Acknowledgement Receipt	
EFS ID:	41920366
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Jeffrey Armstrong
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	14-FEB-2021
Filing Date:	17-APR-2013
Time Stamp:	13:04:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$ 2000
RAM confirmation Number	E20212DD05233335
Deposit Account	132490
Authorized User	Jeffrey Armstrong
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)					
37 CFR 1.20 (Post Issuance fees)					
37 CFR 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	13-0402_RCE.pdf	697594	no	3
			e68afa1d6f683f00ceb00823b601e41aa11574fb		
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	13-0402_0_IDS_20210211180834.pdf	1054030	no	5
			6871c41833f2448209ad16287cf0f7501cbb2126		
Warnings:					
Information:					
3	Non Patent Literature	NPL01_16459605_FOA_14-0204-CON0719A_10-28-20_14pages.pdf	508785	no	14
			73b8890315e222968f41073418a2ddb219f0b478		
Warnings:					
Information:					
4	Non Patent Literature	NPL02_16459661_NFOA_14-0204-CON0719B_10-20-20_9pages.pdf	300681	no	9
			dc492271a8e2eaed268e984bbe06c6d559db995d		
Warnings:					
Information:					
5	Non Patent Literature	NPL03_15946660_NOA_13-0411-CON0418_12-15-2020_5pages.pdf	352819	no	5
			971f1a4c857cfd4b37e2f53aba3d4027d64dbb77		
Warnings:					
Information:					
6	Non Patent Literature	NPL04_16999048_NOA_04-0401-CON0720_11-25-20_9pages.pdf	448291	no	9
			b4432aafa55f8e9c57bcd6053ae92500e52a07a9		
Warnings:					
Information:					

7	Non Patent Literature	NPL05_337-TA-1191_2021-01-22_Sonos_Pr e-Hearing_Brief- redacted_513pgs.pdf	1927734	no	513
			26e6ce8595ed1829f210cbc442e90c5e2039e545		
Warnings:					
Information:					
8	Non Patent Literature	NPL06_REDACTED-RX-1479C_Dan_Schonfeld_Wit ness_Statement_390pgs.pdf	13883382	no	390
			4b0cf341b244e2468efcdc80e3c1b51d493db41e		
Warnings:					
Information:					
9	Non Patent Literature	NPL07_Almeroth_Rebuttal_Exp ert_Report-redacted_547pgs. pdf	18853977	no	547
			c8ddad60b16d74a7353e08e1b3e182177493257		
Warnings:					
Information:					
10	Non Patent Literature	NPL08_CX-0014C-Almeroth_Rebuttal_Witness_St atement-redacted_735pgs.pdf	9493577	no	735
			045630c1f32733fcd0ece07a3fa2bb44ed923f75		
Warnings:					
Information:					
11	Non Patent Literature	NPL09_REDACTED_2021-01-22 _Respondent_Google_Pre- Hearing_Brief_516pgs.pdf	4025954	no	516
			ae90e00cd70ed374d0f69842b6b0ddced06f7c57		
Warnings:					
Information:					
12	Fee Worksheet (SB06)	fee-info.pdf	30726	no	2
			331b1ebd3651edce7e6eacc12a95f950ff5400b2		
Warnings:					
Information:					
Total Files Size (in bytes):			51577550		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL **(Submitted Only via EFS-Web)**

Application Number	13/864,249	Filing Date	2013-04-07	Docket Number (if applicable)	13-0402 (15-518-CON)	Art Unit	2442
First Named Inventor	Millington			Examiner Name	Survillo		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.

Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 1, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☐ Other _____

☒ Enclosed

☐ Amendment/Reply

☒ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____.
 (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No. 132490

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)

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

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	Jeffrey P. Armstrong/	Date (YYYY-MM-DD)	2021-02-14
Name	Jeffrey P. Armstrong	Registration Number	54967

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is : 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 estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

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

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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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).
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public 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.



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Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806
107361	7590	12/04/2020	EXAMINER	
McDonnell Boehnen Hulbert & Berghoff LLP			SURVILLO, OLEG	
Sonos, Inc.				
300 South Wacker Drive				
Chicago, IL 60606				
			ART UNIT	PAPER NUMBER
			2442	
			MAIL DATE	DELIVERY MODE
			12/04/2020	PAPER

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

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

**UNITED STATES DEPARTMENT OF COMMERCE****U.S. Patent and Trademark Office**

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR/ PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
13/864,249	04/17/2013	Millington, Nicholas A. J.	13-0402 (MBHB 15-

McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606		EXAMINER	
		OLEG SURVILLO	
		ART UNIT	PAPER
		2442	20201204

DATE MAILED: _____

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

Commissioner for Patents

To Whom This May Concern:

Information Disclosure Statement dated December 1, 2020 has been considered by the Examiner. Copy is attached with this correspondence.

NO SEPARATE RESPONSE TO THIS COMMUNICATION IS REQUIRED

/OLEG SURVILLO/
Primary Examiner, Art Unit 2442

dated 12/01/2020

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	None						
If you wish to add additional U.S. Patent citation information please click the Add button.							Add	
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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	None						
If you wish to add additional U.S. Published Application citation information please click the Add button.							Add	
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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	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	None						
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NON-PATENT LITERATURE DOCUMENTS								Remove
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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

/O.S/	1	Sonos, Inc. v. Google LLC, Expert Report of Dan Schonfeld, PH.D., Regarding Invalidity of Asserted Claims of U.S. Patent Nos. 9,195, 258 and 10,209,953 [Redacted] dated 23 October 2020, 387 pages.
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If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/OLEG SURVILLO/	Date Considered	12/04/2020
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
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	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
<p>That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).</p>			
OR			
<p>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).</p>			
<p>See attached certification statement.</p>			
<p>☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.</p>			
<p>A certification statement is not submitted herewith.</p>			
SIGNATURE			
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	/Brandon J. Kennedy/	Date (YYYY-MM-DD)	2020-12-01
Name/Print	Brandon J. Kennedy	Registration Number	67,894
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	None						
If you wish to add additional U.S. Patent citation information please click the Add button.							Add	
U.S.PATENT APPLICATION PUBLICATIONS							Remove	
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	None						
If you wish to add additional U.S. Published Application citation information please click the Add button.							Add	
FOREIGN PATENT DOCUMENTS							Remove	
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	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	None						
If you wish to add additional Foreign Patent Document citation information please click the Add button								Add
NON-PATENT LITERATURE DOCUMENTS								Remove
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

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	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

1	Sonos, Inc. v. Google LLC, Expert Report of Dan Schonfeld, PH.D., Regarding Invalidity of Asserted Claims of U.S. Patent Nos. 9,195, 258 and 10,209,953 [Redacted] dated 23 October 2020, 387 pages.		
If you wish to add additional non-patent literature document citation information please click the Add button <input type="button" value="Add"/>			
EXAMINER SIGNATURE			
Examiner Signature			Date Considered
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			
<small> ¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached. </small>			

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
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Signature	/Brandon J. Kennedy/	Date (YYYY-MM-DD)	2020-12-01
Name/Print	Brandon J. Kennedy	Registration Number	67,894
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Brandon Jacob Kennedy/Jaden Knosher		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	260	260
Total in USD (\$)				260

Electronic Acknowledgement Receipt	
EFS ID:	41264498
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Brandon Jacob Kennedy
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	01-DEC-2020
Filing Date:	17-APR-2013
Time Stamp:	17:41:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 260
RAM confirmation Number	E2020B1H42065279
Deposit Account	506632
Authorized User	Brandon Kennedy
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)					
37 CFR 1.20 (Post Issuance fees)					
37 CFR 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	Sonos_v_Google_Expert_Report_Schonfeld_redated_10-23-20_387pgs.pdf	16693486	no	387
			1ec3c4c6070fb97c49b706fd395ece796461eb78		
Warnings:					
Information:					
2	Transmittal Letter	IDS_Transmittal.pdf	83098	no	1
			0a07664a0dca0751a6dfce878ba45c8a7763f2b7		
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	13_0402_0_IDS_20201201165612.pdf	1053215	no	4
			322baa568e4db53c1a59b1fc7917bf7adf313a43		
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30737	no	2
			7fc66fca88bffb6a75f92d41afb7ecb7678aaade		
Warnings:					
Information:					
Total Files Size (in bytes):			17860536		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Docket No. 13-0402)**

In re the Application of:	)	
	)	
Sonos, Inc.	)	
	)	Group Art Unit 2442
Serial No.: 13/864,249	)	
	)	
Filed: April 17, 2013	)	
	)	Examiner: SURVILLO, Oleg
Confirmation No. 9806	)	
	)	
For: CONCURRENT TRANSMISSION AND	)	
PLAYBACK OF AUDIO	)	
INFORMATION	)	

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

TRANSMITTAL WITH INFORMATION DISCLOSURE STATEMENT

Pursuant to 37 CFR § 1.34, the undersigned hereby confirms that the attached Information Disclosure Statement (IDS) is being filed in accordance with the undersigned's authority to act in a representative capacity on behalf of Applicant, Sonos, Inc., in connection with the preparation and filing of IDSs for the above-referenced matter.

Respectfully submitted,

Dated: December 1, 2020

By: /Brandon J. Kennedy/
Brandon J. Kennedy
Reg. No. 67,894
Lee Sullivan Shea & Smith LLP
656 W. Randolph St., Floor 5W
Chicago, Illinois 60661
(312) 754-9315
kennedy@ls3ip.com



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

107361 7590 11/13/2020
McDonnell Boehnen Hulbert & Berghoff LLP
Sonos, Inc.
300 South Wacker Drive
Chicago, IL 60606

EXAMINER	
SURVILLO, OLEG	
ART UNIT	PAPER NUMBER
2442	

DATE MAILED: 11/13/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806

TITLE OF INVENTION: CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	02/15/2021

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)

107361 7590 11/13/2020
McDonnell Boehnen Hulbert & Berghoff LLP
Sonos, Inc.
300 South Wacker Drive
Chicago, IL 60606

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.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806

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nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	02/15/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
SURVILLO, OLEG	2442	709-219000

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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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518 CON)	9806
107361	7590	11/13/2020	EXAMINER	
McDonnell Boehnen Hulbert & Berghoff LLP			SURVILLO, OLEG	
Sonos, Inc.				
300 South Wacker Drive			ART UNIT	
Chicago, IL 60606			PAPER NUMBER	
			2442	

DATE MAILED: 11/13/2020

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. 13/864,249	Applicant(s) Millington, Nicholas A. J.	
	Examiner OLEG SURVILLO	Art Unit 2442	AIA (FITF) Status No

-- 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 Request for Continued Examination, response dated 10/13/2020.
☐ 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 47-79. 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 <u>10/13/20</u> .	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. _____.	

/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	
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EXAMINER'S COMMENT

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on October 13, 2020 has been entered.

Response to Arguments

With regard to the Applicants' Remarks dated October 13, 2020:

No new issues are noted. No previously noted issues exist.

Information Disclosure Statement dated 10/13/2020 has been considered by Examiner. No reference(s) was/were found that affect patentability of the pending claims.

As to any arguments not specifically addressed, they are the same as those discussed above.

Allowed Claims

Claims 47-79 are allowed.

Allowable Subject Matter

The examiner's statement of reasons for allowance was previously presented and is unchanged.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to OLEG SURVILLO whose telephone number is (571)272-9691. The examiner can normally be reached on 9:00am - 5:00pm.

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, William Trost can be reached on 571-272-7872. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/OLEG SURVILLO/
Primary Examiner, Art Unit 2442

Issue Classification 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CPC						
Symbol				Type	Version	
G06F	/	3	/	165	F	2013-01-01
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H04N	/	21	/	43615	I	2013-01-01
H04L	/	65	/	4076	I	2013-01-01
H04L	/	65	/	80	I	2013-01-01
H04L	/	69	/	28	I	2013-01-01
G06F	/	16	/	60	I	2019-01-01
G06F	/	16	/	63	I	2019-01-01
G06F	/	16	/	638	I	2019-01-01
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G06F	/	16	/	2322	I	2019-01-01
G06F	/	16	/	635	I	2019-01-01
G06F	/	16	/	639	I	2019-01-01
G05B	/	15	/	02	I	2013-01-01
G06F	/	1	/	00	I	2013-01-01
G06F	/	1	/	12	I	2013-01-01
G06F	/	3	/	048	I	2013-01-01
G06F	/	3	/	0482	I	2013-01-01
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G06F	/	3	/	04847	I	2013-01-01
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G06F	/	3	/	167	I	2013-01-01
G06F	/	17	/	00	I	2013-01-01
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H03G	/	3	/	20	I	2013-01-01
H04L	/	12	/	2854	I	2013-01-01
H04L	/	65	/	1069	I	2013-01-01
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H04L	/	65	/	4084	I	2013-01-01

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	33	
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	07 November 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	56	2

U.S. Patent and Trademark Office

Part of Paper No.: 20201107

Issue Classification 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CPC						
Symbol				Type	Version	
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H04L	/	65	/	601	I	2013-01-01
H04L	/	67	/	12	I	2013-01-01
H04W	/	84	/	20	I	2013-01-01
H05K	/	999	/	99	I	2013-01-01
H04J	/	3	/	0644	I	2013-01-01
H04J	/	3	/	0664	I	2013-01-01
H04R	/	27	/	00	I	2013-01-01
H04L	/	65	/	60	I	2013-01-01
H04L	/	67	/	1095	I	2013-01-01
H04R	/	3	/	12	I	2013-01-01
H04L	/	67	/	26	I	2013-01-01
H04H	/	20	/	103	I	2013-01-01
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G11B	/	20	/	10527	I	2013-01-01
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H04H	/	2201	/	20	A	2013-01-01
H04R	/	2227	/	003	A	2013-01-01
G11B	/	2020	/	10592	A	2013-01-01

CPC Combination Sets					
Symbol				Type	Version
	/		/		

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 33	
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442 (Primary Examiner) _____ (Date) 07 November 2020		O.G. Print Claim(s) 56	O.G. Print Figure 2

Issue Classification 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

INTERNATIONAL CLASSIFICATION			
CLAIMED			
G06F	/	15	/ 16
NON-CLAIMED			
	/		/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	33	
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	07 November 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	56	2

Issue Classification 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47																
CLAIMS																
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	5		15		25		35		45	22	55	23	65	16	75	
	6		16		26		36		46	1	56	24	66	3	76	
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NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	33	
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	07 November 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	56	2

U.S. Patent and Trademark Office

Part of Paper No.: 20201107

<i>Index of Claims</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
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<i>Index of Claims</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CLAIM		DATE								
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27	79						=			

Search Notes 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CPC - Searched*		
Symbol	Date	Examiner
G06F 3/167, 17/00, 17/3074, 3/048, 3/0482, 3/0484, 3/126, 3/16	11/07/2020	OS
H04L 65/60, 12/2812	11/07/2020	OS

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
709	219, 220, 231	11/07/2020	OS

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Updated Inventor search	11/07/2020	OS
Updated Assignee search	11/07/2020	OS
Updated EAST search in USPAT, US-PGPUB, EPO, JPO, and FPRS databases	11/07/2020	OS

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	Text search in US-PGPUB database - See Interference search history printout	11/07/2020	OS

/OLEG SURVILLO/ Primary Examiner.Art Unit 2442	
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BIB DATA SHEET

CONFIRMATION NO. 9806

SERIAL NUMBER 13/864,249	FILING or 371(c) DATE 04/17/2013 RULE	CLASS 709	GROUP ART UNIT 2442	ATTORNEY DOCKET NO. 13-0402 (MBHB 15-518-CON)		
APPLICANTS SONOS, INC., Santa Barbara, CA INVENTORS Nicholas A. J. Millington, Santa Barbara, CA; ** CONTINUING DATA ***** This application is a CON of 13/297,000 11/15/2011 PAT 9182777 which is a CON of 10/816,217 04/01/2004 PAT 8234395 which claims benefit of 60/490,768 07/28/2003 ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 05/21/2013						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and /OLEG SURVILLO/ Acknowledged Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY CA	SHEETS DRAWINGS 5	TOTAL CLAIMS 33	INDEPENDENT CLAIMS 3
ADDRESS McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606 UNITED STATES						
TITLE CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION						
FILING FEE RECEIVED 2800	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			☐ All Fees		
				☐ 1.16 Fees (Filing)		
				☐ 1.17 Fees (Processing Ext. of time)		
				☐ 1.18 Fees (Issue)		
				☐ Other _____		
			☐ Credit			

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S70	1	"8131389".pn.	US-PGPUB; USPAT	OR	ON	2020/11/07 14:56
S71	1	"20020015003"	US-PGPUB; USPAT	OR	ON	2020/11/07 14:57
S72	12,161	G06F3/167.CPC.	US-PGPUB; USPAT	OR	ON	2020/11/07 14:59
S73	3,967	G06F17/00.CPC.	US-PGPUB; USPAT	OR	ON	2020/11/07 14:59
S74	4	G06F17/3074.CPC.	US-PGPUB; USPAT	OR	ON	2020/11/07 14:59
S75	7,858	G06F3/048.CPC.	US-PGPUB; USPAT	OR	ON	2020/11/07 15:00
S76	39,861	G06F3/0482.CPC.	US-PGPUB; USPAT	OR	ON	2020/11/07 15:00
S77	15,297	G06F3/0484.CPC.	US-PGPUB; USPAT	OR	ON	2020/11/07 15:00
S78	2,556	G06F3/126.CPC.	US-PGPUB; USPAT	OR	ON	2020/11/07 15:00
S79	4,133	G06F3/16.CPC.	US-PGPUB; USPAT	OR	ON	2020/11/07 15:00
S80	5,801	H04L65/60.CPC.	US-PGPUB; USPAT	OR	ON	2020/11/07 15:00
S81	1,127	H04L12/2812.CPC.	US-PGPUB; USPAT	OR	ON	2020/11/07 15:00
S82	15,737	709/219.ccls.	US-PGPUB; USPAT	OR	ON	2020/11/07 15:00

S83	9,133	709/220.ccls.	US-PGPUB; USPAT	OR	ON	2020/11/07 15:00
S84	7,659	709/231.ccls.	US-PGPUB; USPAT	OR	ON	2020/11/07 15:00
S85	257	millington-nicholas\$.in.	US-PGPUB; USPAT	OR	ON	2020/11/07 15:00
S86	74	sonos.as. and zone adj player.clm.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/11/07 15:00
S87	76	group\$3 near5 (player or output adj1 device or appliance or multimedia adj1 device) with (location or proximity or vicinity) and (gui or graphical near2 interface) and (player or output adj1 device or appliance or multimedia adj1 device) with (audio or music) and (@ad<"20040401" or @rlad<"20040401")	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/11/07 15:00
S88	5	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) with (performance or latency) near2 (master or leader or broadcast or broadcaster or device or player) with based same (audio or video or streaming or music) and (@ad<"20040401" or @rlad<"20040401")	US-PGPUB; USPAT	OR	ON	2020/11/07 15:02
S89	131	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) with (performance or latency) and sonos	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/11/07 15:02
S90	270	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) and millington-\$.in.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/11/07 15:02
S91	48	((select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server)).clm. and millington-\$.in.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/11/07 15:02

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S92	2	((select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) with (performance or latency) near2 (master or leader or broadcast or broadcaster or device or player) with based same (audio or video or streaming or music)).clm.	US-PGPUB	OR	ON	2020/11/07 15:34
S93	1,157	((select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) with (performance or latency)).clm.	US-PGPUB	OR	ON	2020/11/07 15:35
S94	30	((select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) with (performance or latency) and playback).clm.	US-PGPUB	OR	ON	2020/11/07 15:48

11/7/2020 3:49:42 PM

C:\Users\osurvillo\Documents\EAST\Workspaces\16516567.wsp

dated 10/13/2020

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	8131389		2012-03-06	HARDWICK; John C. et al.			
If you wish to add additional U.S. Patent citation information please click the Add button.							Add	
U.S.PATENT APPLICATION PUBLICATIONS							Remove	
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	20020015003		2002-02-07	KATO; Masami et al.			
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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	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	2001251360	JP	A	2001-09-14	SHARP KK.		×
	2	2003037585	JP	A	2003-02-07	SONY CORP.		☒
	3	2003101958	JP	A	2003-04-04	TOSHIBA CORP.		☒

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

	4	02073851	WO	A1	2002-09-19	PULSE LINK INC [US]	☐
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NON-PATENT LITERATURE DOCUMENTS

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	Advisory Action mailed on 08 March 2017, issued in connection with U.S. Patent Application No. 13/871795, filed on 26 April 2013, 22 pages.	
	2	CHINESE PATENT OFFICE, Second Office Action mailed on 27 February 2017, issued in connection with Chinese Patent Application No. 201380044380.2, 22 pages.	
	3	IEEE Standards 1588-2002. IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems, 8 November 2002, 154 pages.	
	4	JAPANESE PATENT OFFICE, Office Action and Translation mailed on 17 August 2020, issued in connection with Japanese Patent Application No. 2019-104398, 5 pages.	×
	5	Non-Final Office Action mailed on 11 August 2020, issued in connection with U.S. Patent Application No. 16/383910, filed on 15 April 2019, 23 pages.	☐
	6	Non-Final Office Action mailed on 5 August 2020, issued in connection with U.S. Patent Application No. 16/544905, filed on 20 August 2019, 15 pages.	☐
	7	Notice of Allowance mailed on 13 July 2020, issued in connection with U.S. Patent Application No. 16/516567, filed on 19 July 2019, 19 pages.	☐
	8	Notice of Allowance mailed on 16 September 2020, issued in connection with U.S. Patent Application No. 15/946660, filed on 5 April 2018, 5 pages.	☐

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	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

9	Notice of Allowance mailed on 22 September 2020, issued in connection with U.S. Patent Application No. 16/545844, filed on 20 August 2019, 8 pages.	☐
10	Notice of Allowance mailed on 24 August 2020, issued in connection with U.S. Patent Application No. 16/009182, filed on 14 June 2018, 8 pages.	☐
11	Notice of Allowance mailed on 29 September 2020, issued in connection with U.S. Patent Application No. 16/459565, filed on 1 July 2019, 7 pages.	☐
12	Notice of Allowance mailed on 29 September 2020, issued in connection with U.S. Patent Application No. 16/516567, filed on 19 July 2019, 7 pages.	☐
13	Slim Devices. Index of /downloads. slimdevices.com, 13 April 2003, 1 page.	☐
14	Slim Devices. Index of /downloads/SLIMP3_Server_v4.0. slimdevices.com, 14 April 2003, 1 page.	☐
15	Slim Devices. Support Downloads. slimdevices.com, 11 April 2003, 1 page.	☐
16	Sonos, Inc. v. Google LLC. Order 20: Construing the Terms of the Asserted Claims of the Patents at Issue dated 25 September 2020, 53 pages.	☐
17	Sonos, Inc. v. Google LLC. Respondents' Final Invalidity Claim Charts for US Patent 10,209,953, Exhibits 1-10 and B, dated 4 September 2020, 406 pages.	☐
18	Sonos, Inc. v. Google LLC. Respondents' Final Invalidity Claim Charts for US Patent 9,195,258, Exhibits 1-10 and B, dated 4 September 2020, 461 pages.	☐
19	Sonos, Inc. v. Google LLC. Respondents' Final Invalidity Contentions [Redacted] dated 4 September 2020, 261 pages.	☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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EXAMINER SIGNATURE

Examiner Signature	/OLEG SURVILLO/	Date Considered	11/07/2020
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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.

☒ A certification statement is not submitted herewith.

SIGNATURE

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	/Jeffrey P. Armstrong/	Date (YYYY-MM-DD)	2020-10-14
Name/Print	Jeffrey P. Armstrong	Registration Number	54967

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt	
EFS ID:	40832579
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Jeffrey Armstrong
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	13-OCT-2020
Filing Date:	17-APR-2013
Time Stamp:	16:51:58
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	Non Patent Literature	NPL15_slimdevices_support_downloads.pdf	391593 91d065e6b7efcadcdfcec8f1a2d02931501b20e4	no	1
Warnings:					

Information:					
2	Non Patent Literature	NPL16_Sonos_v_Google_Order_20_Construing_the_Terms_9-25-20_53pages.pdf	664743	no	53
			8a230feaa6a3659e030d86abdb1a22d23ab08f34		
Warnings:					
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3	Non Patent Literature	NPL17_Sonos_v_Google_Final_Invalidity_charts_953_ex-1-10_and_B_9-4-20_406pages.pdf	17402146	no	406
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Information:					
4	Non Patent Literature	NPL18_Sonos_v_Google_Final_Invalidity_charts_258_ex-1-10_and_b_9-4-20_461pages.pdf	19325555	no	461
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Information:					
5	Non Patent Literature	NPL19_Sonos_v_Google_Respondents_Final_Invalidity_Contentions_redacted_9-4-20_261pages.pdf	8540365	no	261
			4583a6c76da5e257c4c59deb093dcf32261d1270		
Warnings:					
Information:					
Total Files Size (in bytes):			46324402		
<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>					

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL **(Submitted Only via EFS-Web)**

Application Number	13864249	Filing Date	2013-04-17	Docket Number (if applicable)	13-0402 (15-518-CON)	Art Unit	2442
First Named Inventor	Millington			Examiner Name	Survillo		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.

Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 1, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☐ Other _____

☒ Enclosed

☐ Amendment/Reply

☒ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
 (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No. 132490

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)

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

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Signature of Registered U.S. Patent Practitioner			
Signature	Jeffrey P. Armstrong/	Date (YYYY-MM-DD)	2020-10-14
Name	Jeffrey P. Armstrong	Registration Number	54967

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is : 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 estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

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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.
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	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	2	2003037585	JP	A	2003-02-07	SONY CORP.		☒
	3	2003101958	JP	A	2003-04-04	TOSHIBA CORP.		☒

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249	
	Filing Date		2013-04-17	
	First Named Inventor	MILLINGTON; Nicholas A. J.		
	Art Unit	2442		
	Examiner Name	SURVILLO, Oleg		
	Attorney Docket Number	13-0402		

	4	02073851	WO	A1	2002-09-19	PULSE LINK INC [US]	☐
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	1	Advisory Action mailed on 08 March 2017, issued in connection with U.S. Patent Application No. 13/871795, filed on 26 April 2013, 22 pages.	
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	5	Non-Final Office Action mailed on 11 August 2020, issued in connection with U.S. Patent Application No. 16/383910, filed on 15 April 2019, 23 pages.	☐
	6	Non-Final Office Action mailed on 5 August 2020, issued in connection with U.S. Patent Application No. 16/544905, filed on 20 August 2019, 15 pages.	☐
	7	Notice of Allowance mailed on 13 July 2020, issued in connection with U.S. Patent Application No. 16/516567, filed on 19 July 2019, 19 pages.	☐
	8	Notice of Allowance mailed on 16 September 2020, issued in connection with U.S. Patent Application No. 15/946660, filed on 5 April 2018, 5 pages.	☐

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9	Notice of Allowance mailed on 22 September 2020, issued in connection with U.S. Patent Application No. 16/545844, filed on 20 August 2019, 8 pages.	☐
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13	Slim Devices. Index of /downloads. slimdevices.com, 13 April 2003, 1 page.	☐
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	Filing Date	2013-04-17
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	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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Signature	/Jeffrey P. Armstrong/	Date (YYYY-MM-DD)	2020-10-14
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Bibliographic data: JP2001251360 (A) — 2001-09-14

SYSTEM AND METHOD FOR TRANSMITTING AND SYNCHRONIZING MEDIA
CONTENTS IN REAL TIME IN PACKET NETWORK

Inventor(s): ISHII ATSUSHI ± (ISHII ATSUSHI)

Applicant(s): SHARP KK ± (SHARP CORP)

Classification: - international: H04J3/00; H04J3/06; H04L12/56; H04L29/06;
H04L7/00; H04N7/173; (IPC1-7): H04J3/00;
H04J3/06; H04L12/56; H04L7/00; H04N7/173
- cooperative: H04L29/06027 (EP); H04L65/1026 (EP);
H04L65/1036 (EP); H04L65/4076 (EP); H04L65/80
(EP); H04L69/28 (EP)

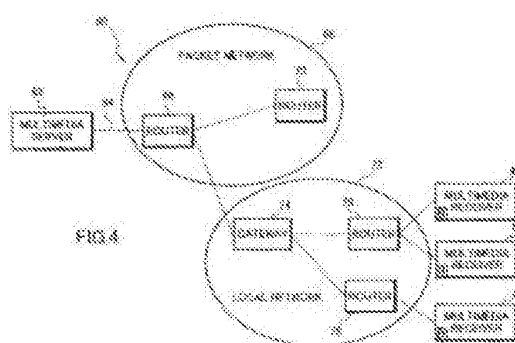
**Application
number:** JP20010015572 20010124

**Priority
number(s):** US20000499701 20000207

**Also published
as:** DE60118269 (T2) EP1122931 (A2) EP1122931 (A3)
EP1122931 (B1) JP4475827 (B2) more

Abstract of JP2001251360 (A)

PROBLEM TO BE SOLVED: To provide a multimedia carrier network where receivers can provide synchronized A/V outputs. **SOLUTION:** The multimedia carrier network includes a multimedia server 62 that generates and transmits a multimedia packet 64 including multimedia A/V information in the reproduction order, a packet network 66 having routers 68, 70 connected to the server 62 so as to receive the packet 64



and to distribute the packet 64 to destinations, a means that inserts total delay information(TDI) including an end-to-end full delay(TED) and a cumulative network delay(CND) to the packet 64, and receivers 80, 82, 84 that receive the media packet 64 having the TDI. Each receiver includes a buffer that stores the received packet 64, a sequencing means that retrieves the stored packet 64 from the buffer and that arranges the packets 64 in the reproduction order, and a reproduction device that reproduces the packet at a point of time TED after transmission of the packet by the server 62.

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開2001-251360

(P2001-251360A)

(43) 公開日 平成13年9月14日 (2001.9.14)

(51) Int.Cl. ⁷	識別部号	F I	サーチワード (参考)
H 0 4 L 12/56	2 3 0	H 0 4 L 12/56	2 3 0 B
H 0 4 J 3/00		H 0 4 J 3/00	M
	3/06		Z
H 0 4 L 7/00		H 0 4 L 7/00	Z
// H 0 4 N 7/173	6 2 0	H 0 4 N 7/173	6 2 0 D
審査請求 未請求 請求項の数23 O L (全 13 頁)			

(21) 出願番号 特願2001-15572(P2001-15572)

(22) 出願日 平成13年1月24日 (2001.1.24)

(31) 優先権主張番号 0 9 / 4 9 9 7 0 1

(32) 優先日 平成12年2月7日 (2000.2.7)

(33) 優先権主張国 米国 (US)

(71) 出願人 000005049

シャープ株式会社

大阪府大阪市阿倍野区長池町22番22号

(72) 発明者 イシイ アツシ

アメリカ合衆国, 98663 ワシントン州,

バンクーバー, 8611 エヌ, ダブリュ, 18
番アベニュー

(74) 代理人 100079843

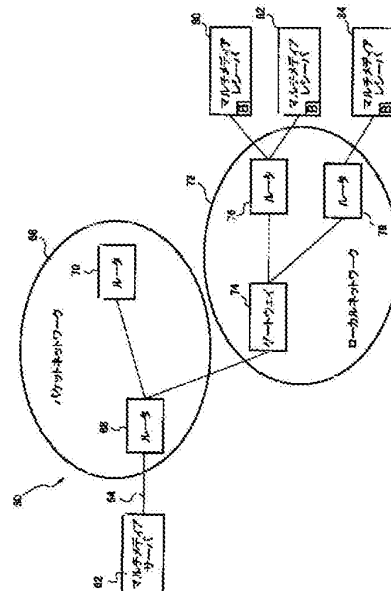
弁理士 高野 明近 (外 2 名)

(54) 【発明の名称】 パケットネットワークにおけるリアルタイムメディアコンテンツを伝送し同期化するシステム及び方法

(57) 【要約】

【課題】 マルチメディア搬送ネットワークの複数のレシーバにおいて同期化したA/V出力を提供する。

【解決手段】 マルチメディアのA/V情報を再生順に含むマルチメディアパケット64を生成・伝送するマルチメディアサーバ62と、パケット64を受信するためにサーバ62と接続した、パケット64を複数の宛先に配信する複数のルータ68、70を有するパケットネットワーク66と、エンドツーエンドの全遅延 (TED) と累積ネットワーク遅延 (CND) を含む総遅延情報 (TDI) をパケット64に挿入する手段と、TDIを有するメディアパケット64を受信する複数のレシーバ80、82、84を含み、各レシーバは受信したパケット64を蓄積するバッファと、蓄積したパケット64をバッファから検索しパケット64を再生順に配列する順序付け手段と、そのパケットをサーバ62による伝送後TEDの時点で再生する再生機構を含む。



【特許請求の範囲】

【請求項1】 リアルタイムマルチメディアコンテンツを送信し同期化するシステムにおいて、マルチメディアオーディオ／ビジュアル情報を再生順に有するマルチメディアパケットを生成し、該マルチメディアパケットを送信するマルチメディアサーバと、複数の目的地に前記マルチメディアパケットを配信する複数のルータを有し、前記マルチメディアパケットを受信するために前記マルチメディアサーバに接続しているパケットベースの通信ネットワークと、エンドツーエンドの全遅延（TED）と累積ネットワーク遅延（CND）を含む総遅延情報（TDI）を前記マルチメディアパケットに挿入する挿入手段と、TDIを有する前記マルチメディアパケットを受信する複数のマルチメディアレシーバとを有し、各マルチメディアレシーバは、受信したマルチメディアパケットを蓄積するバッファと、該バッファから蓄積したマルチメディアパケットを検索し該マルチメディアパケットを前記再生順に配列するためのシーケンス手段と、該シーケンス手段により検索し配列したマルチメディアパケットを前記マルチメディアサーバで伝送後TEDの時間に再生するための再生機構とを含んでいることを特徴とするリアルタイムマルチメディアコンテンツを送信し同期化するシステム。

【請求項2】 前記挿入手段は前記マルチメディアサーバ内に設けられていることを特徴とする請求項1に記載のリアルタイムマルチメディアコンテンツを送信し同期化するシステム。

【請求項3】 前記挿入手段はルータ内に設けられていることを特徴とする請求項1に記載のリアルタイムマルチメディアコンテンツを送信し同期化するシステム。

【請求項4】 前記パケットベースの通信ネットワークと少なくとも幾つかの前記マルチメディアレシーバとの間に設けられ、ゲートウェイを含むローカルエリアネットワーク（LAN）をさらに含んでいることを特徴とする請求項1に記載のリアルタイムマルチメディアコンテンツを送信し同期化するシステム。

【請求項5】 前記挿入手段は前記ゲートウェイ内に設けられていることを特徴とする請求項4に記載のリアルタイムマルチメディアコンテンツを送信し同期化するシステム。

【請求項6】 前記ルータの少なくとも1つは、マルチメディアパケットを複写する複写手段を含み、前記挿入手段は前記ルータ内に設けられ、前記ルータはTDIを前記複写手段により複写した各複写マルチメディアパケットに挿入することを特徴とする請求項1に記載のリアルタイムマルチメディアコンテンツを送信し同期化するシステム。

【請求項7】 マルチメディアパケットが生存可能なパケットであるか、又は、マルチメディアパケットが生存不可能なパケットであるかを決定する手段をさらに含

み、該生存不可能なパケットを破棄することを特徴とする請求項1に記載のリアルタイムマルチメディアコンテンツを送信し同期化するシステム。

【請求項8】 前記マルチメディアレシーバは、前記挿入手段からより大きいTDIを要求する手段を含むことを特徴とする請求項1に記載のリアルタイムマルチメディアコンテンツを送信し同期化するシステム。

【請求項9】 リアルタイムマルチメディアコンテンツを送信し同期化する方法において、マルチメディアオーディオ／ビジュアル情報を複数のマルチメディアパケットにローディングするステップと、エンドツーエンドの全遅延（TED）と累積ネットワーク遅延（CND）を含む総遅延情報（TDI）を少なくとも1つの前記マルチメディアパケットに挿入するステップと、複数のマルチメディアレシーバに前記マルチメディアパケットを再生順にパケットベースの通信ネットワークで伝送するステップと、各マルチメディアレシーバに前記マルチメディアパケットを一時保管するステップと、前記マルチメディアパケットを再生順に呼び出すステップと、前記マルチメディアパケットをTEDの時点で各レシーバで再生するステップとを含んでなるリアルタイムマルチメディアコンテンツを送信し同期化する方法。

【請求項10】 前記挿入ステップは、1つのマルチメディアサーバにおけるTDIの挿入を含むことを特徴とする請求項9に記載のリアルタイムマルチメディアコンテンツを送信し同期化する方法。

【請求項11】 前記挿入ステップは、前記パケットベースのネットワークに設けられた1つのルータにおけるTDIの挿入を含むことを特徴とする請求項9に記載のリアルタイムマルチメディアコンテンツを送信し同期化する方法。

【請求項12】 前記挿入ステップは、前記パケットベースのネットワークと1つのマルチメディアレシーバとの間に設けられたローカルエリアネットワーク（LAN）に設けられているゲートウェイにおけるTDIの挿入を含むことを特徴とする請求項9に記載のリアルタイムマルチメディアコンテンツを送信し同期化する方法。

【請求項13】 複数のマルチメディアレシーバにマルチキャストするためにマルチメディアパケットを複写するステップを含み、該ステップは、TDIを幾つかの前記複写されたマルチメディアパケットに挿入することを特徴とする請求項9に記載のリアルタイムマルチメディアコンテンツを送信し同期化する方法。

【請求項14】 伝送期間においてCND>TEDであれば何時でもそのマルチメディアパケットを破棄するステップを含むことを特徴とする請求項9に記載のリアルタイムマルチメディアコンテンツを送信し同期化する方法。

【請求項15】 CND>TEDであればTEDの値を増大させるステップを含むことを特徴とする請求項14

に記載のリアルタイムマルチメディアコンテンツを送送し同期化する方法。

【請求項16】 マルチメディアパケットが生存可能なパケットであるか、又は、生存不可能なパケットであるかを決定するステップと、生存不可能なパケットを破棄するステップとをさらに含むことを特徴とする請求項9に記載のリアルタイムマルチメディアコンテンツを送送し同期化する方法。

【請求項17】 マルチメディアパケットが生存可能なパケットか、又は、生存不可能なパケットかを決定するステップと、生存不可能なパケットを破棄するステップとを含んでなるリアルタイムマルチメディアコンテンツを送送し同期化する方法。

【請求項18】 マルチメディアのオーディオ/ビジュアル情報を複数のマルチメディアのパケットにロードイングするステップと、エンドツーエンドの全遅延(TED)と累積ネットワーク遅延(CND)を含む総遅延情報(TDI)をマルチメディアパケットの少なくとも1つに挿入するステップと、複数のマルチメディアレシーバにパケットベースのネットワークを介し前記マルチメディアパケットを再生順に伝送するステップと、伝送期間においてCND>TEDであれば何時でも前記マルチメディアパケットを破棄するステップと、各マルチメディアレシーバにおいて前記マルチメディアパケットを一時保管するステップと、前記マルチメディアパケットを再生順に呼び出すステップと、前記マルチメディアパケットを各レシーバにおいてTEDの時点で再生するステップとをさらに含んでいる請求項17に記載のリアルタイムマルチメディアコンテンツを送送し同期化する方法。

【請求項19】 前記挿入ステップは、1つのマルチメディアサーバにおけるTDIの挿入を含むことを特徴とする請求項18に記載のリアルタイムマルチメディアコンテンツを送送し同期化する方法。

【請求項20】 前記挿入ステップは、前記パケットベースのネットワークに設けられた1つのルータにおけるTDIの挿入を含むことを特徴とする請求項18に記載のリアルタイムマルチメディアコンテンツを送送し同期化する方法。

【請求項21】 前記挿入ステップは、前記パケットベースのネットワークと1つのマルチメディアレシーバとの間に設けられたローカルエリアネットワーク(LAN)に設けられているゲートウェイにおけるTDIの挿入を含むことを特徴とする請求項18に記載のリアルタイムマルチメディアコンテンツを送送し同期化する方法。

【請求項22】 複数のマルチメディアレシーバにマルチキャストするためにマルチメディアパケットを複製するステップを含み、該ステップは、TDIを幾つかの前記複製されたマルチメディアパケットに挿入することを

含むことを特徴とする請求項18に記載のリアルタイムマルチメディアコンテンツを送送し同期化する方法。

【請求項23】 CND>TEDであればTEDの値を増大させるステップを含むことを特徴とする請求項18に記載のリアルタイムマルチメディアコンテンツを送送し同期化する方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、リアルタイムマルチメディアコンテンツを送送し同期化するシステム及び方法に関し、より詳細には、マルチメディア装置例えばモニタ及びオーディオシステムにより再生される際のマルチキャストにより配信されたメディアコンテンツを同期化するための、リアルタイムマルチメディアコンテンツを送送し同期化するシステム及び方法に関する。

【0002】

【従来の技術】集会及び展示場のような状況においては、マルチビデオモニタで同期化した同一の動画コンテンツを再生することが要求される。一般には、個別に配置したモニタとスピーカ間の音声と動画を同期化させることが要求される。現在のリアルタイムメディア伝送技術は、サービス品質(QoS)が保証されないパケットネットワークを介してオーディオ/ビデオストリームを妥当な品質で、より高品質のネットワークに比べて安い価格で伝送することを可能にしている。かように、複数のレシーバにパケットネットワークにより配信したマルチメディアコンテンツを同期化して再生することが要求される。

【0003】図3は、パケットネットワークを使用する、従来技術によるマルチメディアコンテンツの配信システムを示す図で、図中10は配信システムを示している。マルチメディアサーバ12は、マルチメディアオーディオ/動画コンテンツを含むマルチメディアパケット14のストリームを生成する。通常、サーバ又はソース(情報発生源)12は、例えば20ms毎に1パケットの一定速度(パケットレート)でマルチメディアパケットを生成する。パケットのサイズは、マルチメディアのコーデックに依存し、固定又は可変サイズのパケットを生成することになる。生成されたマルチメディアパケットは、複数のルータすなわちノード18、20、22、24、28、30を有するパケットネットワーク16を介して伝送され、マルチメディアレシーバ32、34、36、38に配信される。複数の装置に配信する伝送機構は、“マルチキャスト”として知られている。サーバからのマルチメディアコンテンツの受信を望む全てのレシーバは、1つのマルチキャストグループに入る。パケットネットワーク16内のルータはこのマルチキャストグループを知っており、受信したマルチメディアパケットを複数ルートに伝送する。各レシーバはスピーカ及び/又は動画ディスプレイを装備しており、受信した

マルチメディアパケット中のコンテンツをリアルタイムで再生する。マルチメディアレシーバは、受信したマルチメディアパケットを或る期間一時保管して、ネットワークにより生じた遅延差を吸収しマルチメディアパケットを正しい順序で再生する。

【0004】IPネットワークのような従来のパケットネットワークの場合、複数パケットは各ルータで待ち行列を形成する。パケットの待ち時間は、特定ルータが処理する通信量により異なる。従って、各マルチメディアレシーバに配信された各マルチメディアパケットは予測不能の遅延を持ち得る。その結果、オーディオ／動画コンテンツは、複数の場所で同期化せずに再生される。

【0005】前述のように、リアルタイムマルチメディア伝送技術は、現在、サービス品質(QoS)を保証しないパケットネットワークを介して妥当な品質で伝送することを可能にしている。無線データネットワークのような帯域を制限された通信チャンネルによりデータを伝送するモバイルインターネットのアクセスが増大するに従い、最小の帯域を要するリアルタイムでメディアパケットを伝送する技術が必要となり、その重要性が益々増大している。

【0006】図4は、パケットベースのリアルタイムメディア伝送システムを示す図で、図中40はリアルタイムメディア伝送システムを示している。マルチメディアソース又はサーバ42は、オーディオ／動画のマルチメディアコンテンツを有するマルチメディアパケット44をパケットネットワーク46に周期的に伝送する。パケットネットワーク46において、各マルチメディアパケットは複数のネットワークノードすなわちルータ48、50、52、54によりレシーバ56に向け配信される。各マルチメディアパケットは、レシーバ56で再生されるためのタイミングをセットするために用いられるタイミング情報を含んでいる。図3中の複数のルータとレシーバは、簡明にするために図4には示していない。

【0007】パケットネットワーク46は各マルチメディアパケットの配信における遅延時間に差を生じる。さらに、ネットワーク46は伝送時と同じ順序でマルチメディアパケットを配信することを保証しない。かように、レシーバはバッファを装備して、マルチメディアパケット受信における遅延差及び／又は順序の不同に対処する。しかしながら、コンテンツのリアルタイムプロパティにより、レシーバは受信したマルチメディアパケットを、着信時の遅延時間が或る特定の値を超えるか、或は、再生予定時間までに着信しなければ破棄することになる。

【0008】図5は、レシーバで受信して再生するパケットの一例を示す図である。各パケットはタイミング情報を含んでいる。ライン1は、サーバ42により順次に伝送された7つのマルチメディアパケットを示す。ライン2は、レシーバでマルチメディアパケットを受信した

順序を示している。ライン3は、レシーバでの再生順序を示している。図5は、タイミング情報を持つマルチメディアパケットを過度の遅延により破棄することを示している。基本的に、従来技術のパケットネットワークにおけるルータは、パケットの伝送及び受信時の遅延に気付かず、パケット伝送の順序変更にも気付くことがない。かように、各ルータは、マルチメディアパケットがレシーバで再生される機会を持たない場合でも各受信したリアルタイムマルチメディアパケットを、次のルータ又はレシーバに再度送信する。2つのルータ間の物理的なリンク又はレシーバと近隣のルータ間の物理的なリンクが制限された帯域を有する場合、レシーバ側で破棄されるマルチメディアパケットの伝送は、リンクの貴重な帯域のかんりの部分を無駄に使用することになる。遅延と順序変更は、マルチメディアパケットをルータ48からルータ50とルータ52を介しルータ54へ、又はルータ48から直接ルータ54へと経路を可変にすることにより説明される。

【0009】1985年3月19日付けでMontgomeryの“パケット交換システム用タイムスタンプing (Time stamping for a packet switching system)” に対し付与された米国特許第4, 506, 358号の明細書には、パケットネットワークにおけるネットワークの遅延を測定する方法が記載されており、各パケットに累積ネットワークの遅延と各ネットワークノードにおける各パケットの着信と再伝送のタイムスタンプとを示す情報フィールドを含ませ、各パケットに対するネットワークの各ノードにおける情報フィールドを更新して各ノードにおいて発生する遅延、即ち、再伝送時間と着信時間の差を加算することが開示されている。

【0010】1985年7月16日付けでCrockettの“パケット交換システムにおけるリアルタイムクロックの同期化 (Synchronization of real-time clocks in a packet switching system)” に対し付与された米国特許第4, 530, 091号の明細書には、X. 25 (CCITT) ネットワークを介したスタンダードリアルタイムクロックに遠隔リアルタイムクロックを同期させる手段が記載されているが、マルチメディアストリームを同期させる方法を教示又は示唆しておらず、パケットネットワークに生じるネットワーク遅延を考慮していない。

【0011】1990年4月17日付けでBustini他の“デジタルパケット交換ネットワーク (Digital packet switching networks)” に対し付与された米国特許第4, 918, 687号の明細書には、ネットワーク内のノード列でボイスパケット (音声パケット) をクリッピングする必要がある場合に、クリッピングに適していることを示す内容を持つ音声パケットをクリッピングすることにより、連続したパケットの損失を避ける方法が記載されている。

【0012】1995年7月11日付けでHuchy J 他“遅延に係わるサービス品質を保証するパケット指向通信ネットワークにおけるノード間リンク帯域の割り当て方法 (Method for allocating internodal link bandwidth in a packet oriented communication network to guarantee delay quality-of-service)”に対し付与された米国特許第5,432,790号の明細書には、予定のエンドツーエンドの遅延に係わるサービス品質 (QoS) を維持するために統計学的な利得 (ゲイン) を提供し、最悪時の最大遅延と最悪時の平均遅延を保証するようにノード間リンクに帯域を割り当てる方法が記載されている。

【0013】1995年8月22日付けでRiddle の“リアルタイムデータ移送用プロトコル (Protocol for transporting real time data)”に対し付与された米国特許第5,444,709号の明細書には、タイミングがずれて受信されたデータを破棄することによりリアルタイムデータ伝送の等時性を維持する方法が記載されている。

【0014】1995年9月12日付けでGruber 他“電話通信ネットワークの遅延の監視 (Delay monitoring of telecommunication networks)”に対し付与された米国特許第5,450,394号の明細書には、ネットワーク通過時間の往復遅延の測定手段が記載されているが、マルチメディアの伝送と同期化のために知る必要がある遅延は1方向のネットワーク遅延である。

【0015】1996年9月17日付けでSampat 他“動画、オーディオ及び又はテキストストリームを有するチャネルを選択・再生するユーザインタフェース、その方法及び装置 (User interface, method, and apparatus selecting and playing channels having video, audio, and/or text streams)”に対し付与された米国特許第5,557,724号の明細書には、マルチメディアストリームを再生するためのコンピュータシステム内ユーザインタフェースが記載されている。

【0016】1997年1月14日付けでSung 他“マルチメディアシステム用のプログラム可能なオーディオ/動画同期化方法及び装置 (Programmable audio-video synchronization method and apparatus for multimedia systems)”に対し付与された米国特許第5,594,660号の明細書には、オーディオ/動画ストリームを単一ネットワークベースのレシーバに同期して再生する手段が記載されている。

【0017】1997年1月28日付けでRasena 他“MPEG再生システムにおけるオーディオ/動画同期化方法及び装置 (Method and apparatus for audio and video synchronizing in MPEG playback systems)”に対し付与された米国特許第5,598,352号の明細書には、オーディオ/動画ストリームを単一ネットワークベースのレシーバに同期して再生する手段が

記載されている。

【0018】1997年4月22日付けでAgawal 他“ネットワーク化したマルチメディアストリーム用の同期化システム (Synchronization system for networked multimedia streams)”に対し付与された米国特許第5,623,483号の明細書には、統計的ネットワーク遅延分布からエンドツーエンドの全遅延を計算し、各サーバ及び各レシーバに配置された同期クロックを介して異なるソースからの2つのメディアストリームの同期を決定するレシーバ用手段が記載されている。

【0019】1997年5月13日付けでLee 他“パケットバッファにおける逐次パケットロス制御 (Control of consecutive packet loss in a packet buffer)”に対し付与された米国特許第5,629,936号の明細書には、所望のパケットギャップに基いてパケットをドロップして逐次パケットの損失を制御する方法が記載されている。

【0020】1997年10月7日付けでKarol 他“リアルタイムトラフィックに対する保証帯域配信を持つ最小遅延システム (Delay-minimizing system with guaranteed bandwidth delivery for real-time traffic)”に対し付与された米国特許第5,675,573号の明細書には、各トラフィックの流れに係る個別の帯域保証条件に基づく帯域の割り当て方法が記載されている。

【0021】1997年10月28日付けでZarras の“リアルタイムネットワーク装置用マルチパーティの同期化を実現する装置と方法 (Apparatus and methods achieving multiparty synchronization for real-time network application)”に対し付与された米国特許第5,682,384号の明細書にはネットワークの単一レシーバに同期して複数のソースからのコンテンツを再生する手段が記載されている。

【0022】1998年6月16日付けでZhu 他“リアルタイムマルチメディアのストリーミングのための装置、システム及び方法 (Device, system and method of real-time multimedia streaming)”に対し付与された米国特許第5,768,527号の明細書には、再伝送による損失パケットの回復方法が記載されている。

【0023】1998年9月1日付けでFischbach 他“データネットワークにおけるデータパケットリアルタイム伝送のためのプロセスとデータネットワーク (Data network and a process for real time transmission of data packets in a data network)”に対し付与された米国特許第5,802,060号の明細書には、ネットワークアクセスをトークンの交換によって制御する局に対しパケット伝送を優先させる方法が記載されている。

【0024】1998年9月29日付けでDaum 他“MPEG再生システム用ストリームの同期化方法及び装

置 (Stream synchronization method and apparatus for MPEG playback system) ” に対し付与された米国特許第5, 815, 634号の明細書には、単一ネットワークベースのレシーバに同期してオーディオ／動画ストリームを再生する手段が記載されている。

【0025】1998年12月1日付けでKerrの“移送ネットワークを介してマルチメディア会議データストリームを移送するための方法、装置及びシステム (Methods, apparatus, and systems for transporting multimedia conference data streams through a transport network)” に対し付与された米国特許第5, 844, 600号の明細書には、ATMネットワークを用いるオーディオ／動画会議手段が記載されている。オーディオストリームは、ネットワークベースのミキサーで結合させて端末機に配信する。各端末機では、受信したオーディオ／動画ストリームを同期して再生するが、しかしながら、ネットワーク中の複数端末機で同時再生することは何も開示されていない。

【0026】1999年2月23日付けでHaighの“結合動画／オーディオデータの同期化の測定と調整 (Measuring and regulating synchronization of merged video and audio data)” に対し付与された米国特許第5, 874, 997号の明細書には、単一ネットワークベースのレシーバに同期してオーディオ／動画ストリームを再生する手段が記載されている。

【0027】インターネットエンジニアリングタスクフォース (IETF) は、コメント要求 (RFC) とそれに応答して記録されたコメントを公開している。

RFC1889: リアルタイムプロパティを有するデータ用の現存するトランスポートレイヤを利用するリアルタイムエンドツーエンドプロトコル。

RFC2508: 低速シリアルリンク用IP/UCD/RTPヘッダの圧縮。

RFC1144: RFC2508と類似であるがTCP/IPパケット用である低速シリアルリンク用TCP/IPヘッダの圧縮。

【0028】

【発明が解決しようとする課題】従来技術のシステムは、1つ以上の情報源からのマルチメディアのデータストリームをパケットベースのシステムにより複数のレシーバに伝送し同期化するのに付随して発生する問題を考慮していない。異なる場所から伝送された相互に関連するメディアストリームを1つのレシーバで同期化して再生することを可能にする多数の技法が存在しているが、公知の従来技術は、単一ソース又は複数のソースにより生成されたメディアストリームをパケットベースのネットワークによりマルチキャストして複数の場所で同期再生させることはできない。

【0029】本発明は、上述のごとき実状に鑑みてなされたものでありマルチメディア搬送ネットワークの複数

のレシーバにおいて同期化したA/V出力を提供することが可能な、リアルタイムマルチメディアコンテンツを伝送し同期化するシステム及び方法を提供することをその目的とする。また、本発明は、ネットワークのレシーバにより使用されないマルチメディアのパケットの伝送を阻止することが可能な、リアルタイムマルチメディアコンテンツを伝送し同期化するシステム及び方法を提供することを他の目的とする。

【0030】

【課題を解決するための手段】本発明は前記課題を解決するためになされたものであって、その第1の技術手段は、リアルタイムマルチメディアコンテンツを伝送し同期化するシステムにおいて、マルチメディアオーディオ／ビジュアル情報を再生順に有するマルチメディアパケットを生成し、該マルチメディアパケットを伝送するマルチメディアサーバと、複数の目的地に前記マルチメディアパケットを配信する複数のルータを有し、前記マルチメディアパケットを受信するために前記マルチメディアサーバに接続しているパケットベースの通信ネットワークと、エンドツーエンドの全遅延 (TED) と累積ネットワーク遅延 (CND) を含む総遅延情報 (TDI) を前記マルチメディアパケットに挿入する挿入手段と、TDIを有する前記マルチメディアパケットを受信する複数のマルチメディアレシーバとを有し、各マルチメディアレシーバは、受信したマルチメディアパケットを蓄積するバッファと、該バッファから蓄積したマルチメディアパケットを検索し該マルチメディアパケットを前記再生順に配列するためのシーケンス手段と、該シーケンス手段により検索し配列したマルチメディアパケットを前記マルチメディアサーバで伝送後TEDの時間に再生するための再生機構を含んでいることを特徴としたものである。

【0031】第2の技術手段は、第1の技術手段において、前記挿入手段は前記マルチメディアサーバ内に設けられていることを特徴としたものである。

【0032】第3の技術手段は、第1の技術手段において、前記挿入手段はルータ内に設けられていることを特徴としたものである。

【0033】第4の技術手段は、第1の技術手段において、前記パケットベースの通信ネットワークと少なくとも幾つかの前記マルチメディアレシーバとの間に設けられ、ゲートウェイを含むローカルエリアネットワーク (LAN) をさらに含んでいることを特徴としたものである。

【0034】第5の技術手段は、第4の技術手段において、前記挿入手段は前記ゲートウェイ内に設けられていることを特徴としたものである。

【0035】第6の技術手段は、第1の技術手段において、前記ルータの少なくとも1つは、マルチメディアパケットを複写する複写手段を含み、前記挿入手段は前記

ルータ内に設けられ、前記ルータはT D Iを前記複写手段により複写した各複写マルチメディアパケットに挿入することを特徴としたものである。

【0036】第7の技術手段は、第1の技術手段において、マルチメディアパケットが生存可能なパケットであるか、又は、マルチメディアパケットが生存不可能なパケットであるかを決定する手段をさらに含み、該生存不可能なパケットを破棄することを特徴としたものである。

【0037】第8の技術手段は、第1の技術手段において、前記マルチメディアレシーバは、前記挿入手段からより大きいT D Iを要求する手段を含むことを特徴としたものである。

【0038】第9の技術手段は、リアルタイムマルチメディアコンテンツを伝送し同期化する方法において、マルチメディアオーディオ/ビジュアル情報を複数のマルチメディアパケットにローディングするステップと、エンドツーエンドの全遅延(T E D)と累積ネットワーク遅延(C N D)を含む総遅延情報(T D I)を少なくとも1つの前記マルチメディアパケットに挿入するステップと、複数のマルチメディアレシーバに前記マルチメディアパケットを再生順にパケットベースの通信ネットワークで伝送するステップと、各マルチメディアレシーバに前記マルチメディアパケットを一時保管するステップと、前記マルチメディアパケットを再生順に呼び出すステップと、前記マルチメディアパケットをT E Dの時点で各レシーバで再生するステップとを含んでなるリアルタイムマルチメディアコンテンツを伝送し同期化する方法である。

【0039】第10の技術手段は、第9の技術手段において、前記挿入ステップは、1つのマルチメディアサーバにおけるT D Iの挿入を含むことを特徴としたものである。

【0040】第11の技術手段は、第9の技術手段において、前記挿入ステップは、前記パケットベースのネットワークに設けられた1つのルータにおけるT D Iの挿入を含むことを特徴としたものである。

【0041】第12の技術手段は、第9の技術手段において、前記挿入ステップは、前記パケットベースのネットワークと1つのマルチメディアレシーバとの間に設けられたローカルエリアネットワーク(L A N)に設けられているゲートウェイにおけるT D Iの挿入を含むことを特徴としたものである。

【0042】第13の技術手段は、第9の技術手段において、複数のマルチメディアレシーバにマルチキャストするためにマルチメディアパケットを複写するステップを含み、該ステップは、T D Iを幾つかの前記複写されたマルチメディアパケットに挿入することを含むことを特徴としたものである。

【0043】第14の技術手段は、第9の技術手段にお

いて、伝送期間においてC N D>T E Dであれば何時でもそのマルチメディアパケットを破棄するステップを含むことを特徴としたものである。

【0044】第15の技術手段は、第14の技術手段において、C N D>T E DであればT E Dの値を増大させるステップを含むことを特徴としたものである。

【0045】第16の技術手段は、第9の技術手段において、マルチメディアパケットが生存可能なパケットであるか、又は、生存不可能なパケットであるかを決定するステップと、生存不可能なパケットを破棄するステップとをさらに含むことを特徴としたものである。

【0046】第17の技術手段は、マルチメディアパケットが生存可能なパケットか、又は、生存不可能なパケットかを決定するステップと、生存不可能なパケットを破棄するステップとを含んでなるリアルタイムマルチメディアコンテンツを伝送し同期化する方法である。

【0047】第18の技術手段は、第17の技術手段において、マルチメディアのオーディオ/ビジュアル情報を複数のマルチメディアのパケットにローディングするステップと、エンドツーエンドの全遅延(T E D)と累積ネットワーク遅延(C N D)を含む総遅延情報(T D I)をマルチメディアパケットの少なくとも1つに挿入するステップと、複数のマルチメディアレシーバにパケットベースのネットワークを介し前記マルチメディアパケットを再生順に伝送するステップと、伝送期間においてC N D>T E Dであれば何時でも前記マルチメディアパケットを破棄するステップと、各マルチメディアレシーバにおいて前記マルチメディアパケットを一時保管するステップと、前記マルチメディアパケットを再生順に呼び出すステップと、前記マルチメディアパケットを各レシーバにおいてT E Dの時点で再生するステップとをさらに含んでいることを特徴としたものである。

【0048】第19の技術手段は、第18の技術手段において、前記挿入ステップは、1つのマルチメディアサーバにおけるT D Iの挿入を含むことを特徴としたものである。

【0049】第20の技術手段は、第18の技術手段において、前記挿入ステップは、前記パケットベースのネットワークに設けられた1つのルータにおけるT D Iの挿入を含むことを特徴としたものである。

【0050】第21の技術手段は、第18の技術手段において、前記挿入ステップは、前記パケットベースのネットワークと1つのマルチメディアレシーバとの間に設けられたローカルエリアネットワーク(L A N)に設けられているゲートウェイにおけるT D Iの挿入を含むことを特徴としたものである。

【0051】第22の技術手段は、第18の技術手段において、複数のマルチメディアレシーバにマルチキャストするためにマルチメディアパケットを複写するステップを含み、該ステップは、T D Iを幾つかの前記複写さ

れたマルチメディアパケットに挿入することを含むことを特徴としたものである。

【0052】第23の技術手段は、第18の技術手段において、 $CND > TED$ であればTEDの値を増大させるステップを含むことを特徴としたものである。

【0053】

【発明の実施の形態】本発明によるリアルタイムマルチメディアコンテンツを送信し同期化するシステムは、マルチメディアのオーディオ／動画情報を再生順に含むマルチメディアパケットを生成してそのマルチメディアパケットを送信するマルチメディアサーバと、マルチメディアパケットを複数の宛先に配送する複数のルータを有し、マルチメディアパケットを受信するためにマルチメディアサーバと接続したパケットベースの通信ネットワークと、エンドツーエンドの全遅延(TED)と累積ネットワーク遅延(CND)を含む総遅延情報(TDI)をマルチメディアパケットに挿入する手段と、TDIを有するマルチメディアパケットを受信する複数のレシーバを含み、各レシーバは受信したマルチメディアパケットを蓄積するバッファと、蓄積したマルチメディアパケットをバッファから検索してマルチメディアパケットを再生順に配列する順序付け(シーケンス)手段と、検索して配列したマルチメディアパケットをマルチメディアサーバによる伝送後TEDの時点で再生する再生装置を含んでいる。

【0054】本発明によるリアルタイムマルチメディアのコンテンツを送信して同期化する方法は、マルチメディアのオーディオ／ビジュアルを複数のマルチメディアのパケットにローディングすることと、エンドツーエンドの全遅延(TED)とネットワークの累積遅延(CND)を含む総遅延情報(TDI)をマルチメディアパケットの少なくとも1つに挿入することと、複数のマルチメディアレシーバにパケットベースのネットワークを介しマルチメディアパケットを再生順に伝送することと、各マルチメディアレシーバにおいてマルチメディアパケットを一時保管し、マルチメディアパケットを再生順に呼び出し、各レシーバでマルチメディアパケットをTEDの時点で再生することを含んでいる。

【0055】特にパケットベースのシステムによるマルチキャストマルチメディアの同期化と伝送は、情報配信の効率のよい安価な技法である。従来技術のシステム

$$(\text{ジッタ}) = (\text{2つの順次パケット伝送の時間間隔}) - (\text{パケットレート})$$

例えば、パケットレートが20msでありパケットが実際に先行パケットから30msの間隔で送信される場合、ジッタは10msであり、パケットのCNDを10msに設定する。

【0058】ネットワーク中の各ルータは、そのルータの配置場所がパケットネットワーク66又はLAN72であるかに係わりなく、そのルータにより生じる各マル

は、1つ以上の情報源からのマルチメディアのデータストリームをパケットベースのシステムにより複数のレシーバに伝送し同期化するのに付随して発生する問題を考慮していない。異なる場所から伝送された相互に関連するメディアストリームを1つのレシーバで同期化して再生することを可能にする多数の技法が存在しているが、公知の従来技術は、単一ソース又は複数のソースにより生成されたメディアストリームをパケットベースのネットワークによりマルチキャストして複数の場所で同期再生させることはできない。本発明は、同一のオーディオ／動画ストリームを異なる場所に伝送し同時に再生させると共に、マルチメディアパケットが伝送先で再生しないことが明らかな場合にそのパケットの伝送を止めるシステムと方法を提供する。

【0056】図1は、本発明により構築されたコンテンツの同期マルチメディア伝送システムを示す図で、図中60はこのシステムを示す。システム60は、マルチメディアサーバ62を含んでおり、このサーバは、通過する各マルチメディアパケット64に、後述するTED及びCND情報を挿入する。このパケットネットワーク66には2つのルータ68と70が含まれているが、かような汎用ネットワークには、より多数のルータが存在することが多い。ルータ68は、ゲートウェイ74とルータ76、78を含むローカルエリアネットワーク(LAN)72に接続している。マルチメディアレシーバ80、82、84はLAN72に接続している。

【0057】本発明の方法は、マルチメディア情報を、以後マルチメディアパケットと記述する一連のパケット64にローディングする。マルチメディアサーバ62は、エンドツーエンドの全遅延(TED)と累積ネットワーク遅延(CND)のフィールドを各マルチメディアパケットに挿入する。これを、総遅延情報(TDI)と記述する。TEDは、マルチメディアパケットをサーバから伝送した時からそのマルチメディアパケットがレシーバで再生される時までの時間を示し、CNDは、マルチメディアパケットがレシーバに配信される前に通信ネットワーク内のルータにより生じた実際の潜伏時間(latency)を示す。マルチメディアサーバ62は、ネットワークの統計値からTEDの値を計算する。マルチメディアパケットを伝送する際に、サーバ62はCNDにジッタ値を設定する。このジッタは次式により得られる。

$$(1)$$

チメディアパケットの待ちによる遅延を測定する。待ち遅延(queueing delay)は、マルチメディアパケットの受信と伝送のタイムスタンプから得る。マルチメディアパケットを伝送する時、各ルータは待ち遅延を現在のCND値に加算してCND値を更新する。ルータが受信したマルチメディアパケットを複数のルータに、即ち、ルータ70とゲートウェイ74にマルチキャストするルー

タ68のようにマルチキャストする必要があるれば、マルチメディアパケットを複写し、複写したマルチメディアパケットに対する待ち遅延をオリジナルなものとは別個に処理する。複写パケットは1つ以上あってよく、待ち遅延を各複写パケットに挿入する。

【0059】各マルチメディアレシーバは、入ってくるマルチメディアパケットを蓄積するバッファ“B”を含み、バッファからマルチメディアパケットを呼び出し、受信後(TED-CND)の時間にマルチメディアパケットのコンテンツを再生する。かようにして、マルチメディアレシーバに配信されたマルチメディアパケットは、各レシーバへのルートに生じた実際のネットワーク遅延と係わり無く、サーバで伝送してからTEDの時点で再生される。

【0060】先の例において説明したように、CNDは待ち遅延のみを含み、2つのルータ間の物理的な伝送により発生した物理的な潜伏時間は含まない。物理的な潜伏時間は僅かであるので無視できる。別案として、ルータに既知の物理的な潜伏時間を与え、待ち遅延に加算して精度を上げることができる。

【0061】全てのレシーバがパケットレートを知っている場合は、メディアストリームの第一のマルチメディアパケットに対して前述の手順を実行すれば十分である。理由は、TEDとCNDを持つマルチメディアパケットを受信するレシーバは、マルチメディアパケットの再生時間を知っており、TEDとCNDを含む最初のマルチメディアパケットが“失われ”、即ち、1つ以上のレシーバによって受信されない場合は、サーバに最初の若干数のマルチメディアパケットにTEDとCNDを含ませることを要求するからである。別案として、TEDとCNDを有するマルチメディアパケットがマルチキャストグループに属する全レシーバに受信されたことを確認するまでTEDとCNDを含むようにサーバに要求してもよい。

【0062】前述のように、マルチメディアサーバ62は、ネットワークの統計値に基づいてTED値を計算する。TEDはネットワーク管理者によってサーバに提供されるか或は自動的に測定される。TEDの実際の計算は、本発明の範囲外であり、米国特許第5,623,483号明細書にTEDをネットワーク遅延の統計分布から計算する技法が提示されている。但し、米国特許第5,623,483号明細書の全体的な解決法は、サーバとレシーバが同期したクロックを有することである。サーバは各パケットにレシーバがパケットの内容を再生すべき時刻を指定する。しかしながら、パケットネットワークのサーバとレシーバが同期化クロックに正確に同一の計時を維持することを期待するのは現実的ではない。

【0063】待ち遅延と物理的な潜伏時間が、マルチメディアパケットがレシーバに到着する時点にまで達し、

“遅れた”状況が発生することが予測される。従来技術のシステムの場合、音声と映像の不連続がユーザに感知され、この状況を正す手段がない。本発明によるシステムと方法は、レシーバの1つが、マルチメディアパケットにおいて、そのマルチメディアパケットに対するTEDを超えるCNDを検出した場合に対処する機能を準備している。この場合、マルチメディアパケットは、マルチメディアパケットの内容を再生する時間が既に経過しているので、同期して再生することはできない。レシーバは、より大きいTDIを要求する手段を有し、CND-TEDの値を持つサーバにメッセージを送る。サーバは、TED値を増大させて、次のマルチメディアパケットに対するTDIを増大させる。

【0064】図1に示した実施例において、パケットネットワーク66に含まれる全ルータとサーバ62並びにマルチキャストグループ用LAN72がTEDとCNDを支持する。図1に示すように、マルチキャストグループ中の全マルチメディアレシーバが1つのLANに存在しているが、1台のマルチメディアレシーバをパケットネットワーク66中の1台のルータに接続することができる。マルチメディアサーバは、前述のようにマルチメディアパケットにTDIを挿入するための特別なハードウェア又はソフトウェアを含まなくてよい。その代わりに、LANを(公共の)パケットネットワークに接続するゲートウェイがサーバから受信したマルチメディアパケット用のTEDとCNDからTDIを生成する。このゲートウェイはTED値を生成する能力を有しており、このゲートウェイにパケットレートを供給しなければならぬ。LAN内のルータとレシーバは同じ機能を実行できる。従って、本発明は、パケットネットワーク全体がここに提示の方法を支持していない場合であっても実施することができる。別の方法では、TDIの挿入手段をマルチメディアサーバ、ルータ又はゲートウェイによって供給してもよい。

【0065】図2に示す他の実施例90は、動画ストリーム(ビデオストリーム)94とオーディオストリーム96を生成するマルチメディアサーバ92と、ルータ100,102,104,106,108、動画モニタ(ビデオモニタ)110及びスピーカ112を有するパケットネットワーク98より成る。ビデオストリーム94とオーディオストリーム96は、パケットネットワーク98に接続したビデオモニタ110とスピーカ112により各々個別に、同期して再生される。動画パケット(ビデオパケット)とオーディオパケットの宛先アドレスは、各々、ビデオモニタとスピーカのアドレスである。サーバ92は、TEDとCNDを含むTDIを動画パケットとオーディオパケットの両方に挿入する手段を有している。ルータは他の実施形態において示したと同様の手順を実行する。

【0066】本発明は、米国特許第4,506,358

号明細書に記載の方法と異なり、従来技術が教示も示唆もしていないタイプの各パケット内情報フィールドを採用しパケットのオーディオ／動画コンテンツを再生すべき時間を指示している。これにより、同期したサーバとレシーバのクロックを必要とせずに、複数のレシーバで同一コンテンツを同時に再生することができる。

【0067】本発明は、ルータとレシーバ間の物理的なリンクにおいて、CNDがTEDより大きい場合に最終目的地（即ち、メディアプレーヤ又はレシーバ）で再生されないマルチメディアパケットをルータが伝送するの防止することにより帯域の使用効率を最大にする。

【0068】再生できないマルチメディアパケットは、必要でないか、又は、使用しないことが決定されれば破棄することができる。以下の方法を、独立した技法として又は前述の同期化技法と組み合わせて使用することができる。

$$T_{is} = T_{is}[n_g] \quad (2)$$

$$T_p = t_p[n_g] \quad (3)$$

【0071】一連番号nの連続受信マルチメディアパケットを受信する度に、ルータは $t_{is}[n]$ 値と $t_p[n]$ 値を調べる。

$$t_{is}[n] - T_{is} < t_p[n] - T_p + D \quad (4)$$

ここで、Dはレシーバにおけるバッファ遅延を含む最大TED許容値を示す。式(4)の状態であれば、ルータはマルチメディアパケットを再送信し、下式(5)。

$$T_{is} = t_{is}[n] \quad (5)$$

$$T_p = t_p[n] \quad (6)$$

【0072】 $t_{is}[n] - T_{is}$ の値は、ルータが最後に再送信してきたマルチメディアパケットの到着時間と現在の対象マルチメディアパケットの到着時間との差である。

$$t_{is}[n] - T_{is} > t_p[n] - T_p + D \quad (7)$$

【0073】上式(7)で示す条件を満たせば、シーケンス番号nのマルチメディアパケットはすでにTED許容値を使い切っている。この場合、このマルチメディアパケットはレシーバに再生時間までに到着しないので再生される機会は無い。ここで生存不可能なパケット(non-viable packet)と記述する。かようなマルチメディアパケットを不必要に伝送することを無くし、このルータと次のエントリ間の物理的リンクにおける帯域を、次のエントリがルータかレシーバであるかに係わり無く、効率よく利用できる。ルータは、マルチメディアパケットが生存可能な(viable)マルチメディアパケットである（この場合は、そのマルチメディアパケットを伝送する）、或いは、生存不可能なマルチメディアパケットである（この場合は、そのマルチメディアパケットを破棄する）ことを決定する手段を含んでいる。

【0074】ルータにおけるDの値は、(1)ノードのソフトウェア又はハードウェアでハード符号化するか、(2)システム管理者によって手動で構成するか、或いは、(3)マルチメディアサーバによって各々のリアルタイムマルチメディアパケットに供給される。この値

【0069】ルータがメディアソースとレシーバ間を送受信されるマルチメディアパケットの各々にタイムスタンプシーケンス（一連）番号を付ける。

$T_{is}[n]$ ：シーケンス番号nのマルチメディアパケットのタイムスタンプ（時刻印）。

$T_p[n]$ ：シーケンス番号nのマルチメディアパケット内に含まれるタイミング情報で、このマルチメディアパケットのコンテンツをレシーバで再生する時間を示す。この情報は、一連のマルチメディアパケット間の相対的なタイミング情報であり、絶対的な時間を示すものではない。

【0070】シーケンス番号 n_g を有する最初のマルチメディアパケットを受信すると、ルータは、 $t_{is}[n_g]$ と $t_p[n_g]$ をメモリに蓄積し、マルチメディアパケットを次のルータ又はレシーバに再送付する。下式を想定する。

$$t_{is}[n] \text{ 値を調べる。}$$

$$t_p[n] \text{ 値を調べる。}$$

(6)を設定する。ルータは、マルチメディアパケットが生存可能なパケットであることを決定し、そうでなければ、そのマルチメディアパケットを破棄する。

$$t_{is}[n] \text{ 値を調べる。}$$

$$t_p[n] \text{ 値を調べる。}$$

る。同様に、 $t_p[n] - T_p$ の値は、これら2つのマルチメディアパケット間の再生時における時間間隔を示す。

は、要求されるQoS（サービスの品質）によって決定され、レシーバにおけるバッファの遅れよりも大きくすべきである。Dは双方向の音声会話のような遅延感度の高い用途の場合は小さい値になる。レシーバは、共通の通信プロトコルを用いてメディアソースとD値を交渉できる。

【0075】本発明による伝送方法は、ヘッダ情報を差分符号化スキームによって圧縮するRFC2508に規定されているIP/UDP/RTPヘッダ圧縮器で機能する。この圧縮器はルータの伝送部に実装でき、メディアソースとレシーバ間の特定のリアルタイムメディアストリームを他のトラフィック間において区別し特定する手段を提供する。差分符号化のために、圧縮器はパケットベースのネットワーク内のリアルタイムマルチメディアパケットのヘッダ内タイミング情報を調べることが要求されるが、本発明の方法を実装するために必要な追加の処理力は最小である。

【0076】パケットベースのネットワークを介してリアルタイムにマルチメディアのパケットベースのコンテンツを送信して同期化するシステムと方法を開示してき

た。本発明の方法とシステムの若干の変更例も開示してあるが、さらなる変更と修正をこの特許請求範囲に規定した本発明の範囲から逸脱することなく実施できることは明白であろう。

【図面の簡単な説明】

【図1】本発明により構築されたLANマルチメディアコンテンツの配信システムを示す図である。

【図2】動画ストリームとオーディオストリームを個別経路で伝送するマルチメディアコンテンツの配信システムを示す図である。

【図3】従来技術によるマルチメディアコンテンツの配信システムを示す図である。

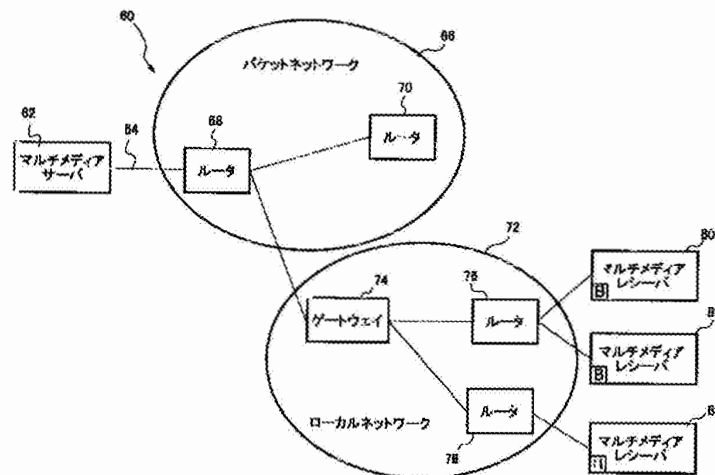
【図4】パケットベースのリアルタイムマルチメディアコンテンツの伝送システムを示す図である。

【図5】パケットの受信及び再生を示すブロック図である。

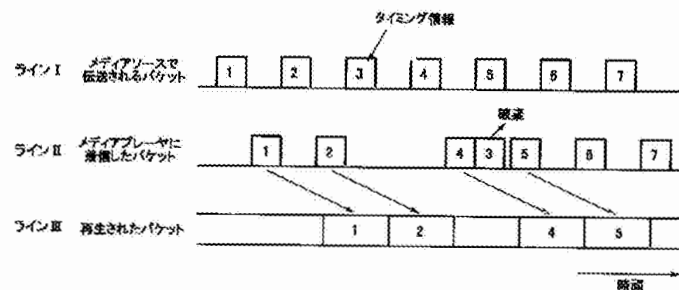
【符号の説明】

12…マルチメディアサーバ、16…パケットネットワーク、18～30…ルータ、32～38…マルチメディアレシーバ、42…メディアソース、46…パケットネットワーク、48～52…ルータ、56…レシーバ、ラインI…メディアソースで伝送されるパケット、ラインII…メディアプレーヤに着信したパケット、ラインIII…再生されたパケット、62…マルチメディアサーバ、66…パケットネットワーク、68～78…ルータ、80～84…マルチメディアレシーバ、72…ローカルネットワーク、74…ゲートウェイ、92…マルチメディアサーバ、94…ビデオストリーム、96…オーディオストリーム、98…パケットネットワーク、100～108…ルータ、110…ビデオモニタ、112…スピーカ。

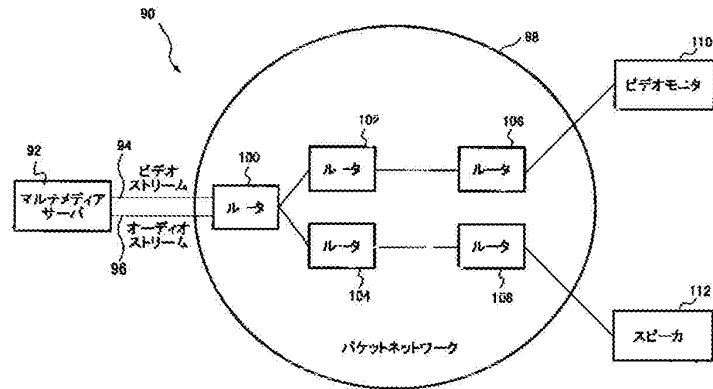
【図1】



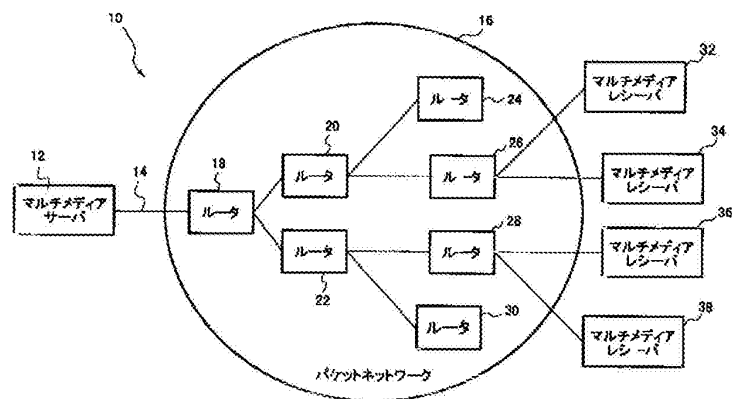
【図5】



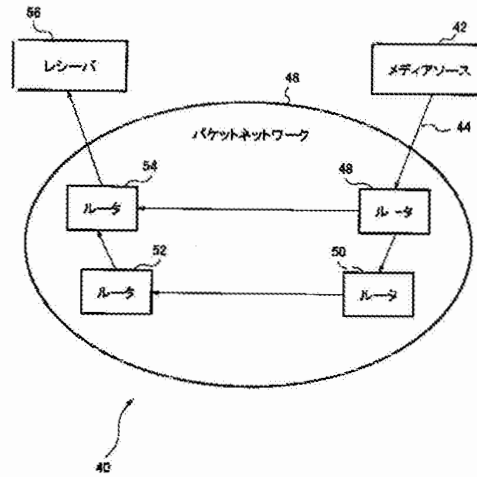
【図2】



【図3】



【図4】





Espacenet

Bibliographic data: JP2003037585 (A) — 2003-02-07

NETWORK SYSTEM, OUTPUT DEVICE, AND METHOD FOR SYNCHRONIZING
NETWORK SYSTEM

Inventor(s): FUJINAMI YASUSHI ± (FUJINAMI YASUSHI)

Applicant(s): SONY CORP ± (SONY CORP)

Classification: - **international:** G06F1/14; G06F13/00; H04B1/20; H04L12/28;
H04L12/413; H04L7/00; H04N21/43; H04N7/62;
H04S3/00; H04J3/06; (IPC1-7): G06F1/14;
G06F13/00; H04L7/00
- **cooperative:** G06F1/14 (EP); H04B1/205 (EP); H04L12/2803
(EP); H04L12/2807 (EP); H04L12/2838 (EP);
H04L47/28 (EP); H04N21/4305 (EP); H04S3/008
(EP); H04J3/0638 (EP)

**Application
number:** JP20010224983 20010725

**Priority
number(s):** JP20010224983 20010725

**Also published
as:** CN1271813 (C) CN1471769 (A) EP1320213 (A1)
EP1320213 (A4) HK1063392 (A1) more

Abstract of JP2003037585 (A)

PROBLEM TO BE SOLVED: To provide a clock synchronized between reproducing devices connected to the digital network. SOLUTION: A clock is transmitted to a sink device group like speakers 5 (5-1 to 5-5) connected to a network 1 and a display 6. And also this network system is equipped with a clock source 2 which transmits time information per prescribed time, a contents source 4 which provides the contents for the sink device group through the network 1, and a controller 3 which provides for the contents source 4 the delay time based on the network delay when the content data are transmitted to the sink device group and the decode delay in the sink device group when reproducing the contents.

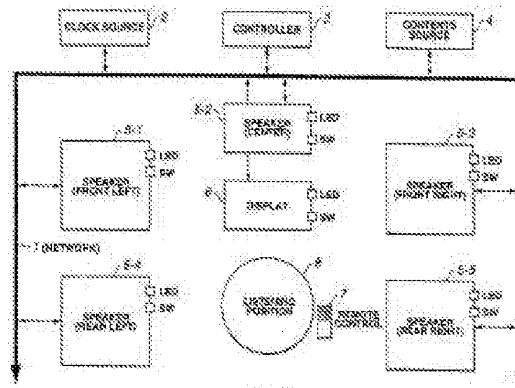


FIG.1

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開2003-37585

(P2003-37585A)

(43) 公開日 平成15年2月7日(2003.2.7)

(51) Int.Cl. ⁷	識別記号	F I	テーマコード [*] (参考)
H 0 4 L 7/00		H 0 4 L 7/00	Z 5 B 0 8 9
G 0 6 F 1/14		C 0 6 F 13/00	3 5 1 C 5 K 0 4 7
13/00	3 5 1	1/04	3 5 1 B

審査請求 未請求 請求項の数13 O L (全 23 頁)

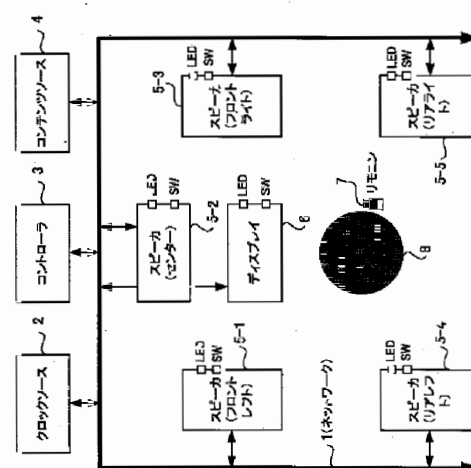
(21) 出願番号	特願2001-224983(P2001-224983)	(71) 出願人	000002185 ソニー株式会社 東京都品川区北品川6丁目7番35号
(22) 出願日	平成13年7月25日(2001.7.25)	(72) 発明者	藤波 靖 東京都品川区北品川6丁目7番35号 ソニー株式会社内
		(74) 代理人	100104880 弁理士 古部 次郎 (外1名) Fターム(参考) 5B089 GA23 JB11 KA12 KB04 KE10 5K047 AA18 DD02 GC01 GG06

(54) 【発明の名称】 ネットワークシステム、出力機器、およびネットワークシステムの同期方法

(57) 【要約】

【課題】 デジタルネットワークに接続された各再生機器の間において、クロックと位相の同期をとる。

【解決手段】 ネットワーク1に接続されるスピーカ5(5-1～5-5)やディスプレイ6等のシンク機器群に対してクロックを送信すると共に所定時間ごとに時刻情報を送信するクロックソース2と、このシンク機器群に対してネットワーク1を介してコンテンツを提供するコンテンツソース4と、コンテンツを再生するにあたり、コンテンツデータがシンク機器群に送られるときのネットワーク遅延とシンク機器群におけるデコード遅延とに基づく遅延時間をコンテンツソース4に対して提供するコントローラ3とを備えた。



【特許請求の範囲】

【請求項1】 複数の機器がデジタルネットワークに接続されるネットワークシステムであって、前記複数の機器に対してクロックを配信すると共に時刻情報を配信するクロック配信手段と、前記クロック配信手段により配信された前記クロックおよび前記時刻情報に基づき、各々の機器においてクロックを調整するクロック調整手段と、前記デジタルネットワーク上をストリームが通信される際に生じるネットワークディレイを考慮して前記複数の機器に対してディレイ補正を施すディレイ補正手段とを備えたことを特徴とするネットワークシステム。

【請求項2】 前記ディレイ補正手段は、前記複数の機器が前記ストリームに関する変換に際して生じる変換ディレイを考慮してディレイ補正を施すことを特徴とする請求項1記載のネットワークシステム。

【請求項3】 前記ディレイ補正手段は、前記機器が置かれた位置によって生じるディレイ補正を含むことを特徴とする請求項1記載のネットワークシステム。

【請求項4】 デジタルネットワークに接続されるシンク機器群に対してクロックを送信するクロックソースと、前記デジタルネットワークに接続される前記シンク機器群に対して当該デジタルネットワークを介してコンテンツを提供するコンテンツソースと、前記コンテンツを再生するにあたり、コンテンツデータが前記シンク機器群に送られるときのネットワークディレイと当該シンク機器群におけるデコードディレイとに基づく遅延時間を前記コンテンツソースに対して提供するコントローラとを備えたことを特徴とするネットワークシステム。

【請求項5】 前記クロックソースは、前記シンク機器群に対して所定時間ごとに時刻情報を送信することを特徴とする請求項4記載のネットワークシステム。

【請求項6】 前記コンテンツソースは、前記コントローラから提供された前記遅延時間に基づく遅延情報メッセージを作成し、コンテンツデータに伴って前記シンク機器群に対して配信することを特徴とする請求項4記載のネットワークシステム。

【請求項7】 デジタルネットワークに接続され、当該デジタルネットワークを介して提供されるコンテンツデータをデコードする出力機器であって、前記デジタルネットワークを介して受信した基準時刻信号に基づいてクロックを再生するクロック再生手段と、前記デジタルネットワークを介して受信した前記コンテンツデータに対して必要なディレイを施し、デコードして出力するストリーム再生手段とを備えたことを特徴とする出力機器。

【請求項8】 内部にて用いられるクロックを発振する

クロック発振手段とを更に備え、

前記クロック再生手段は、受信された前記基準時刻信号と前記クロック発振手段からの出力の値とを比較して、当該クロック発振手段の発振周波数を調整することにより、前記クロックを再生することを特徴とする請求項7記載の出力機器。

【請求項9】 前記ストリーム再生手段は、前記コンテンツデータに伴って受信される当該コンテンツデータを出力すべき時刻情報から、自らのデコードディレイ時間を考慮してデコードを開始することを特徴とする請求項7記載の出力機器。

【請求項10】 デジタルネットワークに接続される複数の機器にて入力または出力の同期をとるためのネットワークシステムの同期方法であって、前記複数の機器に対してクロックと共に時刻情報を配信し、

配信される前記クロックと前記時刻情報とに基づいて、共通な時計を前記複数の機器で動作させ、ネットワークディレイおよび前記複数の機器における変換ディレイを考慮して前記時計の時刻を用いた入力タイミングまたは出力タイミングを当該複数の機器に使用し、

使用された前記入力タイミングまたは前記出力タイミングと各々の機器における変換ディレイとに基づいて、当該各々の機器における変換を開始することを特徴とするネットワークシステムの同期方法。

【請求項11】 前記入力タイミングまたは前記出力タイミングは、前記ネットワークディレイの最大時間に、前記複数の機器における前記変換ディレイの最大時間を加えて決定されることを特徴とする請求項10記載のネットワークシステムの同期方法。

【請求項12】 デジタルネットワークに接続される複数の機器にて出力の同期をとるためのネットワークシステムの同期方法であって、

前記デジタルネットワークを介してクロックと共に時刻情報を受信し、

受信した前記クロックおよび前記時刻情報に基づいてクロックを調整し、

コンテンツデータと共に当該コンテンツデータの再生を開始する時刻を示す情報を受信し、

受信した前記情報に基づき、前記コンテンツデータをデコードする際に生じるディレイに基づいてデコードの開始タイミングを決定し、

決定した前記開始タイミングによりデコードを開始して前記コンテンツデータを再生することを特徴とするネットワークシステムの同期方法。

【請求項13】 前記デジタルネットワークを介してコンテンツソースとしてのネットワークアドレスの指定を受け、

前記ネットワークアドレスに対してなされるディレイの

指示に基づいて前記開始タイミングを決定することを特徴とする請求項1記載のネットワークシステムの同期方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、複数の機器を備えたネットワークシステム等に係り、特に、ネットワークに接続された複数の機器において同期をとるネットワークシステム等に関する。

【0002】

【従来の技術】近年、通信ネットワークが企業、学校、家庭に浸透しつつ有り、このインフラを利用してオーディオビデオのコンテンツを配信しようという試みがなされている。これをもう一歩進めて、家庭内のオーディオビデオの配線をネットワークで置き換えることが当然考えられる。しかしながら、新しい技術分野であるために、未だ充分な検討が行われていなかった。

【0003】家庭内のオーディオビデオの配線を通信ネットワークで置き換えることは、例えばDVD (Digital Versatile Disk)、ディスプレイ、スピーカなどをそれぞれ通信ネットワークに接続することを意味する。例えば、DVDを再生すると、デジタル通信ネットワークを介してディスプレイ、スピーカからそれぞれ動画と音声出力されるということになる。

【0004】

【発明が解決しようとする課題】しかしながら、現在の通信ネットワークでは、その上を流れるデータにおいて、配信されるタイミングが保証されないという問題点がある。即ち、複数の入出力機器間の入出力位相関係(時間的前後関係)にて、現在のデジタルネットワークでは、伝送遅延が固定ではないことから、十分に小さい位相誤差で出力されるという保証がない。また、デジタル通信ネットワークを介した場合に、アナログ接続に比べて遅延の絶対値が大きくなる。かかる場合、上記の例では、DVDから発信されたコンテンツにおいて、ディスプレイや複数存在するスピーカに到着する時刻がまちまちになってしまう。これをそのまま再生すると、結果としてまちまちなタイミングで再生が行われることになる。

【0005】これは、即ち、アナログケーブルで接続されていた場合に実現されていた出力信号の同期が達成されないということになる。デジタルネットワーク化によるメリットは数多く存在するが、ディスプレイとスピーカ、あるいはスピーカ同士の出力位相、更にはマイクとカメラの入出力位相を合わせることが出来なければ、家庭内におけるオーディオビデオの配線をデジタル通信ネットワークで置き換えることは困難となる。

【0006】本発明は、以上のような技術的課題を解決するためになされたものであって、デジタルネットワークに接続された各機器の間において、クロックを同期

させると共に、入出力位相を一致させることを主たる目的とする。

【0007】

【課題を解決するための手段】かかる目的のもと、本発明は、複数の機器がデジタルネットワークに接続されるネットワークシステムであって、複数の機器に対してクロックを配信すると共に時刻情報を配信するクロック配信手段と、配信されたクロックおよび時刻情報に基づき各々の機器においてクロックを調整するクロック調整手段と、デジタルネットワーク上をストリームが通信される際に生じるネットワークディレイ、複数の機器がストリームに関する変換に際して生じる変換ディレイを考慮して複数の機器に対してディレイ補正を施すディレイ補正手段とを備えたことを特徴としている。

【0008】また、本発明が適用されるネットワークシステムは、デジタルネットワークに接続されるシンク機器群に対してクロックを送信するクロックソースと、このシンク機器群に対してデジタルネットワークを介してコンテンツを提供するコンテンツソースと、コンテンツを再生するにあたり、コンテンツデータがシンク機器群に送られるときのネットワークディレイとシンク機器群におけるデコードディレイとに基づく遅延時間をコンテンツソースに対して提供するコントローラとを備えたことを特徴としている。

【0009】ここで、このクロックソースは、シンク機器群に対して所定時間ごとに時刻情報を送信することの特徴とすれば、位相調整の前提として、クロックを同期させることができる点で好ましい。また、このコンテンツソースは、コントローラから提供された遅延時間に基づく遅延情報メッセージを作成し、コンテンツデータに伴ってシンク機器群に対して配信することの特徴とすれば、各シンク機器群では、自らのデコードディレイを考慮してデコードを開始することで、シンク機器群の間における再生タイミングを合わせることが可能となる。

【0010】他の観点から把握すると、本発明は、デジタルネットワークに接続され、このデジタルネットワークを介して提供されるコンテンツデータをデコードする出力機器であって、デジタルネットワークを介して受信した基準時刻信号に基づいてクロックを再生するクロック再生手段と、デジタルネットワークを介して受信したコンテンツデータに対して必要なディレイを施し、デコードして出力するストリーム再生手段とを備えたことを特徴としている。

【0011】ここで、内部にて用いられるクロックを発振するクロック発振手段とを更に備え、クロック再生手段は、受信された基準時刻信号とクロック発振手段からの出力の値とを比較して、クロック発振手段の発振周波数を調整することにより、クロックを再生することの特徴とすることができる。

【0012】一方、本発明を方法のカテゴリから捉える

と、本発明は、デジタルネットワークに接続される複数の機器にて入力または出力の同期をとるためのネットワークシステムの同期方法であって、複数の機器に対してクロックと共に時刻情報を配信し、配信されるクロックと時刻情報とに基づいて、共通な時計を複数の機器で動作させ、ネットワークディレイおよび複数の機器におけるデコードディレイやエンコードディレイ等の変換ディレイを考慮して時計の時刻を用いた入力タイミングまたは出力タイミングを複数の機器に使用し、使用された入力タイミングまたは出力タイミングと各々の機器における変換ディレイとに基づいて、各々の機器における変換を開始することを特徴とすることができる。

【0013】また、本発明は、ネットワークに接続されるシンク機器にて適用される発明として把握できる。即ち、本発明におけるネットワークシステムの同期方法は、デジタルネットワークを介してクロックと共に時刻情報を受信し、受信したクロックおよび時刻情報に基づいてクロックを調整し、コンテンツデータと共にコンテンツデータの再生を開始する時刻を示す情報を受信し、受信した情報に基づき、コンテンツデータをデコードする際に生じるディレイに基づいてデコードの開始タイミングを決定し、決定した開始タイミングによりデコードを開始してコンテンツデータを再生することを特徴としている。

【0014】

【発明の実施の形態】以下、添付図面に示す実施の形態に基づいて本発明を詳細に説明する。図1は、本実施の形態におけるネットワークシステムの全体像を示した構成図である。図1に含まれる各機器は、ネットワーク1により相互に接続されている。リスニングポジション8は、特定の機器ではないが、このネットワークシステムにおけるユーザの存在位置を模式的に示したものである。ユーザは、リスニングポジション8にて操作のリモコン7を用いてネットワークシステムに対する指令を行うことができる。

【0015】ネットワーク1には、システムにクロックを供給するクロックソース2、システム全体を制御するコントローラ3、コンテンツデータ(信号)を送り出すコンテンツソース4、ユーザに対して音声信号を供給する5つのスピーカ5(5-1~5-5)、ユーザに対し映像信号を供するディスプレイ6、の各入出力機器が接続されている。ここで、ディスプレイ6とスピーカ5とを、コンテンツソース4に対して(コンテンツ)シンク機器群と呼ぶことができる。また、各スピーカ5は、図1に示すような位置、即ち、フロントレフト(5-1)、センター(5-2)、フロントライト(5-3)、リアレフト(5-4)、リアライト(5-5)の各位置に設置されている。各スピーカ5およびディスプレイ6は、各々LEDとブッシュスイッチを備えており、LEDを用いたユーザへの働きかけとブッシュスイッチによるユーザからの

反応を得ることができる。

【0016】図2は、クロックソース2における第1の構成例を示した図である。この第1の構成例におけるクロックソース2は、クロック発振器11、カウンタ12、タイマ13、ラッチ14、およびネットワークインタフェース15を備えており、このネットワークインタフェース15を介してネットワーク1と接続されている。クロック発振器11の出力はカウンタ12とタイマ13に各々入力される。カウンタ12の出力(時刻信号)はラッチ14に入力される。またラッチ14の出力はネットワークインタフェース15に入力される。更に、タイマ13の出力(トリガ信号)は、ラッチ14のラッチ信号端子とネットワークインタフェース15の送信信号端子に入力されている。クロックソース2は、ネットワーク1によって相互に接続された機器に対し、このような構成を用いてクロックを送信している。

【0017】図3は、クロックソース2における第2の構成例を示した図である。この第2の構成例におけるクロックソース2は、クロック発振器21、カウンタ22、タイマ23、およびラッチ24を備えている。またクロックソース2は、制御装置としてのCPU25、ROM27、RAM28を備えており、ネットワークインタフェース26を介してネットワーク1と接続されている。このCPU25とROM27、RAM28は、システムバス20により相互に接続されたマイクロコンピュータを構成している。また、ネットワークインタフェース26はシステムバス20に接続されている。クロック発振器21の出力はカウンタ22とタイマ23に入力される。カウンタ22の出力(時刻信号)はラッチ24に入力される。ラッチ24の出力はシステムバス20に接続されている。またタイマ23の出力(トリガ信号)はラッチ24のラッチ信号端子とCPU25の割り込み端子に入力される。クロックソース2は、ネットワーク1によって相互に接続された機器に対し、このような構成を用いてクロックを送信している。

【0018】図4は、図1に示したコントローラ3の構成を説明するための図である。本実施の形態におけるコントローラ3は、CPU31、ROM32、およびRAM33を備えており、これらはシステムバス34により相互に接続されてマイクロコンピュータを構成している。また、コントローラ3は、システムバス34に接続されるネットワークインタフェース35を備え、このネットワークインタフェース35を介してネットワーク1と接続されている。またコントローラ3はリモコン受光部36を有しており、リモコン受光部36はシステムバス34に接続されている。このコントローラ3は、図1のシステム全体を制御する役割を担っており、具体的な制御は、システムの構成の設定や、システムの動作(コンテンツの再生)の制御等である。特に本実施の形態では、コンテンツ再生時におけるディレイの設定が機能と

して重要である。

【0019】図5は、図1に示したコンテンツソース4の構成を説明するための図である。本実施の形態におけるコンテンツソース4は、ネットワーク1に接続された機器に、ネットワーク1を経由して、コンテンツストリームを供給している。図5に示すように、コンテンツソース4は、CPU41、ROM42、およびRAM43を備えており、これらはシステムバス44により相互に接続されマイクロコンピュータを構成している。また、コンテンツソース4は、ネットワークインタフェース45を介してネットワーク1と接続されている。ネットワークインタフェース45はシステムバス44に接続されている。

【0020】更に、本実施の形態におけるコンテンツソース4は、クロック発振器46とカウンタ47を備えている。クロック発振器46の出力はカウンタ47に入力されている。クロック発振器46とカウンタ47はそれぞれシステムバス44に接続されている。また、コンテンツソース4は、ハードディスク装置48、ビットストリーム解析器49、バッファ50を備えている。ハードディスク装置48は、自身に格納されているコンテンツストリームをビットストリーム解析器49に入力している。ビットストリーム解析器49の出力はバッファ50に入力され、その出力はシステムバス44に供給されている。また、ハードディスク装置48およびビットストリーム解析器49は、それぞれシステムバス44に接続されている。

【0021】尚、コンテンツソース4は、デコーダを持たないためデコードディレイという値には意味は無いが、デコードディレイとして0を持っている。このデコードディレイ値は、ROM42に記録され、CPU41から読み出すことができるようになっている。また、コンテンツソース4は、自身の種別を知っており、その種別は「コンテンツソース」である。この種別はROM42に記録され、CPU41から読み出すことができるようになっている。本実施の形態における種別として、ディスプレイ6は「ディスプレイ型」、各スピーカ5は「モノラルスピーカ型」の種別を持つものとする。この他にも、例えば「ステレオスピーカ型」、「ディスプレイ+ステレオスピーカ一体型」、「スーパーウーファ型」、「オーディオソース型」などの種別が考えられる。

【0022】コンテンツソース4は、内部にクロックの再生機能を持ち、クロックソース2から供給される基準時刻信号からクロックを再生している。また、コントローラ3の制御を受けて、内部に蓄えているコンテンツストリームを供給している。このとき、コントローラ3から指定されるディレイ値と再生したクロックから、ストリームにタイムスタンプを付加する機能を備えている。

【0023】図6は、図1に示したスピーカ5(5-1

～5-5)の構成を説明するための図である。この図6に示す構成は、図1に示す5本のスピーカ5(5-1～5-5)の全てに共通しており、これらは同一の内部構造(および動作)を備えている。スピーカ5は、CPU51、ROM52、およびRAM53を備えており、これらはシステムバス54により相互に接続されマイクロコンピュータを構成している。また、スピーカ5は、システムバス54に接続されているネットワークインタフェース55を介して、ネットワーク1と接続されている。

【0024】このスピーカ5は、システムバス54に接続されるクロック発振器56とカウンタ57とを備えており、このクロック発振器56の出力はカウンタ57に入力されている。更に、スピーカ5は、バッファ59、タイムスタンプ抽出器60、デコーダ61、アンプ62、およびスピーカ63を備えている。スピーカ5を流れるストリームデータは、システムバス54からバッファ59、タイムスタンプ抽出器60を経てデコーダ61に入力されてデコードされる。デコーダ61の出力は、アンプ62を経てスピーカ63により、音声信号に変換されて出力される。タイムスタンプ抽出器60、デコーダ61、およびアンプ62は、各々システムバス54に接続されている。このデコーダ61の内部は、後述するMPEGデコーダの構成をなしている。具体的にはデマルチプレクサ、オーディオバッファ、オーディオデコーダで構成されている。

【0025】スピーカ5は、更に、ボタン/LED操作器58を備えている。CPU51は、システムバス54経由で、ボタン/LED操作器58のボタンが押されたか否かの情報を読み出すことができる。また、CPU51は、システムバス54経由でボタン/LED操作器58におけるLEDの点滅を制御することができる。

【0026】ここで、スピーカ5は、自身のデコーダ61におけるデコードディレイを知っている。ここでデコードディレイとは、デコーダ61にデータが入力されてからデコードされたデータが出力されるまでの時間であり、各種のディレイである変換ディレイの中で代表的なものである。このデコードディレイ値はROM52に記録され、CPU51から読み出すことができるようになっている。また、スピーカ5は自身の種別を知っており、このスピーカ5の種別は「モノラルスピーカ」である。この種別はROM52に記録され、CPU51から読み出すことができるようになっている。

【0027】スピーカ5にて実行される動作は大きく3つに分けられる。この3つの動作とは、(1)クロックの再生、(2)ユーザインタフェース対応、(3)ストリームの再生、である。これらの動作は、CPU51上で動作するタスクと、それぞれ必要な構成要素とが組み合わされて成り立っている。なお、CPU51上で動作するこれらの3つのタスクは、CPU51で動作するマルチタスクオペレーティングシステムの上で独立に動作してい

るものとする。

【0028】上述した第1の動作である、(1)クロックの再生、では、クロックソース2から発信された基準時刻信号により、スピーカ5の内部にクロックが再生される。第2の動作である、(2)ユーザインタフェース対応、では、例えばコントローラ3の指示により内部のLEDを発光させ、内部のボタンが押されたか否かの情報をコントローラ3に戻す動作がなされる。第3の動作である、(3)ストリームの再生、では、受け取ったコンテンツデータに必要なディレイが施され、デコードして出力される。

【0029】図7は、図1に示したディスプレイ6の構成を説明するための図である。このディスプレイ6の内部構成は、図6で説明したスピーカ5の内部構成に、OSD(On Screen Display)82、表示装置83を加えたものとして把握することができる。即ち、図7に示すディスプレイ6は、CPU71、ROM72、およびRAM73を備えており、これらはシステムバス74により相互に接続されマイクロコンピュータを構成している。また、ディスプレイ6は、システムバス74に接続されているネットワークインタフェース75を介して、ネットワーク1と接続されている。

【0030】このディスプレイ6は、それぞれシステムバス74に接続されているクロック発振器76とカウンタ77を備えており、クロック発振器76の出力は、カウンタ77に入力されている。更に、ディスプレイ6はバッファ79、タイムスタンプ抽出器80、デコーダ81、OSD82、および表示装置83を備えている。ディスプレイ6を流れるストリームデータは、システムバス74からバッファ79、タイムスタンプ抽出器80を経てデコーダ81に入力されてデコードされる。デコーダ81からの出力は、OSD82の出力と混合された後に、表示装置83に表示される。このタイムスタンプ抽出器80、デコーダ81およびOSD82は、それぞれシステムバス74に接続されている。尚、デコーダ81の内部は、後述するMPEGデコーダの構成をなしている。具体的にはデマルチプレクサ、ビデオバッファ、ビデオデコーダで構成されている。

【0031】また、ディスプレイ6は、ボタン/LED操作器78を備えている。CPU71は、システムバス74経由でボタンが押されたか否かの情報を読み出すことができる。また、CPU71は、システムバス74経由でLEDの点滅を制御することができる。ディスプレイ6は自身のデコーダ81におけるデコードディレイを知っている。ここでデコードディレイとは、デコーダ81にデータが入力されてから、デコードされたデータが出力されるまでの時間である。このデコードディレイ値はROM72に記録され、CPU71から読み出すことができるようになっていいる。また、ディスプレイ6は、自身の種別を知っている。ディスプレイ6の種別は「デ

ィスプレイ」である。この種別はROM72に記録され、CPU71から読み出すことができるように構成されている。

【0032】ディスプレイ6の行う動作は大きく3つに分けられる。この3つの動作とは、スピーカ5の動作と同様であり、(1)クロックの再生、(2)ユーザインタフェース対応、(3)ストリームの再生、である。これらの動作は、CPU71上で動作するタスクと、それぞれ必要な構成要素とが組み合わされて成り立っている。なお、CPU71上で動作するこれらの3つのタスクは、CPU71で動作するマルチタスクオペレーティングシステム上で独立に動作しているとする。

【0033】この(1)クロックの再生、とは、クロックソース2から発信された基準時刻信号により、ディスプレイ6の内部にクロックを再生することである。(2)ユーザインタフェース対応、とは、例えばコントローラ3の指示により内部のLEDを発光させ、内部のボタンが押されたか否かの情報をコントローラ3に戻すことである。(3)ストリームの再生、とは、受け取ったコンテンツデータに必要なディレイを施した後、デコードして出力することである。

【0034】次に、本実施の形態が適用されるネットワークシステムの全体の動作について説明する。図1に示すクロックソース2は、ネットワーク1で相互に接続された機器に対して、クロックを送信している。より具体的には、一定時間ごとの時刻情報(ここでは基準時刻信号'Ts')を送信している。但し、この時刻情報の送信は、必ずしも決まった時間間隔である必要はなく、所定時間ごとに送信されるものとする。クロックの受信側(スピーカ5(5-1~5-5)、ディスプレイ6、コンテンツソース4)では、受け取った基準時刻情報と内部発振回路の出力の値とが比較されて、内部発振回路の発振周波数が調整され、クロックが再現される。

【0035】図1に示すコントローラ3は、システム構成を設定している。この動作は、コントローラ3の指示に従いディスプレイ6にて表示されるメッセージや、コントローラ3の指示に従い各スピーカ5が発光させるLEDに反応して、ユーザが各スピーカ5の持つスイッチを押す事により達成される。また、コントローラ3は、ストリーム再生を制御している。この動作は、コントローラ3の指示に従い、コンテンツソース4がストリームを出力し、各スピーカ5およびディスプレイ6がストリームをデコードすることにより行われる。また、コントローラ3の指示により各スピーカ5の音声出力を調整することも行われる。

【0036】次に、クロックソース2が行うクロック配信について説明する。ここでは、図2および図3に示した2種類の構成のそれぞれに対して説明を行う。まず、図2に示すクロックソース2の動作を説明する。ここで

クロック発振器11の発振周波数を'U' [Hz] とする。クロック発振器11で発信されたクロックは、カウンタ12とタイマ13のそれぞれに入力される。カウンタ12は、入力されたクロックにより自身のカウンタ12をインクリメントし、時刻情報'T'を生成する。入力されるクロックが'U' [Hz] であるため、時刻情報'T'は'U' [Hz] の周波数でインクリメントされる。カウンタ12の出力(時刻情報'T')は、ラッチ14に入力される。ラッチ14は、ラッチ信号が入力された時に入力信号をラッチして出力する。ラッチ信号が入力されない場合には、直前にラッチした信号が保持される。

【0037】タイマ13は、入力されたクロックを計数し、あらかじめ設定された設定値'S'ごとにトリガ信号を出力している。ここで、タイマ13への入力クロックは'U' [Hz] であるので、トリガ信号は'S/U' [秒] ごとに出力される。言い換えると、トリガ信号の周期は'S/U' [秒]、あるいはトリガ信号の周波数は'U/S' [Hz] となる。タイマ13から出力されるトリガ信号は、ラッチ14のラッチ信号端子に入力されると同時に、ネットワークインタフェース15の送信信号端子に入力される。

【0038】ラッチ14は、ラッチ信号端子にタイマ13からのトリガ信号が入力された時点で、カウンタ12から入力されている時刻信号'T'をホールドして出力する。ラッチ14の出力は、次のラッチ信号が入力されるまで変化しない。この値を基準時刻信号'Ts'とする。送信信号端子にトリガ信号を受け取ったネットワークインタフェース15は、入力されているラッチ14の出力信号'Ts'を読み取り、ブロードキャストパケットに格納してネットワーク1に送り出す。ブロードキャストパケットは宛先を指定しないために、ネットワーク1に接続されている各機器に到着する。

【0039】次に、図3に示すクロックソース2の動作を説明する。ここでクロック発振器21の発振周波数を'U' [Hz] とする。クロック発振器21で発信されたクロックは、カウンタ22とタイマ23のそれぞれに入力される。カウンタ22は、入力されたクロックにより自身のカウンタをインクリメントして時刻情報'T'を生成する。入力されるクロックが'U' [Hz] であるため、時刻情報'T'は、'U' [Hz] の周波数でインクリメントされる。カウンタ22の出力(時刻情報'T')はラッチ24に入力される。ラッチ24は、ラッチ信号が入力された時に入力信号をラッチして出力する。ラッチ信号が入力されない場合には、直前にラッチした信号が保持される。

【0040】タイマ23は、入力されたクロックを計数し、あらかじめ設定された設定値'S'ごとにトリガ信号を出力している。ここでタイマ23への入力クロックは'U' [Hz] であるので、トリガ信号は'S/U' [秒] ごとに出力される。言い換えると、トリガ信号の

周期は'S/U' [秒]、あるいはトリガ信号の周波数は'U/S' [Hz] となる。タイマ23から出力されるトリガ信号は、ラッチ24のラッチ信号端子に入力されると同時にCPU25の割り込み端子に入力される。ラッチ24は、ラッチ信号端子にタイマ23からのトリガ信号が入力された時点で、カウンタ22から入力されている時刻信号'T'をホールドして出力する。ラッチ24の出力は、次のラッチ信号が入力されるまで変化しない。この値を基準時刻信号'Ts'とする。

【0041】割り込み端子にトリガ信号を受け取ったCPU25は、システムバス20を介して、ラッチ24の値、即ち基準時刻信号'Ts'を読み出す。さらにCPU25は、システムバス20経由でネットワークインタフェース26に指令し、ネットワーク1に接続されている各機器に対して、ラッチ24から読み出した基準時刻信号'Ts'を送信させる。ネットワークインタフェース26は、CPU25から受け取った指令に従い、基準時刻信号'Ts'をブロードキャストパケットに格納して、ネットワーク1に送り出す。ブロードキャストパケットは宛先を指定しないために、ネットワーク1に接続されている各機器に到着する。尚、CPU25は、ROM27に蓄えられているプログラムによりRAM28を利用して動作している。

【0042】図8は、クロック配信におけるクロックソース2の動作を説明するための図である。ここでは、横軸に時刻をとり、縦軸はそれぞれの信号の値が割り当てられている。クロック発振器11(あるいはクロック発振器21)は、'U' [Hz] の周波数で発信している。カウンタ12(あるいはカウンタ22)の出力、即ち時刻情報'T'は、同じく'U' [Hz] の周波数でインクリメントされる。図8の横軸の原点't0'をタイマ13(あるいはタイマ23)のトリガ信号が出力された時刻にとり、その時点での時刻情報'T'を'T0'とする。

【0043】次のトリガ信号は、時刻't0'からクロック'U'の周波数で周期'S'だけ計数した時刻't1'に出力され、この時の時刻情報'T'は'T0+S'となる。このとき、同時に時刻情報'T'はラッチ14(あるいはラッチ24)によりラッチされ、基準時刻信号'Ts'は'T0+S'となる。その後、トリガ信号は'U'の周波数でクロック周期'S'ごとに出力され、基準時刻情報'Ts'はそれぞれ'T0+2S'、'T0+3S'と変化して行く。基準時刻信号'Ts'は、トリガ信号が発生する度にネットワーク1に対してブロードキャストされる。

【0044】次に、クロック再生の動作について、スピーカーカ5(5-1~5-5)を例に挙げて説明する。このクロック再生は、コンテンツソース4およびディスプレイ6においても実行される。ここで「クロックの再生」とは、クロックソース2から送られたクロックをクライアント機器内部で再び発生させることを示している。

【0045】通常状態において、図6に示すクロック発

振器56の出力はカウンタ57に入力され、カウンタ57は、入力されたクロックにより自身のカウンタをインクリメントして時刻情報'Tt'を生成する。CPU51は、バス54を経由してカウンタ57の値(時刻情報'Tt')を読み込むことができる。時刻情報'Tt'は、CPU51により読み出され、デコードのタイミング調整に使用される。クロック発振器56は可変周波数発振器であり、CPU51がシステムバス54を経由して指示を行うことにより、発振周波数を一定の範囲で変化させることができる。また、CPU51は、システムバス54を経由して、カウンタ57に所望の値を設定することができる。

【0046】クロックソース2からの基準時刻信号'Ts'は、例えば一定時刻ごとに受信され、その際、CPU51は、以下で説明する時計合わせのタスクを実行する。カウンタ57は、クロック発振器56の自走クロックで時刻情報'Tt'を生成する。クロックソース2の発信した基準時刻信号'Ts'は、スピーカ5のネットワークインタフェース55で受信される。ネットワークインタフェース55は、CPU51に基準時刻信号'Ts'の到着を伝える。CPU51では、この信号により時計合わせのタスクが起動される。

【0047】図9は、クロック再生における時刻合わせの処理を説明するためのフローチャートである。CPU51は、まず、ネットワークインタフェース55に到着した基準時刻信号'Ts'を読み出す(ステップ101)。その後、カウンタ57から時刻情報'Tt'を読み出す(ステップ102)。次に、基準時刻信号'Ts'と時刻情報'Tt'の差分を計算し('Ts'-'Tt')、変数'diff'に代入する(ステップ103)。CPU51は、'diff'の絶対値と定数kを比較し(ステップ104)、'diff'の絶対値の方が大きいと判断された場合には、'Ts'の値をカウンタ57に代入して(ステップ105)、処理を終了する。ステップ104にて'diff'の絶対値の方が大きいと判断されなかった場合には、ステップ106に進む。

【0048】ステップ106にて、CPU51は、'diff'の値が0(ゼロ)であるか否かを確認し、'diff'の値が0でない場合にはステップ107へ進み、'diff'の値が0である場合には処理を終了する。ステップ107にて、CPU51は、'diff'の値と0(ゼロ)とを比較し、'diff'の値が0(ゼロ)より大きいと判断された場合('Ts'>'Tt')にはステップ109に進み、そうでない('Ts'<'Tt')と判断された場合にはステップ108へ進む。ステップ108において、CPU51は、クロック発振器56に対して発振周波数を遅くするよう指令した後、処理を終了する。また、ステップ109においてCPU51は、クロック発振器56に対して発振周波数を速くするよう指令した後、処理を終了する。

【0049】以上のようなCPU51のタスクにより、受信した基準時刻信号'Ts'と内部時刻情報'Tt'の差が大きい場合には受信した基準時刻信号'Ts'を内部時刻カウンタに代入し、内部時刻情報'Tt'が少し進んでいる時にはクロックを遅くし、また内部時刻情報'Tt'が少し遅れている時にはクロックを速める。これらの動作により、基準時刻信号'Ts'にあわせた内部時刻情報'Tt'を再生することができる。尚、上記の例では、クロック配信に際してブロードキャスト通信を使用した、ユニキャスト(一対一通信)の通信を用いることも可能である。

【0050】次に、コントローラ3を中心に行われるシステム構成設定の動作について説明する。図10および図11は、ネットワーク1に各機器が接続された直後からの処理を示したフローチャートである。図10に示すように、まず、コントローラ3は、物理的にネットワーク1に接続されて電源が投入されると、ネットワーク1への接続を確認する。即ち、図4に示すコントローラ3のCPU31は、まず、ネットワークインタフェース35に対してネットワーク1に接続したことを確認させる(ステップ201)。そして、ネットワーク1に接続したと判断されるとステップ203に進み、ネットワーク1に接続したと判断されない場合にはステップ201に戻って確認を繰り返す(ステップ202)。

【0051】ステップ203において、CPU31は、「応答リクエストメッセージ」を作成し、ネットワークインタフェース35に指令して、ネットワーク1に対して送信させる。この「応答リクエストメッセージ」は所定の文字列で構成されている。ネットワークインタフェース35は、CPU31から受け取った指令に従い、「応答リクエストメッセージ」をブロードキャストパケットに格納してネットワーク1に送り出す。ブロードキャストパケットは、宛先を指定していないために、「応答リクエストメッセージ」はネットワーク1に接続されている各機器に到着する。「応答リクエストメッセージ」を受け取った各機器は、自身の種別およびデコードディレイ値を返答する。種別およびデコードディレイ値は各機器のROMに記録されている。例えばスピーカ5において、このメッセージはネットワークインタフェース55に到着し、CPU51は、このメッセージを解読して、ROM52から種別とデコードディレイを読み取り、「応答」メッセージを作成し、ネットワークインタフェース55に指令してコントローラ3に対して送信させる。各機器の返答したメッセージは、ネットワークインタフェース35で受信され、ネットワークインタフェース35は、CPU31にメッセージの到着を伝える。

【0052】ステップ204においてメッセージが到着していると判断される場合には、コントローラ3のCPU31は、ステップ205に進む。メッセージが到着していないと判断された時には、ステップ208に進む。

ステップ205において、CPU31は、ネットワークインタフェース35に到着したメッセージを読み出す。その後、CPU31は、読み出したメッセージが各機器から返答された所定の「応答」であるかどうかを確認する(ステップ206)。所定の「応答」であった場合にはステップ207へ進む。所定の「応答」ではなかった場合には、ステップ208へ進む。

【0053】ステップ207において、CPU31は、受け取った「応答」をRAM33に置かれた機器データベースに記録する。図12は、機器データベースの構造を示した図である。機器データベースの先頭には、登録されているエントリの数が記録され、引き続いて、エントリの数だけ各機器のレコードが記録されている。機器のレコードには、その機器をネットワーク上で特定するためのネットワークアドレス、種別、役割、デコードディレイがそれぞれ記録される。「応答」を機器データベースに記録する際には、まず、エントリ数を1だけインクリメントする。そして、新しいレコードをリストの終りに追加する。その後、新しく追加したレコードに対して、受け取った「応答」の送り先の機器を特定するためのネットワークアドレス、種別、デコードディレイを記録する。役割の項はシステム構成設定動作の後半で記録される。

【0054】ステップ208において、CPU31では、ステップ203の「応答リクエストメッセージ」を送信してから、所定の時間が経過したかどうかを判断される。所定時間が経過したと判断された場合には、図11に示すステップ210に進む。まだ所定時間が経過していないと判断された場合には、ステップ204に戻って、これまでの動作を繰り返す。

【0055】図11に示すステップ210において、RAM33に置かれている機器データベースの内容は、図13に示すような内容になっており、そのエントリ数は7となっている。7つあるレコードの内訳としては、まず、ディスプレイ6を示すネットワークアドレスを持ち、種別がディスプレイとなっているレコードが置かれる。また、5つのスピーカ5(5-1~5-5)の各々を示すネットワークアドレスを持ち、種別がモノラルスピーカとなっているレコードが計5つ置かれている。最後に、コンテンツソース4を示すネットワークアドレスを持ち、種別がコンテンツソースとなっているレコードが置かれている。尚、レコードの順番は一例として示したものであり、図13に示す順番になるものと決まっているものではない。

【0056】ステップ210において、CPU31は、RAM33に置かれている機器データベースから種別がディスプレイとなっているものを探す。この例では、図13に示すように、最初に記録されているレコードの種別がディスプレイとなっている。CPU31は、最初のレコードに記録されているネットワークアドレスを持つ

機器がディスプレイであることを認識する。その後、CPU31は、「システムを設定開始する」旨のメッセージを作成し、ネットワーク1経由でディスプレイ6に指令して表示させる(ステップ220)。前のステップにてディスプレイ手段を持つ機器としてディスプレイ6を認識したので、CPU31は、直接、ディスプレイ6(を示すネットワークアドレスを持つ機器)に対して指令を行う。具体的には、CPU31は、メッセージを作成し、ネットワークインタフェース35に指令してディスプレイ6に対して送信させる。ディスプレイ6では、図7に示すネットワークインタフェース75がメッセージを受信し、CPU71によってそのメッセージが読み取られて解読され、OSD82に指令してメッセージを出力して表示装置83に表示させる。

【0057】次に、コントローラ3のCPU31により「フロントレフト」が指定される(ステップ230)。即ち、「フロントレフトの位置に有るスピーカのスイッチを押して下さい」という旨のメッセージが作成され、ネットワーク1を経由してディスプレイ6に表示される。

【0058】その後、コントローラ3は、「LED点滅/ボタン待ち」を指令するメッセージを作成し、RAM33に置かれている機器データベースから種別がモノラルスピーカになっている機器の全て(スピーカ5(5-1~5-5))に対して送出する。この「LED点滅/ボタン待ち」のメッセージを受信した機器は、LEDを点滅させ(ステップ231)、ボタンが押されることを待ち受ける。スピーカ5においては、このメッセージはネットワークインタフェース55に到着し、CPU51はこのメッセージを解読して、ボタン/LED操作器58に指令してLEDを点滅させる。またCPU51は、ボタン/LED操作器58にてボタンが押されたことを探知したら、コントローラ3に返答を返すべく、待ち受ける。

【0059】ユーザは、LEDの点滅しているスピーカ5(5-1~5-5)の中から、フロントレフトの位置にあたるスピーカ5-1のスイッチを押す。スピーカ5-1では、ボタンを押されたことをボタン/LED操作器58が感知し、CPU51に伝える。CPU51は、「ボタン押下」のメッセージを作成し、ネットワークインタフェース55に指令してコントローラ3に対して送信させる。コントローラ3のCPU31は、ステップ232にて「ボタン押下」のメッセージが受信されるまで待ち(ステップ232)、受信するとスピーカ5-1のLEDを消灯する(ステップ233)。

【0060】その後、CPU31は、ネットワークインタフェース35からメッセージを読み出し、「ボタン押下」メッセージ発信元のネットワークアドレスを読み取り、RAM33に記録されている機器データベースのレコードの中で、ネットワークアドレスが一致するもの、即ち、図13の例では第2番目のレコードを探し出し、

該当するレコードの役割のフィールドに「フロントレフト」の属性を書き込んで設定する(ステップ234)。最後にCPU31は、役割のフィールドの内容、ここでは「フロントレフト」の属性を記述した「役割メッセージ」を作成し、ネットワーク1を経由して「ボタン押下」メッセージの発信元に送り返す(ステップ235)。「ボタン押下」メッセージの発信元(ここではスピーカ5-1)は、「役割メッセージ」を受信し、役割(ここでは「フロントレフト」の属性)を取り出してRAM53に格納する。即ち、このメッセージは、ネットワークインタフェース5に到着し、CPU51は、このメッセージを解読して、RAM53に記録する。以上のようなステップ230からステップ235の操作によって、「フロントレフト」の位置に設置されたスピーカ5はスピーカ5-1であるということがコントローラ3の機器データベースに記録される。また、スピーカ5-1は、自身の役割(ここではフロントレフト)を知り、自身のRAM53に記録する。

【0061】以下同様に、ステップ240からステップ245の操作により「フロントライト」、ステップ250からステップ255の操作により「センター」、ステップ260からステップ265の操作により「リアレフト」、ステップ270からステップ275の操作により「リアライト」のそれぞれの位置に設置されたスピーカ5を知ることができる。更に、各スピーカ5(5-2～5-5)は、自身の役割を知り自身のRAM53に記録する。

【0062】最後に、コントローラ3のCPU31は「システム設定が終了した」という旨のメッセージを作成し、ネットワーク1経由でディスプレイ6に指令して表示させる(ステップ280)。以上の手順により、物理的な配置とネットワーク1上でのアドレスの対応をとることができる。尚、ここでは説明しなかったが、ディスプレイ6が複数、存在する場合には、ディスプレイ6が持つボタン/LED操作器78、あるいはリモコン7と画面表示などを用いて、上記と同様の設定を行うことができる。

【0063】次に、スピーカ5(5-1～5-5)のデコーダ61やディスプレイ6のデコーダ81にて構成されるMPEGデコーダについて説明する。図14は、MPEG2システム(ISO13818-1)に準拠したデコーダシステムの概略を示した図である。図14に示すデコーダシステムでは、ストリーム入力91からストリームが入力され、デマルチプレクサ92にてビデオストリームとオーディオストリームとに振り分けられる。ビデオストリームは、ビデオバッファ93に入力され、所定のディレイ時間を経過した後にビデオデコーダ94に入力され、デコードされてビデオ出力97から出力される。オーディオストリームは、オーディオバッファ95に入力され、所定のディレイ時間を経過した後にオーディオデコ

ーダ96に入力され、デコードされてオーディオ出力98から出力される。

【0064】図15は、MPEGデコーダに供給されるデータフォーマットの一例を示した図である。このフォーマットは、MPEG2の多重化ビットストリーム(ProgramStream)として規定されているものである。図15に示すように、多重化ビットストリームは、1つ以上のパック(PACK)で構成され、各パックは1つ以上のパケット(PACKET)で構成される。パックの先頭にはパックヘッダ(PACK HEADER)が配置され、このパックヘッダにはパックの開始点を示すパックスタートコード(PACK START CODE)、SCR(System Clock Reference)およびMUX RATEが配置されている。SCRは、その最後のバイトがデマルチプレクサ92に入力される時刻を表わしている。MUX RATEは、転送レートを示すものである。

【0065】図15に示す例においては、パックヘッダに続いて、ビデオパケット(VIDEO PACKET)とオーディオパケット(AUDIO PACKET)とが配置されている。これらのパケットの先頭にもパケットヘッダが配置され、これらのパケットヘッダは、ビデオまたはオーディオのパケットの開始点を表すビデオパケットスタートコード(VIDEO PACKET START CODE)またはオーディオパケットスタートコード(AUDIO PACKET START CODE)と、ビデオまたはオーディオデータのデコード(表示)開始時刻を示すDTS(V)(PTS V(PTS video))またはDTS(A)(PTS A(PTS audio))が配置されている。そして、この各パケットヘッダの次に、ビデオデータあるいはオーディオデータが配置されている。尚、これらSCR、PTS(PTS VまたはPTS A)などのタイミングデータは、90kHzの周波数からなるクロックのカウント値で表わされ、33ビットの有効数字を有している。更に、システム表現のための簡略モデル化を行っているため、デコードにかかる時間は0となっている。このためデコード開始時刻と表示開始時刻が等しい。

【0066】図16は、SCRとPTS V(PTS video)、SCRとPTS A(PTS audio)の関係を示した図である。パックヘッダがデマルチプレクサ92を通過した時刻が t_1 であり、該当するパックに含まれるビデオとオーディオの表示時間がそれぞれ t_2 と t_3 となる。ここでは、SCRからPTS A(PTS audio)までの時間を ΔT_a とし、SCRからPTS V(PTS video)までの時間を ΔT_v としている。 ΔT_a と ΔT_v は、エンコード時に決まる任意の時間である。該当するパックがデマルチプレクサ92に入力される時刻がSCRであり、該当するパックに含まれるビデオデータとオーディオデータは、それぞれビデオバッファ93とオーディオバッファ95で所定の時間、遅延するために、そのデコード(表示)開始時刻はSCRより遅くなる。また、一般的にビデオバッファ93での遅延はオーディオバッファ95

での遅延より大きい場合、同じタイミングでマルチプレクサ92を通過した場合でも、ビデオのデコード(表示)時刻はオーディオのデコード(表示)開始時刻より遅くなる。尚、前述したように、デコードにかかる時間は0であるので、ここでの遅延は、それぞれビデオバッファ93とオーディオバッファ95で発生している。

【0067】次に、本実施の形態におけるディレイ補償の考え方について説明する。コントローラ3は、コンテンツの再生を行うにあたり、 Δt を設定してコンテンツソース4に知らせる。コンテンツソース4は、コンテンツデータの送信時刻に対して、 Δt だけ遅らせた時刻にコンテンツの出力されるべき時刻を設定してコンテンツデータを送り出す。コンテンツのシンク機器群(スピーカ5(5-1~5-5)、ディスプレイ6)では、受け取ったコンテンツデータを指定された時刻に出力する。

【0068】 Δt は、コンテンツソース4からコンテンツのシンク機器群(スピーカ5(5-1~5-5)、ディスプレイ6)に、コンテンツデータが送られた時のネットワークディレイ(通信ディレイ)のうち最大となる時間と、コンテンツのシンク機器群(スピーカ5(5-1~5-5)、ディスプレイ6)の実際のデコードディレイのうち最大となる時間とを加えたものである。場合によっては、マージンを増やすために幾分かの余裕を加える場合がある。また、この2つ以外の要因によるディレイを加える場合もある。例えば、サブネットをまたぐ場合のルーターのディレイ等が考えられる。

【0069】更に、 Δt の値はシンク機器群の組み合わせによって変化することがある。即ち、コンテンツのシンク機器群の組み合わせが変化すると、その中で最大のネットワークディレイと最大のデコードディレイは変化する可能性がある。シンク機器群の組み合わせによって Δt をその都度変えて制御する場合と、システム内で起こり得る最大のネットワークディレイと最大のデコードディレイを用いて、即ち、 Δt の最大値を見積もってそれを使用する場合の二つの方法が考えられる。

【0070】図17は、本実施の形態におけるディレイを説明するための図である。コンテンツソース4がストリーム先頭に対する発信を開始した時刻を t_{10} とする。 t_{10} に最大の通信ディレイ(ネットワークディレイ)を加えた時刻を t_{11} とする。コンテンツソース4から発信されたコンテンツデータは、遅くとも t_{11} までには全てのコンテンツのシンク機器群(スピーカ5(5-1~5-5)、ディスプレイ6)に到着している。即ち、通信のディレイに関しては、配信時刻から再生時刻を最大の通信ディレイだけ遅らせることで補償可能である。

【0071】次に、 t_{11} に最大のデコードディレイを加えた時刻、即ち、 t_{10} に Δt を加えた時刻を t_{12} とする。MPEG系の多重化ストリームの場合には、デコード開始とはビットストリームの処理開始、即ちマ

ルチプレクス開始ということになる。このため、時刻 t_{12} は、該当するビットストリームのSCRが対応することになる。図16に示した数値を当てはめて考えると、デコーダでは t_{12} がSCRの時刻となるから、オーディオの出力開始時刻 PTS_{audio} は、 t_{12} に ΔT_a を加えた時刻 t_{20} となり、ビデオの出力開始時刻 PTS_{video} は、 t_{12} に ΔT_v を加えた時刻 t_{22} となる。

【0072】ここで、実際のデコードディレイを考える。ディスプレイ6のデコーダ81のデコードディレイを D_v 、スピーカ5のデコーダ61のデコードディレイを D_a とすると、 t_{20} にオーディオを出力するためには、 t_{20} より D_a だけさかのぼった時刻 t_{21} にオーディオのデコードを開始する必要がある。また、同様に、 t_{22} にビデオを出力するためには、 t_{22} から D_v だけさかのぼった時刻 t_{23} にビデオのデコードを開始する必要がある。

【0073】このとき、 ΔT_a あるいは ΔT_v が非常に小さく与えられたとすると、 t_{20} あるいは t_{22} は t_{12} に限りなく近付くので、 t_{21} あるいは t_{23} は t_{12} からデコードディレイ分さかのぼった時刻になる。このため、 t_{12} から最大のデコードディレイ分をさかのぼった時刻が、 t_{11} の後になっていれば良い。繰り返すと、 t_{11} までデコード開始を待てばネットワークによるディレイは無視できる。更に、見かけ上のデコード開始時刻(t_{12} 、SCR)を、 t_{11} から実際のデコードディレイにおける最大のものだけ遅らせることにより、デコードディレイの影響も無視できるようになる。このために、 Δt には最大のデコードディレイが加算されている。

【0074】次に、ストリーム再生動作について説明する。図1にて、ユーザがリモコン7を使用して、再生モードの指定をコントローラ3に対して与えた場合を考える。ここではディスプレイ6とスピーカ5(5-1~5-5)を使用するサラウンド再生を指定したものととする。このとき、リモコン信号は、コントローラ3のリモコン受光部36で受信される。リモコン受光部36は、CPU31に対して再生モード指定のコマンドを伝える。CPU31は、RAM33に記録されている機器データベースを参照し、シンク機器(スピーカ5(5-1~5-5)、ディスプレイ6)から、デコードディレイの最大値を選び出し、更に、予め決まっているネットワークのディレイをROM32から読み出して加算し、 Δt とする。

【0075】ここで、ユーザがリモコン7を使用して、コンテンツ再生の命令をコントローラ3に対して与えた場合を考える。このリモコン信号は、コントローラ3のリモコン受光部36で受信される。リモコン受光部36は、CPU31にコンテンツ再生のコマンドを伝える。CPU31は、RAM33に記録されている機器データ

ベースを参照して、コンテンツソースを探し出す。ここではコンテンツソース4を発見し、ネットワークアドレスを得る。コントローラ3は、コンテンツソース4に対して「コンテンツ再生開始」のメッセージを送出する。このとき、 Δt の値も同時に与える。また、通常では、ここでコンテンツの指定がなされる。

【0076】即ち、CPU31は、「コンテンツ再生開始メッセージ」を作成し、その中で Δt を指定する。そして、CPU31は、ネットワークインタフェース35に指令して、「コンテンツ再生開始メッセージ」をコンテンツソース4に対して送信させる。この「コンテンツ再生開始メッセージ」は、所定の文字列で構成される。

【0077】コントローラ3は、今回のシンク機器群(スピーカ5(5-1~5-5)、ディスプレイ6)に対して、コンテンツソース4からのコンテンツデータを再生するように指示する。即ち、CPU31は、「コンテンツソース指定メッセージ」を作成し、その中でコンテンツソース4のネットワークアドレスを指定する。CPU31は、ネットワークインタフェース35に指令して、今回のシンク機器群(スピーカ5(5-1~5-5)、ディスプレイ6)に対して、一つづつ順番に「コンテンツソース指定メッセージ」を送信させる。この「コンテンツソース指定メッセージ」は、所定の文字列で構成される。

【0078】同時に、コントローラ3は、今回のシンク機器群の中で、スピーカ5群(スピーカ5-1~5-5)に対してボリュームを設定する。即ち、CPU31は、「ボリューム設定メッセージ」を作成し、その中でボリュームの値を指定する。CPU31は、ネットワークインタフェース35に指令して、シンク機器群の中の指定されたシンク機器であるスピーカ5(5-1~5-5)に対して、一つづつ順番に「ボリューム設定メッセージ」を送信させる。この「ボリューム設定メッセージ」は、所定の文字列で構成されている。

【0079】次に、コンテンツソース4の動作について説明する。コンテンツソース4は、「コンテンツ再生開始メッセージ」を受信する。即ち、ネットワークインタフェース45にメッセージが到着し、CPU41はこのメッセージを解釈し、 Δt の値を受け取ると共に、コンテンツの再生を開始する。まず、CPU41は、ハードディスク装置48に対して所定のコンテンツの出力を指示する。ハードディスク装置48から出力したストリームは、ビットストリーム解析器49にて解析され、先頭のSCRの値が読み出される。SCRの数値はCPU41によって読み出され、ストリームはそのままバッファ50へ進む。

【0080】このとき、コンテンツソース4での時刻情報'T_t'が'T₁₀'、ストリーム先頭のSCRの値が'S₁₀'であったとする。即ち、ビットストリームの'S₁₀'の値を持つタイムスタンプが、スピーカ5におけ

るデコーダ61内の図示せぬデマルチプレクサ、あるいはディスプレイ6のデコーダ81内の図示せぬデマルチプレクサにて処理される時刻'T₁₂'は、現在時刻'T₁₀'にコントローラ3より与えられた' Δt 'を加えた時刻となる。

$$T_{12} = T_{10} + \Delta t$$

コンテンツソース4のCPU41は、「タイムスタンプオフセットメッセージ」を作成し、'S₁₀'の値と'T₁₂'の値を指定する。CPU41は、ネットワークインタフェース45に指令して、「タイムスタンプオフセットメッセージ」をネットワーク1にブロードキャストする。これにより、全てのシンク機器は、MPEG2のタイムスタンプと'クロック'の関係を知ることになる。

【0081】コンテンツソース4のCPU41は、ネットワークインタフェース45に指定して、バッファ50の内容(ストリーム)をネットワーク1にブロードキャストさせる。ここではネットワーク1に対してブロードキャストするが、ユニキャスト(一対一通信)でも構わない。その際には、コントローラ3が、シンク機器の一覧をコンテンツソース4に伝える必要があり、コンテンツソース4は、その一覧データに従ってデータを送信する。

【0082】次に、本実施の形態におけるスピーカ5の動作について説明する。スピーカ5のCPU51は、コントローラ3の発信した「コンテンツソース指定メッセージ」のメッセージを受け取る。CPU51は、コンテンツソースとして指定されたネットワークアドレスをRAM53に格納する。スピーカ5は、コントローラ3の指示により、コンテンツソース4からのコンテンツデータを待ち受ける。このメカニズムにより、同一ネットワーク上に、コンテンツソースとシンク機器の組み合わせが複数存在することができる。

【0083】また、スピーカ5のCPU51は、コントローラ3の発信した「ボリューム設定メッセージ」のメッセージを受け取る。CPU51はアンプ62に対してボリュームを設定する。更にスピーカ5は、コンテンツソース4の発信した「タイムスタンプオフセットメッセージ」を受け取る。この「タイムスタンプオフセットメッセージ」は、コンテンツデータに伴って送られるものであり、スピーカ5は、予めコンテンツソース4からのコンテンツデータを待ち受けていたので、このメッセージを受け入れた。この「タイムスタンプオフセットメッセージ」からMPEGのタイムスタンプと時刻情報の関係が判る。スピーカ5のCPU51は、差分オフセット値= $S_{10} - T_{12}$ を計算する。これによりスピーカ5での時刻情報'T_t'にオフセット値を加えることで、MPEGの時計であるところのSTC(システムタイムクロック)の値を計算することができる。また、MPEG系のタイムスタンプからオフセットを減じることで、時刻情報'T_t'の値を求めることができる。

【0084】スピーカ5は、コンテンツソース4の発信したストリームを受け取り、バッファ59に入力する。バッファ59に入ったストリームは、タイムスタンプ抽出器60を経てデコーダ61に入力される。CPU51は、タイムスタンプ抽出器60からSCRとPTSaudioを読み出す。また、CPU51はデコードディレイDaの値を知っている。デコーダ61にはデコードディレイがあるために、名目上の出力開始時刻からDaだけさかのぼって(前に)デコードを開始する必要がある。この調整を行うために、スピーカ5のCPU51は以下の処理を行う。

【0085】まず、T12からDaだけさかのぼった時刻をT11(実際のデマルチプレクス開始時刻)とする。ストリームの最初のPTSaudio(名目上のオーディオデコード/表示開始)をT20とし、T20からDaだけさかのぼった時刻をT21とする。即ちT12は名目上のデマルチプレクス開始時刻であり、T11はデコードディレイの分、前倒しにした実際のデマルチプレクス開始時刻となる。また、T20は、ストリームの最初のPTSaudioにおける名目上のデコード(表示)開始時刻であり、T21はデコードディレイの分、前倒しにした実際のデコード開始時刻となる。CPU51はカウンタ57から再生された時刻情報'Tt'を読み出し、時刻がT11に等しくなった時点でデマルチプレクスを開始する。引き続いて時刻がT21になった時点でデコードを開始する。これにより、T20にオーディオの出力を開始することができる。

【0086】次に、本実施の形態におけるディスプレイ6の動作について説明する。ディスプレイ6のCPU71は、コントローラ3の発信した「コンテンツソース指定メッセージ」のメッセージを受け取る。CPU71は、コンテンツソースとして指定されたネットワークアドレスをRAM73に格納する。ディスプレイ6は、コントローラ3の指示により、コンテンツソース4からのコンテンツデータを待ち受ける。この仕掛けにより、同一ネットワーク上に、コンテンツソースとシンク機器の組み合わせが複数存在することができる。

【0087】ディスプレイ6は、コンテンツソース4の発信した「タイムスタンプオフセットメッセージ」を受け取る。この「タイムスタンプオフセットメッセージ」は、コンテンツデータに伴って送られるものであり、ディスプレイ6は、予めコンテンツソース4からのコンテンツデータを待ち受けていたのでこのメッセージを受け入れた。この「タイムスタンプオフセットメッセージ」からMPEGのタイムスタンプと時刻情報の関係が判る。ディスプレイ6のCPU71は、差分オフセット値=S10-T12を計算する。これによりディスプレイの時刻情報'Tt'にオフセット値を加えることで、MPEGの時計であるところのSTC(システムタイムクロック)の値を計算することができる。また、MPEG

系のタイムスタンプからオフセットを減じることで、時刻情報'Tt'の値を求めることができる。

【0088】ディスプレイ6は、コンテンツソース4の発信したストリームを受け取り、バッファ79に入力する。バッファ79に入ったストリームは、タイムスタンプ抽出器80を経てデコーダ81に入力する。CPU71は、タイムスタンプ抽出器80からSCRとPTSvideoを読み出す。また、CPU71はデコードディレイDvの値を知っている。デコーダ81にはデコードディレイがあるために、名目上の出力開始時刻からDvだけさかのぼって(前に)デコードを開始する必要がある。この調整を行うために、ディスプレイ6のCPU71は以下の処理を行う。

【0089】まず、T12からDvだけさかのぼった時刻をT11(実際のデマルチプレクス開始時刻)とする。ストリームの最初のPTSvideo(名目上のビデオデコード/表示開始)をT22とし、T22からDvだけさかのぼった時刻をT23とする。即ちT12は名目上のデマルチプレクス開始時刻であり、T11はデコードディレイの分、前倒しにした実際のデマルチプレクス開始時刻となる。また、T22はストリームの最初のPTSvideoにおける名目上のデコード(表示)開始時刻であり、T23はデコードディレイの分、前倒しにした実際のデコード開始時刻となる。CPU71は、カウンタ77から再生された時刻情報'Tt'を読み出し、時刻がT11に等しくなった時点でデマルチプレクスを開始する。引き続いて時刻がT23になった時点でデコードを開始する。これにより、T22にビデオの出力を開始することができる。

【0090】最後に、位置補償の方法について説明する。上記の例では、Δtの要素として、ネットワークによるディレイとデコードディレイの二つを考えたが、このほかにもスピーカ5(5-1~5-5)の位置によるディレイ調整が考えられる。例えば、スピーカ5-4がスピーカ5-5より1.7メートルだけリスニングポジション8に近いとする。音速はおよそ340メートル毎秒なので、1.7メートルの距離を進むのに約5ミリ秒かかる。即ち、スピーカ5-4とスピーカ5-5を同時に発した音は、スピーカ5-4からの音が5ミリ秒だけ早くリスニングポジション8に到達する。これを補償するために、スピーカ5-4に対して5ミリ秒のディレイを加えるという方法がある。言い換えれば、スピーカ5-4だけが1.7メートルだけリスニングポジション8に近い場合に、スピーカ5-4以外のスピーカに対して5ミリ秒だけ早く出力させるということになる。

【0091】本実施の形態では、かかる方法にも対応することが可能である。具体的には、上記例においてΔtを計算する際に、「ネットワークディレイの最大値」と「デコードディレイの最大値」に加えて「位置補償ディレイの最大値」を加算する。即ち、上記例よりもΔtは

5ミリ秒だけ大きくなる。また、コントローラ3は、スピーカ5-4に対して0ミリ秒のディレイを指示し、スピーカ5-4以外のスピーカに対して5ミリ秒の前倒しを指示する。このとき、コントローラ3から発信される「コンテンツソース指定メッセージ」によって指定されたネットワークアドレスに基づいて、シンク機器毎にディレイの指示を受けることが可能である。また、コントローラ3のCPU31により各スピーカ5の「位相補償ディレイ設定メッセージ」が作成され、各スピーカ5に送られることで、シンク機器毎にディレイを指示するように構成することも可能である。

【0092】図18は、位置補償ディレイの最大値を考慮した場合のディレイを説明するための図である。コンテンツソース4は、コンテンツの送り出し時刻 t_{10} に対して Δt を加え、名目上のデマルチプレクス開始時刻として t_{12} を指定する。リアレフトであるスピーカ5-4では、最初のSCRにあたる t_{12} から“デコードディレイ $D_a + 0$ ミリ秒”だけさかのぼった時刻 t_{11} にデマルチプレクスを開始し、最初のPTSaudioにあたる t_{20} から“デコードディレイ $D_a + 0$ ミリ秒”だけさかのぼった時刻 t_{21} にデコードを開始する。これによって、 t_{20} に音声出力することができる。

【0093】スピーカ5-4以外のスピーカ5では、最初のSCRにあたる t_{12} から“デコードディレイ $D_a + 5$ ミリ秒”だけさかのぼった時刻 t_{31} にデマルチプレクスを開始し、最初のPTSaudioにあたる t_{20} から“デコードディレイ $D_a + 5$ ミリ秒”だけさかのぼった時刻 t_{32} にデコードを開始する。すると t_{20} から5ミリ秒前に音声出力することができる。即ち、これらの操作によりスピーカ5-4以外のスピーカ5からの出力は、スピーカ5-4からの出力よりも5ミリ秒だけ早く出力することができる。このようにしてスピーカ位置の補償が可能となる。

【0094】以上、詳述したように、本実施の形態では、まず、ソース機器とシンク機器における動作クロックの関係(結びつき)について対策を施している。即ち、両者のクロックが非同期である場合、両者のデータ処理速度、即ち同一サンプル数に対する処理時間が異なるため、結果として二つの機器の間に存在するバッファには破綻(アンダーフロー、オーバーフロー)をきたすことになる。本実施の形態では、クロックの配信を行い、受信した基準時刻信号と内部時刻情報との差が大きい場合には受信した基準時刻信号を内部時刻カウンタに代入し、内部時刻情報が進んでいるときにはクロックを遅くし、遅れているときにはクロックを速めるように構成した。これによって、デジタルネットワークに接続された機器におけるクロックの同期をとることが可能となる。

【0095】また、ネットワークに接続された複数の入出力機器間の位相(タイミング)の関係について、デジタルネットワークでは伝送遅延が固定ではないことか

ら、十分に小さい位相誤差にて出力されるという保証が無い。また、アナログ接続に比べて遅延の絶対値が大きくなる。しかしながら、本実施の形態によれば、まず、上記のように、同じ時計を各機器で動作させ、入出力タイミングをその時計の時刻で指定することで、位相情報(入出力時刻/タイミング)配信を行っている。また、ネットワーク(通信)ディレイと末端機器におけるデコードディレイを考慮し、コンテンツの再生に際して生じるディレイ分を補正するように構成した。これによって、理想状態で位相を合わせた上で実際の位相調整を行うことが可能となる。

【0096】尚、本実施の形態にて説明したデコードディレイに代表される変換ディレイには、例えば、サンプリング周波数変換、ノイズフィルタ、また、サラウンド機能を通した場合のディレイ等の各種ディレイを含むことができる。また、本実施の形態では、ストリームを再生して出力するデコードを備える出力機器を中心に説明したが、例えば、デジタルカメラやマイク、リモコン操作等を行うスイッチ等、各種入力機器がデジタルネットワークに接続された状態に対しても適用することができる。かかる状態の場合には、エンコードしてストリームを生成する際に生じるエンコードディレイを考慮し、位相の同期が図られる。

【0097】

【発明の効果】以上説明したように、本発明によれば、デジタルネットワークに接続された各機器の間において、同期をとることが可能となる。

【図面の簡単な説明】

【図1】 本実施の形態におけるネットワークシステムの全体像を示した構成図である。

【図2】 クロックソースにおける第1の構成例を示した図である。

【図3】 クロックソースにおける第2の構成例を示した図である。

【図4】 図1に示したコントローラの構成を説明するための図である。

【図5】 図1に示したコンテンツソースの構成を説明するための図である。

【図6】 図1に示したスピーカの構成を説明するための図である。

【図7】 図1に示したディスプレイの構成を説明するための図である。

【図8】 クロック配信におけるクロックソースの動作を説明するための図である。

【図9】 クロック再生における時刻合わせの処理を説明するためのフローチャートである。

【図10】 ネットワークに各機器が接続された直後からの処理を示したフローチャートである。

【図11】 ネットワークに各機器が接続された直後からの処理を示したフローチャートである。

【図12】 機器データベースの構造を示した図である。

【図13】 コントローラのRAMに置かれている機器データベースの内容を示した図である。

【図14】 MPEG2システム(ISO13818-1)に準拠したデコーダシステムの概略を示した図である。

【図15】 MPEGデコーダに供給されるデータフォーマットの一例を示した図である。

【図16】 SCRとPTSV(PTSvideo)、SCRとPTSA(PTSaudio)の関係をj示した図である。

【図17】 本実施の形態におけるディレイを説明するための図である。

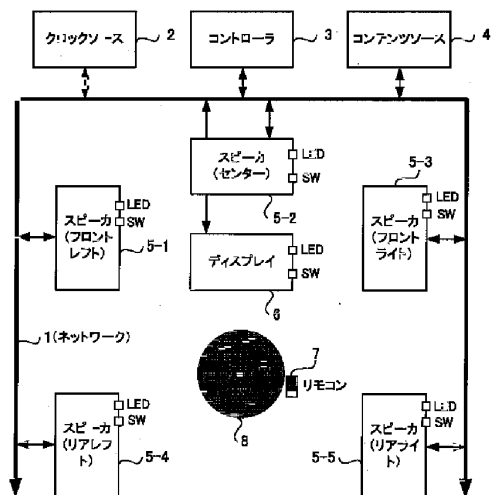
【図18】 位置補償ディレイの最大値を考慮した場合のディレイを説明するための図である。

【符号の説明】

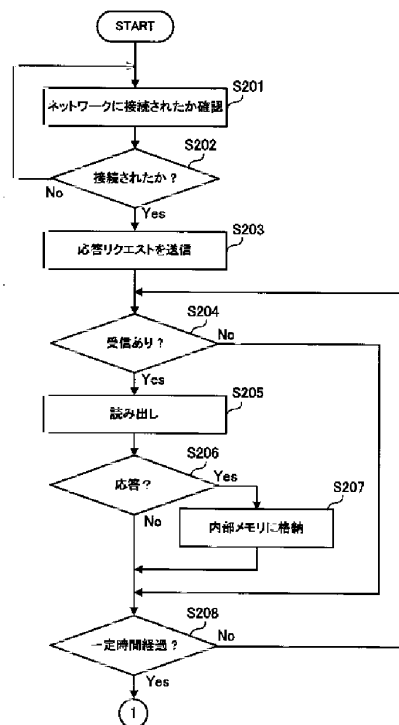
1…ネットワーク、2…クロックソース、3…コントローラ、4…コンテンツソース、5(5-1～5-5)…ス

ピーカ、6…ディスプレイ、11…クロック発振器、12…カウンタ、13…タイマ、14…ラッチ、15…ネットワークインタフェース、20…システムバス、21…クロック発振器、22…カウンタ、23…タイマ、24…ラッチ、25…CPU、26…ネットワークインタフェース、31…CPU、32…ROM、33…RAM、34…システムバス、35…ネットワークインタフェース、41…CPU、44…システムバス、45…ネットワークインタフェース、46…クロック発振器、47…カウンタ、48…ハードディスク装置、49…ビットストリーム解析器、50…バッファ、51…CPU、54…システムバス、55…ネットワークインタフェース、56…クロック発振器、57…カウンタ、59…バッファ、60…タイムスタンプ抽出器、61…デコーダ、71…CPU、75…ネットワークインタフェース、76…クロック発振器、77…カウンタ、79…バッファ、80…タイムスタンプ抽出器、81…デコーダ

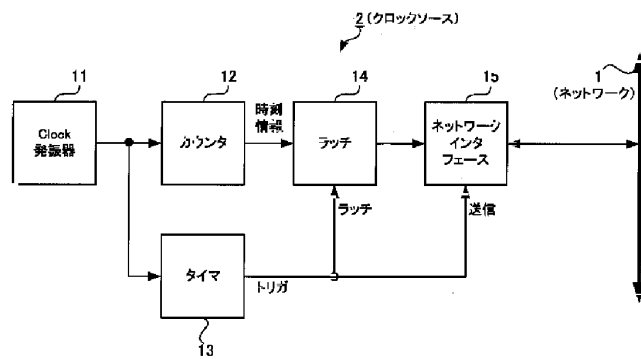
【図1】



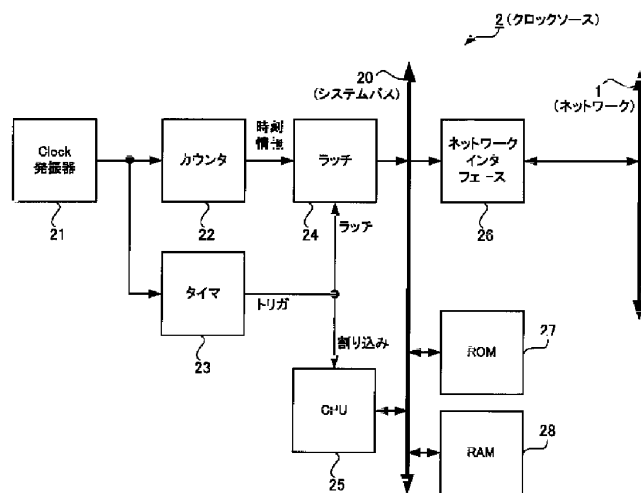
【図10】



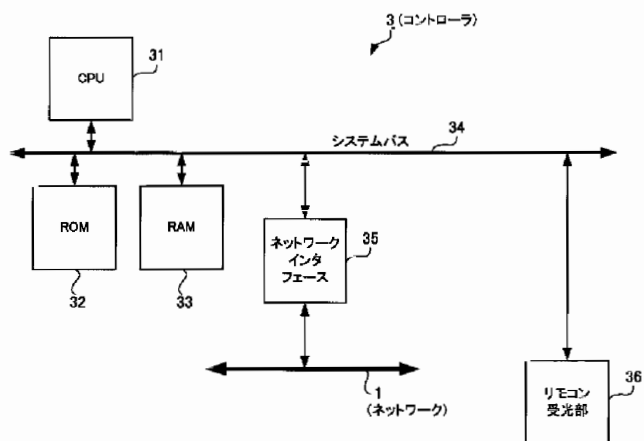
【図2】



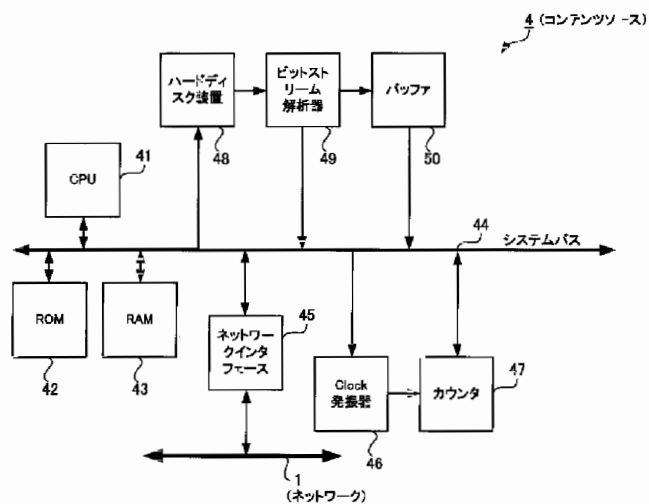
【図3】



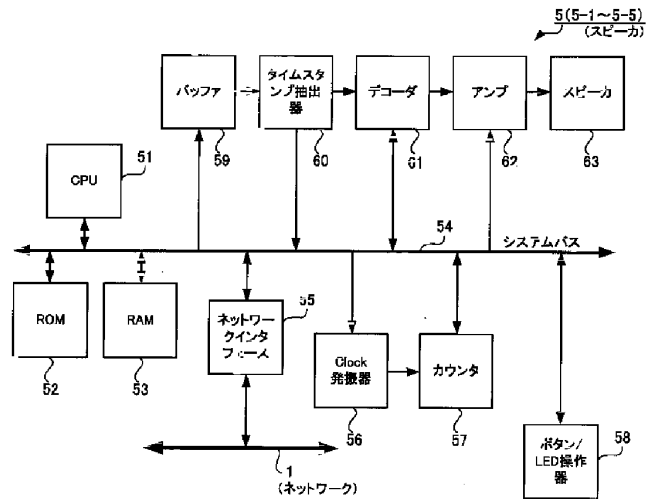
【図4】



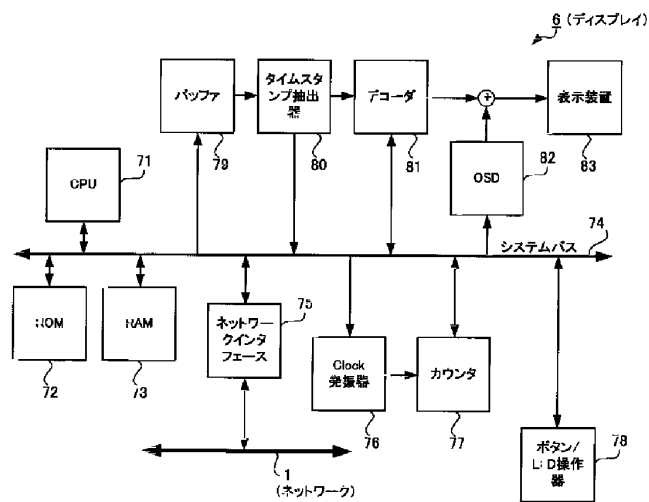
【図5】



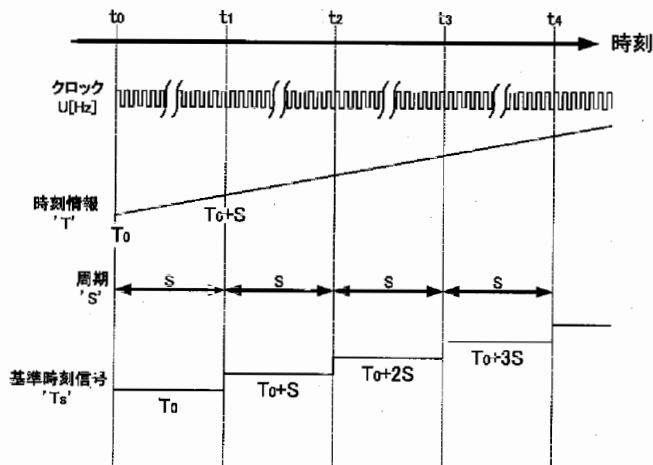
【図6】



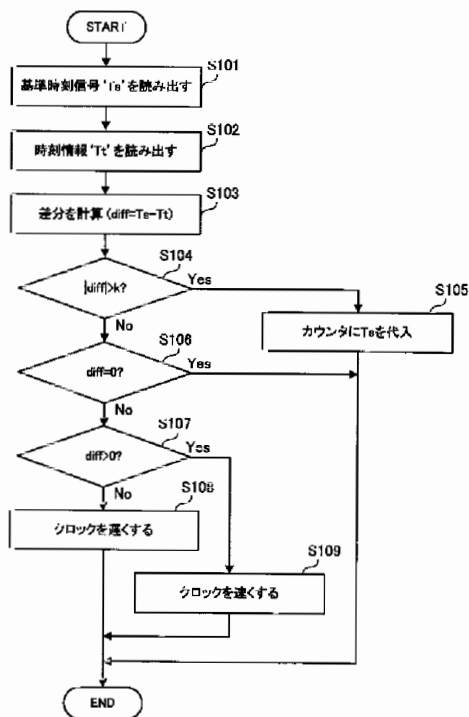
【図7】



【図8】



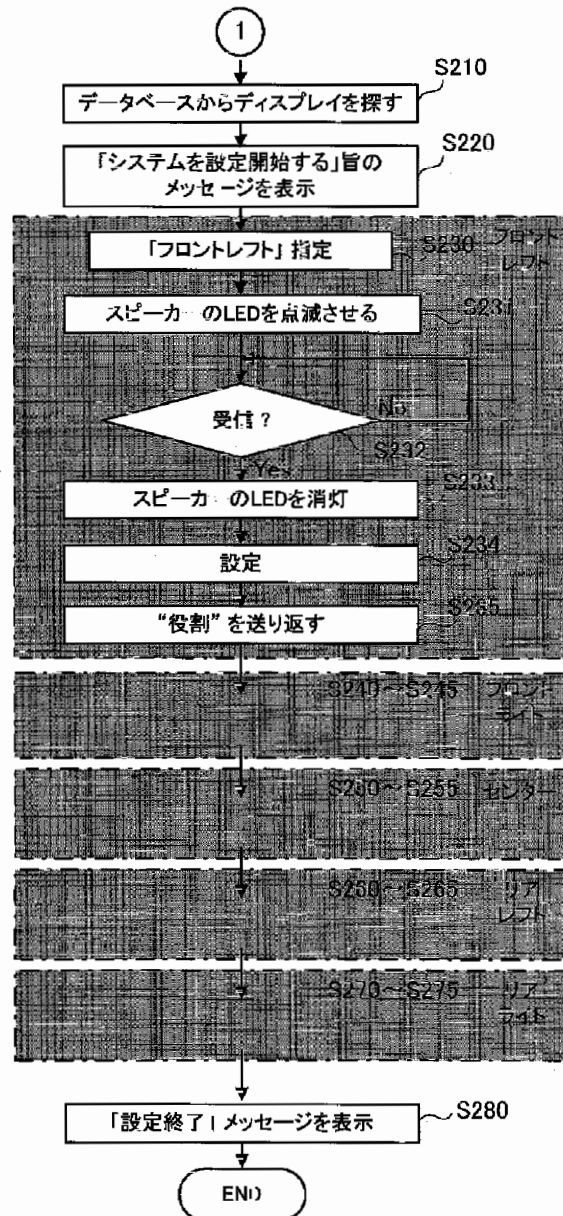
【図9】



【図12】

エンタリ数		N
第1番目	ネットワークアドレス	XXX.XXX.XXX.XXX
	種別	ディスプレイ
	役割	—
第2番目	デコードディレイ	XX.X
	ネットワークアドレス	XXX.XXX.XXX.XXX
	種別	モノラルスピーカ
第3番目	デコードディレイ	XX.X
	ネットワークアドレス	XXX.XXX.XXX.XXX
	種別	モノラルスピーカ
第4番目	役割	—
	デコードディレイ	XX.X

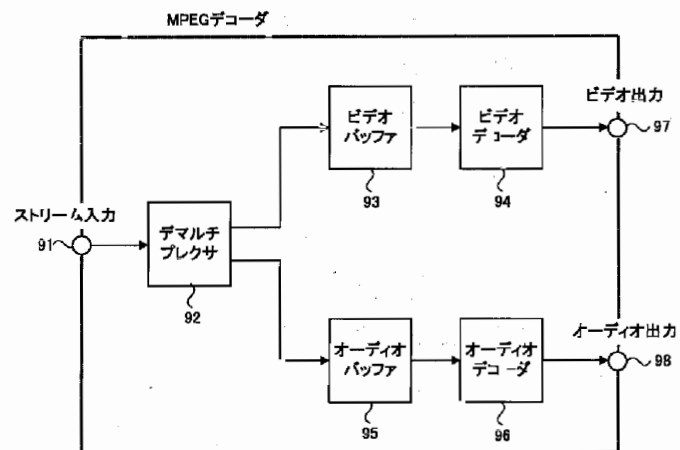
【図11】



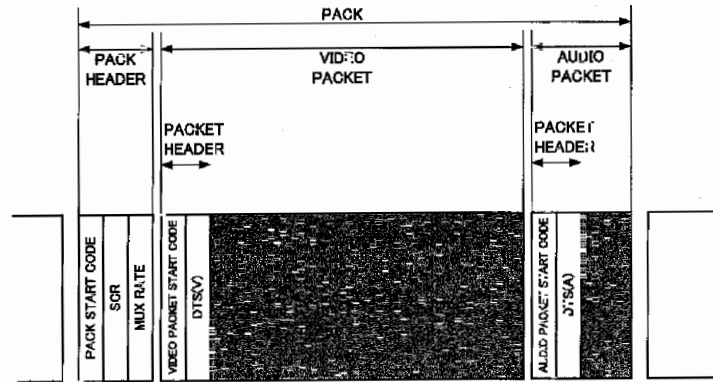
【図13】

エン트리数 7				
ネットワークアドレス	種別	役割	デコード遅延	(参考)
XXX.XXX.XXX.XXX	ディスプレイ	—		(ディスプレイ 8)
XXX.XXX.XXX.XXX	モノラルスピーカ	—		(スピーカ 5-1)
XXX.XXX.XXX.XXX	モノラルスピーカ	—		(スピーカ 5-2)
XXX.XXX.XXX.XXX	モノラルスピーカ	—		(スピーカ 5-3)
XXX.XXX.XXX.XXX	モノラルスピーカ	—		(スピーカ 5-4)
XXX.XXX.XXX.XXX	モノラルスピーカ	—		(スピーカ 5-5)
XXX.XXX.XXX.XXX	コンテンツソース	—		(コンテンツソース 4)

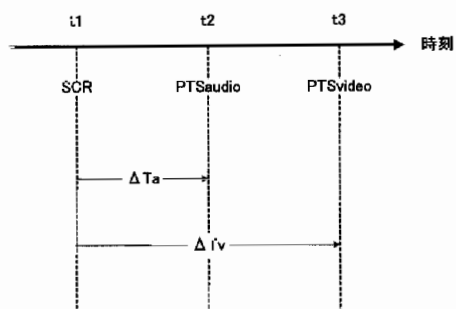
【図14】



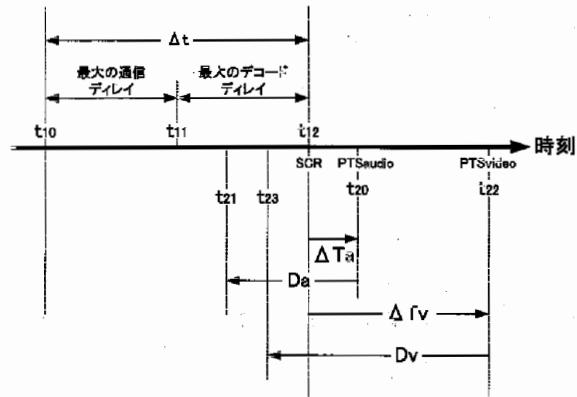
【図15】



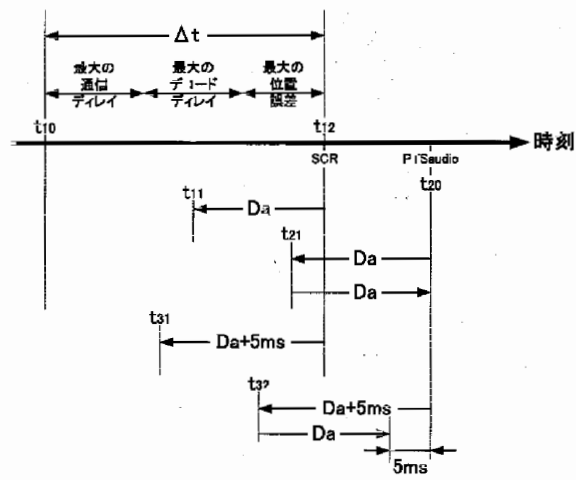
【図16】



【図17】



【図18】





Espacenet

Bibliographic data: JP2003101958 (A) — 2003-04-04

METHOD AND DEVICE FOR SYNCHRONOUS REPRODUCTION

Inventor(s): IDE KENICHI ± (IDE KENICHI)
Applicant(s): TOSHIBA CORP ± (TOSHIBA CORP)
Classification: - **international:** *H04B1/16; H04L7/00; H04N5/93;*
(IPC1-7): H04B1/16; H04L7/00; H04N5/93
- **cooperative:**
Application number: JP20010287375 20010920
Priority number(s): JP20010287375 20010920
Also published as: JP3544963 (B2)

Abstract of JP2003101958 (A)

PROBLEM TO BE SOLVED: To synchronize information synchronized with each other such as a moving picture and sound accompanying the moving picture in different devices and to reproduce the information without transmitting information about reproducing time. **SOLUTION:** A maximum estimation value of the total delay time including the transmission delay time of data and a processing delay time needed for decoding processing, etc., is defined as delayMax. A value Period larger than the delayMax is defined, and a reproduction start reference point is provided on a time base with an interval Period. An alpha is defined by (Period-delayMax), and the section between the reproduction start reference point and the Alpha is defined as a transmission commenceable section. A transmitting side device starts to transmit data within the transmission commenceable section. After the data reach a receiving side device, the existence range of a time R when the data can be reproduced after being subjected to processing such as decoding is limited to a range existing after a transmission start time S and up to the first reproduction start reference point to come after passing the transmission commenceable section. The transmitting side device

and the receiving side device individually start reproduction by taking the reproduction start reference point P0 as a reference.

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開2003-101958

(P2003-101958A)

(43) 公開日 平成15年4月4日(2003.4.4)

(51)Int.Cl. ⁷	識別記号	F I	サーチワード(参考)
H 0 4 N 5/93		H 0 4 B 1/16	M 5 C 0 5 3
H 0 4 B 1/16		H 0 4 L 7/00	Z 5 K 0 4 7
H 0 4 L 7/00		H 0 4 N 5/93	A 5 K 0 6 1

審査請求 有 請求項の数18 O L (全 10 頁)

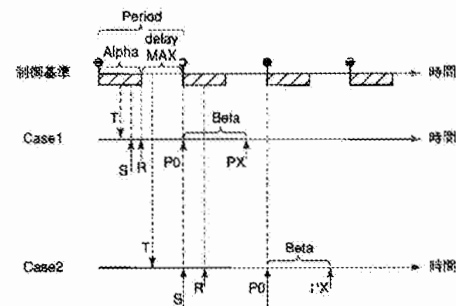
(21) 出願番号	特願2001-287375(P2001-287375)	(71) 出願人	000003078 株式会社東芝 東京都港区芝浦一丁目1番1号
(22) 出願日	平成13年9月20日(2001.9.20)	(72) 発明者	井手 賢一 東京都青梅市末広町2丁目9番地 株式会 社東芝青梅工場内
		(74) 代理人	100058479 弁理士 鈴江 武彦 (外6名)
		Fターム(参考)	5C053 FA24 GB21 JA01 JA22 JA26 KA24 LA05 LA06 LA20 5K047 AA03 AA18 BB01 DD01 DD02 JJ08 MM23 5K061 AA15 EF06

(54) 【発明の名称】 同期再生のための方法および装置

(57) 【要約】

【課題】再生時刻に関する情報を送信することなく、動画とそれに付随する音声のように互いに同期した情報を異なる機器で同期して再生する。

【解決手段】データの伝送遅延時間と復号処理などに要する処理遅延時間を含む合計の遅延時間の最大見積もり値をdelayMaxとする。そして、delayMaxよりも大きい値Periodを定め、間隔Periodで時間軸上に再生開始基準点を設ける。また、Alphaを(Period - delayMax)と定め、前記再生開始基準点からAlphaの区間を送信開始可能区間とする。送信側機器は送信開始可能区間にデータ送信を開始する。このデータが受信側機器に届いた後、復号などの処理を経て再生可能になる時刻Rの存在範囲は送信開始時刻S以降で、送信開始可能区間経過後に最初に到来する再生開始基準点までの範囲に限定される。この再生開始基準点をP0を基準として、送信側機器および受信側機器がそれぞれ再生を開始する。



- 送信開始可能区間
- 再生開始基準点
- 再生ボタン押下時刻
- 音声データ送信開始時刻
- 最初の音声データが到着して再生可能となった時刻
- 最も早い再生開始時刻
- 一般の再生開始時刻(PX=P0+Beta)
- 再生開始基準点の間隔
- delayMax (伝送遅延+処理遅延)の最大値
- Alpha = Period - delayMax
- Beta 0以上の定数。再生開始時刻をP0以降に遅延させる値

【特許請求の範囲】

【請求項1】 第一のデータの再生を行いつつ同期して再生すべき第二のデータを通信路を介して送信する第一の機器と前記第一の機器から送信された第二のデータを受信して再生する第二の機器との間で、前記第一および第二のデータの再生タイミングを同期させるための同期再生方法であって、

前記第二のデータの送信は、前記第二のデータを送信してから受信側で再生可能になるまでの最大遅延時間に所定の送信開始可能区間を加えた時間間隔で時間軸上に一意に定められる複数の基準点の内、いずれかの基準点から始まる送信開始可能区間内に開始し、

前記第一および第二のデータの再生は、前記第二のデータの送信を開始した送信開始可能区間後の最初の基準点を基に開始することを特徴とする同期再生方法。

【請求項2】 前記第二のデータの送信を開始する前に、前記第一の機器と前記第二の機器との間で、前記第一および第二の機器がそれぞれ前記基準点を定める時間軸の時刻基準となる時計を同期させる同期処理を実行することを特徴とする請求項1記載の同期再生方法。

【請求項3】 前記第一のデータは動画データであり、前記第二のデータは音声データであることを特徴とする請求項1記載の同期再生方法。

【請求項4】 前記第一のデータは音声データであり、前記第二のデータは動画データであることを特徴とする請求項1記載の同期再生方法。

【請求項5】 前記第一および第二のデータの再生は、前記第二のデータの送信を開始した送信開始可能区間後の最初の基準点から予め定められた時間が経過した時点で開始することを特徴とする請求項1記載の同期再生方法。

【請求項6】 前記通信路は、無線通信路であることを特徴とする請求項1記載の同期再生方法。

【請求項7】 第一のデータの再生を行いつつ同期して再生すべき第二のデータの再生開始を指示する再生開始コマンドを通信路を介して送信する第一の機器と前記第一の機器から送信された再生開始コマンドにตอบสนองして前記第二のデータの再生を行う第二の機器との間で、前記第一および第二のデータの再生タイミングを同期させるための同期再生方法であって、

前記再生開始コマンドの送信は、前記再生開始コマンドを送信してから受信側で前記再生開始コマンドにตอบสนองした再生処理を開始可能になるまでの最大遅延時間に所定の送信開始可能区間を加えた時間間隔で時間軸上に一意に定められる複数の基準点の内、いずれかの基準点から始まる送信開始可能区間内に開始し、

前記第一および第二のデータの再生は、前記再生開始コマンドの送信を開始した送信開始可能区間後の最初の基準点を基に開始することを特徴とする同期再生方法。

【請求項8】 前記再生開始コマンドの送信を開始する

前に、前記通信路を介して前記第一の機器から前記第二の機器に前記第二のデータの送信を開始することを特徴とする請求項7記載の同期再生方法。

【請求項9】 第一のデータの再生を行いつつ同期して再生すべき第二のデータを通信路を介して送信する第一の機器と前記第一の機器から送信された第二のデータを受信して再生する第二の機器とを含む同期再生システムであって、

前記第一の機器は、

前記第二のデータを送信してから受信側で再生可能になるまでの最大遅延時間に所定の送信開始可能区間を加えた時間間隔で時間軸上に一意に定められる複数の基準点の内、いずれかの基準点から始まる送信開始可能区間内に、前記第二のデータの送信を開始する手段と、前記第二のデータの送信を開始した送信開始可能区間後の最初の基準点を基に、前記第一のデータの再生を開始する手段とを具備し、

前記第二の機器は、

前記第二のデータを受信する手段と、前記時間間隔で時間軸上に一意に定められた前記複数の基準点を管理し、前記受信した第二のデータの再生開始可能後の最初の基準点を基に、前記第二のデータの再生を開始する手段とを具備することを特徴とする同期再生システム。

【請求項10】 第一のデータの再生を行いつつ同期して再生すべき第二のデータの再生開始を指示する再生開始コマンドを通信路を介して送信する第一の機器と前記第一の機器から送信された再生開始コマンドにตอบสนองして前記第二のデータの再生を行う第二の機器とを含む同期再生システムであって、

前記第一の機器は、

前記再生開始コマンドを送信してから受信側で前記再生開始コマンドにตอบสนองした再生処理を開始可能になるまでの最大遅延時間に所定の送信開始可能区間を加えた時間間隔で時間軸上に一意に定められる複数の基準点の内、いずれかの基準点から始まる送信開始可能区間内に、前記再生開始コマンドの送信を開始する手段と、前記再生開始コマンドの送信を開始した送信開始可能区間後の最初の基準点を基に、前記第一のデータの再生を開始する手段とを具備し、

前記第二の機器は、

前記再生開始コマンドを受信する手段と、前記時間間隔で時間軸上に一意に定められる前記複数の基準点を管理し、前記再生開始コマンドにตอบสนองして再生処理が開始可能になった後の最初の基準点を基に、前記第二のデータの再生を開始する手段とを具備することを特徴とする同期再生システム。

【請求項11】 第一のデータの再生を行いつつ同期して再生すべき第二のデータを通信路を介して受信側の装置に送信可能な再生装置であって、

前記第二のデータを送信してから受信側で再生可能になるまでの最大遅延時間に所定の送信開始可能区間を加えた時間間隔で時間軸上に一意に定められる複数の基準点の内、いずれかの基準点から始まる送信開始可能区間内に、前記第二のデータの送信を開始する手段と、前記第二のデータの送信を開始した送信開始可能区間後の最初の基準点を基に、前記第一のデータの再生を開始する手段とを具備することを特徴とする再生装置。

【請求項12】 第一のデータを再生する送信側装置から通信路を介して送信される第二のデータを受信して再生する再生装置であって、前記第二のデータを送信してから受信側で再生可能になるまでの最大遅延時間に所定の送信開始可能区間を加えた時間間隔で時間軸上に一意に定められる複数の基準点の内、いずれかの基準点から始まる送信開始可能区間内に前記送信側装置によって送信が開始された前記第二のデータを受信する手段と、前記時間間隔で時間軸上に一意に定められた前記複数の基準点を管理し、前記受信した第二のデータの再生開始可能後の最初の基準点を基に、前記第二のデータの再生を開始する手段とを具備することを特徴とする再生装置。

【請求項13】 第一のデータの再生を行いかつ同期して再生すべき第二のデータの再生開始を指示する再生開始コマンドを通信路を介して受信側の装置に送信可能な再生装置であって、前記再生開始コマンドを送信してから受信側で前記再生開始コマンドに応答した再生処理を開始可能になるまでの最大遅延時間に所定の送信開始可能区間を加えた時間間隔で時間軸上に一意に定められる複数の基準点の内、いずれかの基準点から始まる送信開始可能区間内に、前記再生開始コマンドの送信を開始する手段と、前記再生開始コマンドの送信を開始した送信開始可能区間後の最初の基準点を基に、前記第一のデータの再生を開始する手段とを具備することを特徴とする再生装置。

【請求項14】 第一のデータを再生する送信側装置から通信路を介して送信される再生開始コマンドに応答して、前記第一のデータと同期して再生すべき第二のデータを再生する再生装置であって、前記再生開始コマンドを送信してから受信側で前記再生開始コマンドに応答した再生処理を開始可能になるまでの最大遅延時間に所定の送信開始可能区間を加えた時間間隔で時間軸上に一意に定められる複数の基準点の内、いずれかの基準点から始まる送信開始可能区間内に前記送信側装置が送信を開始した前記再生開始コマンドを受信する手段と、前記時間間隔で時間軸上に一意に定められる前記複数の基準点を管理し、前記再生開始コマンドに応答して再生処理が開始可能になった後の最初の基準点を基に、前記第二のデータの再生を開始する手段とを具備することを

特徴とする再生装置。

【請求項15】 コンピュータに第一のデータを再生させ且つ前記第一のデータと同期して再生すべき第二のデータを通信路を介して受信側の装置に送信させるコンピュータプログラムであって、前記第二のデータを送信してから受信側で再生可能になるまでの最大遅延時間に所定の送信開始可能区間を加えた時間間隔で時間軸上に一意に定められる複数の基準点の内、いずれかの基準点から始まる送信開始可能区間内に、前記第二のデータの送信を前記コンピュータに開始させる手順と、前記第二のデータの送信を開始した送信開始可能区間後の最初の基準点を基に、前記第一のデータの再生を前記コンピュータに開始させる手段とを具備することを特徴とするコンピュータプログラム。

【請求項16】 第一のデータを再生する送信側装置から通信路を介して送信される第二のデータをコンピュータに再生させるコンピュータプログラムであって、前記第二のデータを送信してから受信側で再生可能になるまでの最大遅延時間に所定の送信開始可能区間を加えた時間間隔で時間軸上に一意に定められる複数の基準点の内、いずれかの基準点から始まる送信開始可能区間内に前記送信側装置によって送信が開始された前記第二のデータを前記コンピュータに受信させる手順と、前記時間間隔で時間軸上に一意に定められた前記複数の基準点を前記コンピュータに管理させ、前記受信した第二のデータの再生開始可能後の最初の基準点を基に、前記第二のデータの再生を前記コンピュータに開始させる手順とを含むことを特徴とするコンピュータプログラム。

【請求項17】 コンピュータに第一のデータを再生させ且つ前記第一のデータと同期して再生すべき第二のデータの再生開始を指示する再生開始コマンドを通信路を介して受信側の装置に送信させるコンピュータプログラムであって、前記再生開始コマンドを送信してから受信側で前記再生開始コマンドに応答した再生処理を開始可能になるまでの最大遅延時間に所定の送信開始可能区間を加えた時間間隔で時間軸上に一意に定められる複数の基準点の内、いずれかの基準点から始まる送信開始可能区間内に、前記再生開始コマンドの送信を前記コンピュータに開始させる手順と、前記再生開始コマンドの送信を開始した送信開始可能区間後の最初の基準点を基に、前記第一のデータの再生を前記コンピュータに開始させる手段とを具備することを特徴とするコンピュータプログラム。

【請求項18】 第一のデータを再生する送信側装置から通信路を介して送信される再生開始コマンドに応答して、コンピュータに前記第一のデータと同期して再生すべき第二のデータを再生させるコンピュータプログラム

であって、
前記再生開始コマンドを送信してから受信側で前記再生開始コマンドに応答した再生処理を開始可能になるまでの最大遅延時間に所定の送信開始可能区間を加えた時間間隔で時間軸上に一意に定められる複数の基準点の内、いずれかの基準点から始まる送信開始可能区間内に前記送信側装置が送信を開始した前記再生開始コマンドを前記コンピュータに受信させる手順と、
前記時間間隔で時間軸上に一意に定められる前記複数の基準点を前記コンピュータに管理させ、前記再生開始コマンドに応答して再生処理を開始可能になった後の最初の基準点を基に、前記第二のデータの再生を前記コンピュータに開始させる手順とを具備することを特徴とするコンピュータプログラム。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は例えば動画データと音声データのように同期して再生する必要がある第一及び第二のデータを再生するための方法および装置に関し、特に第一及び第二のデータを互いに異なる機器で同期して再生するための方法および装置に関する。

【0002】

【従来の技術】動画データ、音声データのようなストリームデータを送信側機器から受信側機器へ伝送して、予め定められた時刻に処理させる方法としては、例えば特開平11-317748号公報に開示された手法に見られるように、送信するデータに処理されるべき時刻情報を付加して送信し、受信側では受信したデータに含まれる処理すべき時刻の到来を待ってデータを処理する方法が知られている。

【0003】

【発明が解決しようとする課題】しかし、上記手法ではデータを処理すべき時刻を示すタイムスタンプをデータの他に送信する必要があった。このため、データを送信する手順やデータ形式とあわせて、データを処理すべき時刻を示すタイムスタンプについてもそれを送信する手順や形式が定められている必要がある。よって、これらが定められていない通信規約を用いる場合には適用できないという問題があった。

【0004】本発明は上述の事情を考慮してなされたもので、再生時刻に関する情報を送信することなく、動画とそれに付随する音声のように互いに同期した情報を異なる機器で同期して再生することが可能な方法および装置を提供することを目的とする。

【0005】

【課題を解決するための手段】上述の課題を解決するため、本発明は、第一のデータの再生を行いつつ同期して再生すべき第二のデータを通信路を介して送信する第一の機器と前記第一の機器から送信された第二のデータを受信して再生する第二の機器との間で、前記第一および

第二のデータの再生タイミングを同期させるための同期再生方法であって、前記第二のデータの送信は、前記第二のデータを送信してから受信側で再生可能になるまでの最大遅延時間に所定の送信開始可能区間を加えた時間間隔で時間軸上に一意に定められる複数の基準点の内、いずれかの基準点から始まる送信開始可能区間内に開始し、前記第一および第二のデータの再生は、前記第二のデータの送信を開始した送信開始可能区間後の最初の基準点を基に開始することを特徴とする。

【0006】このように、最大遅延時間に所定の送信開始可能区間を加えた時間間隔で予め時間軸上に複数の基準点を定め、これら複数の基準点の内のいずれかの基準点から始まる送信開始可能区間内に第二のデータの送信を開始することで、次の基準点以前に第二のデータが受信側で再生可能になることを保証することができる。よって、送信側と受信側が予め定められた同一の規則で複数の基準点それぞれの時刻を定めるだけで、再生時刻に関する情報を何等送信することなく、動画とそれに付随する音声のように互いに同期した情報を異なる機器で同期して再生することが可能となる。

【0007】

【発明の実施の形態】以下、図面を参照して本発明の実施の形態を説明する。図1には、本発明の一実施形態に係る同期再生システムが示されている。この同期再生システムは音声が付随した動画データを再生するシステムであり、図1に示すように2台の機器から構成されている。第一の機器（送信側機器）11は動画データおよびそれに付随する音声データが記録されている記憶装置を備え、動画データを再生してディスプレイ上に再生すると同時に、第二の機器（受信側機器）14に通信路13を介して音声データを送信する。この第一の機器11は例えば携帯情報端末、ビデオプレーヤ、パーソナルコンピュータなどの電子機器から構成される。一方、第二の機器14は、音声データの受信部と受信した音声データを再生する機構を備えており、第一の機器11から受信した音声データを再生する。この第二の機器14も第一の機器11と同様に様々な電子機器として実現できるが、その典型的な一例としてはヘッドフォンである。

【0008】このシステムでは通信路13として無線通信路が用いられており、例えばBluetooth（2.4GHz ISM帯を用いる短距離無線通信方式）を用いることによって動画表示を行う機器と音声の再生を行う機器とを無線接続することによって、便利な視聴システムを実現している。

【0009】ここで、第一の機器11で再生される動画データの呈示と第二の機器14で再生される音声データの発音を同期させることによっていわゆるリップシンク（lipsync）を実現したいと考える。

【0010】次に、上記の要求を実現するために必要な技術的要素について説明する。動画データとそれに付随

する音声データは、それらをデジタルデータとして取り込む際に、互いの時間関係を保存することが既に行われている。例えばパーソナルコンピュータ上の音声つき動画データの形式として用いられているAVI形式(Audio Video Interleave Format)では、動画および音声のメディア毎に、サンプリングレートが記録されており、かつ、記録されている各々のメディアの再生開始時刻が一致しているという仕組みになっている。このため、各々の再生を同時に開始し、かつ、各々のメディアの再生速度を、単一の時計あるいは正確に同期した時計とサンプリングレートに従って決めることによって、リップシンク(Lip sync)を保つことができる仕組みになっている。

【0011】また、複数のメディアの再生を同期させる他の方法としては、インターネット上のストリーミング伝送で用いられるRTP(Real time Transfer Protocol、インターネット上で動画、音声などのメディアデータを送受信するための方式。IETFのRFC1889等で規格化されている。)に見られるように、一群のメディアデータ毎にタイムスタンプを付与すると共にサンプリングレートに関する情報を付与するなどの方法も用いられている。

【0012】このように、互いに同期して再生されるべき複数のメディアデータを同期して再生するためには、進み方が正確な時計と例えばメディアデータの表示開始時刻を一致させる手段が必要である。

【0013】ここで本発明が解決しようとする状況では、動画および音声データは異なる機器上で再生される。そこで、前述の要件を満たすためには、各々の機器の時計間で時刻の同期をとり、さらに、各々のメディアデータの再生開始時刻を2台の機器同士で示し合わせるが必要となる。

【0014】まず、時刻の同期をとる件については、例えばNTP(Network Time Protocol、インターネット上で計算機同士の時刻あわせを行うための方式。IETFのRFC1305等で規格化されている。)と呼ばれる時刻あわせ方式を用いることで実現可能である。あるいは、例えば特開2000-332802号公報に開示されているように、時刻情報を送信側機器から受信側機器へ送り、受信側機器の時計を送信側機器に合わせることも可能である。これら2例の他にも、方式によって実現可能な時刻あわせの精度が異なるものの、様々な時刻あわせ手法が知られており、これらの内の任意の手法を用いることが可能である。

【0015】次に、再生開始時刻を示しあわせる件については、本実施形態では次のような方法を使用する。

【0016】本実施形態では再生開始時刻に関する情報を機器間で伝送せずに、再生開始時刻を合わせることが特徴である。まず、前提条件として以下の条件を設ける。

前提条件：

- ・2台の機器11、14の時計は互いに同期している。
- ・送信側機器11から受信側機器14へ最初のメディアデータを送信する時刻Sを送信側機器11は制御できる。
- ・送信側機器11から受信側機器14へのメディアデータ送信から、受信されたデータが再生されるまでの所要時間delayMax(伝送遅延、メディアデータのデコード処理などに必要な処理遅延時間を含む)の最大値を見積もり可能。

【0017】上記の前提条件の下で、以下に示す方法によって再生開始時刻を同期させる。

同時刻に再生を開始する方法：送信側機器11および受信側機器14がメディアデータ、例えば動画と音声データを再生開始可能な時刻(再生開始基準点)は、予め定められた離散的な時刻に限る。各々の時刻の間隔はPeriod(= Alpha + delayMax)とする。Period, Alpha, delayMaxの定義は以下の通りである。

【0018】

- ・delayMax (伝送遅延+処理遅延)の最大見積もり値
- ・Period 再生開始基準点の間隔
- ・Alpha (= Period - delayMax)

送信側機器11がメディアデータを受信側機器14へ送信開始する時刻Sは、各再生開始基準点以降Alphaの区間内に限る。すなわち、送信側機器11および受信側機器14ではそれぞれ同一の規則を用いて、互いに同期した時間軸上にPeriodの間隔で再生開始基準点を定める処理が行われる。そして、送信側機器11から受信側機器14への音声データの送信は、いずれかの再生開始基準点からAlphaの区間内に開始される。つまりAlphaが送信開始可能区間となる。

【0019】図2は図1に示した各々の機器のシステム構成図である。まず、送信側機器11について説明する。送信側機器11は、図示のように、動画/音声記憶部21、動画/音声分離部22、動画復号部23、動画一時記憶部24、動画表示部25、送信データ一時記憶部26、音声データ送信部27、制御部28、時刻管理部29、および制御データ送受信部2Aから構成されている。

【0020】動画/音声記憶部21には送信側機器11で再生される動画データと受信側機器14で再生される音声データが記憶されている。これらのデータはたとえば前述のAVI形式で保存されており、動画と音声の対応関係を知るために必要な情報とともに記憶されている。また、一般に動画や音声のデータは圧縮されて保存されることが多く、本実施形態の場合も適当な形式で圧縮された上でAVI形式で保管されているものとする。

【0021】動画/音声分離部22は動画/音声記憶部21から読み込まれたAVI形式の動画/音声データを動画データと音声データに分離する。動画復号部23は圧

縮形式の動画データを復号して動画表示部25で表示可能な形式に変換する。動画一時記憶部24は復号された動画データを、表示される時点に達するまでの間、一時的に記憶する。一般に動画の復号処理は時間がかかるため、予め復号処理を行って動画一時記憶部24に保存しておくことによって、表示すべき時刻の到来時に即座に表示することが可能になる。

【0022】動画表示部25は動画一時記憶部24に記憶されている動画データを制御部28からの指示に従って表示する。送信データ一時記憶部26は音声データが送信されるべき時刻が来るまでの間、一時的に音声データを記憶する。音声データ送信部27はBluetoothなどの無線通信インタフェースを用いて受信側機器14へ音声データを送信する。

【0023】制御データ送受信部2AはBluetoothなどの無線通信インタフェースを介して受信側機器14との間で制御情報をやりとりする。時刻管理部29は受信側機器14の時刻と同期した時刻を刻み、動画再生や音声データの送信の基準となる時刻情報を提供する。受信側機器14の時刻との同期は制御部28および制御データ送受信部2Aと連携して前述のNTP方式などの時刻合わせ手順を実行することで行う。

【0024】制御部28は送信側機器11全体の連携制御を行う。制御部28は例えば汎用CPUとRAM、ROMで構成されるマイクロコンピュータとして実現することが可能である。また、制御部28以外の前述した機能モジュールも基本的にマイクロコンピュータにその動作を行わせる形での実現が可能である。

【0025】受信側機器14は、図示のように、音声データ受信部2B、音声復号部2C、音声データ一時記憶部2D、音声再生部2E、制御部2F、制御データ送受信部2G、時刻管理部2Hから構成されている。

【0026】音声データ受信部2Bは送信側機器11から送信された音声データを受信する。音声復号部2Cは圧縮されている音声データの復号を行い、音声再生部2Eで再生可能な形式に変換する。

【0027】音声データ一時記憶部2Dは復号した音声データを再生すべき時刻に達するまでの間、一時的に保存する。一般に音声データは圧縮された形式で伝送される場合が多く、復号には時間がかかるため、予め復号を行って音声データ一時記憶部2Dに記憶しておくことによって、再生時刻の到来時に即座に発音させることが可能になる。

【0028】時刻管理部2Hは送信側機器11の時刻と同期した時刻を刻み、音声データの再生の基準となる時刻情報を提供する。送信側機器11の時刻との同期は制御部2Fおよび制御データ送受信部2Gと連携して送信側機器11と前述のNTP方式などの時刻合わせ手順を実行することで行う。制御部2Fは受信側機器14全体の連携制御を行う。制御部2Fは例えば汎用CPUとR

AM、ROMで構成されるマイクロコンピュータとして実現することが可能である。また、制御部2F以外の前述した機能モジュールも基本的にマイクロコンピュータにその動作を行わせる形での実現が可能である。

【0029】次に、図3を用いて本実施形態のシステムの動作の概要を説明する。受信側機器14は通常は待機モードで動作しており、送信側機器11からの電源ON指示を受けて待機モードから通常の動作モードへ移行する。待機中は電力消費が非常に低い状態であり、電源ON指示のみに反応することが可能である。ユーザが送信側機器11の操作パネル12の電源オンボタンを操作することにより(S38)、電源ON指示(S31)が送信側機器11から受信側機器14に送信される。電源ONの後、双方の機器11、14は通信路確立処理(S32)を行う。

【0030】次に、時刻あわせ処理(S33)を前述のNTP方式などにより行う。送信側機器11と受信側機器14との間の時刻あわせが完了すると、送信側機器11および受信側機器14でそれぞれ上述の送信開始可能区間および再生開始基準点が設定されて同期再生を行うための準備が行われる。

【0031】ユーザが送信側機器11の操作パネル12の再生ボタンを押下すると(S39)、送信側機器11では音声データの送信と動画データの再生が行われる。受信側機器14では受信した音声データの再生が行われる。これらの動作は動画と音声の同期をとるために本発明で提案する手法に従って行われる。この処理の詳細については図4で後述するが、基本的には、送信側機器11から受信側機器14への音声データの送信は送信開始可能区間内でのみ開始され、そして、送信側機器11および受信側機器14それぞれにおける動画データおよび音声データの再生は、音声データが送信開始された送信開始可能区間後の最初の再生開始基準点を基準とすることにより、同時に開始されることになる。

【0032】ユーザが操作パネル12の電源OFFボタンを押下すると(S40)、通信路切断および電源OFF処理が行われ、受信側機器13は待機状態に移行し、送信側機器11は電源OFF状態になる。

【0033】次に図4を用いて本実施形態の特徴とする同期再生の方法を説明する。

【0034】データの伝送遅延時間と復号処理などに要する処理遅延時間を含む合計の遅延時間の最大見積もり値をdelayMaxとする。このdelayMaxの値は、予め測定を行うことによって決められる値である。そして、delayMaxよりも大きい値Periodを定め、間隔Periodで時間軸上に再生開始基準点を設ける。また、Alphaを(Period-delayMax)と定め、前記再生開始基準点からAlphaの間を送信開始可能区間とする。これらの情報は予め決めておくことにより、容易に双方の機器で再生開始基準点の同期を一致させることが可能である。例えば、delayM

axが100msecである場合にPeriodを200msecに定め、200msecの整数倍の時刻を再生開始基準点とするという具合である。時刻合わせを行っているので、双方の機器で各再生開始基準点の時刻は一致する。

【0035】ここで、図4中のCase1およびCase2の場合を例にあげ、送信開始時刻および再生開始時刻の決め方を説明する。

【0036】Case1は、送信開始可能区間内の時刻Tにユーザが再生ボタンを押下した場合を示している。この場合は、直ちにデータの送信を開始する。図では時刻Sで送信している。このデータが受信側機器14に届いた後、復号などの処理を経て再生可能になる時刻をRとすれば、前述のdelayMaxの定義からRの存在範囲は時刻S以降で、前記送信開始可能区間経過後に最初に到来する再生開始基準点までの範囲に限定される。この再生開始基準点をP0とするとP0は送信側機器11においても、受信側機器14においても一意に定まる。送信側機器11においては送信開始時刻を把握しているため自明であり、受信側機器14においてはRの存在範囲から時刻R以降の最初の再生可能基準点をP0と判断すれば良い。要するに、受信側機器14では受信データの再生が可能になってから最初の再生開始基準点がP0である。

【0037】そこで、P0に予め定めた値Betaを加算した時刻PXも一意に定まり、時刻PXに両方の機器で再生を開始することによって、再生開始時刻を一致させることができる。Betaは0以上の値が可能であるが、0にした場合にユーザの再生ボタン押下に対する反応が一番速い。

【0038】Case2は、送信可能区間外の時刻Tにユーザが再生ボタンを押下した場合を示している。この場合は、データの送信開始は時刻Tの直後に到来する送信開始可能区間まで待たされる。送信開始可能区間の到来と共に時刻Sにデータの送信を開始する。なお、データの送信開始はこの送信開始可能区間内であれば良い。受信側14でデータが再生可能になる時刻Rの存在範囲は、時刻S以降で、時刻Sが含まれる送信開始可能区間経過後の最初の再生開始基準点までの範囲に限定される。この再生開始基準点をP0とするとP0は送信側機器11においても受信側機器14においても一意に定まる。送信側機器11においては送信開始時刻を把握しているため自明であり、受信側機器14においてはRの存在範囲から時刻R以降の最初の再生可能基準点をP0と判断すれば良い。そこで、P0に予め定めた値Betaを加算した時刻PXも一意に定まり、時刻PXに両方の機器で再生を開始することによって、再生開始時刻を一致させることができる。Betaの値はCase1の場合と同様、0の場合にユーザの再生ボタン押下に対する反応が一番速い。

【0039】なお、Beta=0とした場合には、Case1の場合のユーザの再生ボタン押下から再生開始までの最大遅延はPeriodとなり、Case2の場合のユーザの再生ボタ

ン押下から再生開始までの最大遅延は(delayMax+Period)となる。

【0040】次に図5のフローチャートを用いて、再生開始ボタン押下時の送信側機器11の処理手順を説明する。

【0041】ユーザが再生ボタンを押すと図5に示す処理が起動される。Step51では現在の時刻を取得する。これは送信側機器11の時刻管理部29に問い合わせを行うことにより行う。次にStep52に進み、現在、送信開始可能区間の内部であるか否かを判定する。送信開始可能区間に関する情報は時刻管理部29が保持している。ここで、現在、送信開始可能区間の内部である場合にはStep53に進み、直ちに音声データの送信処理を起動する。引き続きStep54に進み、動画再生準備処理を起動した後、処理を終了する。動画再生準備処理では圧縮されている動画データの復号を表示に先行して行い、動画一時記憶部24に蓄積する。この段階では表示は行われない。動画表示部25への表示開始は、後述する動画データ再生開始判定処理の中で起動される。Step52で送信開始可能区間外と判定された場合はStep55に進み、既定の時間待機した後にStep51へ進み、再度、前述の処理を行う。

【0042】次に図6のフローチャートを用いて、動画データ再生開始判定処理について説明する。

【0043】この処理は図5のStep54から起動される。まず、Step61では現在の時刻を取得する。次にStep62に進み、現在、再生開始可能時刻(P0)に達しているか否かを判定する。再生開始可能時刻(P0)に関する情報は時刻管理部29が保持している。ここで、現在、再生開始可能時刻(P0)に達している場合はStep63へ進み、動画データの再生処理を起動する。Step62で再生開始時刻に達していないと判定された場合はStep64へ進み、既定の時間待機した後Step61へ進み、再度、前述の処理を行う。Step63で起動された動画データの再生処理では、時刻管理部29の刻む時刻と動画データのフレームレートに従って再生を行う。

【0044】次に、図7を用いて受信側機器14における音声データの再生開始処理について説明する。この処理は例えば、最初の音声データを受信した時に起動される。Step71では現在の時刻を取得する。次にStep72に進み、現在、再生開始時刻(P0)に達しているかを判定する。再生開始時刻に達している場合はStep73へ進み、音声データの再生処理を起動する。Step72で再生開始時刻に達していないと判定された場合はStep74へ進み、既定の時間待機した後Step71へ進み、再度、前述の処理を行う。Step73で起動された音声データの再生処理では、時刻管理部29の刻む時刻と音声データのサンプリングレートに従って再生を行う。

【0045】このように、本方式によれば送信開始時刻に関する情報を伝送路を介して送らなくとも、再生指示

から再生までの遅延時間が高々(delayMax+Period)で、同時に再生を開始することが可能になる。再生開始タイミングを揃えることで、後は、動画データおよび音声データそれぞれのサンプリングレートに従って再生処理を行うことで、リップシンク(lip sync)を保つことができる。

【0046】なお、以上の説明では、音声データの送信開始を送信開始可能区間内に限定したが、これに代えて、送信側機器11から受信側機器14に対して再生開始を指示するための再生開始コマンドの送信開始時刻を、送信開始可能区間内に限定してもよい。つまり、音声データについては例えば再生開始ボタンが押された時点で送信し始めておき、再生開始コマンドの送信は、最初の送信開始可能区間で開始する。なお、この場合、delayMaxは、再生開始コマンドの送信を開始してから受信側機器14がその再生開始コマンドに応答して再生処理を開始可能となるまでの最大時間となり、これは再生開始コマンドの伝送遅延時間とそのコマンド解釈処理などに要する処理遅延時間を含む合計の遅延時間の最大見積もり値として規定される。また、この場合には、音声データを記憶した記憶装置を受信側機器14に用意しておくことも可能となる。他の点については音声データの送信開始タイミングを制御する場合と全く同じ方法が用いられる。

【0047】また、上記の例では動画データを送信側機器11で再生し、動画データと同期再生すべき音声データを送信側機器11から受信側機器14に送信したが、これとは逆に、音声データを送信側機器11で再生し、音声データと同期再生すべき動画データを送信側機器11から受信側機器14に送信しても良い。この再生システムの一例を図8に示す。

【0048】図8のシステムでは、携帯型オーディオプレイヤー101は、動画データおよびそれに付随する音声データが記録されている記憶装置を備えており、音声データを再生してイヤホン103から出力すると共に、携帯型LCDなどの表示装置102に無線通信路を介して動画データを送信する。

【0049】また、本実施形態の同期再生方法は、同期再生する必要がある2つの動画データ同士を2つの異なる機器で再生する場合や、同期再生する必要がある2つの音声データ同士を2つの異なる機器で再生する場合にも適用可能である。2つの音声データを2つの異なる機器で同期再生するシステムの一例を図9に示す。

【0050】図9のシステムは、DVDプレイヤー201を用いた視聴システムであり、DVDプレイヤー201によって再生される動画データはTVなどのモニタ203に表示される。またDVDプレイヤー201から出力される複数チャンネルの音声データはオーディオアンプ202に送られる。オーディオアンプ202はメインのL、Rチャンネルの音声データを再生してL、Rのフロントスピー

ーカ204、205から再生すると共に、サラウンド用のL、Rチャンネルの音声データを無線通信路などを介してL、Rのバックスピーカシステム206、207に送信する。オーディオアンプ202とバックスピーカシステム206、207にそれぞれ本実施形態の方法を適用することで、音声データ同士の同期再生を容易に実現することが出来る。

【0051】また、本実施形態の同期再生方法で使用する送信側機器および受信側機器それぞれの機能はすべてコンピュータプログラムによって実現することができるので、そのコンピュータプログラムが記憶されたコンピュータ読み取り可能な記憶媒体を通じてそのコンピュータプログラムを通常のコンピュータに導入して実行するだけで、本実施形態と同様の効果を容易に得ることが出来る。

【0052】また、本発明は、上記実施形態に限定されるものではなく、実施段階ではその要旨を逸脱しない範囲で種々に変形することが可能である。例えばPeriodは常に一定である必要はなく、delayMaxよりも長ければ、予め決められたパターンで変化させるようにしても良い。同様に、Alphaの値も一定である必要はなく、予め決められたパターンで変化させるようにしても良い。また、delayMaxの値を通信環境に合わせて最適化する仕組みなどを用意することで、delayMaxの値も可変にすることが可能となる。

【0053】更に、上記実施形態には種々の段階の発明が含まれており、開示される複数の構成要件における適宜な組み合わせにより種々の発明が抽出され得る。例えば、実施形態に示される全構成要件から幾つかの構成要件が削除されても、発明が解決しようとする課題の欄で述べた課題が解決でき、発明の効果の欄で述べられている効果が得られる場合には、この構成要件が削除された構成が発明として抽出され得る。

【0054】

【発明の効果】以上説明したように、本発明によれば、再生時刻に関する情報を送信することなく、動画とそれに付随する音声のように互いに同期した情報を異なる機器で同期して再生することが可能となる。

【図面の簡単な説明】

【図1】本発明の一実施形態に係る再生システムの構成の一例を示すブロック図。

【図2】同実施形態の再生システムを構成する送信側機器と受信側機器それぞれの構成を示すブロック図。

【図3】同実施形態の再生システムの動作を示す図。

【図4】同実施形態の再生システムにおける同期再生処理のタイミングを説明するための図。

【図5】同実施形態の再生システムにおける再生開始ボタン押下時の送信側機器の処理手順を示すフローチャート。

【図6】同実施形態の再生システムにおける送信側機器

の動画データ再生開始判定処理の手順を示すフローチャート。

【図7】同実施形態の再生システムにおける受信側機器の音声データ再生開始判定処理の手順を示すフローチャート。

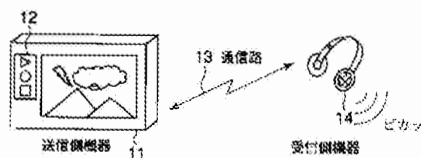
【図8】本発明の一実施形態に係る再生システムの他の構成の一例を示すブロック図。

【図9】本発明の一実施形態に係る再生システムのさらに他の構成の一例を示すブロック図。

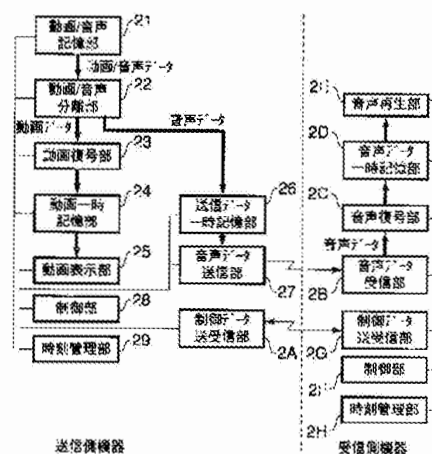
【符号の説明】

11…送信側機器
12…操作パネル
13…通信路
14…受信側機器
21…動画/音声記憶部
22…動画/音声分離部
23…動画復号部
24…動画一時記憶部
25…動画表示部
26…送信データ一時記憶部
27…音声データ送信部
28…制御部
29…時刻管理部
2A…制御データ送受信部
2B…音声データ受信部
2C…音声復号部
2D…音声データ一時記憶部
2E…音声再生部
2F…制御部
2G…制御データ送受信部
2H…時刻管理部

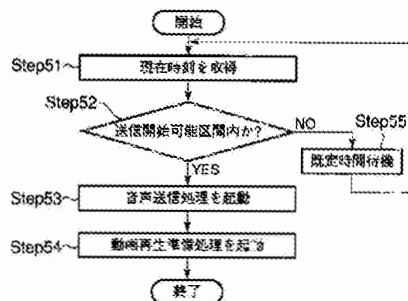
【図1】



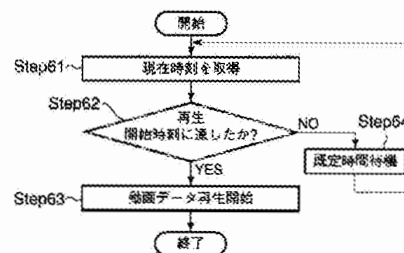
【図2】



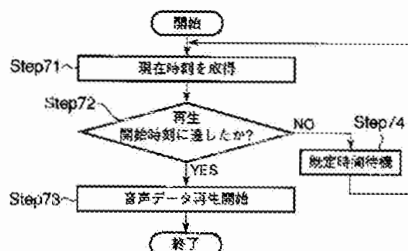
【図5】



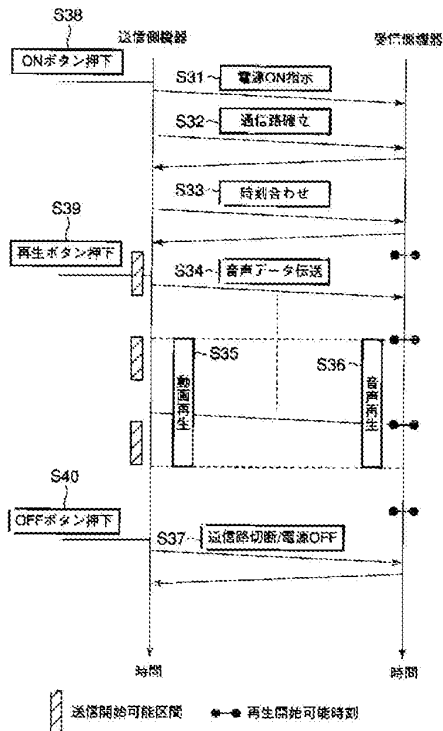
【図6】



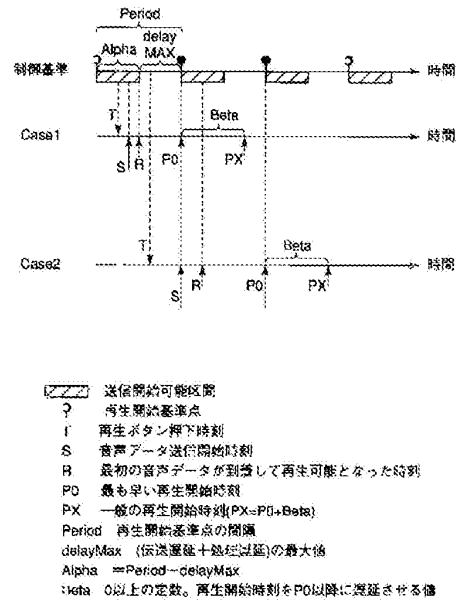
【図7】



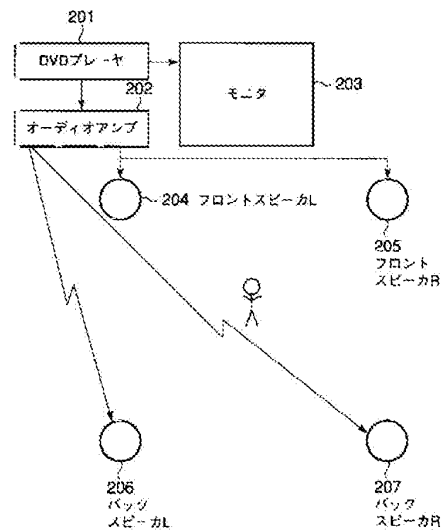
【図3】



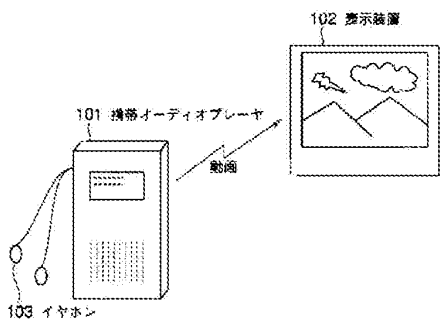
【図4】



【図9】



【図8】



(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
19 September 2002 (19.09.2002)

PCT

(10) International Publication Number
WO 02/073851 A1

(51) International Patent Classification⁷: **H04J 3/06**

(21) International Application Number: **PCT/US02/07082**

(22) International Filing Date: **7 March 2002 (07.03.2002)**

(25) Filing Language: **English**

(26) Publication Language: **English**

(30) Priority Data:
09/805,735 **13 March 2001 (13.03.2001)** **US**

(71) Applicant: **PULSE-LINK, INC.** [US/US]; 9155 Brown Deer Road, Suite 8, San Diego, CA 92121 (US).

(72) Inventor: **TAYLOR, James, L.**; 8 Allee de la Grenouillere, 78680 Epone (FR).

(74) Agent: **BRISSON, Timothy A.**; SIERRA PATENT GROUP, LTD., P.O. Box 6149, Stateline, NV 89449 (US).

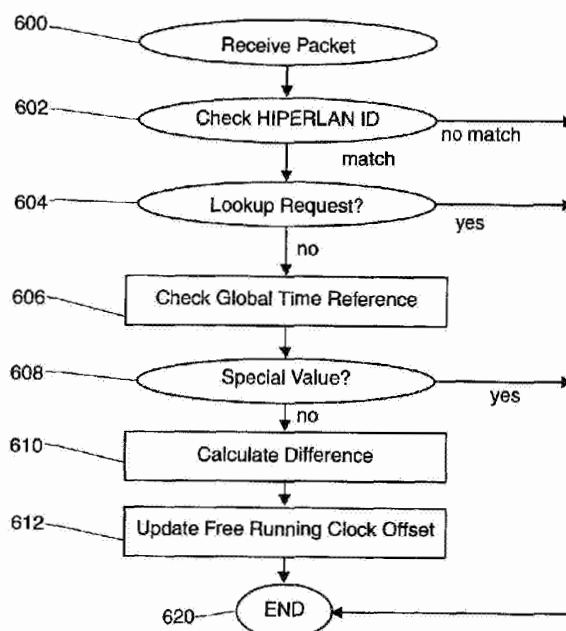
(81) Designated States (*national*): AF, AG, AI, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SI, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report

[Continued on next page]

(54) Title: **MAINTAINING A GLOBAL TIME REFERENCE AMONG A GROUP OF NETWORKED DEVICES**



(57) Abstract: Synchronization is maintained among a plurality of network devices (102,...) having local clocks. A first packet including global time reference (606) derived from local clock is broadcast from a first network device to other devices. The clocks of the network devices are adjusted. The difference between a free running clock and a first network global time reference is determined (610). A first network offset is calculated (612). Similarly, a second network offset is calculated to account for the difference between the free running clock and the second network global time reference.

WO 02/073851 A1



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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5

MAINTAINING A GLOBAL TIME REFERENCE
AMONG A GROUP OF NETWORKED DEVICES

FIELD OF THE INVENTION

10 The present invention relates generally to networks of devices. More specifically, maintaining a global time reference in an ad hoc wireless network is disclosed.

BACKGROUND OF THE INVENTION

15 Wireless networks are becoming increasingly important as solutions for transferring data among devices that move, are located in a home, or are otherwise situated so that it is desirable to connect the devices without wires. Numerous physical and MAC layer solutions have been proposed. For example, a baseband ultra wideband wireless network is described in U.S. Patent Application No. 09/393,126 "Baseband Wireless Network for Isochronous Communication" by Aiello, et. al., which is herein incorporated by reference.

20 An ultra wide band network transmits a signal that covers a very large portion of the frequency spectrum but transmits at a very low power in any individual frequency band.

 Wireless networks are sometimes referred to as ad hoc networks because the network is comprised of devices that happen to be within the broadcast vicinity of the other devices in the network. Devices may join or leave the network as they are powered up or move out

25 of range. A particular ad hoc network is described in the HIPERLAN Type 1, Functional Specification, ETS 300 652 published by the European Telecommunications Standards Institute. It is available at www.etsi.org.

 Figure 1 is a block diagram illustrating a set of wireless devices that communicate together in a wireless ad hoc network. Video player 102 transmits an audio signal to

30 speakers 106a, 106b, 106c and 106d. Video player 102 also transmits a video signal to screen 104. Screen 104 and speakers 106 may also transmit information to each other or to video player 102.

 For an application such as the one shown in Figure 1, it is readily seen that synchronization among the various devices is important to achieve a desirable result.

35 Different amounts of delay or jitter may exist in the signal paths between video player 102, speakers 106a and 106b, and screen 104. If the difference in delay is significant, then the

5 video presentation shown on screen 104 may not be properly synchronized with the audio being played on the speakers. Even worse, if speaker 106a and speaker 106b are not properly synchronized, then the left and right stereo audio channels could become separated in time, resulting in an unpleasant audio experience. Thus, it would be useful if a method of synchronizing the devices in such a wireless network could be developed.

10

SUMMARY OF THE INVENTION

Accordingly, a system and method for maintaining a global time reference among a group of wireless devices participating in a wireless network is disclosed. It should be noted that the techniques described herein may also be applied to other networks including certain networks that transmit signals partially or wholly using wires, fiberoptic cables or other means. For the purposes of example, this specification will describe in detail a wireless network and in particular a wireless ad hoc network that uses the HIPERLAN standard. It should be appreciated that the invention is not limited to such a network and that the techniques described are applicable to many different types of networks.

20 In one embodiment, each device in a network maintains its own clock. Instead of designating the clock of one particular device as the master clock, each device transmits its own clock signal or part of its own clock signal when it sends a packet to other devices in the network. The devices receiving the packet read the clock signal and adjust their own clocks to the transmitted value. This clock adjustment is made in a manner that causes the clocks to smoothly approach a common value without oscillating in an unstable manner.

25 It should be appreciated that the present invention can be implemented in numerous ways, including as a process, an apparatus, a system, a device, a method, or a computer readable medium such as a computer readable storage medium or a computer network wherein program instructions are sent over optical or electronic communication links.

30 Several inventive embodiments of the present invention are described below.

In one embodiment, synchronization is maintained among a plurality of network devices having local clocks that participate in a network. A first packet is broadcast from a first network device to other network devices that participate in the network. The first packet includes a global time reference derived from the local clock of the first network device. The clocks of the network devices that receive the first packet are adjusted to be closer to the local clock of the first network device.

5 In one embodiment, a first network local time reference and a second network local time reference are maintained for a device that participates in a first network and a second network. A free running clock is maintained on the device. The difference between the free running clock and a first network global time reference is determined. A first network offset is calculated to account for the difference between the free running clock and the first
10 network global time reference. The difference between the free running clock and a second network global time reference is determined. A second network offset is calculated to account for the difference between the free running clock and the second network global time reference.

 These and other features and advantages of the present invention will be presented in
15 more detail in the following detailed description and the accompanying figures which illustrate by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

 The present invention will be readily understood by the following detailed
20 description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

 Figure 1 is a block diagram illustrating a set of wireless devices that communicate together in a wireless ad hoc network.

 Figure 2 is a diagram illustrating in some detail how a channel may introduce delay
25 and jitter into the timing of packets sent from a transmitter to a receiver.

 Figure 3 is a diagram illustrating how the timestamp, referred to as the global time reference is inserted into a packet header.

 Figure 4A is a diagram illustrating how the global time reference is split into a most significant part and a least significant part.

30 Figure 4B is a diagram illustrating a memory register that stores the free running clock. The free running clock is a 32 bit clock.

 Figure 4C is a diagram illustrating a memory register that stores the free running clock offset.

 Figure 5 is a diagram illustrating an embodiment where devices belong to two
35 different ad hoc networks and a new device is joining one of the networks.

 Figure 6 is a flow chart illustrating a process that a network device executes when a

5 packet that includes a global time reference is received to determine whether to adjust the network device local time reference.

Figure 7A is a flow chart illustrating a process for including a global time reference in a packet.

10 Figure 7B is a flow chart illustrating a process executed by a receiver to prepare to update its free running clock offset.

DETAILED DESCRIPTION

A detailed description of a preferred embodiment of the invention is provided below. While the invention is described in conjunction with that preferred embodiment, it should
15 be understood that the invention is not limited to any one embodiment. On the contrary, the scope of the invention is limited only by the appended claims and the invention encompasses numerous alternatives, modifications and equivalents. For the purpose of example, numerous specific details are set forth in the following description in order to provide a thorough understanding of the present invention. The present invention may be
20 practiced according to the claims without some or all of these specific details. For the purpose of clarity, technical material that is known in the technical fields related to the invention has not been described in detail so that the present invention is not unnecessarily obscured.

Figure 2 is a diagram illustrating in some detail how a channel may introduce delay and jitter into the timing of packets sent from a transmitter to a receiver. Transmitter 200
25 sends packets in an isochronous manner. That is, each packet begins transmission at a regular interval. The difference in time between t_1 , t_2 , t_3 , and t_4 is constant. Channel 202 introduces delay and jitter into the transmission so that Δ_1 , Δ_2 , Δ_3 , and Δ_4 time delays are added to each of the times that the respective packets are received by the receiver 204.
30 Thus, the evenly spaced transmitted packets are not evenly spaced when they are received.

So long as there is only one transmitter and one receiver, the inter packet timing can be corrected at the receiver if a timestamp is included at the beginning of each packet. The difference between each of the timestamps would indicate the correct relative time spacing of the packets enabling the receiver to reposition or perhaps even reorder the packets in
35 time.

When there are more than two devices, then simply timestamping the packets will

5 not synchronize the display of data among the devices. It should also be noted that even when there are only two devices, the timestamp can adjust the relative spacing between packets but it does not facilitate making sure that events occur on the receiver at a specific time relative to an event occurring at the transmitter. Referring back to the example shown in Figure 1, even if packets sent from video player 102 to left and right speakers 106a and
10 106b are timestamped, there may still be a time offset between the left and right stereo channels. The timestamp on the packets only serves to enable each of the channels to correctly position in time the packets that it receives.

In order to synchronize the video or audio display of information received in packets over the wireless network or otherwise coordinate the use of information received from
15 packets, a clock is maintained on each of the network devices that is in synchronization with the clocks on each of the other network devices.

In one embodiment, a clock is specified for each network device that needs to be correct only to about 5 parts per million. In order to maintain acceptable synchronization between all of the device clocks on the network, each time one of the devices transmits a
20 packet, the device includes in the packet header at a well defined point the value or, as described below, part of the value of its clock. When the other devices receive that packet, they adjust each of their respective clocks toward the time indicated by the timestamp. As described below, in one embodiment, the time adjustment is implemented by calculating a clock offset and the clock offset is calculated by taking half the difference between the
25 device clock and the timestamp.

Figure 3 is a diagram illustrating how the timestamp, referred to as the global time reference is inserted into a packet header. Packet header 300 includes a clock sync sequence 302. Clock sync sequence 302 is chosen to be an appropriate sequence to facilitate the receiver acquiring a clock signal used to sample the remainder of the packet.
30 Frame sync sequence 304 is included next for the purpose of precisely identifying the beginning of encoded data in the packet. Thus, the end of the frame sync sequence precisely determines the beginning of a frame. Any number of well known frame sync sequences may be used. In one embodiment, a 13 bit Barker code is used. As soon as the frame sequence is sent, the transmitter records its local time reference.

35 It should be noted that ideally, the local time reference of the transmitter will agree with the local time reference kept at each of the devices participating in the network. If that

5 is the case, then each of the local time references actually is a global time reference because it is in agreement with every other local time reference in the system. For the purpose of this explanation, the local time reference that the transmitter records and then inserts in the packet will be referred to as the global time reference. That is because the transmitter asserts it to be the global time reference and it is the time that all receiving devices will
10 adjust their own local time references toward. It should also be noted that each device considers its own local time reference to be the global time reference and asserts that its own local time reference is the global time reference it transmits a packet. Thus, each transmitting device asserts its local time reference as the global time reference when it includes its local time reference in a packet that it broadcasts to the other devices. Over
15 time, as enough packets are sent, all of the local time references converge to the same global time and the broadcast global time reference results in only small, if any, changes by receiving devices.

Global time reference 306 is inserted in the packet after frame sync sequence 304. In the embodiment shown, the global time reference is inserted immediately after the frame
20 sync sequence, but that is not required. The receiver notes its local time reference at the time when the frame sync sequence is detected and the frame sync sequence signal is asserted. The global time reference from the packet may be read immediately or it may be read much later, so long as it is compared to the time when the frame sync sequence signal is asserted. Thus, global time reference 306 may occur in the packet immediately following
25 frame sync sequence 304 or may occur at a later point in the packet. The remainder of the packet 308 is then sent. The remainder of the packet will likely include further information for the packet header as well as finally the packet payload of data.

It should be noted that in one embodiment, the entire global time reference is not included in the packet. Instead, only the least significant bits, referred to as the least
30 significant part, of the global time reference is included. It is sufficient to include just the least significant part of the global time reference so long as the difference between the clocks is less than the amount of time counted by the least significant part of the global time reference. This condition is met if the amount of drift between the clocks before an adjustment is made is not enough to move the clocks out of synchronization by more than
35 the maximum amount of time that can be represented by the least significant part. In one embodiment, a 32 bit global time reference is used and the least significant part that is

5 transmitted with each packet is the least significant 12 bits of the 32 bit global time reference.

In the embodiment described above, the relative clock drift of the clocks being used is about 5 parts per million (ppm) and the clock rate is 1 MHz. The least significant part of the global time reference can count up to 2^{12} microseconds. Therefore, the clocks would
10 need to be updated before a 2^{12} microsecond error could accumulate. For a 1 MHz clock with 5 ppm accuracy, the maximum time interval between updates would be on the order of about 5 minutes, depending on the method of updating used. Of course, the maximum time interval varies in different systems depending on the speed and accuracy of the clock and the number of bits transmitted with the least significant part of the clock. If more of the
15 global time reference is provided in the least significant part, then the frequency of update is lower. For example, if 14 bits are used, then the least significant part of the global time reference can accurately represent a cumulative drift of up to 2^{14} microseconds. Assuming that the relative clock drift is unchanged, then updates would be required only one fourth as often.

20 One advantage of the described arrangement where the global time reference is included along with every packet sent by one of the devices participating in the network is that as the amount of network traffic increases, updates of the local time references occur more frequently. This decreases the variance among the local time references.

Figure 4A is a diagram illustrating how the global time reference is split into a most
25 significant part and a least significant part. As mentioned above, the most significant part is, in one embodiment, 20 bits and the least significant part is 12 bits. The size of the least significant part may be increased to reduce the required frequency of updates at the cost of requiring more overhead for transmission. It should also be noted that, in addition to the least significant part being included in packets that are sent by each of the devices,
30 periodically a MAC layer protocol prompts one or more of the devices to broadcast the entire global time reference, that is both the most significant part and the least significant part. In one embodiment, the global time reference is broadcast every 20 seconds. The reason for periodically broadcasting the entire global time reference is to allow for an error that occurred in one of the devices that changed the global time reference by more than the
35 maximum time represented by the least significant part of the global time reference to be corrected.

5 In different embodiments, the task of broadcasting the entire global time reference may be performed by either one or all of the devices participating in the network. For example, each device may be directed to broadcast the global time reference periodically. The periodic broadcast may be staggered. Alternatively, the MAC layer protocol may direct a designated device to broadcast the entire global time reference at certain intervals.

10 Figure 4B is a diagram illustrating a memory register that stores the free running clock. The free running clock is a 32 bit clock. As mentioned previously, in one embodiment, the clock is a 1 megahertz clock. In other embodiments, the clock rate may be set as desired. Preferably, the free running clock is read only. That is, adjustments to the global time reference are not written to the clock. Rather, a free running clock offset is
15 defined such that the global time reference is equal to the sum of the free running clock plus the free running clock offset.

 Figure 4C is a diagram illustrating a memory register that stores the free running clock offset. Like the free running clock, the free running clock offset is a 32 bit register. However, the free running clock offset may be written as well as read. Each time a global
20 time reference is received from one of the other devices, the free running clock is adjusted so that the sum of the free running clock and the free running clock offset converges toward the global time reference specified by the broadcasting device.

 In different embodiments, adjustments to the local time reference based on the received global time reference are made according to different schemes. In one
25 embodiment, a linear adjustment to the local time reference is made based on the difference between the received global time reference and the local time reference. The adjustment may be represented by the equation:

$$\Delta\text{FRCO}=(\text{GTR}-\text{LTR}) * \text{L}.$$

 Where ΔFRCO is the change in the free running clock offset. GTR is the global time
30 reference received with a packet. LTR is the current value of the local time reference stored by the device. As mentioned above, after several packets are received and adjustments are made, the local time references stored on each of the devices will converge toward a single value and that value will be the global time reference. L is a linear factor that adjusts the amount that the free running clock offset is adjusted compared to the difference between the
35 global time reference and the local time reference that is computed. In one embodiment, L is equal to .5 and the adjustment to the free running clock offset is equal to half the

5 difference between the received global time reference and the stored local time reference.

Adjustment schemes are used in different embodiments that make non-linear adjustments to the free running clock offset based on the difference between the global time reference and the local time reference. In one embodiment, the change to the free running clock offset is equal to a scaling factor times the square of the difference between the global time reference and the local time reference. Squaring the difference between the two references has the advantage of making greater changes to the free running clock offset if the difference between the global time reference and the local time reference is large. If the square of the difference is used, then the sign of the difference between the global time reference and the local time reference is computed and applied to the difference so that the free running clock offset is adjusted in the proper direction.

In another embodiment, another non-linear adjustment scheme is implemented to allow the system to be more robust. The difference between the global time reference and the local time reference is computed. If the difference is greater than a threshold, then no adjustment is made to the local time reference. If the difference is less than a threshold, then the adjustment is made. Thus, if one of the devices in the network malfunctions or a new device signing on to the network attempts to assert a global time reference that is incorrect and would perturb the global time reference agreed upon by the current devices in the network, that device's assertion of the global time reference may be ignored.

In some embodiments, the threshold test can be turned off under certain circumstances. For example, if more than a certain number of changes are rejected by a device, then the threshold function may be temporarily turned off. This would be appropriate since a device that is receiving a large number of global time references that differ from its local time reference by a great amount most likely is actually incorrect by a large amount. A counter may be used to count the number of recent times that the difference between a received global time reference and the local time reference exceeds the threshold. In one embodiment, the counter is programmed to only count global time references from unique sources so that a single inaccurate source broadcasting repeatedly will be ignored. Both the threshold and the number of times that the threshold must be exceeded to turn off the threshold test may be programmed or may be preset.

Figure 5 is a diagram illustrating an embodiment where devices belong to two different ad hoc networks and a new device is joining one of the networks. Devices 502,

5 504, 506, and 508 all belong to a first ad hoc network 530. Device 508 along with devices 512 and 514 also belong to an ad hoc network 540. Device 522 is requesting to join network 530. As mentioned above, in one embodiment, the HIPERLAN protocol is utilized by the wireless ad hoc networks. In such an embodiment, each network has its own HIPERLAN ID. The HIPERLAN ID is included in packets sent by devices.

10 The two separate networks can have two separate independent clocks with a device such as device 508 that participates in both networks maintaining two separate clocks. More precisely, the device need only maintain a single free running clock and keep track of two free running clock offsets. Changes are applied to each of the respective free running clock offsets to keep track of the two different global times for the networks. Thus, device 15 508 may have a single free running clock but two registers used to calculate two different free running clock offsets to adjust the free running clock time to the global time of whichever network it is participating in at a given moment.

Other aspects of the HIPERLAN specification are used to facilitate the implementation of a global time reference shared among the devices of an ad hoc network. 20 For example, the entire global time reference may be periodically broadcast using a Hello packet as described in the specification. The standard Hello procedure is modified to carry the full global time reference. The Hello procedure is described more fully in the HIPERLAN Type 1, Functional Specification, ETS 300 652 at 6.5.4 Neighbour Information Declaration. See also 6.1.14 Neighbour Information Base and 6.1.15 Hello Information 25 Base.

As described above, a device may use the HIPERLAN ID to determine whether a packet belongs to its network and therefore whether to adjust its local time reference toward the global time reference specified in the packet. Also, a reserved network management ID may be used by devices joining the network. Network devices may be configured to ignore 30 time references included in HIPERLAN lookup requests.

Various methods may be implemented to avoid a stable network global time reference from being perturbed by a new device. In one embodiment, new devices are instructed to provide a global time reference of all 0's which is a special value that is ignored by all network devices. Also, a new device is preferably configured to initially set 35 its local time reference to equal a received global time reference instead of adjusting its local reference as described above. Specification of conventions for new devices, however,

5 does not protect against rogue devices that do not observe the correct conventions or devices that belong to other networks. For that reason, other procedures such as checking the HIPERLAN ID or rejecting certain large changes may also be implemented.

Figure 6 is a flow chart illustrating a process that a network device executes when a packet that includes a global time reference is received to determine whether to adjust the
10 network device local time reference. The process starts at 600. In step 602, the HIPERLAN ID is checked. If there is no match, then the process ends at 620. If there is a match, then control is transferred to step 604 and it is determined whether the packet is a look up request. If the packet is a look up request, then the process ends at 620. If the packet is not a lookup request, then control is transferred to step 606 and the global time
15 reference is checked. In step 608, it is determined whether the global time reference is a special value. If it is, then control is transferred to 620 and the process ends. If the global time reference is not a special value, then control is transferred to step 610 and the difference between the global time reference and the local time reference is calculated. Then, in step 612, the free running clock offset is updated. The free running clock may be
20 updated according to any of the linear or nonlinear schemes described above or any other appropriate scheme. The process then ends at 620.

Figure 7A is a flow chart illustrating a process for including a global time reference in a packet. The process starts at 700 when a clock sync sequence is written. Next, in step 702, the frame sync sequence is written. As soon as the frame sync sequence is completed
25 the local time reference of the transmitting device is read in step 704. This value will be inserted into the packet as the global time reference corresponding to the time that the frame sync sequence was finished. Next, in step 706, the global time reference is written into the packet. It should be noted that other steps may intervene between steps 704 and 706. The key point is that the global time reference is stored either immediately after or at some
30 specific time after the frame sync sequence is completed so that the receiving device can compare its local time reference to the transmitted global time reference at a specific reference point.

Figure 7B is a flow chart illustrating a process executed by a receiver to prepare to update its free running clock offset. The process starts at 710 when the frame sync
35 sequence is detected. The local time is immediately stored in step 712. It should be noted that although it is preferred that the local time be stored immediately, it is also possible to

5 store the local time at a set period of time after the assertion of the frame sync signal. Then,
in step 714, the global time reference is read from the packet. In this manner, the
transmitted global time and the local time are stored at a specific point in time referenced to
the writing of the frame sync sequence and the detection of the frame sync sequence,
respectively. In this manner, the local time reference and the global time reference can be
10 compared and the free running clock offset can be appropriately adjusted.

Maintaining a global time reference in an ad hoc network has been disclosed. Each
device maintains a local free running clock and a local free running clock offset, which
together comprise a local time reference. Each free running clock is adjusted toward a
received global time reference that is the local time reference of whatever device happens to
15 be broadcasting. In this manner, eventually all of the local time references of devices in the
network converge. A device may participate in more than one network by keeping track of
one free running clock offset for each network.

Although the foregoing invention has been described in some detail for purposes of
clarity of understanding, it will be apparent that certain changes and modifications may be
20 practiced within the scope of the appended claims. It should be noted that there are many
alternative ways of implementing both the process and apparatus of the present invention.
Accordingly, the present embodiments are to be considered as illustrative and not
restrictive, and the invention is not to be limited to the details given herein, but may be
modified within the scope and equivalents of the appended claims.

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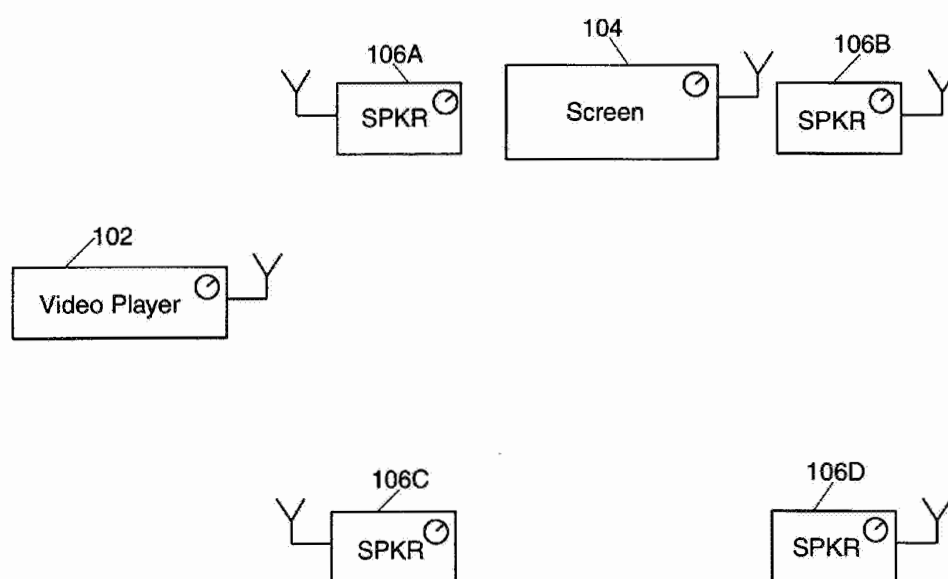
WHAT IS CLAIMED IS:

1. A method of maintaining synchronization among a plurality of network devices having local clocks that participate in a network comprising:
 - broadcasting a first packet from a first network device to other network devices that
 - 10 participate in the network wherein the first packet includes a global time reference derived from the local clock of the first network device; and
 - adjusting the clocks of the network devices that receive the first packet to be closer to the local clock of the first network device.
2. A method of maintaining synchronization among a plurality of network devices as
15 recited in claim 1 further including:
 - broadcasting a second packet from a second network device to other network devices that participate in the network wherein the second packet includes a global time reference derived from the local clock of the second network device; and
 - adjusting the clocks of the other network devices network devices that receive the
 - 20 second packet to be closer to the local clock of the second network device.
3. A method of maintaining synchronization among a plurality of network devices as recited in claim 1 wherein the global time reference includes the least significant part of the local clock of the first network device and does not include the most significant part of the local clock of the first network device.
- 25 4. A method of maintaining synchronization among a plurality of network devices as recited in claim 3 wherein the most significant part of one of the network device local clocks is broadcast periodically and the most significant parts of all local clocks are conformed to the broadcast most significant part.
5. A method of maintaining synchronization among a plurality of network devices as
30 recited in claim 1 wherein adjusting the clocks of the network devices that receive the first packet to be closer to the local clock of the first network device includes adjusting the clocks of the network devices according to a linear function of the difference between the unadjusted value of the clock being adjusted and the broadcast global time reference.
6. A method of maintaining synchronization among a plurality of network devices as
35 recited in claim 1 wherein adjusting the clocks of the network devices that receive the first packet to be closer to the local clock of the first network device includes adjusting the

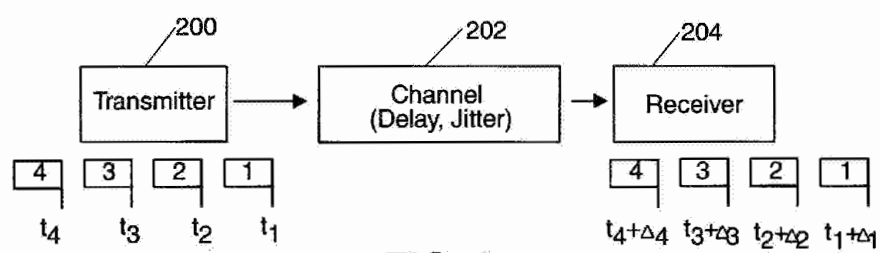
- 5 clocks of the network devices by approximately one half the difference between the
broadcast global time reference and the unadjusted value of the clock being adjusted.
7. A method of maintaining synchronization among a plurality of network devices as
recited in claim 1 wherein adjusting the clocks of the network devices that receive the first
packet to be closer to the local clock of the first network device includes adjusting the
10 clocks of the network devices according to a nonlinear function of the difference between
the unadjusted value of the clock being adjusted and the broadcast global time reference.
8. A method of maintaining synchronization among a plurality of network devices as
recited in claim 7 wherein the nonlinear function of the difference between the unadjusted
value of the clock being adjusted and the broadcast global time reference causes
15 substantially no adjustment to the clock being adjusted when the difference between the
unadjusted value of the clock being adjusted and the broadcast global time reference is
greater than a maximum adjustable difference.
9. A method of maintaining synchronization among a plurality of network devices as
recited in claim 1 wherein the global time reference is derived from the local clock of the
20 first network device immediately after a frame synchronization portion of a packet is
transmitted.
10. A method of maintaining synchronization among a plurality of network devices as
recited in claim 1 wherein adjusting the clocks of the network devices that receive the first
packet to be closer to the local clock of the first network device includes comparing the
25 local clock of a receiving network device at the instant that frame synchronization is
detected to the transmitted global time reference.
11. A method of maintaining synchronization among a plurality of network devices as
recited in claim 1 wherein all data packets broadcast by any network device that participates
in the network includes a global time reference derived from the local clock of the
30 broadcasting network device so that as more data is transmitted, the local clocks of the
receiving network devices are updated more frequently.
12. A method of maintaining a first network local time reference and a second network
local time reference for a device that participates in a first network and a second network
comprising:
- 35 maintaining a free running clock on the device;
determining the difference between the free running clock and a first network global

- 5 time reference;
- calculating a first network offset to account for the difference between the free
running clock and the first network global time reference;
- determining the difference between the free running clock and a second network
global time reference; and
- 10 calculating a second network offset to account for the difference between the free
running clock and the second network global time reference.
13. A receiving network device configured to maintain synchronization with a
transmitting network device comprising:
- a receiving network device local clock;
- 15 an interface configured to receive a first packet from the transmitting network device
wherein the first packet includes a global time reference derived from a transmitting
network device local clock; and
- a processor configured to adjust the receiving network device local clock to be closer
to the transmitting network device local clock.
- 20 14. A receiving network device configured to maintain synchronization with a
transmitting network device as recited in claim 13 wherein the receiving network device
local clock includes a free running clock and a free running clock offset.
15. A transmitting network device configured to maintain synchronization with a
receiving network device comprising:
- 25 a transmitting network device local clock;
- an interface configured to transmit a first packet wherein the first packet includes a
global time reference derived from the transmitting network device local clock and wherein
the global time reference is used by the receiving network device to adjust the receiving
network device local clock to be closer to the transmitting network device local clock.
- 30 16. A network of devices comprising:
- a transmitting network device configured to transmit a first packet wherein the first
packet includes a global time reference derived from a transmitting network device local
clock; and
- a receiving network device configured to receive the first packet from the
35 transmitting network device and to adjust a receiving network device local clock to be
closer to the global time reference.

- 5 17. A network device comprising:
- a free running clock;
- a processor configured to:
- determine the difference between the free running clock and a first network
- 10 global time reference;
- calculate a first network offset to account for the difference between the free
- running clock and the first network global time reference;
- determine the difference between the free running clock and a second network
- global time reference; and
- calculate a second network offset to account for the difference between the
- 15 free running clock and the second network global time reference.

**FIG. 1**

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**FIG. 2**

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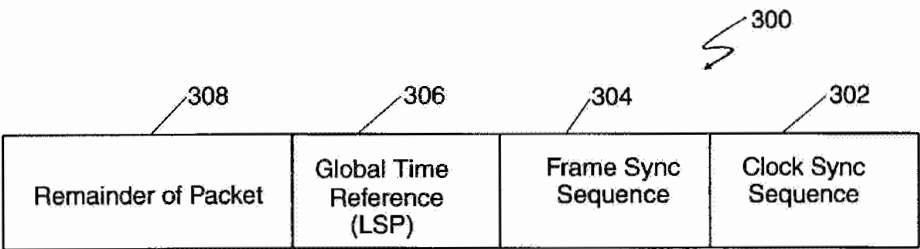


FIG. 3

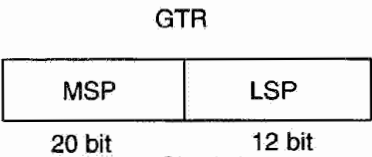


FIG. 4A

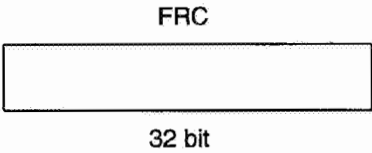
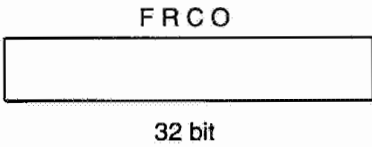
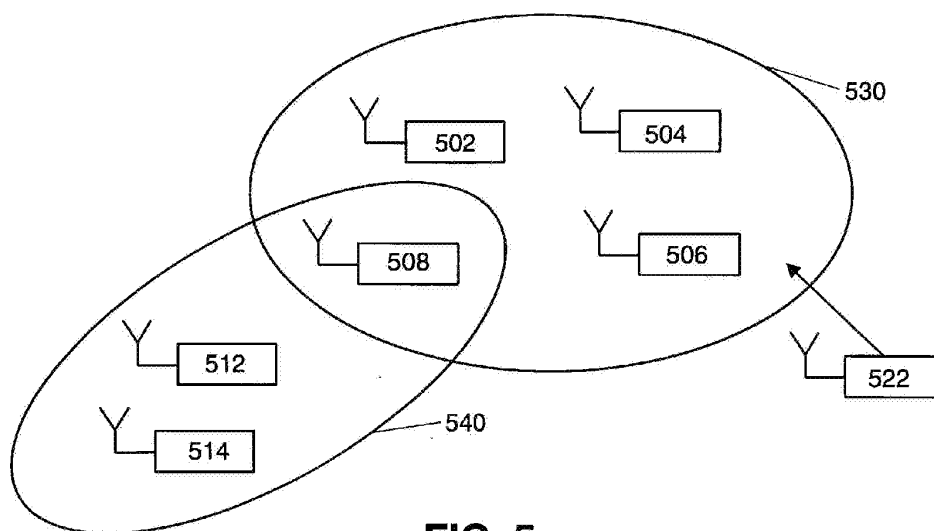


FIG. 4B

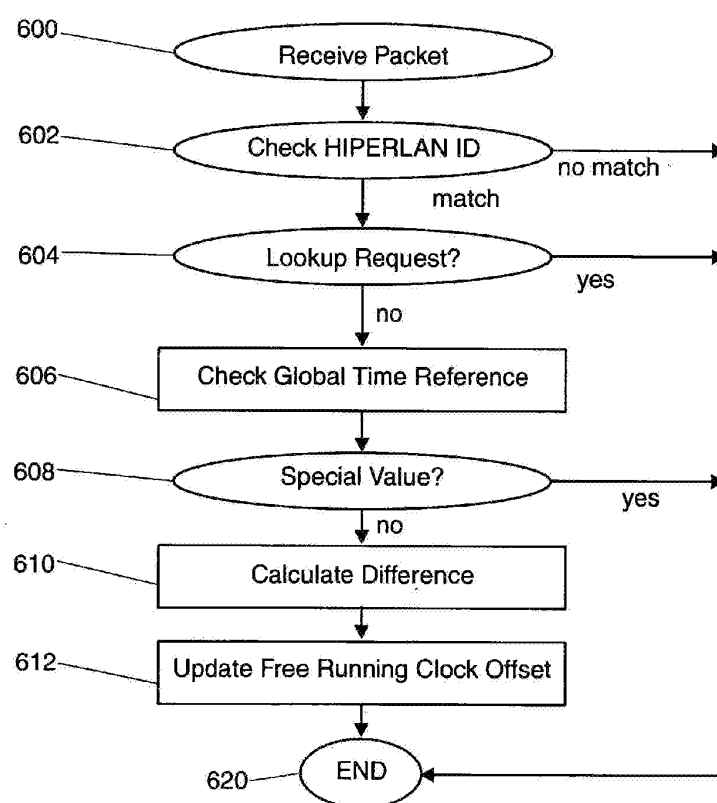


$GTR = FRC + FRCO$

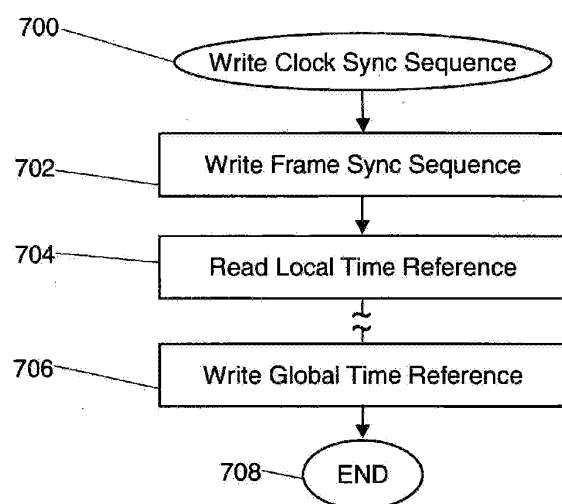
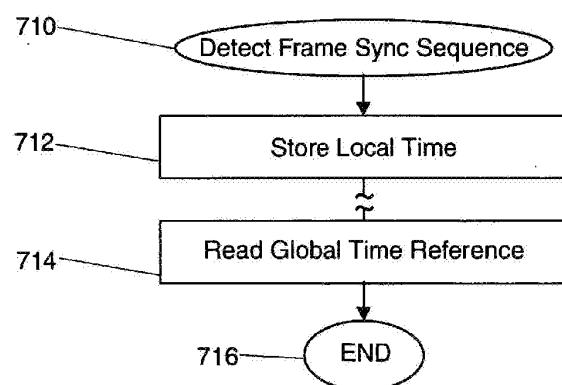
FIG. 4C

**FIG. 5**

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**FIG. 6**

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**FIG. 7A****FIG. 7B**

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/07082

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H04J 3/06

US CL : 370/350, 432, 503, 516; 375/356; 455/265

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)

U.S. : 370/350, 390, 432, 503, 516; 375/356; 455/208, 265; 709/248, 249

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EAST, WEST, IEEE, DIALOG**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y,P	US 5,334,975 A (WACHOB et al.) 02 August 1994, col. 1, lines 35-52, col. 2, lines 10-68, col. 3, lines 1-40.	1-17
Y,P	US 6,285,873 B1 (QUICK, Jr.) 04 September 2001, col. 4, lines 5-19, col. 6, lines 31-67, col. 7, lines 1-67, col. 8, lines 1-7, 54-63	1-17
Y,P	US 6,347,084 B1 (HULYALKAR et al.) 12 February 2002, col. 1, lines 37-48, 66-67, col. 2, lines 1-12, col. 6, lines 53-67, col. 7, lines 1-4, col. 8, lines 21-32, 43-64.	1-17

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

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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

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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

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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

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Date of the actual completion of the international search

13 June 2002 (13.06.2002)

Date of mailing of the international search report

11 JUL 2002

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Authorized officer

Afsar M. Qureshi

Telephone No. (703) 308 8542

Form PCT/ISA/210 (second sheet) (July 1998)

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Jeffrey Armstrong		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	1820	1	2000	2000
Total in USD (\$)				2000

Electronic Acknowledgement Receipt	
EFS ID:	40832364
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Jeffrey Armstrong
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	13-OCT-2020
Filing Date:	17-APR-2013
Time Stamp:	16:43:21
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$ 2000
RAM confirmation Number	E20200CG44261578
Deposit Account	132490
Authorized User	Jeffrey Armstrong
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)					
37 CFR 1.20 (Post Issuance fees)					
37 CFR 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	13-0402_RCE.pdf	697596	no	3
			43e2a184bd6b6f4346f57a5276d957f2474c77f7		
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	13-0402_0_IDS_20201013115250.pdf	1054417	no	6
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3	Foreign Reference	Foreign01_JP2001251360A.pdf	6798645	no	15
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Information:					

7	Non Patent Literature	NPL01_13871795_AA_03-08-2017.pdf	1041248	no	22
			8661815f4635b302cfbca3df371ddb02612d1b79		
Warnings:					
Information:					
8	Non Patent Literature	NPL02_Chinese_No_2013800443802_Second_Office_Action_2-27-17.pdf	539567	no	22
			ac73a0ab2bab9b15832286a629cdd5f0d4b2fdb5		
Warnings:					
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9	Non Patent Literature	NPL03_IEEE_1588-2002_154pages.pdf	13070620	no	154
			608bab840526e0d544c5dc3eb506c19797773dc		
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10	Non Patent Literature	NPL04_2019104398_JP_OA_04-0401-JP-DIV5_8-17-20_5pages.pdf	1334694	no	5
			5233e872bb33b338362408a26b712f41e4968006		
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12	Non Patent Literature	NPL06_16544905_NFOA_04-0401-CON0819C_8-05-20_15pages.pdf	511600	no	15
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13	Non Patent Literature	NPL07_16516567_NOA_04-0401-CON0719D_7-13-20_19pages.pdf	779713	no	19
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14	Non Patent Literature	NPL08_15946660_NOA_13-041 1-CON0418_9-16-20_5pages. pdf	352887	no	5
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15	Non Patent Literature	NPL09_16545844_NOA_04-040 1- CON0819D_09-22-20_8pages. pdf	427990	no	8
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18	Non Patent Literature	NPL12_16516567_NOA_04-040 1-CON0719D_9-29-20_7pages. pdf	415908	no	7
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806
107361	7590	08/04/2020	EXAMINER	
McDonnell Boehnen Hulbert & Berghoff LLP			SURVILLO, OLEG	
Sonos, Inc.			ART UNIT	PAPER NUMBER
300 South Wacker Drive			2442	
Chicago, IL 60606			MAIL DATE	DELIVERY MODE
			08/04/2020	PAPER

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

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

Corrected Notice of Allowability	Application No. 13/864,249	Applicant(s) Millington, Nicholas A. J.	
	Examiner OLEG SURVILLO	Art Unit 2442	AIA (FITF) Status No

-- 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 IDS filed 07/24/2020 before payment of Issue Fee.
☐ 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 47-79. 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. _____.
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Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892) 2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date <u>See Continuation Sheet</u> . 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____.	5. ☐ Examiner's Amendment/Comment 6. ☐ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
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/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	
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Continuation of Attachment(s) 2. Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date: 07/24/20; 07/24/20; 07/24/20; 07/24/20; 07/24/20; 07/24/20; 07/24/20; 07/24/20

dated 07/24/2020

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

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	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

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Examiner Signature	/OLEG SURVILLO/	Date Considered	08/03/2020
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
<p>That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).</p>			
OR			
<p>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).</p>			
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Signature	/David R. Grosby/	Date (YYYY-MM-DD)	2020-07-23
Name/Print	David R. Grosby	Registration Number	75912
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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.
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See attached certification statement.

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SIGNATURE

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 R. Grosby/	Date (YYYY-MM-DD)	2020-07-23
Name/Print	David R. Grosby	Registration Number	75912

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	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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1	Yahoo Finance. BridgeCo Successfully Commercializes its BeBoB Application for the Music Industry: Four Manufacturers Demonstrate BeBoB-enabled Products at NAMM 2004. 16 January 2004, 3 pages.
2	Yamaha. Digital Audio Server, MCX-1000, Owner's Manual, 1996-2002, 148 pages.
3	Yamaha MusicCAST Digital Audio Server MCX-1000 Owner's Manual, Copyright 1996-2002, 148 pages.
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6	Zero Configuration networking with Bonjour -YouTube available via https://www.youtube.com/watch?v=ZhtZJ6EsCXo 3 pages [produced by Google in Inv. No. 337-TA-1191 on May 6, 2020].
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10	Zeroconf Working Group, Dynamic Configuration of Link-Local IPv4 Addresses, Internet-Draft, 16 February 2004, 60 pages.
11	Zeroconf Working Group, Dynamic Configuration of Link-Local IPv4 Addresses, Internet-Draft, 31 March 2004, 60 pages.

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See attached certification statement.

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A certification statement is not 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 R. Grosby/	Date (YYYY-MM-DD)	2020-07-23
Name/Print	David R. Grosby	Registration Number	75912

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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.
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7	cd30 Backgrounder, 1 page [produced by Google in Inv. No. 337-TA-1191 on May 6, 2020].
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12	cd30. Careers, 21 November 2003, 1 page.
13	cd30. Contact, 12 December 2003, 1 page.
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17	cd30 Introduces Family of MP3 Players at this year's Consumer Electronics Show. 9-12 January, 2003 Las Vegas Convention Center, 12 February 2004, 2 pages.
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36	cd30. Product Support. 10 May 2006, 17 pages.
37	cd30 Product Support Forums. Forum Index, 15 April 2003, 1 page.
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41	Cd3o. Network MP3 Player, Product Manual, 2003, 65 pages.
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48	C-Media. CM102-A/102S USB 2CH Audio Controller, Data Sheet. Version 1.4. 21 May 2003, 20 pages.
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Name/Print	David R. Grosby	Registration Number	75912

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EFS ID:	40087458
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	David Rittenhouse Grosby
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Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
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Total Files Size (in bytes):			208168062		

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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.

Electronic Acknowledgement Receipt	
EFS ID:	40087331
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	David Rittenhouse Grosby
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	24-JUL-2020
Filing Date:	17-APR-2013
Time Stamp:	18:41:00
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no				
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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.

Electronic Acknowledgement Receipt	
EFS ID:	40086425
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	David Rittenhouse Grosby
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	24-JUL-2020
Filing Date:	17-APR-2013
Time Stamp:	18:39:32
Application Type:	Utility under 35 USC 111(a)

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Submitted with Payment	no
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Electronic Acknowledgement Receipt	
EFS ID:	40086891
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	David Rittenhouse Grosby
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Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	24-JUL-2020
Filing Date:	17-APR-2013
Time Stamp:	18:40:02
Application Type:	Utility under 35 USC 111(a)

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47	Non Patent Literature	HomePod_MP-100_Wireless_Network_Music_Player_Spec_2003_2pages.pdf	917295	no	2
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51	Non Patent Literature	NewsRoom_Yamaha_Musiccast_12-1-03_2pages.pdf	435559	no	2
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58	Non Patent Literature	Yamaha_Digital_Audio_Server_Owners_Manual_1996-2002_148pages_Part1.pdf	20738269	no	79
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59	Non Patent Literature	Yamaha_Digital_Audio_Server_Owners_Manual_1996-2002_148pages_Part2.pdf	18653022	no	69
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2	Yamaha. Digital Audio Server, MCX-1000, Owner's Manual, 1996-2002, 148 pages.
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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
20 November 2003 (20.11.2003)

PCT

(10) International Publication Number
WO 03/096741 A2

(51) International Patent Classification⁷: **H04R**
(21) International Application Number: PCT/US03/14603
(22) International Filing Date: 8 May 2003 (08.05.2003)
(25) Filing Language: English
(26) Publication Language: English
(30) Priority Data:
60/379,313 9 May 2002 (09.05.2002) US
(71) Applicants and
(72) Inventors: **BRAITHWAITE, Michael** [US/US]; 2875
Boldt Street, Las Cruces, NM 88005 (US). **CARDENAS,**
Herman [US/US]; 770 Loma Verde, Las Cruces, NM
88011 (US).

(74) Agent: **TOUPAL, John, E.**; Law Offices of John E.
Toupal, 116 Concord Street, Framingham, MA 01702
(US).

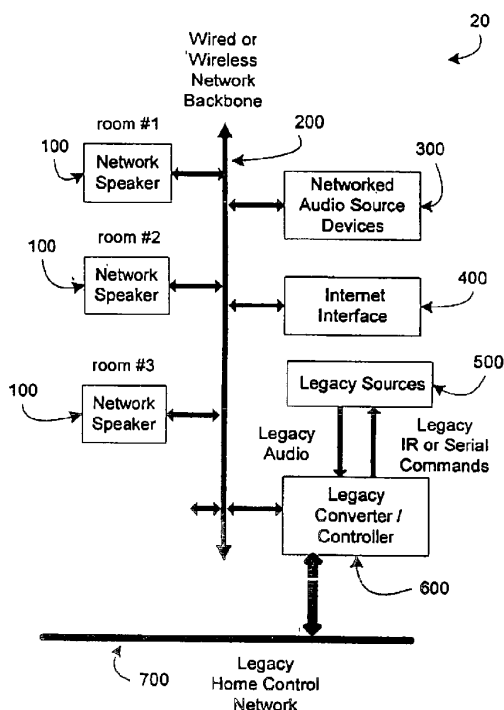
(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ,
DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR,
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SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VC, VN,
YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— without international search report and to be republished
upon receipt of that report

[Continued on next page]

(54) Title: AUDIO NETWORK DISTRIBUTION SYSTEM



(57) Abstract: An audio distribution network system (20) allowing an audio distribution system to be created that is integrated with the home automation system into a home network that permits vocal feedback, status and even control with the audio through network speakers (100).

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AUDIO NETWORK DISTRIBUTION SYSTEM

BACKGROUND OF THE INVENTION

Currently, most audio speakers are passive devices that receive an analog or digital audio signal. A few advanced models have limited self-diagnostics that can be communicated out over additional wire runs as well. These speakers are usually wired to racks or source switching pre-amps and amplifiers. The problem with this approach is that these systems are not very flexible. It is hard to expand the audio sources that can be heard through the speakers embedded in walls or other places after the system has been installed without buying and installing additional costly components. Other audio sources include as home control system voice communication, intercom audio, soundtracks for CD-ROM games, solid-state sound memories. Digital audio broadcasting systems, and even Internet audio can not easily be added and routed through to the existing speakers at a future date if the existing system was not originally designed to input and handle it. This is mostly due to the ongoing proliferation of new audio compression formats. High-quality digital audio data takes a lot of hard disk space to store (or channel bandwidth to transmit). Because of this many companies have worked on compressing and or coding of the bit stream to allow for a smaller binary footprint. This allows for high quality music to take up less storage space and to be transported across vast networks with a smaller amount of data, and therefore less bandwidth. However, these new compression and encoding formats require that un-compression and decoding be performed to reconstitute the original

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audio before it is played out the loudspeaker. If an existing audio system is limited to reconstituting only audio formats known at the time of installation, the audio system quickly becomes obsolete.

Many new products have wireless network capabilities, but still cannot be easily connected into a home network, because of a lack of easily accessible wireless to wired network bridging within range of the device. This can especially be a problem if the wireless device is a handheld mobile unit such as a PDA, and due to a lack of access points, can not communicate from all rooms in the house.

The current approach to controlling audio and doing home automation is often cumbersome. The sound system remote that allows the room audio level to be adjusted does not allow the room lights to be dimmed. Therefore, different remote controllers for each function are needed. Nor do users like the "wall clutter" created by putting separate multiple audio and other home network control units in the walls. Wireless solutions to this problem such as Radio Frequency, known as RF, or Infra-Red, called IR, have limitations. The biggest limitation for RF is that in many large cities, the RF noise background is very high, creating communication problems, and there may be health concerns with excessive RF. The IR limitation is that IR is effective in "line of sight" only, and the home automation devices to be controlled may be in other rooms. These problems are compounded in retrofit situations where the

minimal changes that affect the current building and existing systems are desired.

It is therefore the object of this invention to provide a networked speaker, so that an audio distribution system can be created that is integrated with the home automation system into a home network that permits vocal feedback, status, and even control with the audio through the network speakers. The network should let the user know what is happening, and provide very intuitive instruction on how to use the system. This will enable the audio speakers to easily adjust to and allow new audio sources and to become wireless access points in the home, or provide the wireless bridge to the hard-wired network.

DESCRIPTION OF THE DRAWINGS

These and other objects and features of the invention will become more apparent upon a perusal of the following description taken in conjunction with the accompanying drawings wherein:

Figure 1 is a circuit diagram of an audio distribution system;

Figure 2 is a circuit diagram of a network speaker embodiment of the system shown in Figure 1;

Figure 3 is a circuit diagram of another network speaker embodiment;

Figure 4 is a circuit diagram of another network speaker embodiment;

Figure 5 is a circuit diagram of another network speaker embodiment;

Figure 6 is a circuit diagram of another network speaker embodiment;
and

Figure 7 is a circuit diagram of a CODEC circuit for use in the network speaker embodiments of Figures 2 – 6;

Figure 8 is a circuit diagram of a Legacy Audio Converter/Controller for use in the system shown in Figure 1;

Figure 9 is a circuit diagram of a network speaker including power options; and

Figure 10 is a network speaker including battery powered options and an energy storage module.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

An audio distribution network system 20 (Figure 1) includes a plurality of speaker node units 100 which are coupled to a Transport Control Protocol/Internet Protocol (TCP/IP) based network backbone 200. Also coupled to the network backbone 200 are networked audio source node devices 300, an Internet service interface 400, and a Legacy converter/controller 600. Legacy sources 500 provide analog or digital linear PCM (Pulse Coded Modulation) audio to be converted into a packet switched digital coding for transport across the network. They will also provide analog video which will be used for control status feedback, as well as conversion to a packet switched digital coding for transport across the network. In addition, the Legacy sources 500 will also receive IR or serial commands from the

converter/controller 600 which also communicates with a Legacy home control network 700. Some legacy sources 500 may also provide serial communications to the converter/controller 600.

The source devices 300 can consist of any number of networked digital audio source devices (music playback devices) such as personal computers or audio servers that are able to communicate with one another over the shared TCP/IP network 200 and have the resources to serve digital audio files (WMA, MP3, Corona, etc.) to the network. Bit streamed audio (digital music, in the form of binary data that is sent in packets) from the Internet also may enter the system 20 from the Internet interface 400. The Legacy audio devices 500 (existing analog audio equipment, i.e. CD players, tape decks, VCR's) have their audio converted into a packet switched digital network format (WMA, MP3, Corona) by the Legacy Converter 600 or by the network speakers 100. The network speaker 100 can also real time encode sound received from its internal microphone or from reversing the transduction circuit from the speaker to perform the act of capturing sound waves present in the room, and then coding that sound and providing it for use on the network 20, including by use of differential masking for control purposes. Any new device that is able to send audio out on the network can serve as the audio source for a network speaker 100 as long as the network speaker 100 understands the audio format. Control commands that affect the audio distribution can come from the network server 300, the Internet interface 400,

the legacy home control network 700 via the legacy converter/controller 500, or from other network speakers 100.

The system 20 is a collection of independent computers or other intelligent devices that communicate with one another over the shared TCP/IP network 200. For example, the system 20 can be part of the Internet linked networks that are worldwide in scope and facilitate data communication services such as remote login, file transfer, electronic mail, the World Wide Web and newsgroups, or for security reasons part of a home intranet network utilizing Internet-type tools, but available only within that home. The home intranet is usually connected to the Internet via an Internet interface 400. Intranets are often referred to as LANs (Local Area Networks).

The home network backbone 200 communicates using the TCP/IP network protocol consisting of standards that allow network members to communicate. A protocol defines how computers and other intelligent devices will identify one another on a network, the form that the data should take in transit, and how this information is processed once it reaches its final destination. Protocols also define procedures for handling lost or damaged transmissions or "packets". The TCP/IP network protocol is made up of layers of protocols, each building on the protocol layers below it. The basic layer is the physical layer protocol that defines how the data is physically sent through the physical communication medium, such as Thickwire, thin coax, unshielded twisted pair, fiber optic, telephone cable, fiber optic cable, RF, IR,

power line wires, etc. Those physical media requiring an actual physical connection of some type, such as Thickwire, thin coax, unshielded twisted pair, fiber optic, power line, telephone cable, or fiber optic cable, to the network device are called wired media. Those physical media not requiring an actual physical wire connection of any type to the network device, such as RF and IR, are called wireless media. A TCP/IP home network can be totally wired, totally wireless, or a mix of wireless and wired. A TCP/IP home network is not limited to a single physical communication medium. Different physical communication media can be connected together by bridging components to create a unified communication network. Each network physical media has its physical layer protocol that defines the form that the data should take in transit on that particular physical media. The bridging component enables the transfer and conversion of communication on one physical medium and its physical layer protocol to a different physical media and its physical layer protocol. Bridging components also may provide a proxy from one network to the other, this will be common among UpnP_V1 to V2, and with Ipv6 to Ipv4 (Internet Protocol version 6, 4). Common physical layer LAN technology in use today include Ethernet, Token Ring, Fast Ethernet, Fiber Distributed Data Interface (FDDI), Asynchronous Transfer Mode (ATM) and LocalTalk. Physical layer protocols that are very similar over slightly different physical media are sometimes referred to be the same name but of different type. An example are the three common types of Fast

Ethernet: 100 BASE-TX for use with level 5 UTP cable, 100BASE-FX for use with fiber-optic cable, and 100BASE-T4 which utilizes an extra two wires for use with level 3 UTP cable. The TCP/IP protocol layers are well known and will not be further described in greater detail.

The system 20 may have any number of networked self-sufficient digital audio source devices 300 in it, such as a digital music storage device, PC, music player, personal Digital Assistant (PDA), on board automobile music system, digital integrated audio equipment, personal digital recorder or video digital recorder. Networked audio source devices 300 can provide digital audio files such as WMA, MP3, "Corona", and MLP from its hard disk, internal flash, or an audio input such as a microphone or CD reader or music player. Also, the networked audio source devices 300 can encompass a specialized network server, usually a specialized, network-based hardware device designed to perform a single or specialized set of server functions. It is usually characterized by a minimal operating architecture, and client access that is independent of any operating system or proprietary protocol. Print servers, terminal servers, audio servers, control remote access servers and network time servers are examples of server devices which are specialized for particular functions. Often these types of servers have unique configuration attributes in hardware or software that help them to perform best in their particular arena. While specialized hardware devices are often used to perform these functions in large systems, the specialized functions served by

the network server could be performed by a more general use computer. A single computer, (sometimes referred to as a RISC (reduction instruction set computer), called a web server, could combine the functionality of the networked audio source devices 300 and the Internet interface 400. If no connection to the Internet is desired, the Internet interface 400 function can be removed from the system without loss of intranet network integrity. Network and web servers are well known and will not be described in greater detail.

The legacy home control network 700 is an existing network of devices in the home used to automate and control the home. If the legacy home control network 700 can not communicate over a shared TCP/IP network 200, it cannot directly control or be controlled by the network speakers, and the two dissimilar networks must be bridged by a Legacy Converter/Controller 600. Any legacy home control network 700 that can communicate within the system 20 over a shared TCP/IP network could be combined into the home network backbone 200 and then the legacy home control network 700 device would have access to and be able to control the network speaker 100 if it has the resources and instructions to do so. The Legacy Converter/Controller 600 can also be used to provide network access to un-networked legacy devices that are able to serve as command and control interfaces such as the telephone, cell phone, RF remote, IR remote, direct voice controller or keypad. A networked audio source 300 such as a PDA,

also can act as the legacy converter/controller for a legacy device such as an attached cell phone.

The legacy home audio sources 500 are other audio sources that are not able to communicate over a shared TCP/IP network 200, such as analog audio players, CD players, video game players, tape players, telephone, VCRs or other audio sources that are not able to communicate over a shared TCP/IP network 200. The legacy Converter/Controller 600 takes the analog or digital linear PCM audio from the Legacy home sources 500, converts it into an acceptable digital format or formats if needed, and serves the audio as needed over the shared TCP/IP home network backbone 200. If the legacy home audio source 500 provides an analog audio to the Legacy Converter/Controller 600, the Legacy Converter/Controller 600 must convert the analog audio into an appropriate digital audio format before serving it to the network. The Legacy Converter/Controller 600 can also convert commands sent from the home network 200 to the legacy home source 500 into a command format that is understood by the legacy home source 500, such as serial, RF or IR commands. A system may have multiple Legacy Converter/Controllers 600 for each legacy home source 500 or legacy home control network 700, or a Legacy Converter/Controller 600 may convert and control more than one legacy home source 500 or multiple Legacy home control networks 700.

Illustrated in Figure 2 is one network speaker embodiment 100A. A network interface 110 couples the network backbone 200 of the system 20

(Figure 1) to a network controller 120 which feeds a digital to analog converter (DAC) 122 via an audio format converter 121. Receiving an output from the DAC 122 is a pre-amplifier 123 which also receives inputs from speaker sensors 124. An amplifier 125 receives the output of the pre-amp 123 and feeds a speaker driver 126 coupled to speaker components 127.

The network speakers 100A may be enclosed in a case or box, in a ceiling embedded in or behind a wall, or in a car and constitute the most prevalent enabling components in the system 20. Each network speaker 100A communicates to the network backbone (Ethernet) 200 through the network interface 110 that handles the physical layer hardware protocol. The network interface 110 may connect to one or more physical layers, wired or unwired or both. From there the Network Speaker Controller 120 provides the intelligence to run the various application features of the network speaker, including the higher levels of the TCP/IP protocol. Audio sources (Digital Music content) received from the network and addressed to a particular network speaker 100A are sent to the audio format converter 121 that converts the source digital audio format into a form ready to be converted to analog. The correctly re-formatted digital signal is sent to the digital to DAC 122 to be converted from digital to analog. The analog signal then goes to a pre-amp 123 where the signal is adjusted and filtered. Included in the pre-amp 123 can be an active crossover which operates at preamp level to limit the frequencies to the amplifier or amplifiers connected to it. The speaker components

connected to these pre-amplifiers would therefore receive a limited frequency range, and can be optimized for the frequencies received. The pre-amp signal then goes to the amplifier section 125, and the amplified signal proceeds to the speaker driver 126 and out the speaker microphone components 127 to become audio sound waves. Because the application software in the Network Speaker controller 120 and audio format converter 121 can be updated over the network and with the use of sufficient processing power, and presence of ample memory, the network speaker 100A can be made to play currently unknown digital formats in the future. The audio format converter 121 may have the DAC 122 built in. The speaker sensors 124 which may include temperature, SPL, ambient and noise floor, pressure, and voltage sensors provide the on board application speaker feedback which enable internal auto adjustment to enhance speaker protection and performance and allow for sending control signals back to other devices which may need/want the status information. A very useful application for this would be for the use of differential masking. This is a process in which you are comparing samples from the digital source against the real time encoding samples from within the air space. The original digital source is then subtracted from the combined real time encoding and the result is a new sample.

The network interface 110 connects the network speaker 100A to the actual network backbone 200 and will vary depending on the physical media and physical layer protocol used. Network interface cards, commonly referred

to as NICs, are often used to connect PCs to a wired network, and are used in the preferred embodiment when the network backbone is some form of wired cable or fiber optics. The NIC provides a physical connection between the networking cable and the computer's internal bus. Different computers have different bus architectures; the most common are PCO found on 486/Pentium PCs and ISA expansion slots commonly found on 386 and older PCs. NICs come in three basic varieties: 8-bit, 16-bit, and 32-bit. The larger the number of bits that can be transferred to the NIC, the faster the NIC can transfer data to the network cable. Many NIC adapters comply with Plug-n-Play specifications. On these systems, NICs are automatically configured without user intervention, while on non-Plug-n-Play systems, configuration is done manually through a setup program and/or DIP switches. Cards are available to support almost all networking standards, including the latest Fast Ethernet environment. Fast Ethernet NICs are often 10/100 capable, and will automatically set to the appropriate speed. Full duplex networking is another option, where a dedicated connection to a switch allows a NIC to operate at twice the speed. NIC cards with multiple terminations capable of supporting multiple physical layer protocols or within protocol types are to be preferred. Within the NIC cards are transceivers used to connect nodes to the various Ethernet media. Most computers and network interface cards contain a built-in 10BASE-T or 10BASE2 transceiver, allowing them to be connected directly to Ethernet without requiring an external transceiver. Many Ethernet

devices provide an AUI connector to allow the user to connect to any media type via an external transceiver. The AUI connector consists of a 15-pin D-shell type connector, female on the computer side, male on the transceiver side. Thickwire (10BASE5) cables also use transceivers to allow connections. For Fast Ethernet networks, a new interface called the MII (Media Independent Interface) was developed to offer a flexible way to support 100 Mbps connections. The MII is a popular way to connect 100BASE-FX links to copper-based Fast Ethernet devices. Wireless backbone physical layer network connections are made using RF network receivers made by companies such as Linksys, Cisco, IBM, DLINK and others, using wireless protocols such as 802.11X, UWB (ultra_wideband), Bluetooth, and more as the network interface 101.

The network speaker controller 120 is an embedded controller with flash memory programmed to function as a web server. The network speaker controller 120 and the audio format converter 121 are enable to allow their application programming to be updated over the network, the network speaker can be made to play currently unknown digital formats in the future. The audio sources received from the network most likely will be in an encoded and/or compressed format. Digital audio coding or digital audio compression is the art of minimizing storage space (or channel bandwidth) requirements for audio data. Modern perceptual audio coding protocols, synonymously called digital audio compression techniques, like MPEG Layer-III or MPEG-2 AAC,

ATRACK3, WMA, Ogg Vorbis, or "Corona", and even a packet switched Dolby Digital (AC3 over Ipv6), exploit the properties of the human ear (the perception of sound) to achieve a respectable size reduction with little or no perceptible loss of quality. This compression is usually more than just reducing the sampling rate and the resolution of your samples. Basically, this is realized by perceptual coding techniques addressing the perception of sound waves by the human ear, which remove the redundant and irrelevant parts of the sound signal. The sensitivity of the human auditory systems for audio signals varies in the frequency domain being high for frequencies between 2.5 and 5 kHz and decreasing beyond and below that frequency band. The sensitivity is represented by the Threshold In Quiet so that any tone below the threshold will not be perceived. The most important psychoacoustics fact is the masking effect of spectral sound elements in an audio signal like tones and noise. For every tone in the audio signal a masking threshold can be calculated. If another tone lies below this masking threshold, it will be masked by the louder tone and remains inaudible, too. These inaudible elements of an audio signal are irrelevant for the human perception and thus can be eliminated by the encoder. The result after encoding and decoding is different from the original, but it will sound more or less the same to the human ear. How closely it would sound to the original depends on how much compression had been performed on it.

Audio compression really consists of two parts. The first part, called encoding, transforms the digital audio data that resides, say, in a WAVE file, into a highly compressed form called bitstream (or coded audio data). To play the bitstream on your soundcard, you need the second part, called decoding. Decoding takes the bitstream and reconstructs it to a WAVE file. Highest coding efficiency is achieved with algorithms exploiting signal redundancies and irrelevancies in the frequency domain based on a model of the human auditory system. Current coders use the same basic structure. The coding scheme can be described as “perceptual noise shaping” or “perceptual sub-band/transform coding”. The encoder analyzes the spectral components of the audio signal by calculating a filterbank (transform) and applies a psychoacoustics model to estimate the just noticeable noise-level. In its quantization and coding stage, the encoder tries to allocate the available number of data bits in a way to meet both the bit rate and masking requirements. The decoder is much less complex. Its only task is to synthesize an audio signal out of the coded spectral components.

The term psychoacoustics describes the characteristics of the human auditory system on which modern audio coding technology is based providing audio quality of a coded and decoded audio signal the quality of the psychoacoustics model used by an audio encoder is of prime importance. Audio data decompression and de-coding of audio formats into the audio format acceptable the loudspeaker is performed by the audio format converter

121. This audio format conversion of different formats allows high quality low bit-rate applications, like soundtracks for CD-ROM game, solid-state sound memories, Internet audio, or digital audio broadcasting systems to all be played over the same speaker. The audio format converter 121 function in the current embodiment of the networked speaker will be performed by an audio coding and decoding chip set (CODEC). CODEC hardware and or software is currently available from such companies as Micronas, Sigmatel, TI, Cirrus, Motorola, Fraunhofer, and Microsoft. CODECs handle the many current encoding protocols such as WMA, MPEG-2 AAC, MP3(MPEG Layer III), MPSPRO, G2, ATRACK3, MP3PRO, "Corona", (WMAPro)Ogg-Vorbis and others. To best perform the audio format conversion function, the CODEC should be designed to handle all types of audio content, from speech-only audio recorded with a low sampling rate to high-quality stereo music. The CODEC should be very resistant to degradation due to packet loss, and have an efficient encoding algorithms to perform fast encodes and decodes, and to minimize the size of the compressed audio files, and still produce quality sound when they are decoded. In addition, the CODEC should be highly scalable and provide high-quality mono or stereo audio content over a wide range of bandwidths, to allow selection of the best combination of bandwidth and sampling rate for the particular content being played or recorded. Content encoded at 192 Kbps by the CODEC should be virtually indistinguishable to a human ear from content originating on a compact disc. This extremely high-

quality content is called CD transparency. Shown in Figure 6 is a circuit diagram of a CODEC circuit that could be used to implement the audio format converter 121 function of the network speaker. A preferred embodiment of this invention uses the Windows Media Audio (WMA) Audio CODEC by Microsoft. The audio format converter 121 function could also be performed by a decoder chip with no encoder functionality if no digital audio reformatting or digital encoding of analog audio is desired.

The digital to analog converter 122, converts a digital input into an analog level output. At the pre-amp 123, the analog signal is adjusted and filtered, and any desired active or electronic crossover may be performed. An electric crossover is a powered electronic circuit which limits or divides frequencies. Most electronic crossovers have output controls for each individual channel. This allows you to set the gains for all amplifiers at one convenient location, as well as the ability to level match a system. Some crossovers will allow you to set the low and high pass filters separately, which allows you to tune out acoustic peaks or valleys at or near the crossover frequencies. One of the advantages of electronic crossovers is that there is little or no insertion loss. Passive crossovers reduce the amplifier power slightly, due to their resistance. Another advantage of electronic crossovers is the ability to separate low frequencies into their own exclusive amplifier, which reduces distortion heard at high volumes in the high frequency speakers. Amplification of low frequencies requires greater power than higher

frequencies. When an amplifier is at or near peak output, clipping may occur, which is able to destroy tweeters and other speakers with small voice coils. A separate low frequency amplifier allows the total system to play louder and with lower distortion. An adjustable crossover allows the user to make crossover changes easily and to immediately hear the effect of the changes. Changing the filters, or crossover points, lets users adjust the audio to meet their preferences. The electronic crossover, by limiting the frequencies to the amplifier or amplifiers connected to it, also ensures that the speakers which are connected to these amplifier(s) would therefore receive a limited frequency range, and these speakers can be optimized for the frequencies received. It also enables personal preferences in frequency range pre-amplification adjustment. The advantages of using active filters are that they are built onto the pre-amp circuit board. Changing the filters (or crossover points) is usually accomplished through external dial turning, by changing frequency modules with a switch or by changing crossovers if fixed types are used. An adjustable crossover is preferred.

The amplifier 125 is comprised of one or more amplifier circuits that amplify the audio signal to the desired final signal strength. Using multiple amplifiers takes advantage of the crossover frequency filtering to optimize the amplifier for the frequency range received. Amplifiers using the latest in digital amplifier technology that can efficiently produce large amounts of power with a much smaller heat sink than in past designs are preferable, and

this also will eliminate the need for another DAC. The speaker driver 126 is comprised of one or more speaker drivers circuits. Using multiple drivers for multiple speakers allows the speakers to be optimized for the frequency range received. The speaker components 127 convert the signal to sound and are voiced and designed to handle a wide dynamic range of audio frequencies and are able to aid in the accurate reproduction of sound from a digital source.

Figure 3 shows another network speaker embodiment 100B. The speaker embodiment 100B includes all of the components of the speaker embodiment 100A and identical components bear the same reference numerals. In addition, speaker embodiment includes an analog to digital converter (ADC) 128 and a modified speaker/microphone driver 126b. The Speaker Driver 126b circuitry is expanded to serve as both an output driver and a microphone input for half duplex operation (one way conversations), and an internal microphone can implement a full duplex operation (simultaneous two way conversations). The microphone input is sent to the pre-amp 123 for signal adjustment and filtering. From there it is sent to the analog to digital converter 128 to convert the analog signal to a simple digital format. The audio format converter 121 then takes the digital microphone input and compresses and encodes it into a desired format for distribution. The encoded format of which may vary, depending on the application is sent to the network controller 120 where, depending on the software application and programming, its final destination and function are determined. The input

may be stored locally for future audio feedback, used locally, or it may be sent out to the network through the network interface 110. The input could be used with a voice recognition application to initiate spoken audio or home control commands. Speaker sensors 124 feedback received by the pre-amp 123 can also be sent to the ADC 128 to be converted from analog to digital format, and then passed on to the network controller 120. Depending on the network controller 120 applications, the feedback can then be sent out the network interface 110 onto the network backbone 200 as an alarm or other condition if desired. Additional features in the audio format converter 121 in conjunction with application software could enable the ability to change audio setting(s) based on the type of music that is being played, or even the user playing it, or Time of Day (TOD). The network speaker 100B may have the ability, through the audio format converter 121 or other circuitry, to support headphones.

Figure 4 depicts another network speaker embodiment 100C with wireless remote control access. All components of speaker embodiment 100B are present in speaker embodiment 100C and bear the same reference numerals. In addition, additional components provide wireless remote control from IR and RF remotes. It should be noted that the additional components could have been added to the network speaker embodiment 100A as well. An internal IR sensor 131 senses IR from one or more external IR remotes 170. The sensed IR is sent to an IR receiver 130 that processed the IR input, and the

processed IR input is sent to the network controller 120 which then performs commands as per its application software. If desired, the IR sensor 131 may be external of the speaker 100C which then can be installed behind a wall as wall speakers, and still receive IR. The network controller 120 can send the processed IR commands out the network interface 110 onto the network to be processed remotely by the Legacy Converter/Controller 600 which then translates them into commands to the legacy sources 500. Alternatively, the network controller 120 can send the processed IR commands out the network interface 110 onto the network to be processed remotely by the legacy Converter/Controller 60 which then translates them into Legacy home control network 700 commands. In the same manner, RF control access is provided by a RF Sensor/Transceiver 135 which receives input from RF remotes 175 and other network speaker transceivers, and transmits information to the network controller 120. While this embodiment 100C shows both IR and RF access through the same network speaker, it will be appreciated that IR only control access or RF only control access could be implemented.

The wireless control access allow IR or RF input to the speakers 100C to be used to remotely control the system 20 including control of the audio, (including multi destination sync), video, HVAC, security, room light level, house scenes, etc., if the system is so programmed. Where the software application includes the ability to "learn" new IR commands and associate them with audio or house control commands, existing legacy sources with IR

remotes can be integrated into the network controller through the legacy Converter/Controller 600. And because the legacy Converter/Controller 600 is upgradeable over the network, the network speaker IR input ability could be made to control currently unknown system devices in the future.

Figure 5 shows another network speaker embodiment 100D that serves as bridge between one or more wireless network devices and a wired segment of the network 200, known as a wireless access point. This wireless access point embodiment includes the components of embodiment 100B with additional components added for wireless-wired bridging, such as dual mode ad-hoc to infrastructure mode. The network 200 consists of at least one physically wired network section 240 and at least wireless network segment 250. The network interface 110 consists of two parts, a wired network interface 111 connecting the network speaker 100D to the wired network backbone 240 and an RF network interface 112 connecting the network speaker 100D to the wireless RF network backbone 250. Network communication can pass between the wired backbone 240 and the wireless RF network backbone 250 via the network speaker 100D. The RF network interface 112 consists of an RF receiver/transmitter capable of both receiving and sending RF network communication.

Figure 6 illustrates another speaker embodiment 100E that has wireless control access and that serves as a wireless access point. This wireless access

point embodiment includes all of the components of embodiments of 100B, 100C and 100D.

If a home has a network speaker type system, the application software opens all kinds of possibilities. New sources or new source content may enable these intelligent speakers 100 to have more features and playback formats that are not in existence today, and to adjust to the source content. An example of this would be the ability to change audio settings based on the type of music that is being played, or even the user playing it, or Time of Day (TOC). This will be highly customizable long past the time of installation, to keep the audio system upgradeable without structural changes to the home even if the network speakers are embedded in walls and other not easily accessed locations. In addition, a network speaker 100 with a microphone and the appropriate application software could record and route messages digitally to any house network node or internet node; locate and identify a user in a room, which in turn enables the system 20 to route voice mail and message to the room the user is presently in on demand; locate and identify a room user, which in turn enables the system to route voice mail and message to the room the user is presently in on demand; serve as a voice recognition and authorization point to enable direct voice control of any node on the network or any legacy audio source 500 or legacy control network 700 device that may be connected to the network 200 through a legacy converter/controller 600; or to automatically record and/or route voice messages from one user to the room

in which the recipient identified in the voice message is currently located.

Multiple network speakers 100 with microphones in one room could even triangulate the location of the user, which in turn enables the system to optimize the audio for the users current location.

The network speaker 100 with a sufficient memory and the appropriate application software could store voice mail to be played on demand by the room user or in a totally wireless network 200 serve as a wireless repeater within a home if the wireless communication medium signal strength was insufficient to reach all rooms or areas of the home from all locations. Also, a strategically placed network speaker 100 serving as a wireless access point allows the communication of audio, data, commands or any other communications from mobile network nodes whenever they are within communication range, such as PDAs, mobile controllers, mobile computers, wireless headphones, or network speakers 100 in mobile units such as automobiles.

A network speaker 100 with IR or RF receivers and the appropriate application software would allow wireless remote control, status and feedback from any IR or RF remote, or other network speaker transceiver, to any node on the network or any legacy audio source 500 or legacy control network 700 device that may be connected to the network 200 through a legacy converter/controller 600. A network speaker 100 with a RF receiver capable of transmitting RF could enable wireless non-networked headphones. Also, a

network speaker 100 could encode and send and transmit sound and images from a room out on the network, as well as act as the source point for room control and automation and voice recognition services for control and automation. In addition, a network speaker 100 could participate in a multi speaker session during which each network speaker 100 could perform as a master or slave mode. A network speaker 100 in the master mode would control and distribute multi session clocks and this is where they would originate and be calculated. The network speaker 100 in the slave mode would receive via TCP/IP and/or RF clocking information from the master in a multi session mode.

A network speaker 100 additionally could be an audio source locally within the room via internal solid-state memory as well as terrestrial analog reception (AM/FM/CATV) if components were added to receive and play back digital and analog terrestrial radio frequencies (AM/FM/CATV).

Figure 8 depicts a legacy Audio Converter/Controller 600 embodiment, which includes many similar components as the Network Speaker 100. The legacy Audio Converter/Controller 600 communicates with the network backbone (Ethernet) 200 through a network interface 610 which handles the physical layer hardware protocol and may connect to one or more physical layers, wired or unwired or both. Coupled to the network interface 610 is a Network Controller 620 which provides the intelligence to run various application features of the legacy Audio Converter/Controller 600, including

the higher levels of the TCP/IP protocol. The Network Controller 620 controls an audio format converter 621 which converts the legacy source audio into the desired network digital format for distribution. Digital audio from legacy sources 500 are transmitted directly to the audio format converter 621 to be re-formatted into the desired digital format. Analog audio from legacy sources 500 are fed to an analog to digital converter ("ADC") 622, and the resultant digitized signal then goes to the audio format converter 621 to be coded into the desired digital format. The Network Controller 620 takes the properly formatted digital audio and sends it to the network 200 via the network interface 610. Also, the audio format converter 621 may consist of multiple encoders to provide multiple conversions of different legacy audio inputs simultaneously. The Legacy_Converter/Controller 600 uses the analog video from the legacy source device for encoding to a packet switched digital format such as WMAPro "Corona", and also uses the analog video inputs for power status and feedback.

The network interface 610 may vary depending on the physical medium and physical layer protocol used. Network interface cards, commonly referred to as NICs, are often used to connect a PC to a wired network, and are used in the preferred embodiment when the network backbone is some form of wired cable or fiber optics. Such a NIC provides a physical connection between the networking cable and the computer's internal bus. Different computers have different bus architectures; the most common are PCI found

on 486/Pentium PCs and ISA expansion slots commonly found on 386 and older PCs. Typically NICs come in three basic varieties: 8-bit, 16-bit, and 32-bit. The larger the number of bits that can be transferred to the NIC, the faster the NIC can transfer data to the network cable. Many NIC adapters comply with Plug-n-Play specifications. On these systems, NICs are automatically configured without user intervention, while on non-Plug-n-Play systems, configuration is done manually through a setup program and/or DIP switches. Cards are available to support almost all networking standards, including the latest Fast Ethernet environment. Fast Ethernet NICs are often 10/100 capable, and will automatically set to the appropriate speed. Full duplex networking is another option, where a dedicated connection to a switch allows a NIC to operate at twice the speed. NIC cards with multiple terminations capable of supporting multiple physical layer protocols or within protocol types are preferred so that the NIC cards include transceivers used to connect nodes to the various Ethernet media. Most computers and network interface cards contain a built-in 10BASE-T or 10BASE2 transceiver, allowing them to be connected directly to Ethernet without requiring an external transceiver. Many Ethernet devices provide an AUI connector to allow the user to connect to any media type via an external transceiver. The AUI connector consists of a 15-pin D-shell type connector, female on the computer side, male on the transceiver side. Thickwire (10 BASE5) cables also use transceivers to allow connections. For Fast Ethernet networks, a new interface called the MII

(Media Independent Interface) was developed to offer a flexible way to support 100 Mbps connections. The MII is a popular way to connect 100BASE-FX links to copper-based Fast Ethernet devices. Wireless backbone physical layer network connections are made using RF network receivers made by companies such as Linksys, Cisco, IBM, DLINK, and others, using wireless protocols such as 802.11X, UWB, Bluetooth, and more as the network interface 610.

The network speaker controller 620 is an embedded controller with flash memory programmed to function as a web server and enabled with the audio format converter 621 to allow their application programming to be updated over the network, the legacy Audio Converter/Controller 600 can be made to code audio to currently unknown digital formats in the future. As in the speaker embodiments described above, the desired audio to be distributed will likely be in a coded and/or compressed format. Digital audio coding or digital audio compression is the art of minimizing storage space (or channel bandwidth) requirements for audio data. Modern perceptual audio coding protocols, synonymously called digital audio compression techniques, like MPEG Layer-III or MPEG-2 AAC, ATRACK3, G2, WMA, Ogg Vorbis, or WMAPro, "Corona", exploit the properties of the human ear (the perception of sound) to achieve a respectable size reduction with little or no perceptible loss of quality. As described above, this compression, in addition to reducing the sampling rate and the resolution of the audio samples employees

perceptual coding techniques addressing the perception of sound waves by the human ear, that remove the redundant and irrelevant parts of the sound signal. The sensitivity of the human auditory systems for audio signals varies in the frequency domain being high for frequencies between 2.5 and 5 kHz and decreasing beyond and below this frequency band. The sensitivity is represented by the Threshold In Quiet. Any tone below this threshold will not be perceived. The most important psychoacoustics fact is the masking effect of spectral sound elements in an audio signal like tones and noise. For every tone in the audio signal a masking threshold can be calculated. If another tone lies below this masking threshold, it will be masked by the louder tone and remains inaudible too. These inaudible elements of an audio signal are irrelevant for the human perception and thus can be eliminated by the coder. The sound resulting after coding and decoding is different, but will be perceived more or less the same by the human ear. How closely it would sound to the original depends on how much compression had been performed.

Audio compression actually consists of two parts. The first part, called coding or encoding, transforms the digital audio data that resides, say, in a WAVE file, into a highly compressed form called bitstream (or coded audio data). To play the bitstream on your soundcard, you need the second part, called decoding. Decoding takes the bitstream and reconstructs it to a WAVE file. Highest coding efficiency is achieved with algorithms exploiting signal redundancies and irrelevancies in the frequency domain based on a model of

the human auditory system. Current coders use the same basic structure to produce coding that can be described as “perceptual noise shaping” or “perceptual sub-band/transform coding”. The encoder analyzes the spectral components of the audio signal by calculating a filterbank (transform) and applies a psychoacoustics model to estimate the just noticeable noise-level. In its quantization and coding stage, the encoder tries to allocate the available number of data bits in a way to meet both the bit rate and masking requirements. The decoder is much less complex. Its only task is to synthesize an audio signal out of the coded spectral components. Psychoacoustics describes the characteristics of the human auditory system on which modern audio coding technology is based. For the audio quality of a coded and decoded audio signal the quality of the psychoacoustics model used by an audio encoder is of prime importance.

The audio format converter 621 performs audio data compression and encoding of audio formats into the audio format acceptable for distribution to the end receiver on the network and can consist of an audio encoder-decoder chip (CODEC). To best perform the audio format conversion function, the CODEC should be designed to handle all types of audio content, from speech-only audio recorded with a low sampling rate to high-quality stereo music. The CODEC should be very resistant to degradation due to packet loss, and have efficient encoding algorithms to perform fast encodes and decodes, and to minimize the size of the compressed audio files, and still produce quality

sound when they are decoded. Also, the CODEC should be highly scalable and provide high-quality mono or stereo audio content over a wide range of bandwidths, to allow selection of the best combination of bandwidth and sampling rate for the particular content being played or recorded. Content encoded at 192 Kbps by the CODEC should be virtually indistinguishable to a human ear from content originating on a compact disc. This extremely high-quality content is called CD transparency.

The analog to digital converter 622, commonly referred to as an ADC, converts an analog level input to a digital output. Adding a microphone speaker input to the ADC will enable voice control of the legacy Audio Converter/Controller 600. It would also enable the legacy Audio Converter/Controller 600 to record audio input for later use as system messages or audio feedback. Depending on the software application and programming in the network controller 620, the audio input may be stored locally for future audio feedback, used locally, or it may be fed out to the network through the network interface 610. The audio input could be used with a voice recognition application to initiate spoken audio or home control commands.

The Legacy Audio Converter/Controller 600 may also communicate with the legacy sources 500 using a legacy communication method, such as IR or serial commands, that are understood by the legacy device. The planned embodiment of the invention will use the fixed set of serial commands already

understood by the target legacy source. The network controller 620 controls and communicates with a legacy controller 624, which also communicates with the legacy source 500 through a legacy audio network interface 623. In a preferred embodiment of the invention, a RS-232 serial command interface will be used. The functions of the network controller 620 and the legacy controller can be combined into one embedded controller.

The Legacy Audio converter/Controller 600 may also communicate with the legacy home control network 700 using the network communication method understood and practiced by the legacy home control network 700 and such communication may vary greatly depending on the legacy home control network 700 being used. A preferred embodiment of the invention will use the CEBus powerline protocol for its communication method. The legacy controller 624 controls and communicates via a legacy home control network interface 625, with a legacy home control network 700. The functions of the legacy controller in controlling the legacy sources 500 and the legacy home control network 700 and the legacy controller could be separated out into two separate embedded controllers, or combined with the network controller 620. If no legacy source 500 is available, the legacy audio network interface 623 and the legacy source control function of the legacy controller 624 may be eliminated. Similarly, in the absence of a legacy home control network 700, the legacy home control network interface 625 and the legacy home network control function of the legacy controller 624 may be eliminated.

As illustrated in Figure 9 network speaker 100F can receive DC current from external regulated power supplies over existing 14-18 AWG speaker wire or can employ PoE (Power over Ethernet) technology to trickle charge the battery. Also, charge status can be provided for the battery 800.

Network speaker 100F has power applied as DC current from a rechargeable battery source 800 either located within the speaker or inserted into the speaker as a removable battery pack. This would also allow for line power status, which would perform a function specific to the application once this condition occurs.

Figure 10 depicts another speaker embodiment 100G which also can be battery powered. In addition, the speaker 100G includes an ESM (Energy Storage Module) which improves audio performance.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is to be understood, therefore, that the invention can be practiced otherwise than as specifically described.

1. A networked audio system comprising:
a plurality of speaker nodes;
a plurality of self-sufficient audio source node devices connected to said speaker nodes via a network;
service interface means connected to said speaker nodes via said network;
one or more legacy sources connected to said speaker nodes via said network; and
control and converter means connected between said one or more legacy sources and said speaker nodes.
2. A networked audio system according to claim 1 wherein said control and converter means comprises control and encoding nodes.
3. A networked audio system according to claim 1 wherein each said speaker node renders audio media content and distributes, controls, and serves media content connected to said speaker nodes via said network.
4. A networked audio system according to claim 1, wherein each said speaker node comprises a microphone and signal processor means.
5. A networked audio system according to claim 4 wherein said processor means comprises a digital signal processor.
6. The audio system according to claim 5 wherein said digital signal processor comprises a real time adaptive analyzer.

7. A networked audio system according to claim 4 wherein said processor means comprises a speaker controller for providing intelligence to operate application protocol.

8. A networked audio system according to claim 7 wherein said processor means further comprises a format converter for converting a digital audio format input into an analog output.

9. A networked audio system according to claim 8 wherein said processor means further includes an amplifier and a pre-amplifier with an active crossover for limiting frequency output to said amplifier.

10. A networked audio system according to claim 8 wherein said speaker controller and format converter can be updated over said network with increased processing power and/or memory to accommodate future digital formats.

11. A networked audio system according to claim 5 wherein said processor means of each speaker comprises speaker sensor means providing information feedback to other said speakers.

12. A networked audio system according to claim 8 wherein said speaker controller is an embedded controller with flash memory programmed to function as a web server and together with said format converter are enabled to allow their application programming to be updated over said network and to thereby accommodate future digital formats.

13. A networked audio system according to claim 1 wherein said network comprises a wired section and one or more wireless segments, and

one or more of said speaker nodes comprises interface means providing a communication bridge between said wire section and said one or more wireless segments.

14. A networked audio system according to claim 13 wherein said interface means comprises an RF receiver/transmitter capable of both receiving and sending RF network communication.

15. A networked audio system according to claim 1 wherein said speaker nodes are adapted to participate in multi speaker sessions to establish a master speaker node and slave speaker nodes which would receive clocking control information from said master speaker node.

16. A networked audio system according to claim 1 wherein said control and converter means is adapted to convert analog signals from said legacy sources into a desired digital format for distribution to all of said speaker nodes.

17. A networked audio system according to claim 1 wherein said control and converter means is adapted to convert digital signals from said legacy sources into a desired re-formatted digital format for distribution to all of said speaker nodes.

18. A networked audio system according to claim 17 wherein said control and converter means is further adapted to convert analog signals from said legacy source into said desired digital format for distribution to all of said speaker nodes.

19. A networked audio system according to claim 18 wherein control and converter means comprises multiple encoders to provide simultaneous conversion of signals from said legacy sources into said desired digital format.

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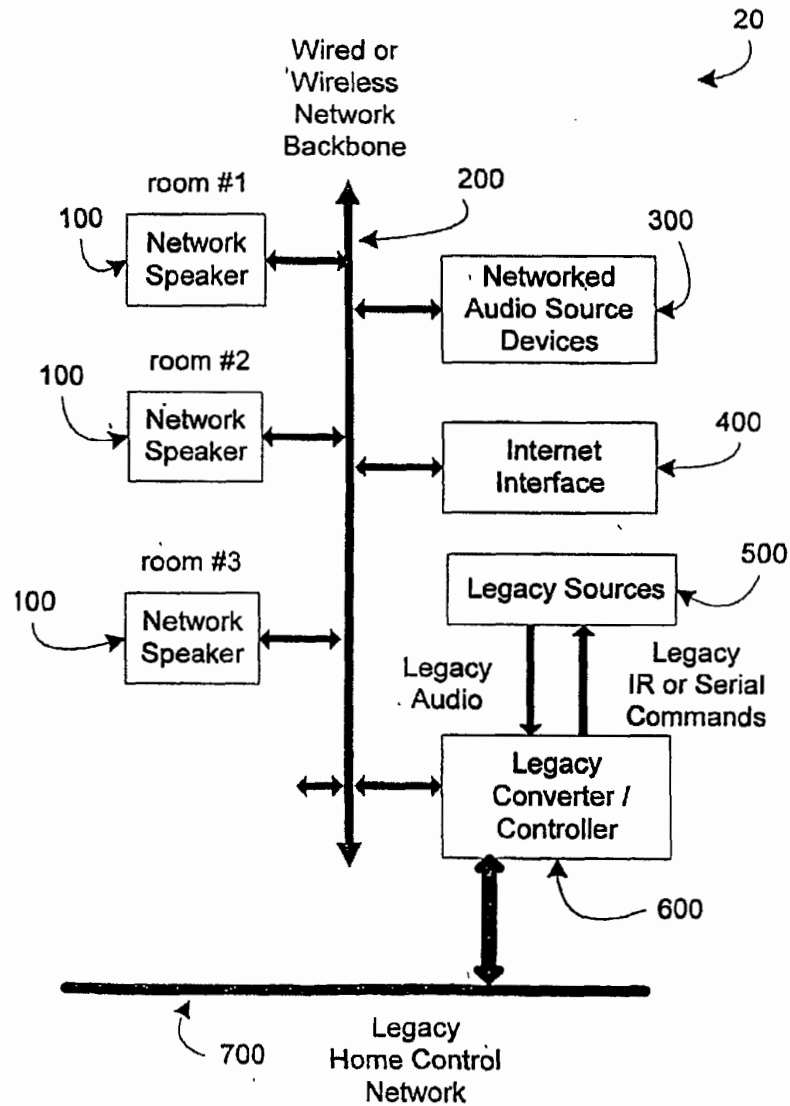


Figure 1.

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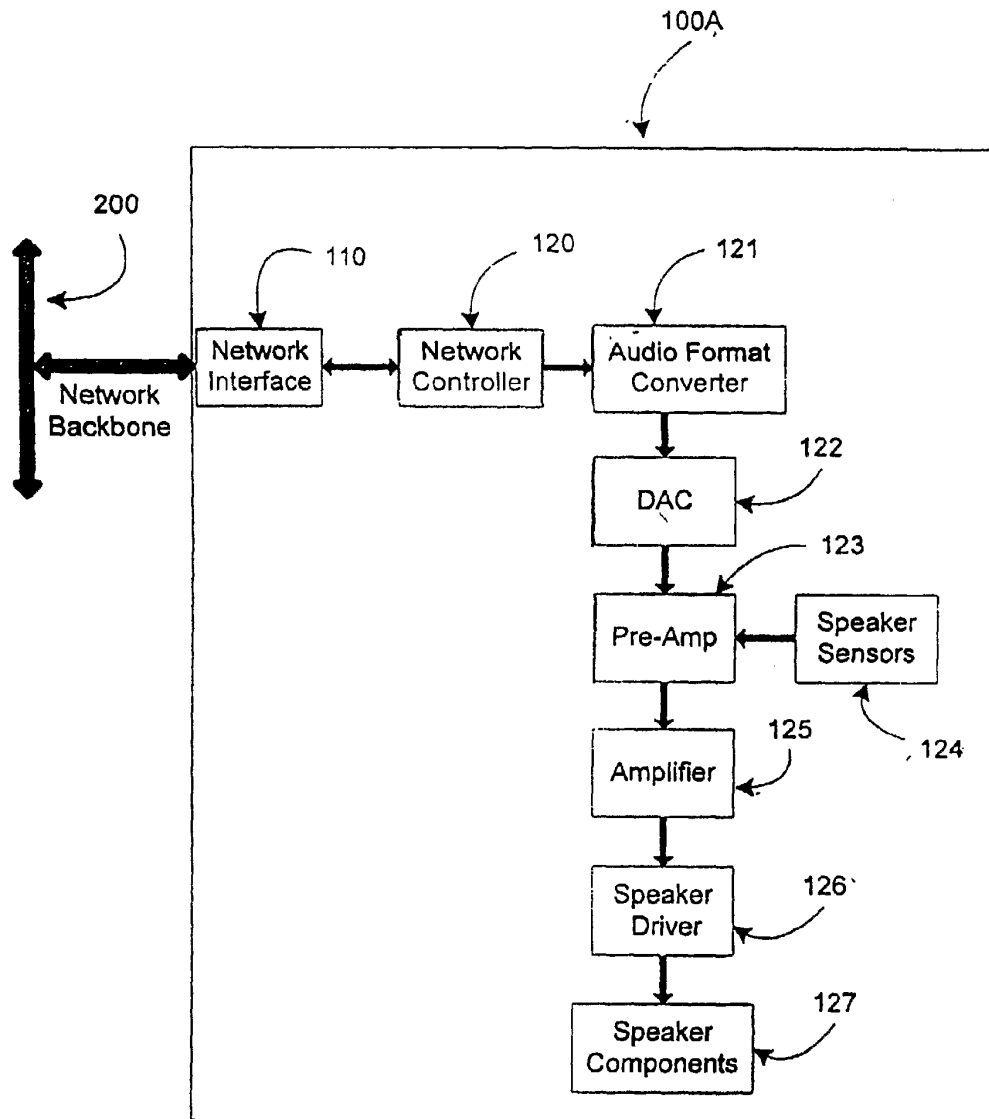


Figure 2.

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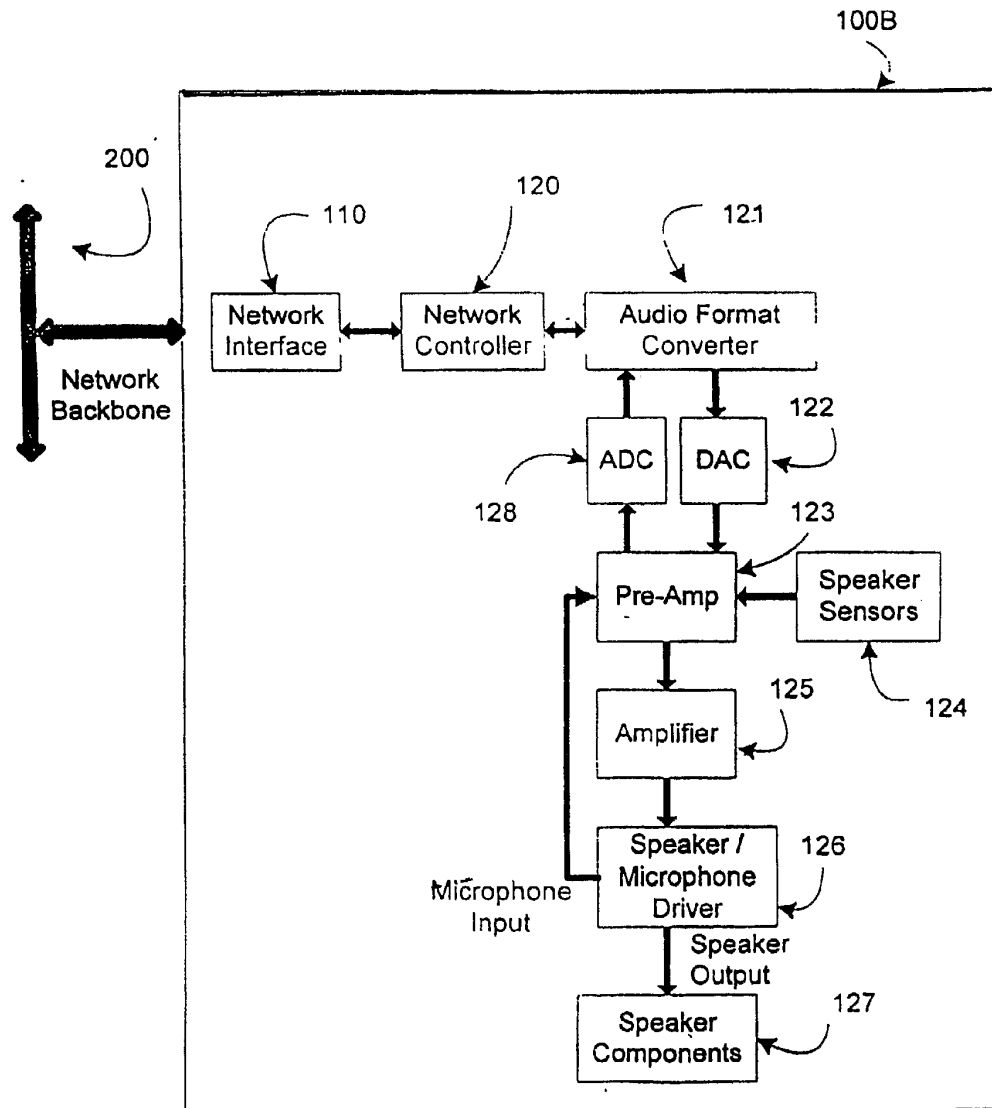


Figure 3.

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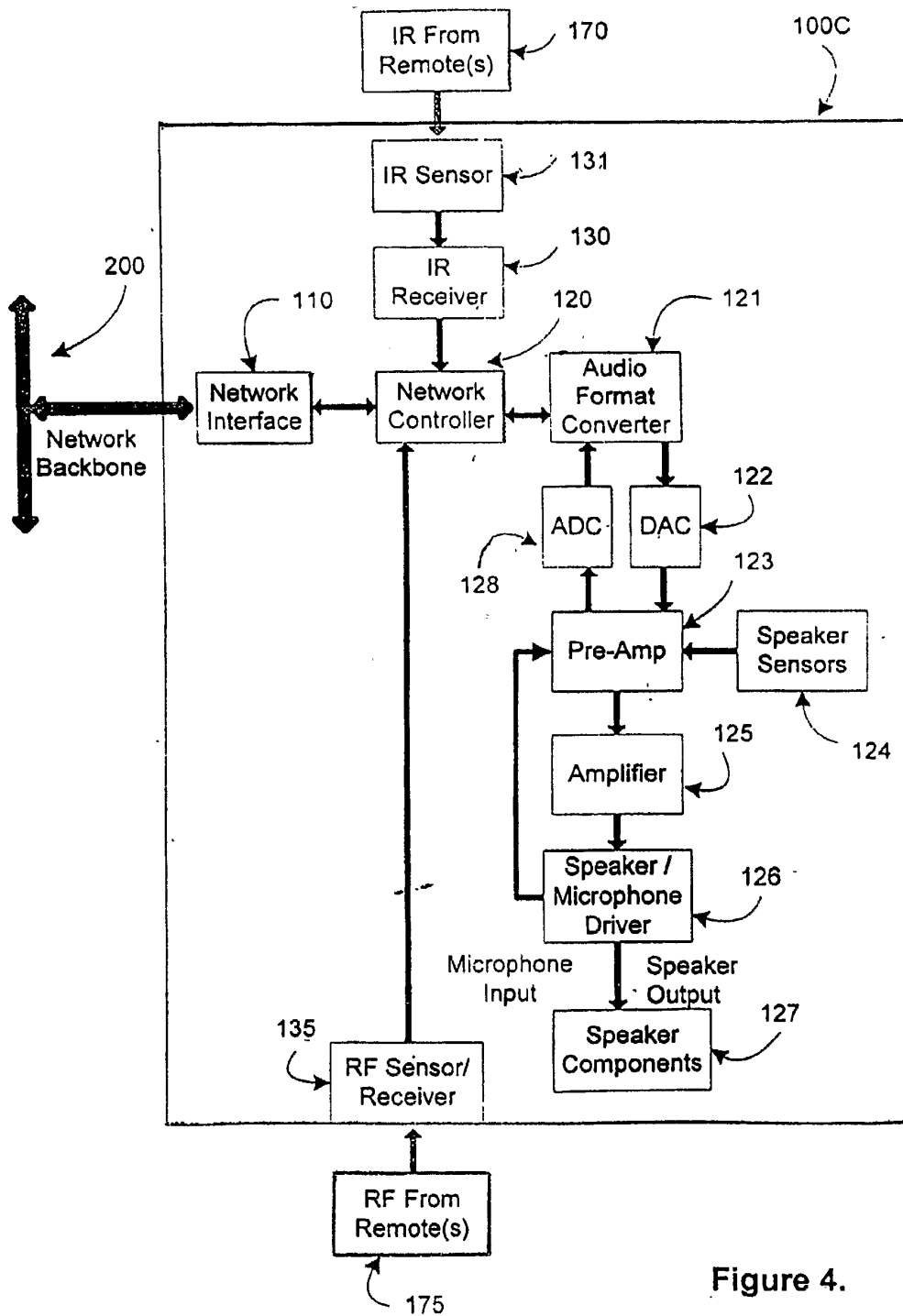


Figure 4.

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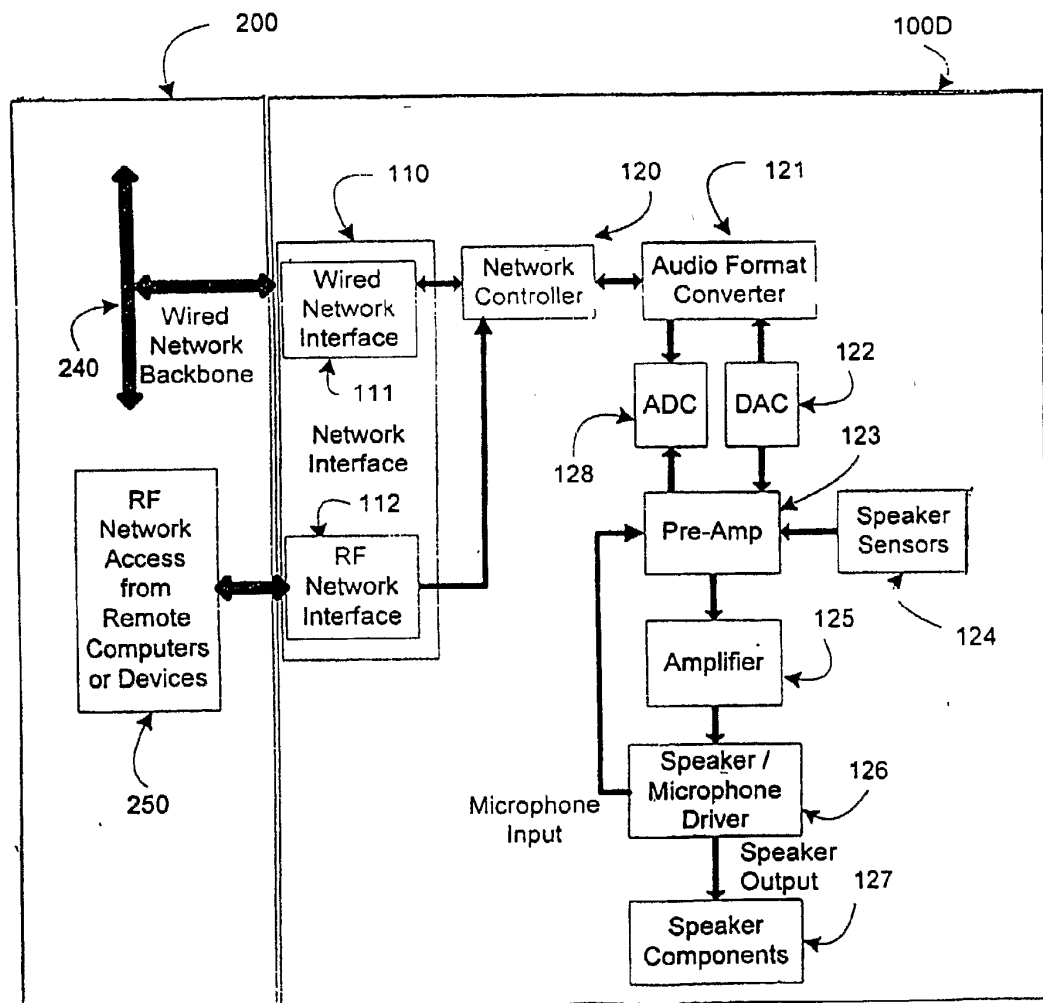


Figure 5.

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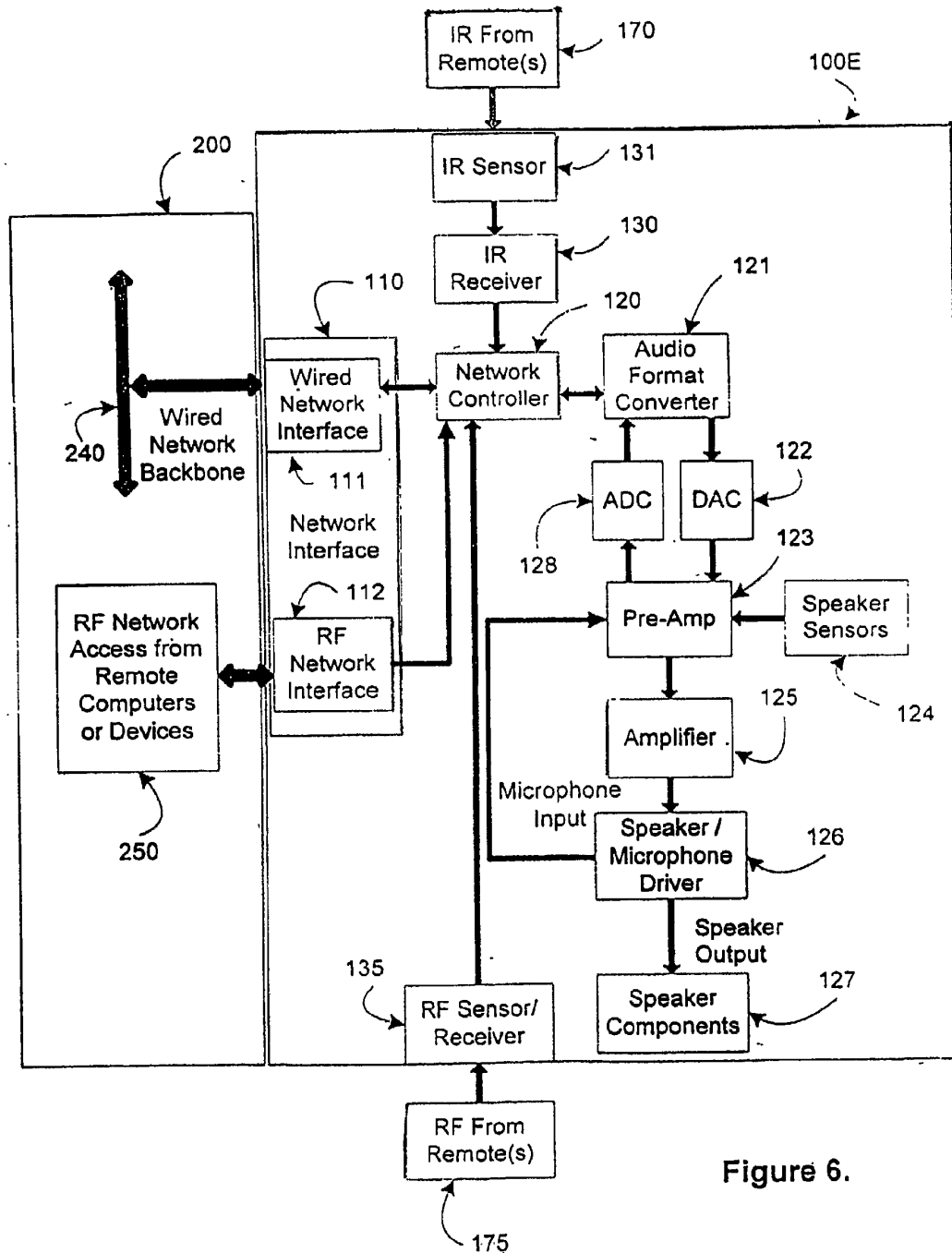


Figure 6.

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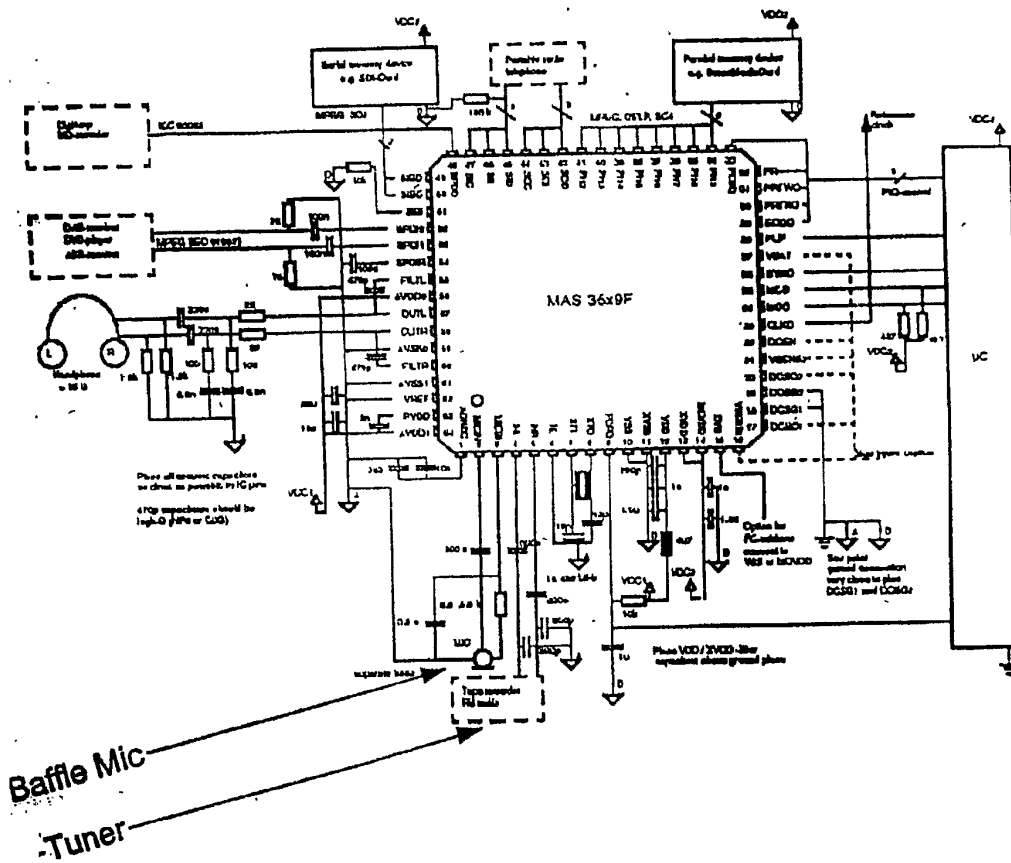


Figure 7.

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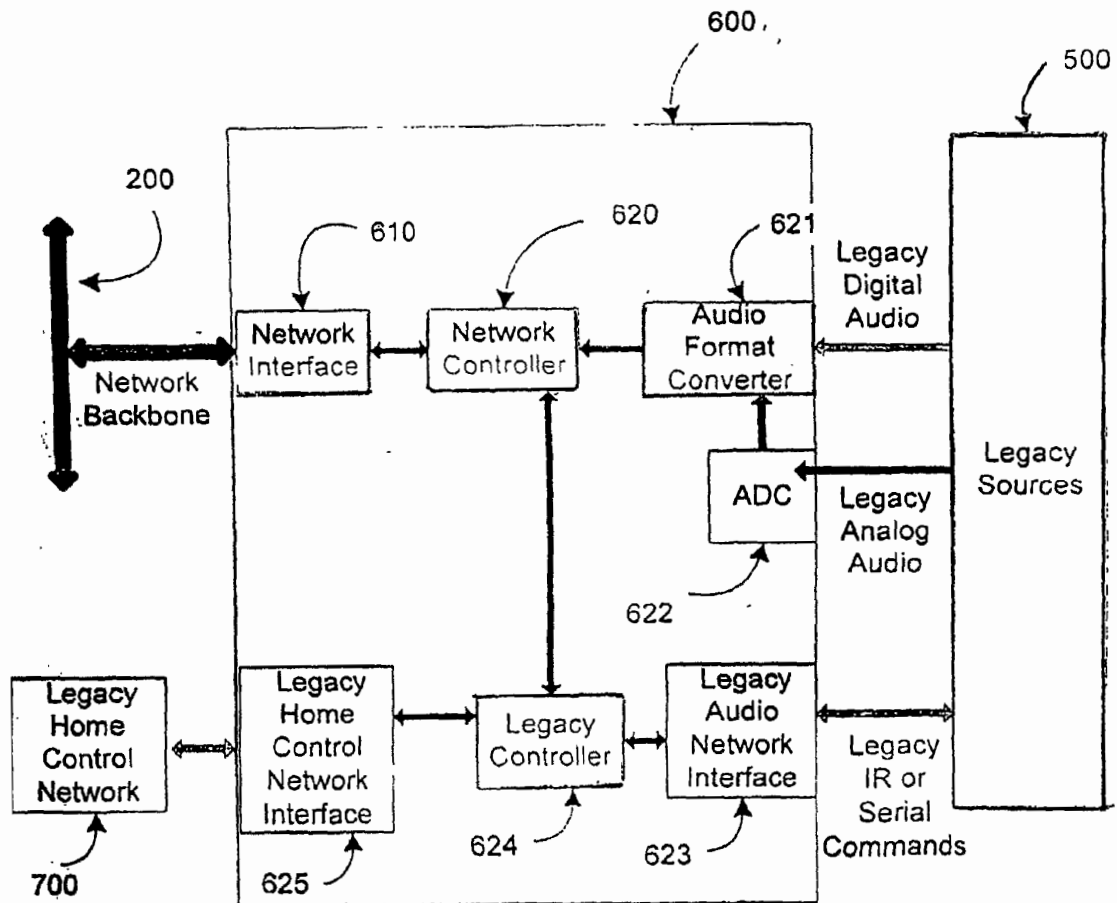
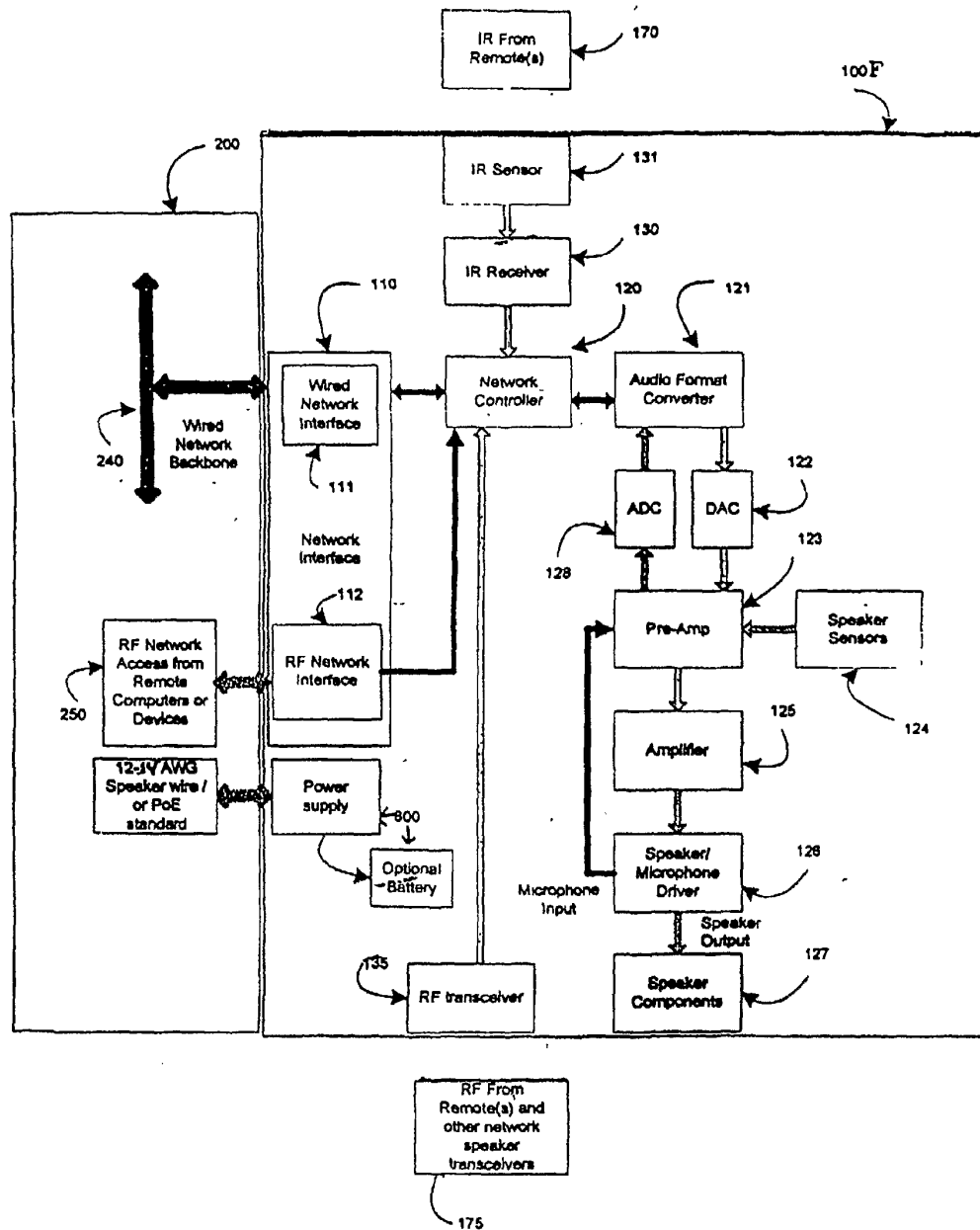


Figure 8.

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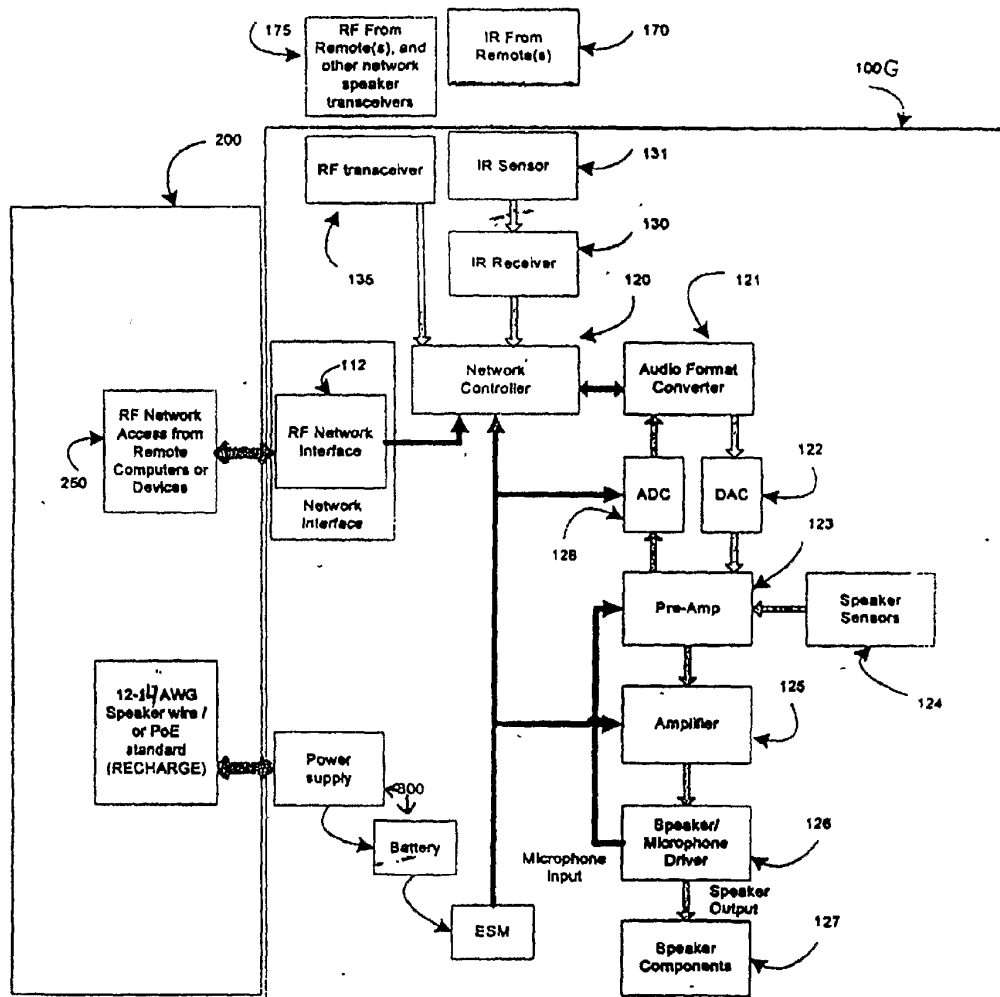


Figure 10

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(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
24 April 2008 (24.04.2008)

PCT

(10) International Publication Number
WO 2008/046530 A2(51) International Patent Classification: **Not classified**(21) International Application Number:
PCT/EP2007/008682

(22) International Filing Date: 5 October 2007 (05.10.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/829,653 16 October 2006 (16.10.2006) US(71) Applicants (for all designated States except US): **FRAUNHOFER-GESELLSCHAFT ZUR FÖRDERUNG DER ANGEWANDTEN FORSCHUNG E.V.** [DE/DE]; Hansastrasse 27 c, 80686 München (DE). **CODING TECHNOLOGIES AB** [SE/SE]; Gävlegatan 12 A, S-113 30 Stockholm (SE). **KONINKLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

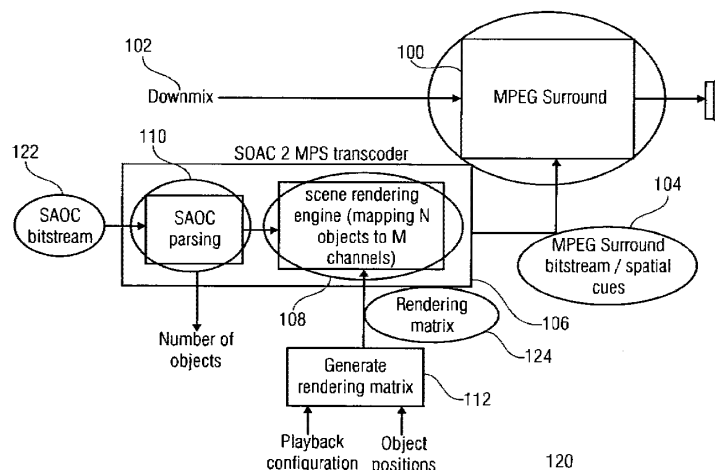
(72) Inventors; and

(75) Inventors/Applicants (for US only): **HILPERT, Johannes** [DE/DE]; Herrnhüttestrasse 46, 90411 Nürnberg (DE). **LINZMEIER, Karsten** [DE/DE]; Elise-Spaeth-Str. 4, 91058 Erlangen (DE). **HERRE, Jürgen** [DE/DE]; Hallerstr. 24, 91054 Buckenhof (DE). **SPERSCHNEIDER, Ralph** [DE/DE]; Debert 75, 91320 Ebermannstadt (DE). **HÖLZER, Andreas** [DE/DE]; Obere Karlstrasse23, 91054 Erlangen (DE). **VILLEMOES, Lars** [DK/SE]; Mandolinvägen 22, S-17556 Järfälla (SE). **ENGDEGARD, Jonas** [SE/SE]; Wenströmsvägen 6, S-11543 Stockholm (SE). **PURNHAGEN, Heiko** [SE/SE]; Gjusteribacken 17, S-172 65 Sundbyberg (SE). **KJÖRLING, Kristofer** [SE/SE]; Lostigen 10, S-170 75 Solna (SE). **BREEBAART, Jeroen** [NL/NL]; c/o Koninklijke Philips Electronic N.V., Groenewoudseweg 1, NL-5621 BA Eindhoven (NL). **OOMEN, Werner** [NL/NL]; c/o Koninklijke Philips Electronic N.V., Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).(74) Agents: **ZINKLER, Franz** et al.; SCHOPPE, ZIMMERMANN, STÖCKELER & ZINKLER, Postfach 246, 82043 Pullach bei München (DE).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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(54) Title: APPARATUS AND METHOD FOR MULTI-CHANNEL PARAMETER TRANSFORMATION



(57) Abstract: A parameter transformer generates level parameters, indicating an energy relation between a first and a second audio channel of a multi-channel audio signal associated to a multi-channel loudspeake configuration. The level parameter are generated based on object parameters for a plurality of audio objects associated to a down-mix channel, which is generated using object audio signals associated to the audio objects. The object parameters comprise an energy parameter indicating an energy of the object audio signal. To derive the coherence and the level parameters, a parameter generator is used, which combines the energy parameter and object rendering parameters, which depend on a desired rendering configuration.



(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL,

PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report*

**Apparatus and Method for Multi-Channel Parameter
Transformation**

5 Field of the Invention

The present invention relates to a transformation of multi-channel parameters, and in particular to the generation of coherence parameters and level parameters, which indicate
10 spatial properties between two audio signals, based on an object-parameter based representation of a spatial audio scene.

15 Background of the Invention and Prior Art

There are several approaches for parametric coding of multi-channel audio signals, such as 'Parametric Stereo (PS)', 'Binaural Cue Coding (BCC) for Natural Rendering'
20 and 'MPEG Surround', which aim at representing a multi-channel audio signal by means of a down-mix signal (which could be either monophonic or comprise several channels) and parametric side information ('spatial cues') characterizing its perceived spatial sound stage.

25 Those techniques could be called channel-based, i.e. the techniques try to transmit a multi-channel signal already present or generated in a bitrate-efficient manner. That is, a spatial audio scene is mixed to a predetermined
30 number of channels before transmission of the signal to match a predetermined loudspeaker set-up and those techniques aim at the compression of the audio channels associated to the individual loudspeakers.

35 The parametric coding techniques rely on a down-mix channel carrying audio content together with parameters, which describe the spatial properties of the original spatial audio scene and which are used on the receiving side to

reconstruct the multi-channel signal or the spatial audio scene.

5 A closely related group of techniques, e.g. 'BCC for Flexible Rendering', are designed for efficient coding of individual audio objects rather than channels of the same multi-channel signal for the sake of interactively rendering them to arbitrary spatial positions and independently amplifying or suppressing single objects
10 without any a priori encoder knowledge thereof. In contrast to common parametric multi-channel audio coding techniques (which convey a given set of audio channel signals from an encoder to a decoder), such object coding techniques allow rendering of the decoded objects to any reproduction setup,
15 i.e. the user on the decoding side is free to choose a reproduction setup (e.g. stereo, 5.1 surround) according to his preference.

Following the object coding concept, parameters can be
20 defined, which identify the position of an audio object in space, to allow for flexible rendering on the receiving side. Rendering at the receiving side has the advantage, that even non-ideal loudspeaker set-ups or arbitrary loudspeaker set-ups can be used to reproduce the spatial
25 audio scene with high quality. In addition, an audio signal, such as, for example, a down-mix of the audio channels associated with the individual objects, has to be transmitted, which is the basis for the reproduction on the receiving side.

30 Both discussed approaches rely on a multi-channel speaker set-up at the receiving side, to allow for a high-quality reproduction of the spatial impression of the original spatial audio scene.

35 As previously outlined, there are several state-of-the-art techniques for parametric coding of multi-channel audio signals which are capable of reproducing a spatial sound

image, which is - dependent on the available data rate - more or less similar to that of the original multi-channel audio content.

5 However, given some pre-coded audio material (i.e. spatial sound described by a given number of reproduction channel signals), such a codec does not offer any means for a-posteriori and interactive rendering of single audio objects according to the liking of the listener. On the
10 other hand, there are spatial audio object coding techniques which are specially designed for the latter purpose, but since the parametric representations used in such systems are different from those for multi-channel audio signals, separate decoders are needed in case one
15 wants to benefit from both techniques in parallel. The drawback that results from this situation is that, although the back-ends of both systems fulfill the same task, which is rendering of spatial audio scenes on a given loudspeaker setup, they have to be implemented redundantly, i.e. two
20 separate decoders are necessary to provide both functionalities.

Another limitation of the prior-art object coding technology is the lack of a means for storing and / or
25 transmitting pre-rendered spatial audio object scenes in a backwards compatible way. The feature of enabling interactive positioning of single audio objects provided by the spatial audio object coding paradigm turns out to be a drawback when it comes to identical reproduction of a
30 readily rendered audio scene.

Summarizing, one is confronted with the unfortunate situation that, although a multi-channel playback environment may be present which implements one of the
35 above approaches, a further playback environment may be required to also implement the second approach. It may be noted, that according to the longer history, channel-based coding schemes are much more common, such as, for example,

the famous 5.1 or 7.1/7.2 multi-channel signals stored on DVD or the like.

That is, even if a multi-channel audio decoder and associated playback equipment (amplifier stages and loudspeakers) are present, a user needs an additional complete set-up, i.e. at least an audio decoder, when he wants to play back object-based coded audio data. Normally, the multi-channel audio decoders are directly associated to the amplifier stages and a user does not have direct access to the amplifier stages used for driving the loudspeakers. This is, for example, the case in most of the commonly available multi-channel audio or multimedia receivers. Based on existing consumer electronics, a user desiring to be able to listen to audio content encoded with both approaches would even need a complete second set of amplifiers, which is, of course, an unsatisfying situation.

20 Summary of the Invention

It is therefore desirable to be able to provide a method to reduce the complexity of systems, which are capable of both decoding of parametric multi-channel audio streams as well as parametrically coded spatial audio object streams.

An embodiment of the invention is a multi-channel parameter transformer for generating a level parameter indicating an energy relation between a first audio signal and a second audio signal of a representation of a multi-channel spatial audio signal, comprising: an object parameter provider for providing object parameters for a plurality of audio objects associated to a down-mix channel depending on the object audio signals associated to the audio objects, the object parameters comprising an energy parameter for each audio object indicating an energy information of the object audio signal; and a parameter generator for deriving the level parameter by combining the energy parameters and

object rendering parameters related to a rendering configuration.

- According to a further embodiment of the present invention,
5 the parameter transformer generates a coherence parameter and a level parameter, indicating a correlation or coherence and an energy relation between a first and a second audio signal of a multi-channel audio signal associated to a multi-channel loudspeaker configuration.
- 10 The correlation- and level parameters are generated based on provided object parameters for at least one audio object associated to a down-mix channel, which is itself generated using an object audio signal associated to the audio object, wherein the object parameters comprise an energy
15 parameter indicating an energy of the object audio signal. To derive the coherence and the level parameter, a parameter generator is used, which combines the energy parameter and additional object rendering parameters, which are influenced by a playback configuration. According to
20 some embodiments, the object rendering parameters comprise loudspeaker parameters indicating the location of the playback loudspeakers with respect to a listening position. According to some embodiments, the object rendering parameters comprise object location parameters indicating
25 the location of the objects with respect to a listening position. To this end, the parameter generator takes advantage of synergy effects resulting from both spatial audio coding paradigms.
- 30 According to a further embodiment of the present invention, the multi-channel parameter transformer is operative to derive MPEG Surround compliant coherence and level parameters (ICC and CLD), which can furthermore be used to steer an MPEG Surround decoder. It is noted that Inter-
35 channel coherence/cross-correlation (ICC) -represents the coherence or cross-correlation between the two input channels. When time differences are not included, coherence and correlation are the same. Stated differently, both

terms point to the same characteristic, when inter channel time differences or inter channel phase differences are not used.

5 In this way, a multi-channel parameter transformer together with a standard MPEG Surround-transformer can be used to reproduce an object-based encoded audio signal. This has the advantage, that only an additional parameter transformer is required, which receives a spatial audio
10 object coded (SAOC) audio signal and which transforms the object parameters such, that they can be used by a standard MPEG SURROUND-decoder to reproduce the multi-channel audio signal via the existing playback equipment. Therefore, common playback equipment can be used without major
15 modifications to also reproduce spatial audio object coded content.

According to a further embodiment of the present invention, the generated coherence and level parameters are
20 multiplexed with the associated down-mix channel into a MPEG SURROUND compliant bitstream. Such a bitstream can then be fed to a standard MPEG SURROUND-decoder without requiring any further modifications to the existing playback environment.

25 According to a further embodiment of the present invention, the generated coherence and level parameters are directly transmitted to a slightly modified MPEG Surround-decoder, such that the computational complexity of a multi-channel
30 parameter transformer can be kept low.

According to a further embodiment of the present invention, the generated multi-channel parameters (coherence parameter and level parameter) are stored after the generation, such
35 that a multi-channel parameter transformer can also be used as a means for preserving the spatial information gained during scene rendering. Such scene rendering can, for example, also be performed at the music-studio while

generating the signals, such that a multi-channel compatible signal can be generated without any additional effort, using a multi-channel parameter transformer as described in more detail in the following paragraphs. Thus,
5 pre-rendered scenes could be reproduced using legacy equipment.

Brief Description of the Drawings

10

Prior to a more detailed description of several embodiments of the present invention, a short review of the multi-channel audio coding and object audio coding techniques and spatial audio object coding techniques will be given. To
15 this end, reference will also be made to the enclosed Figures.

Fig. 1a shows a prior art multi-channel audio coding scheme;

20

Fig. 1b shows a prior art object coding scheme;

Fig. 2 shows a spatial audio object coding scheme;

25 Fig. 3 shows an embodiment of a multi-channel parameter transformer;

Fig. 4 shows an example for a multi-channel loudspeaker configuration for playback of spatial audio
30 content; and

Fig. 5 shows an example for a possible multi-channel parameter representation of spatial audio content;

35

Figs. 6a and 6b show application scenarios for spatial audio object coded content;

Fig. 7 shows an embodiment of a multi-channel parameter transformer; and

Fig. 8 shows an example of a method for generating a coherence parameter and a correlation parameter.

Detailed Description of Preferred Embodiments

Fig. 1a shows a schematic view of a multi-channel audio encoding and decoding scheme, whereas Fig. 1b shows a schematic view of a conventional audio object coding scheme. The multi-channel coding scheme uses a number of provided audio channels, i.e. audio channels already mixed to fit a predetermined number of loudspeakers. A multi-channel encoder 4 (SAC) generates a down-mix signal 6, being an audio signal generated using audio channels 2a to 2d. This down-mix signal 6 can, for example, be a monophonic audio channel or two audio channels, i.e. a stereo signal. To partly compensate for the loss of information during the down-mix, the multi-channel encoder 4 extracts multi-channel parameters, which describe the spatial interrelation of the signals of the audio channels 2a to 2d. This information is transmitted, together with the down-mix signal 6, as so-called side information 8 to a multi-channel decoder 10. The multi-channel decoder 10 utilizes the multi-channel parameters of the side information 8 to create channels 12a to 12d with the aim of reconstructing channels 2a to 2d as precisely as possible. This can, for example, be achieved by transmitting level parameters and correlation parameters, which describe an energy relation between individual channel pairs of the original audio channels 2a and 2d and which provide a correlation measure between pairs of channels of the audio channels 2a to 2d.

When decoding, this information can be used to redistribute the audio channels comprised in the down-mix signal to the

reconstructed audio channels 12a to 12d. It may be noted, that the generic multi-channel audio scheme is implemented to reproduce the same number of reconstructed channels 12a to 12d as the number of original audio channels 2a to 2d input into the multi-channel audio encoder 4. However, other decoding schemes can also be implemented, reproducing more or less channels than the number of the original audio channels 2a to 2d.

10 In a way, the multi-channel audio techniques schematically sketched in Fig. 1a (for example the recently standardized MPEG spatial audio coding scheme, i.e. MPEG Surround) can be understood as bitrate-efficient and compatible extension of existing audio distribution infrastructure towards
15 multi-channel audio/surround sound.

Fig. 1b details the prior art approach to object-based audio coding. As an example, coding of sound objects and the ability of "content-based interactivity" is part of the
20 MPEG-4 concept. The conventional audio object coding technique schematically sketched in Fig. 1b follows a different approach, as it does not try to transmit a number of already existing audio channels but to rather transmit a complete audio scene having multiple audio objects 22a to
25 22d distributed in space. To this end, a conventional audio object coder 20 is used to code multiple audio objects 22a to 22d into elementary streams 24a to 24d, each audio object having an associated elementary stream. The audio objects 22a to 22d (sound sources) can, for example, be
30 represented by a monophonic audio channel and associated energy parameters, indicating the relative level of the audio object with respect to the remaining audio objects in the scene. Of course, in a more sophisticated implementation, the audio objects are not limited to be
35 represented by monophonic audio channels. Instead, for example, stereo audio objects or multi-channel audio objects may be encoded.

A conventional audio object decoder 28 aims at reproducing the audio objects 22a to 22d, to derive reconstructed audio objects 28a to 28d. A scene composer 30 within a conventional audio object decoder allows for a discrete
5 positioning of the reconstructed audio objects 28a to 28d (sources) and the adaptation to various loudspeakers set-ups. A scene is fully defined by a scene description 34 and associated audio objects. Some conventional scene composers 30 expect a scene description in a standardized language,
10 e.g. BIFS (binary format for scene description). On the decoder side, arbitrary loudspeaker set-ups may be present and the decoder provides audio channels 32a to 32e to individual loudspeakers, which are optimally tailored to the reconstruction of the audio scene, as the full
15 information on the audio scene is available on the decoder side. For example, binaural rendering is feasible, which results in two audio channels generated to provide a spatial impression when listened to via headphones.

20 An optional user interaction to the scene composer 30 enables a repositioning/repanning of the individual audio objects on the reproduction side. Additionally, positions or levels of specifically selected audio objects can be modified, to, for example, increase the intelligibility of
25 a talker, when ambient noise objects or other audio objects related to different talkers in a conference are suppressed, i.e. decreased in level.

In other words, conventional audio object coders encode a
30 number of audio objects into elementary streams, each stream associated to one single audio object. The conventional decoder decodes these streams and composes an audio scene under the control of a scene description (BIFS) and optionally based on user interaction. In terms of
35 practical application, this approach suffers from several disadvantages:

Due to the separate encoding of each individual audio (sound) object, the required bitrate for transmission of the whole scene is significantly higher than rates used for a monophonic/stereophonic transmission of compressed audio.

5 Obviously, the required bitrate grows approximately proportionally with the number of transmitted audio objects, i.e. with the complexity of the audio scene.

Consequently, due to the separate decoding of each sound object, the computational complexity for the decoding process significantly exceeds that of a regular mono/stereo audio decoder. The required computational complexity for decoding grows approximately proportionally with the number of transmitted objects as well (assuming a

10 low complexity composition procedure). When using advanced composition capabilities, i.e. using different computational nodes, these disadvantages are further increased by the complexity associated with the synchronization of corresponding audio nodes and with the

15 overall complexity in running a structured audio engine.

Furthermore, since the total system involves several audio decoder components and a BIFS-based composition unit, the complexity of the required structure is an obstacle to the

20 implementation in real-world applications. Advanced composition capabilities furthermore require the implementation of a structured audio engine with the above-mentioned complications.

30 Fig. 2 shows an embodiment of the inventive spatial audio object coding concept, allowing for a highly efficient audio object coding, circumventing the previously mentioned disadvantages of common implementations.

35 As it will become apparent from the discussion of Fig. 3 below, the concept may be implemented by modifying an existing MPEG Surround structure. However, the use of the MPEG Surround-framework is not mandatory, since other

common multi-channel encoding/decoding frameworks can also be used to implement the inventive concept.

Utilizing existing multi-channel audio coding structures,
5 such as MPEG Surround, the inventive concept evolves into a
bitrate-efficient and compatible extension of existing
audio distribution infrastructure towards the capability of
using an object-based representation. To distinguish from
10 the prior approaches of audio object coding (AOC) and
spatial audio coding (multi-channel audio coding),
embodiments of the present invention will in the following
be referred to using the term spatial audio object coding
or its abbreviation SAOC.

15 The spatial audio object coding scheme shown in Fig. 2 uses
individual input audio objects 50a to 50d. Spatial audio
object encoder 52 derives one or more down-mix signals 54
(e.g. mono or stereo signals) together with side
information 55 having information of the properties of the
20 original audio scene.

The SAOC-decoder 56 receives the down-mix signal 54
together with the side information 55. Based on the down-
mix signal 54 and the side information 55, the spatial
25 audio object decoder 56 reconstructs a set of audio objects
58a to 58d. Reconstructed audio objects 58a to 58d are
input into a mixer/rendering stage 60, which mixes the
audio content of the individual audio objects 58a to 58d to
generate a desired number of output channels 62a and 62b,
30 which normally correspond to a multi-channel loudspeaker
set-up intended to be used for playback.

Optionally, the parameters of the mixer/renderer 60 can be
influenced according to a user interaction or control 64,
35 to allow interactive audio composition and thus maintain
the high flexibility of audio object coding.

The concept of spatial audio object coding shown in Fig. 2 has several great advantages as compared to other multi-channel reconstruction scenarios.

5 The transmission is extremely bitrate-efficient due to the use of down-mix signals and accompanying object parameters. That is, object based side information is transmitted together with a down-mix signal, which is composed of audio signals associated to individual audio objects. Therefore,
10 the bit rate demand is significantly decreased as compared to approaches, where the signal of each individual audio object is separately encoded and transmitted. Furthermore, the concept is backwards compatible to already existing transmission structures. Legacy devices would simply render
15 (compose) the downmix signal.

The reconstructed audio objects 58a to 58d can be directly transferred to a mixer/renderer 60 (scene composer). In general, the reconstructed audio objects 58a to 58d could
20 be connected to any external mixing device (mixer/renderer 60), such that the inventive concept can be easily implemented into already existing playback environments. The individual audio objects 58a ... d could principally be used as a solo presentation, i.e. be reproduced as a single
25 audio stream, although they are usually not intended to serve as a high quality solo reproduction.

In contrast to separate SAOC decoding and subsequent mixing, a combined SAOC-decoder and mixer/renderer is
30 extremely attractive because it leads to very low implementation complexity. As compared to the straight forward approach, a full decoding/reconstruction of the objects 58a to 58d as an intermediate representation can be avoided. The necessary computation is mainly related to the
35 number of intended output rendering channels 62a and 62b. As it becomes apparent from Fig. 2, mixer/renderer 60 associated to the SAOC-decoder can in principle be any algorithm suitable of combining single audio objects into a

scene, i.e. suitable of generating output audio channels 62a and 6b associated to individual loudspeakers of a multi-channel loudspeaker set-up. This could, for example, include mixers performing amplitude panning (or amplitude and delay panning), vector based amplitude panning (VBAP schemes) and binaural rendering, i.e. rendering intended to provide a spatial listening experience utilizing only two loudspeakers or headphones. For example, MPEG Surround employs such binaural rendering approaches.

10 Generally, transmitting down-mix signals 54 associated with corresponding audio object information 55 can be combined with arbitrary multi-channel audio coding techniques, such as, for example, parametric stereo, binaural cue coding or 15 MPEG Surround.

Fig. 3 shows an embodiment of the present invention, in which object parameters are transmitted together with a down-mix signal. In the SAOC decoder structure 120, a MPEG Surround decoder can be used together with a multi-channel parameter transformer, which generates MPEG parameters using the received object parameters. This combination results in an spatial audio object decoder 120 with extremely low complexity. In other words, this particular 20 example offers a method for transforming (spatial audio) object parameters and panning information associated with each audio object into a standards compliant MPEG Surround bitstream, thus extending the application of conventional MPEG Surround decoders from reproducing multi-channel audio 25 content towards the interactive rendering of spatial audio object coding scenes. This is achieved without having to apply modifications to the MPEG Surround decoder itself.

The embodiment shown in Fig. 3 circumvents the drawbacks of 35 conventional technology by using a multi-channel parameter transformer together with an MPEG Surround decoder. While the MPEG Surround decoder is commonly available technology, a multi-channel parameter transformer provides a

transcoding capability from SAOC to MPEG Surround. These will be detailed in the following paragraphs, which will additionally make reference to Figs. 4 and 5, illustrating certain aspects of the combined technologies.

5

In Fig. 3, an SAOC decoder 120 has an MPEG Surround decoder 100 which receives a down-mix signal 102 having the audio content. The downmix signal can be generated by an encoder-side downmixer by combining (e.g. adding) the audio object signals of each audio object in a sample by sample manner. Alternatively, the combining operation can also take place in a spectral domain or filterbank domain. The downmix channel can be separate from the parameter bitstream 122 or can be in the same bitstream as the parameter bitstream.

15

The MPEG Surround decoder 100 additionally receives spatial cues 104 of an MPEG Surround bitstream, such as coherence parameters ICC and level parameters CLD, both representing the signal characteristics between two audio signals within the MPEG Surround encoding/decoding scheme, which is shown in Fig. 5 and which will be explained in more detail below.

A multi-channel parameter transformer 106 receives SAOC parameters (object parameters) 122 related to audio objects, which indicate properties of associated audio objects contained within Downmix Signal 102. Furthermore, the transformer 106 receives object rendering parameters via an object rendering parameters input. These parameters can be the parameters of a rendering matrix or can be parameters useful for mapping audio objects into a rendering scenario. Depending on the object positions exemplarily adjusted by the user and input into block 12, the rendering matrix will be calculated by block 112. The output of block 112 is then input into block 106 and particularly into the parameter generator 108 for calculating the spatial audio parameters. When the loudspeaker configuration changes, the rendering matrix or generally at least some of the object rendering parameters

change as well. Thus, the rendering parameters depend on the rendering configuration, which comprises the loudspeaker configuration/playback configuration or the transmitted or user-selected object positions, both of which can be input into block 112.

A parameter generator 108 derives the MPEG Surround spatial cues 104 based on the object parameters, which are provided by object parameter provider (SAOC parser) 110. The parameter generator 108 additionally makes use of rendering parameters provided by a weighting factor generator 112. Some or all of the rendering parameters are weighting parameters describing the contribution of the audio objects contained in the down-mix signal 102 to the channels created by the spatial audio object decoder 120. The weighting parameters could, for example, be organized in a matrix, since these serve to map a number of N audio objects to a number M of audio channels, which are associated to individual loudspeakers of a multi-channel loudspeaker set-up used for playback. There are two types of input data to the multi-channel parameter transformer (SAOC 2 MPS transcoder). The first input is an SAOC bitstream 122 having object parameters associated to individual audio objects, which indicate spatial properties (e.g. energy information) of the audio objects associated to the transmitted multi-object audio scene. The second input is the rendering parameters (weighting parameters) 124 used for mapping the N objects to the M audio-channels.

As previously discussed, the SAOC bitstream 122 contains parametric information about the audio objects that have been mixed together to create the down-mix signal 102 input into the MPEG Surround decoder 100. The object parameters of the SAOC bitstream 122 are provided for at least one audio object associated to the down-mix channel 102, which was in turn generated using at least an object audio signal associated to the audio object. A suitable parameter is, for example, an energy parameter, indicating an energy of

the object audio signal, i.e. the strength of the contribution of the object audio signal to the down-mix 102. In case a stereo downmix is used, a direction parameter might be provided, indicating the location of the audio object within the stereo downmix. However, other object parameters are obviously also suited and could therefore be used for the implementation.

The transmitted downmix does not necessarily have to be a monophonic signal. It could, for example, also be a stereo signal. In that case, 2 energy parameters might be transmitted as object parameters, each parameter indicating each object's contribution to one of the two channels of the stereo signal. That is, for example, if 20 audio objects are used for the generation of the stereo downmix signal, 40 energy parameters would be transmitted as the object parameters.

The SAOC bit stream 122 is fed into an SAOC parsing block, i.e. into object parameter provider 110, which regains the parametric information, the latter comprising, besides the actual number of audio objects dealt with, mainly object level envelope (OLE) parameters which describe the time-variant spectral envelopes of each of the audio objects present.

The SAOC parameters will typically be strongly time dependent, as they transport the information, as to how the multi-channel audio scene changes with time, for example when certain objects emanate or others leave the scene. To the contrary, the weighting parameters of rendering matrix 124 do often not have a strong time or frequency dependency. Of course, if objects enter or leave the scene, the number of required parameters changes abruptly, to match the number of the audio objects of the scene. Furthermore, in applications with interactive user control, the matrix elements may be time variant, as they are then depending on the actual input of a user.

In a further embodiment of the present invention, parameters steering a variation of the weighting parameters or the object rendering parameters or time-varying object rendering parameters (weighting parameters) themselves may be conveyed in the SAOC bitstream, to cause a variation of rendering matrix 124. The weighting factors or the rendering matrix elements may be frequency dependent, if frequency dependent rendering properties are desired (as for example when a frequency-selective gain of a certain object is desired).

In the embodiment of Fig. 3, the rendering matrix is generated (calculated) by a weighting factor generator 112 (rendering matrix generation block) based on information about the playback configuration (that is a scene description). This might, on the one hand, be playback configuration information, as for example loudspeaker parameters indicating the location or the spatial positioning of the individual loudspeakers of a number of loudspeakers of the multi-channel loudspeaker configuration used for playback. The rendering matrix is furthermore calculated based on object rendering parameters, e.g. on information indicating the location of the audio objects and indicating an amplification or attenuation of the signal of the audio object. The object rendering parameters can, on the one hand, be provided within the SAOC bitstream if a realistic reproduction of the multi-channel audio scene is desired. The object rendering parameters (e.g. location parameters and amplification information (panning parameters)) can alternatively also be provided interactively via a user interface. Naturally, a desired rendering matrix, i.e. desired weighting parameters, can also be transmitted together with the objects to start with a naturally sounding reproduction of the audio scene as a starting point for interactive rendering on the decoder side.

The parameter generator (scene rendering engine) 108 receives both, the weighting factors and the object parameters (for example the energy parameter OLE) to calculate a mapping of the N audio objects to M output channels, wherein M may be larger than, less than or equal to N and furthermore even varying with time. When using a standard MPEG Surround decoder 100, the resulting spatial cues (for example, coherence and level parameters) may be transmitted to the MPEG-decoder 100 by means of a standards-compliant surround bitstream matching the down-mix signal transmitted together with the SAOC bitstream.

Using a multi-channel parameter transformer 106, as previously described, allows using a standard MPEG Surround decoder to process the down-mix signal and the transformed parameters provided by the parameter transformer 106 to play back the reconstruction of the audio scene via the given loudspeakers. This is achieved with the high flexibility of the audio object coding-approach, i.e. by allowing serious user interaction on the playback side.

As an alternative to the playback of a multi-channel loudspeaker set-up, a binaural decoding mode of the MPEG Surround decoder may be utilized to play back the signal via headphones.

However, if minor modifications to the MPEG Surround decoder 100 are acceptable, e.g. within a software-implementation, the transmission of the spatial cues to the MPEG Surround decoder could also be performed directly in the parameter domain. I.e., the computational effort of multiplexing the parameters into an MPEG Surround compatible bitstream can be omitted. Apart from the decrease in computational complexity, a further advantage is to avoid of a quality degradation introduced by the MPEG-conforming parameter quantization, since such quantization of the generated spatial cues would in this case no longer be necessary. As already mentioned, this

benefit calls for a more flexible MPEG Surround decoder implementation, offering the possibility of a direct parameter feed rather than a pure bitstream feed.

5 In another embodiment of the present invention, an MPEG Surround compatible bitstream is created by multiplexing the generated spatial cues and the down-mix signal, thus offering the possibility of a playback via legacy equipment. Multi-channel parameter transformer 106 could
10 thus also serve the purpose of transforming audio object coded data into multi-channel coded data at the encoder side. Further embodiments of the present invention, based on the multi-channel parameter transformer of Fig. 3 will in the following be described for specific object audio and
15 multi-channel implementations. Important aspects of those implementations are illustrated in Figs. 4 and 5.

Fig. 4 illustrates an approach to implement amplitude panning, based on one particular implementation, using
20 direction (location) parameters as object rendering parameters and energy parameters as object parameters. The object rendering parameters indicate the location of an audio object. In the following paragraphs, angles α_i 150 will be used as object rendering (location) parameters,
25 which describe the direction of origin of an audio object 152 with respect to a listening position 154. In the following examples, a simplified two-dimensional case will be assumed, such that one single parameter, i.e. an angle, can be used to unambiguously parameterize the direction of
30 origin of the audio signal associated with the audio object. However, it goes without saying, that the general three-dimensional case can be implemented without having to apply major changes. That is, having for example a three-dimensional space, vectors could be used to indicate the
35 location of the audio objects within the spatial audio scene. As an MPEG Surround decoder shall in the following be used to implement the inventive concept, Fig. 4 additionally shows the loudspeaker locations of a five-

channel MPEG multi-channel loudspeaker configuration. When the position of a centre loudspeaker 156a(C) is defined to be at 0°, a right front speaker 156b is located at 30°, a right surround speaker 156c is located at 110°, a left surround speaker 156d is located at -110° and a left front speaker 156e is located at -30°.

The following examples will furthermore be based on 5.1-channel representations of multi-channel audio signals as specified in the MPEG Surround standard, which defines two possible parameterisations, that can be visualized by the tree-structures shown in Fig. 5.

In case of the transmission of a mono-down-mix 160, the MPEG Surround decoder employs a tree-structure parameterization. The tree is populated by so-called OTT elements (boxes) 162a to 162e for the first parameterization and 164a to 164e for the second parameterization.

Each OTT element up-mixes a mono-input into two output audio signals. To perform the up-mix, each OTT element uses an ICC parameter describing the desired cross-correlation between the output signals and a CLD parameter describing the relative level differences between the two output signals of each OTT element.

Even though structurally similar, the two parameterizations of Fig. 5 differ in the way the audio-channel content is distributed from the monophonic down-mix 160. For example, in the left tree-structure, the first OTT element 162a generates a first output channel 166a and a second output channel 166b. According to the visualization in Fig. 5, the first output channel 166a comprises information on the audio channels of the left front, the right front, the centre and the low frequency enhancement channel. The second output signal 166b comprises only information on the surround channels, i.e. on the left surround and the right

surround channel. When compared to the second implementation, the output of the first OTT element differs significantly with respect to the audio channels comprised.

- 5 However, a multi-channel parameter transformer can be implemented based on either of the two implementations. Once the inventive concept is understood, it may also be applied to other multi channel configurations than the ones described below. For the sake of conciseness, the following
10 embodiments of the present invention focus on the left parameterization of Fig. 5, without loss of generality. It may furthermore be noted, that Fig. 5 only serves as an appropriate visualization of the MPEG-audio concept and that the computations are normally not performed in a
15 sequential manner, as one might be tempted to believe by the visualizations of Fig. 5. Generally, the computations can be performed in parallel, i.e. the output channels can be derived in one single computational step.
- 20 In the embodiments briefly discussed in the following paragraphs, an SAOC bitstream comprises (relative) levels of each audio object in the down-mixed signal (for each time-frequency tile separately, as is common practice within a frequency-domain framework using, for example, a
25 filterbank or a time-to-frequency transformation).

Furthermore, the present invention is not limited to a specific level representation of the objects, the description below merely illustrates one method to
30 calculate the spatial cues for the MPEG Surround bitstream based on an object power measure that can be derived from the SAOC object parameterization.

As is apparent from Fig. 3, the rendering matrix W , which
35 is generated by weighting parameters and used by the parameter generator 108 to map the objects o_i to the required number of output channels (e.g. the number of loudspeakers) s , has a number of weighting parameters,

which depends on the particular object index i and the channel index s . As such, a weighting parameter $w_{s,i}$ denotes the mixing gain of object i ($1 \leq i \leq N$) to loudspeaker s ($1 \leq s \leq M$). That is, W maps objects $o=[o_1 \dots o_N]^T$ to
 5 loudspeakers, generating the output signals for each loudspeaker (here assuming a 5.1 set-up)
 $y=[y_{Lf} \ y_{Rf} \ y_C \ y_{LFE} \ y_{Ls} \ y_{Rs}]^T$, thus:

$$y = Wo.$$

10

The parameter generator (the rendering engine 108) utilizes the rendering matrix W to estimate all CLD and ICC parameters based on SAOC data σ_i^2 . With respect to the visualizations of Fig. 5, it becomes apparent, that this
 15 process has to be performed for each OTT element independently. A detailed discussion will focus on the first OTT element 162a, since the teachings of the following paragraphs can be adapted to the remaining OTT elements without further inventive skill.

20

As it can be observed, the first output signal 166a of OTT element 162a is processed further by OTT elements 162b, 162c and 162d, finally resulting in output channels LF, RF, C and LFE. The second output channel 166b is processed
 25 further by OTT element 162e, resulting in output channels LS and RS. Substituting the OTT elements of Fig. 5 with one single rendering matrix W can be performed by using the following matrix W :

30

$$W = \begin{bmatrix} w_{Lf,1} \dots & w_{Lf,N} \\ w_{Rf,1} \dots & w_{Rf,N} \\ w_{C,1} \dots & w_{C,N} \\ w_{LFE,1} \dots & w_{LFE,N} \\ w_{Ls,1} \dots & w_{Ls,N} \\ w_{Rs,1} \dots & w_{Rs,N} \end{bmatrix}$$

The number N of the columns of matrix W is not fixed, as N is the number of audio objects, which might be varying.

One possibility to derive the spatial cues (CLD and ICC) for the OTT element 162a is that the respective contribution of each object to the two outputs of OTT element 0 is obtained by summation of the corresponding elements in $\mathbf{W}$. This summation gives a sub-rendering matrix $\mathbf{W}_0$ of OTT element 0:

$$\mathbf{W}_0 = \begin{bmatrix} w_{1,1} & \cdots & w_{1,N} \\ w_{2,1} & \cdots & w_{2,N} \end{bmatrix} = \begin{bmatrix} w_{Lf,1} + w_{Rf,1} + w_{C,1} + w_{LFE,1} & \cdots & w_{Lf,N} + w_{Rf,N} + w_{C,N} + w_{LFE,N} \\ w_{Ls,1} + w_{Rs,1} & \cdots & w_{Ls,N} + w_{Rs,N} \end{bmatrix}$$

10

The problem is now simplified to estimating the level difference and correlation for sub-rendering matrix $\mathbf{W}_0$ (and for similarly defined sub-rendering matrices $\mathbf{W}_1$, $\mathbf{W}_2$, $\mathbf{W}_3$ and $\mathbf{W}_4$ related to the OTT elements 1, 2, 3 and 4, respectively).

15

Assuming fully incoherent (i.e. mutually independent) object signals, the estimated power of the first output of OTT element 0, $p_{0,1}^2$, is given by:

$$p_{0,1}^2 = \sum_i w_{1,i}^2 \sigma_i^2.$$

20

Similarly, the estimated power of the second output of OTT element 0, $p_{0,2}^2$, is given by:

$$p_{0,2}^2 = \sum_i w_{2,i}^2 \sigma_i^2.$$

The cross-power R_0 is given by:

$$R_0 = \sum_i w_{1,i} w_{2,i} \sigma_i^2.$$

25

The CLD parameter for OTT element 0 is then given by:

$$CLD_0 = 10 \log_{10} \left(\frac{p_{0,1}^2}{p_{0,2}^2} \right),$$

and the ICC parameter is given by:

$$ICC_0 = \left(\frac{R_0}{p_{0,1} p_{0,2}} \right).$$

30

When Fig. 5 left portion is considered, both signals for which $p_{0,1}$ and $p_{0,2}$ have been determined as shown above are

virtual signals, since these signals represent a combination of loudspeaker signals and do not constitute actually occurring audio signals. At this point, it is emphasized that the tree structures in Fig. 5 are not used for generation of the signals. This means that in the MPEG surround decoder, any signals between the one-to-two boxes do not exist. Instead, there is a big upmix matrix using the downmix and the different parameters to more or less directly generate the loudspeaker signals.

10

Below, the grouping or identification of channels for the left configuration of Fig. 5 is described.

For box 162a, the first virtual signal is the signal representing a combination of the loudspeaker signals lf, rf, c, lfe. The second virtual signal is the virtual signal representing a combination of ls and rs.

For box 162b, the first audio signal is a virtual signal and represents a group including a left front channel and a right front channel, and the second audio signal is a virtual signal and represents a group including a center channel and an lfe channel.

For box 162e, the first audio signal is a loudspeaker signal for the left surround channel and the second audio signal is a loudspeaker signal for the right surround channel.

For box 162c, the first audio signal is a loudspeaker signal for the left front channel and the second audio signal is a loudspeaker signal for the right front channel.

For box 162d, the first audio signal is a loudspeaker signal for the center channel and the second audio signal

is a loudspeaker signal for the low frequency enhancement channel.

5 In these boxes, the weighting parameters for the first audio signal or the second audio signal are derived by combining object rendering parameters associated to the channels represented by the first audio signal or the second audio signal as will be outlined later on.

10 Below, the grouping or identification of channels for the right configuration of Fig. 5 is described.

For box 164a, the first audio signal is a virtual signal and represents a group including a left front channel, a
15 left surround channel, a right front channel, and a right surround channel, and the second audio signal is a virtual signal and represents a group including a center channel and a low frequency enhancement channel.

20 For box 164b, the first audio signal is a virtual signal and represents a group including a left front channel and a left surround channel, and the second audio signal is a virtual signal and represents a group including a right front channel and a right surround channel.

25 For box 164e, the first audio signal is a loudspeaker signal for the center channel and the second audio signal is a loudspeaker signal for the low frequency enhancement channel.

30 For box 164c, the first audio signal is a loudspeaker signal for the left front channel and the second audio signal is a loudspeaker signal for the left surround channel.

For box 164d, the first audio signal is a loudspeaker
 signal for the right front channel and the second audio
 signal is a loudspeaker signal for the right surround
 5 channel.

In these boxes, the weighting parameters for the first
 audio signal or the second audio signal are derived by
 combining object rendering parameters associated to the
 10 channels represented by the first audio signal or the
 second audio signal as will be outlined later on.

The above mentioned virtual signals are virtual, since they
 do not necessarily occur in an embodiment. These virtual
 15 signals are used to illustrate the generation of power
 values or the distribution of energy which is determined by
 CLD for all boxes e.g. by using different sub-rendering
 matrices $\mathbf{W}_i$. Again, the left side of Fig. 5 is described
 first

20 Above, the sub-rendering matrix $\mathbf{W}_0$ for box 162a has been
 shown.

For box 162b, the sub-rendering matrix is defined as:
 25

$$\mathbf{W}_1 = \begin{bmatrix} w_{1,1} & \dots & w_{1,N} \\ w_{2,1} & \dots & w_{2,N} \end{bmatrix} = \begin{bmatrix} w_{lf,1} + w_{rf,1} & \dots & w_{lf,N} + w_{rf,N} \\ w_{c,1} + w_{fe,1} & \dots & w_{c,N} + w_{fe,N} \end{bmatrix}$$

For box 162e, the sub-rendering matrix is defined as:

30
$$\mathbf{W}_2 = \begin{bmatrix} w_{1,1} & \dots & w_{1,N} \\ w_{2,1} & \dots & w_{2,N} \end{bmatrix} = \begin{bmatrix} w_{ls,1} & \dots & w_{ls,N} \\ w_{rs,1} & \dots & w_{rs,N} \end{bmatrix}$$

For box 162c, the sub-rendering matrix is defined as:

$$W_3 = \begin{bmatrix} w_{1,1} & \dots & w_{1,N} \\ w_{2,1} & \dots & w_{2,N} \end{bmatrix} = \begin{bmatrix} w_{lf,1} & \dots & w_{lf,N} \\ w_{rf,1} & \dots & w_{rs,N} \end{bmatrix}$$

For box 162d, the sub-rendering matrix is defined as:

$$5 \quad W_4 = \begin{bmatrix} w_{1,1} & \dots & w_{1,N} \\ w_{2,1} & \dots & w_{2,N} \end{bmatrix} = \begin{bmatrix} w_{c,1} & \dots & w_{c,N} \\ w_{fe,1} & \dots & w_{fe,N} \end{bmatrix}$$

For the right configuration in Fig. 5, the situation is as follows:

10 For box 164a, the sub-rendering matrix is defined as:

$$W_0 = \begin{bmatrix} w_{1,1} & \dots & w_{1,N} \\ w_{2,1} & \dots & w_{2,N} \end{bmatrix} = \begin{bmatrix} w_{lf,1} + w_{ls,1} + w_{rf,1} + w_{rs,1} & \dots & w_{lf,N} + w_{ls,N} + w_{rf,N} + w_{rs,N} \\ w_{c,1} + w_{fe,1} & \dots & w_{c,N} + w_{fe,N} \end{bmatrix}$$

For box 164b, the sub-rendering matrix is defined as:

15

$$W_1 = \begin{bmatrix} w_{1,1} & \dots & w_{1,N} \\ w_{2,1} & \dots & w_{2,N} \end{bmatrix} = \begin{bmatrix} w_{lf,1} + w_{ls,1} & \dots & w_{lf,N} + w_{ls,N} \\ w_{rf,1} + w_{rs,1} & \dots & w_{rf,N} + w_{rs,N} \end{bmatrix}$$

For box 164e, the sub-rendering matrix is defined as:

$$20 \quad W_2 = \begin{bmatrix} w_{1,1} & \dots & w_{1,N} \\ w_{2,1} & \dots & w_{2,N} \end{bmatrix} = \begin{bmatrix} w_{c,1} & \dots & w_{c,N} \\ w_{fe,1} & \dots & w_{fe,N} \end{bmatrix}$$

For box 164c, the sub-rendering matrix is defined as:

$$W_3 = \begin{bmatrix} w_{1,1} & \dots & w_{1,N} \\ w_{2,1} & \dots & w_{2,N} \end{bmatrix} = \begin{bmatrix} w_{lf,1} & \dots & w_{lf,N} \\ w_{ls,1} & \dots & w_{ls,N} \end{bmatrix}$$

25 For box 164d, the sub-rendering matrix is defined as:

$$W_4 = \begin{bmatrix} w_{1,1} & \dots & w_{1,N} \\ w_{2,1} & \dots & w_{2,N} \end{bmatrix} = \begin{bmatrix} w_{rf,1} & \dots & w_{rf,N} \\ w_{rs,1} & \dots & w_{rs,N} \end{bmatrix}$$

Depending on the implementation, the respective CLD and ICC parameter may be quantized and formatted to fit into an MPEG Surround bitstream, which could be fed into MPEG Surround decoder 100. Alternatively, the parameter values could be passed to the MPEG Surround decoder on a parameter level, i.e. without quantization and formatting into a bitstream. To not only achieve repanning of the objects, i.e. distributing these signal energies appropriately, which can be achieved using the above approach utilizing the MPEG-2 structure of Fig. 5, but to also implement attenuation or amplification, so-called arbitrary down-mix gains may also be generated for a modification of the down-mix signal energy. Arbitrary down-mix gains (ADG) allow for a spectral modification of the down-mix signal itself, before it is processed by one of the OTT elements. That is, arbitrary down-mix gains are per se frequency dependent. For an efficient implementation, arbitrary down-mix gains ADGs are represented with the same frequency resolution and the same quantizer steps as CLD-parameters. The general goal of the application of ADGs is to modify the transmitted down-mix in a way that the energy distribution in the down-mix input signal resembles the energy of the down-mix of the rendered system output. Using the weighting parameters $w_{k,i}$ of the rendering matrix W and the transmitted object powers σ_i^2 , appropriate ADGs can be calculated using the following equation:

$$ADG [dB] = 10 \log_{10} \left(\frac{\sum_k \sum_i w_{k,i}^2 \sigma_i^2}{\sum_i \sigma_i^2} \right),$$

and it is assumed, that the power of the input down-mix signal is equal to the sum of the object powers (i = object index, k = channel index).

As previously discussed, the computation of the CLD and ICC-parameters utilizes weighting parameters indicating a portion of the energy of the object audio signal associated to loudspeakers of the multi-channel loudspeaker configuration. These weighting factors will generally be dependent on scene data and playback configuration data, i.e. on the relative location of audio objects and loudspeakers of the multi-channel loudspeaker set-up. The following paragraphs will provide one possibility to derive the weighting parameters, based on the object audio parameterization introduced in Fig. 4, using an azimuth angle and a gain measure as object parameters associated to each audio object.

As already outlined above, there are independent rendering matrices for each time/frequency tile; however in the following only one single time/frequency tile is regarded for the sake of clarity. The rendering matrix W has got M lines (one for each output channel) and, N columns (one for each audio object) where the matrix element in line s and column i represents the mixing weight with which the particular audio object contributes to the respective output channel:

$$W = \begin{bmatrix} w_{1,1} & \cdots & w_{1,N} \\ \vdots & \ddots & \vdots \\ w_{M,1} & \cdots & w_{M,N} \end{bmatrix}$$

The matrix elements are calculated from the following scene description and loudspeaker configuration parameters:

Scene description (these parameters can vary over time):

- Number of audio objects: $N \geq 1$
- Azimuth angle for each audio object: α_i ($1 \leq i \leq N$)
- Gain value for each object: g_i ($1 \leq i \leq N$)

Loudspeaker configuration (usually these parameters are time-invariant):

- Number of output channels (= speakers): $M \geq 2$
- Azimuth angle for each speaker: θ_s ($1 \leq s \leq M$)
- $\theta_s \leq \theta_{s+1} \quad \forall s$ with $1 \leq s \leq M-1$

The elements of the mixing matrix are derived from these
 5 parameters by pursuing the following scheme for each audio
 object i :

- Find index s' ($1 \leq s' \leq M$) with $\theta_{s'} \leq \alpha_i \leq \theta_{s'+1}$ ($\theta_{M+1} := \theta_1 + 2\pi$)
- Apply amplitude panning (e.g. tangent law) between
 10 speakers s' and $s'+1$ (between speakers M and 1 in case
 of $s'=M$). In the following description, the variables
 v are the panning weights, i.e. the scaling factors to
 be applied to a signal, when it is distributed between
 two channels, as for example illustrated in Fig. 4.:

$$15 \quad \frac{\tan(\frac{1}{2}(\theta_{s'} + \theta_{s'+1}) - \alpha_i)}{\tan(\frac{1}{2}(\theta_{s'+1} - \theta_{s'}))} = \frac{v_{1,i} - v_{2,i}}{v_{1,i} + v_{2,i}} \quad ; \quad \sqrt[p]{v_{1,i}^p + v_{2,i}^p} = 1 \quad ; \quad 1 \leq p \leq 2.$$

With respect to the above equations, it may be noted that
 in the two-dimensional case, an object audio signal
 20 associated to an audio object of the spatial audio scene
 will be distributed between the two speakers of the multi-
 channel loudspeaker configuration, which are closest to the
 audio object. However, the object parameters chosen for the
 above implementation are not the only object parameters
 25 which can be used to implement further embodiments of the
 present invention. For example, in a three-dimensional
 case, object parameters indicating the location of the
 loudspeakers or the audio objects may be three-dimensional
 vectors. Generally, two parameters are required for the
 30 two-dimensional case and three parameters are required for
 the three-dimensional case, when the location shall be
 unambiguously defined. However, even in the two-dimensional
 case, different parameterizations may be used, for example
 transmitting two coordinates within a rectangular
 35 coordinate system. It may furthermore be noted, that the
 optional panning rule parameter p , which is within a range
 of 1 to 2, is an arbitrary panning rule parameter, which is

set to reflect room acoustic properties of a reproduction system/room, and which is, according to some embodiments of the present invention, additionally applicable. Finally, the weighting parameters $W_{s,i}$ can be derived according to the following formula, after the panning weights $V_{1,i}$ and $V_{2,i}$ have been derived according to the above equations. The matrix elements are finally given by the following equations:

$$w_{s,i} = \begin{cases} \sqrt{g_i} \cdot v_{1,i} & \text{for } s = s' \\ \sqrt{g_i} \cdot v_{2,i} & \text{for } s = s'+1 \\ 0 & \text{otherwise} \end{cases}$$

The previously introduced gain factor g_i , which is optionally associated to each audio object, may be used to emphasize or suppress individual objects. This may, for example, be performed on the receiving side, i.e. in the decoder, to improve the intelligibility of individually chosen audio objects.

The following example of audio object 152 of Fig. 4 shall again serve to clarify the application of the above equations. The example utilizes the ITU-R BS.775-1 conforming 3/2-channel setup previously described. It is the aim to derive the desired panning direction of an audio object i , characterized by an azimuthal angle $\alpha_i = 60^\circ$, with an arbitrary panning gain g_i of 1, (i.e. 0 dB). With this example, the playback room shall exhibit some reverberation, parameterized by the panning rule parameter $p = 2$. According to Fig. 4, it is apparent that the closest loudspeakers are the right front loudspeaker 156b and the right surround loudspeaker 156c. Therefore, the panning weights can be found by solving the following equations:

$$\frac{\tan 10^\circ}{\tan 40^\circ} = \frac{v_{1,i} - v_{2,i}}{v_{1,i} + v_{2,i}} ; \quad \sqrt{v_{1,i}^2 + v_{2,i}^2} = 1.$$

After some mathematics, this leads to the solution:

$$v_{1,i} \approx 0.8374 ; v_{2,i} \approx 0.5466.$$

5 Therefore, according to the above instructions, the weighting parameters (matrix elements) associated to the specific audio object located in direction α_i are derived to be:

10 $w_1 = w_2 = w_3 = 0 ; w_4 = 0.8374 ; w_5 = 0.5466.$

The above paragraphs detail embodiments of the present invention utilizing only audio objects, which can be represented by a monophonic signal, i.e. point-like
15 sources. However, the flexible concept is not restricted to the application with monophonic audio sources. To the contrary, one or more objects, which are to be regarded as spatially "diffuse" do also fit well into the inventive concept. Multi-channel parameters have to be derived in an
20 appropriate manner, when non point-like sources or audio objects are to be represented. An appropriate measure to quantify an amount of diffuseness between one or more audio objects, is an object-related cross-correlation parameter ICC.

25 In the SAOC system discussed so far all audio objects were supposed to be point sources, i.e. pair-wise uncorrelated mono sound sources without any spatial extent. However there are also application scenarios in which it is
30 desirable to allow audio objects that comprise more than only one audio channel, exhibiting to a certain degree pair-wise (de)correlation. The simplest and probably most important case out of these is represented by *stereo objects*, i.e. objects consisting of two more or less
35 correlated channels that belong together. As an example, such an object could represent the spatial image produced by a symphony orchestra.

In order to smoothly integrate stereo objects into a mono audio object based system as it is described above, both channels of a stereo object are treated as individual objects. The interrelationship of both part objects is reflected by an additional cross-correlation parameter which is calculated based on the same time/frequency grid as is applied for the derivation of the sub-band power values σ_i^2 . In other words: A stereo object is defined by a set of parameter triplets $\{\sigma_i^2, \sigma_j^2, ICC_{i,j}\}$ per time/frequency tile, where $ICC_{i,j}$ denotes the pair-wise correlation between the two realizations of one object. These two realizations are denoted by individual objects i and j . having a pair-wise correlation $ICC_{i,j}$.

For the correct rendering of stereo objects an SAOC decoder must provide means for establishing the correct correlation between those playback channels that participate in the rendering of the stereo object, such that the contribution of that stereo object to the respective channels exhibits a correlation as claimed by the corresponding $ICC_{i,j}$ parameter. An SAOC to MPEG Surround transcoder which is capable of handling stereo objects, in turn, must derive ICC parameters for the OTT boxes that are involved in reproducing the related playback signals, such that the amount of decorrelation between the output channels of the MPEG Surround decoder fulfills this condition.

In order to do so, compared to the example given in the previous section of this document, the calculation of the powers $p_{0,1}$ and $p_{0,2}$ and the cross-power R_0 have to be changed. Assuming the indices of the two audio objects that together build a stereo object to be i_1 and i_2 the formulas change in the following manner:

$$R_0 = \sum_i \left(\sum_j ICC_{i,j} \cdot w_{1,i} w_{2,j} \sigma_i \sigma_j \right),$$

$$p_{0,1}^2 = \sum_i \left(\sum_j w_{1,i} w_{1,j} \sigma_i \sigma_j ICC_{i,j} \right),$$

$$p_{0,2}^2 = \sum_i \left(\sum_j w_{2,i} w_{2,j} \sigma_i \sigma_j ICC_{i,j} \right).$$

It can be observed easily that in case of $ICC_{i_1, i_2} = 0 \quad \forall \quad i_1 \neq i_2$ and $ICC_{i_1, i_2} = 1$ otherwise, these equations are identical to those given in the previous section.

Having the capability of using stereo objects has the obvious advantage, that the reproduction quality of the spatial audio scene can be significantly enhanced, when audio sources other than point sources can be treated appropriately. Furthermore, the generation of a spatial audio scene may be performed more efficiently, when one has the capability of using premixed stereo signals, which are widely available for a great number of audio objects.

The following considerations will furthermore show that the inventive concept allows for the integration of point-like sources, which have an "inherent" diffuseness. Instead of objects representing point sources, as in the previous examples, one or more objects may also be regarded as spatially 'diffuse'. The amount of diffuseness can be characterized by an object-related cross-correlation parameter $ICC_{i,i}$. For $ICC_{i,i}=1$, the object i represents a point source, while for $ICC_{i,i}=0$, the object is maximally diffuse. The object-dependent diffuseness can be integrated in the equations given above by filling in the correct $ICC_{i,i}$ values.

When stereo objects are utilized, the derivation of the weighting factors of the matrix M has to be adapted. However, the adaptation can be performed without inventive skill, as for the handling of stereo objects, two azimuth positions (representing the azimuth values of the left and

the right "edge" of the stereo object) are converted into rendering matrix elements.

As already mentioned, regardless of the type of audio
5 objects used, the rendering Matrix elements are generally
defined individually for different time/frequency tiles and
do in general differ from each other. A variation over time
may, for example, reflect a user interaction, through which
the panning angles and gain values for every individual
10 object may be arbitrarily altered over time. A variation
over frequency allows for different features influencing
the spatial perception of the audio scene, as, for example,
equalization.

15 Implementing the inventive concept using a multi-channel
parameter transformer allows for a number of completely
new, previously not feasible, applications. As, in a
general sense, the functionality of SAOC can be
characterized as efficient coding and interactive rendering
20 of audio objects, numerous applications requiring
interactive audio can benefit from the inventive concept,
i.e. the implementation of an inventive multi-channel
parameter transformer or an inventive method for a multi-
channel parameter transformation.

25 As an example, completely new interactive teleconferencing
scenarios become feasible. Current telecommunication
infrastructures (telephone, teleconferencing etc.) are
monophonic. That is, classical object audio coding cannot
30 be applied, since this requires the transmission of one
elementary stream per audio object to be transmitted.
However, these conventional transmission channels can be
extended in their functionality by introducing SAOC with a
single down-mix channel. Telecommunication terminals
35 equipped with an SAOC extension, that is mainly with a
multi-channel parameter transformer or an inventive object
parameter transcoder, are able to pick up several sound
sources (objects) and mix them into a single monophonic

down-mix signal which is transmitted in a compatible way by using the existing coders (for example speech coders). The side information (spatial audio object parameters or object parameters) may be conveyed in a hidden, backwards compatible way. While such advanced terminals produce an output object stream containing several audio objects, the legacy terminals will reproduce the downmix signal. Conversely, the output produced by legacy terminals (i.e. a downmix signal only) will be considered by SAOC transcoders as a single audio object.

The principle is illustrated in Fig. 6a. At a first teleconferencing site 200, A objects (talkers) may be present, whereas at a second teleconferencing site 202 B objects (talkers) may be present. According to SAOC, object parameters can be transmitted from the first teleconferencing site 200 together with an associated down-mix signal 204, whereas a down-mix signal 206 can be transmitted from the second teleconferencing site 202 to the first teleconferencing site 200, associated by audio object parameters for each of the B objects at the second teleconferencing site 202. This has the tremendous advantage, that the output of multiple talkers can be transmitted using only one single down-mix channel and that furthermore, additional talkers may be emphasized at the receiving site, as the additional audio object parameters, associated to the individual talkers, are transmitted in association with the down-mix signal.

This allows, for example, a user to emphasize one specific talker of interest by applying object-related gain values g_i , thus making the remaining talkers nearly inaudible. This would not be possible when using conventional multi-channel audio techniques, since these would try to reproduce the original spatial audio scene as naturally as possible, without the possibility of allowing a user interaction to emphasize selected audio objects.

Fig. 6b illustrates a more complex scenario, in which teleconferencing is performed among three teleconferencing sites 200, 202 and 208. Since each site is only capable of receiving and sending one audio signal, the infrastructure
5 uses so-called multi-point control units MCU 210. Each site 200, 202 and 208 is connected to the MCU 210. From each site to the MCU 210, a single upstream contains the signal from the site. The downstream for each site is a mix of the signals of all other sites, possibly excluding the site's
10 own signal (the so-called "N-1 signal").

According to the previously discussed concept and the inventive parameter transcoders, the SAOC bitstream format supports the ability to combine two or more object streams,
15 i.e. two streams having a down-mix channel and associated audio object parameters into a single stream in a computationally efficient way, i.e. in a way not requiring a preceding full reconstruction of the spatial audio scene of the sending site. Such a combination is supported
20 without decoding/re-encoding of the objects according to the present invention. Such a spatial audio object coding scenario is particularly attractive when using low delay MPEG communication coders, such as, for example low delay AAC.

25 Another field of interest for the inventive concept is interactive audio for gaming and the like. Due to its low computational complexity and independency from a particular rendering set-up, SAOC is ideally suited to represent sound
30 for interactive audio, such as gaming applications. The audio could furthermore be rendered depending on the capabilities of the output terminal. As an example, a user/player could directly influence the rendering/mixing of the current audio scene. Moving around in a virtual
35 scene is reflected by an adaptation of the rendering parameters. Using a flexible set of SAOC sequences/bitstreams would enable the reproduction of a non-linear game story controlled by user interaction.

According to a further embodiment of the present invention, inventive SAOC coding is applied within a multi-player game, in which a user interacts with other players in the same virtual world/scene. For each user, the video and audio scene is based on his position and orientation in the virtual world and rendered accordingly on his local terminal. General game parameters and specific user data (position, individual audio; chat etc.) is exchanged between the different players using a common game server. With legacy techniques, every individual audio source not available by default on each client gaming device (particularly user chat, special audio effects) in a game scene has to be encoded and sent to each player of the game scene as an individual audio stream. Using SAOC, the relevant audio stream for each player can easily be composed/combined on the game server, be transmitted as a single audio stream to the player (containing all relevant objects) and rendered at the correct spatial position for each audio object (= other game players' audio).

According to a further embodiment of the present invention, SAOC is used to play back object soundtracks with a control similar to that of a multi-channel mixing desk using the possibility to adjust relative level, spatial position and audibility of instruments according to the listener's liking. Such, a user can:

- suppress/attenuate certain instruments for playing along (Karaoke type of applications)
- modify the original mix to reflect their preference (e.g. more drums and less strings for a dance party or less drums and more vocals for relaxation music)
- choose between different vocal tracks (female lead vocal via male lead vocal) according to their preference.

As the above examples have shown, the application of the inventive concept opens the field for a wide variety of new, previously unfeasible applications. These applications become possible, when using an inventive multi-channel parameter transformer of Fig. 7 or when implementing a method for generating a coherence parameter indicating a correlation between a first and a second audio signal and a level parameter, as shown in Fig. 8.

Fig. 7 shows a further embodiment of the present invention. The multi-channel parameter transformer 300 comprises an object parameter provider 302 for providing object parameters for at least one audio object associated to a down-mix channel generated using an object audio signal which is associated to the audio object. The multi-channel parameter transformer 300 furthermore comprises a parameter generator 304 for deriving a coherence parameter and a level parameter, the coherence parameter indicating a correlation between a first and a second audio signal of a representation of a multi-channel audio signal associated to a multi-channel loudspeaker configuration and the level parameter indicating an energy relation between the audio signals. The multi-channel parameters are generated using the object parameters and additional loudspeaker parameters, indicating a location of loudspeakers of the multi-channel loudspeaker configuration to be used for playback.

Fig. 8 shows an example of the implementation of an inventive method for generating a coherence parameter indicating a correlation between a first and a second audio signal of a representation of a multi-channel audio signal associated to a multi-channel loudspeaker configuration and for generating a level parameter indicating an energy relation between the audio signals. In a providing step 310, object parameters for at least one audio object associated to a down-mix channel generated using an object

audio signal associated to the audio object, the object parameters comprising a direction parameter indicating the location of the audio object and an energy parameter indicating an energy of the object audio signal are provided.

In a transformation step 312, the coherence parameter and the level parameter are derived combining the direction parameter and the energy parameter with additional loudspeaker parameters indicating a location of loudspeakers of the multi-channel loudspeaker configuration intended to be used for playback.

Further embodiments comprise an object parameter transcoder for generating a coherence parameter indicating a correlation between two audio signals of a representation of a multi-channel audio signal associated to a multi-channel loudspeaker configuration and for generating a level parameter indicating an energy relation between the two audio signals based on a spatial audio object coded bit stream. This device includes a bit stream decomposer for extracting a down-mix channel and associated object parameters from the spatial audio object coded bit stream and a multi-channel parameter transformer as described before.

Alternatively or additionally, the object parameter transcoder comprises a multi-channel bit stream generator for combining the down-mix channel, the coherence parameter and the level parameter to derive the multi-channel representation of the multi-channel signal or an output interface for directly outputting the level parameter and the coherence parameter without any quantization and/or entropy encoding.

Another object parameter transcoder has an output interface is further operative to output the down mix channel in association with the coherence parameter and the level parameter or has a storage interface connected to the output interface for storing the level parameter and the coherence parameter on a storage medium.

Furthermore, the object parameter transcoder has a multi-channel parameter transformer as described before, which is operative to derive multiple coherence parameter and level parameter pairs for different pairs of audio signals representing different loudspeakers of the multi-channel loudspeaker configuration.

Depending on certain implementation requirements of the inventive methods, the inventive methods can be implemented in hardware or in software. The implementation can be performed using a digital storage medium, in particular a disk, DVD or a CD having electronically readable control signals stored thereon, which cooperate with a programmable computer system such that the inventive methods are performed. Generally, the present invention is, therefore, a computer program product with a program code stored on a machine readable carrier, the program code being operative for performing the inventive methods when the computer program product runs on a computer. In other words, the inventive methods are, therefore, a computer program having a program code for performing at least one of the inventive methods when the computer program runs on a computer.

While the foregoing has been particularly shown and described with reference to particular embodiments thereof, it will be understood by those skilled in the art that various other changes in the form and details may be made without departing from the spirit and scope thereof. It is to be understood that various changes may be made in

adapting to different embodiments without departing from the broader concepts disclosed herein and comprehended by the claims that follow.

5

What is claimed:

1. Multi-channel parameter transformer for generating a
level parameter indicating an energy relation between
5 a first audio signal and a second audio signal of a
representation of a multi-channel spatial audio
signal, comprising:

an object parameter provider for providing object
10 parameters for a plurality of audio objects
associated to a down-mix channel depending on the
object audio signals associated to the audio objects,
the object parameters comprising an energy parameter
for each audio object indicating an energy information
15 of the object audio signal; and

a parameter generator for deriving the level parameter
by combining the energy parameters and object
rendering parameters related to a rendering
20 configuration.
2. Multi-channel parameter transformer in accordance with
claim 1, which is adapted to additionally generate a
coherence parameter indicating a correlation between a
25 first and a second audio signal of a representation of
a multi-channel audio signal, and in which the
parameter generator is adapted to derive the coherence
parameter based on the object rendering parameters and
the energy parameter.
- 30 3. Multi-channel parameter transformer in accordance with
claim 1, in which the object rendering parameters
depend on object location parameters indicating a
location of the audio object.
- 35 4. Multi-channel parameter transformer in accordance with
claim 1, in which the rendering configuration
comprises a multi-channel loudspeaker configuration,

and in which the object rendering parameters depend on loudspeaker parameters indicating locations of loudspeakers of the multi-channel loudspeaker configuration.

5

5. Multi-channel parameter transformer in accordance with claim 1, in which the object parameter provider is operative to provide object parameters additionally comprising a direction parameter indicating a location of the object with respect to a listening position; and

10

in which the parameter generator is operative to use object rendering parameters depending on loudspeaker parameters indicating locations of loudspeakers with respect to the listening position and on the direction parameter.

15

6. Multi-channel parameter transformer in accordance with claim 1, in which the object parameter provider is operative to receive user input object parameters additionally comprising a direction parameter indicating a user-selected location of the object with respect to a listening position within the loudspeaker configuration; and

20

25

in which the parameter generator is operative to use the object rendering parameters depending on loudspeaker parameters indicating locations of loudspeakers with respect to the listening position and on the user input direction parameter.

30

7. Multi-channel parameter transformer in accordance with claim 4, in which the object parameter provider and the parameter generator are operative to use a direction parameter indicating an angle within a reference plane, the reference plane comprising the

35

listening position and also comprising the loudspeakers having locations indicated by the loudspeaker parameters.

- 5 8. Multi-channel parameter transformer in accordance with claim 1, in which the parameter generator is adapted to use first and second weighting parameters as object rendering parameters, which indicate a portion of the energy of the object audio signal to be distributed to
10 a first and a second loudspeaker of the multi-channel loudspeaker configuration, the first and second weighting parameters depending on loudspeaker parameters indicating a location of loudspeakers of the multi-channel loudspeaker configuration such that
15 the weighting parameters are unequal to zero when the loudspeaker parameters indicate that the first and the second loudspeakers are among the loudspeakers having minimum distance with respect to a location of the audio object.
20
9. Multi-channel parameter transformer in accordance with claim 8, in which the parameter generator is adapted to use weighting parameters indicating a greater
25 portion of the energy of the audio signal for the first loudspeaker when the loudspeaker parameters indicate a lower distance between the first loudspeaker and the location of the audio object than between the second loudspeaker and the location of the
30 audio object.
10. Multi-channel parameter transformer in accordance with claim 8, in which the parameter generator comprises:
35 a weighting factor generator for providing the first and the second weighting parameters w_1 and w_2 depending on loudspeaker parameters Θ_1 and Θ_2 for the first and second loudspeakers and on a direction

parameter α of the audio object, wherein the
 loudspeaker parameters Θ_1 , Θ_2 and the direction
 parameter α indicate a direction of the location of
 the loudspeakers and of the audio object with respect
 to a listening position.

11. Multi-channel parameter transformer in accordance with
 claim 10, in which the weighting factor generator is
 operative to provide the weighting parameters w_1 and
 w_2 such that the following equations are satisfied:

$$\frac{\tan\left(\frac{1}{2}(\Theta_1 + \Theta_2)\right) - \alpha}{\tan\left(\frac{1}{2}(\Theta_2 - \Theta_1)\right)} = \frac{w_1 - w_2}{w_1 + w_2} ; \text{ and}$$

$$\sqrt[p]{w_1^p + w_2^p} = 1 ; \text{ wherein}$$

p is an optional panning rule parameter which is set
 to reflect room acoustic properties of a reproduction
 system/room, and is defined as $1 \leq p \leq 2$.

12. Multi-channel parameter transformer in accordance with
 claim 10, in which the weighting factor generator is
 operative to additionally scale the weighting
 parameters by applying a common multiplicative gain
 value associated to the audio object.

13. Multi-channel parameter transformer in accordance with
 claim 1, in which the parameter generator is operative
 to derive the level parameter or the coherence
 parameter based on a first power estimate $p_{k,1}$
 associated to a first audio signal, wherein the first
 audio signal being intended for a loudspeaker or being
 a virtual signal representing a group of loudspeaker

signals and on a second power estimate $p_{k,2}$ associated to a second audio signal, the second audio signal being intended for a different loudspeaker or being a virtual signal representing a different group of loudspeaker signals, wherein the first power estimate $p_{k,1}$ of the first audio signal depends on the energy parameters and weighting parameters associated to the first audio signal, and wherein the second power estimate $p_{k,2}$ associated to the second audio signal depends on the energy parameters and weighting parameters associated to the second audio signal, wherein k is an integer indicating a pair of a plurality of pairs of different first and second signals, and wherein the weighting parameters depend on the object rendering parameters.

14. Multi-channel parameter transformer in accordance with claim 13, in which the parameter generator is operative to calculate the level parameter or the coherence parameter for k pairs of different first and second audio signals, and in which the first and second power estimates $p_{k,1}$ and $p_{k,2}$ associated to the first and second audio signals are based on the following equations, depending on the energy parameters σ_i^2 , on weighting parameters $w_{1,i}$ associated to the first audio signal and on weighting parameters $w_{2,i}$ associated to the second audio signal:

$$p_{k,1} = \sum_i w_{1,i}^2 \sigma_i^2$$

$$p_{k,2} = \sum_i w_{2,i}^2 \sigma_i^2,$$

wherein i is an index indicating an audio object of the plurality of audio objects, and wherein k is an integer indicating a pair of a plurality of pairs of different first and second signals.

5

15. Multi-channel parameter transformer in accordance with claim 14, in which k is equal to zero, in which the first audio signal is a virtual signal and represents a group including a left front channel, a right front
10 channel, a center channel and an lfe channel, and in which the second audio signal is a virtual signal and represents a group including a left surround channel and a right surround channel, or

15 in which k is equal to one, in which the first audio signal is a virtual signal and represents a group including a left front channel and a right front channel, and in which the second audio signal is a virtual signal and represents a group including a
20 center channel and an lfe channel, or

in which k is equal to two, in which the first audio signal is a loudspeaker signal for the left surround channel and in which the second audio signal is a
25 loudspeaker signal for the right surround channel, or

in which k is equal to three, in which the first audio signal is a loudspeaker signal for the left front channel and in which the second audio signal is a
30 loudspeaker signal for the right front channel, or

in which k is equal to four, in which the first audio signal is a loudspeaker signal for the center channel

and in which the second audio signal is a loudspeaker signal for the low frequency enhancement channel, and

5 wherein the weighting parameters for the first audio signal or the second audio signal are derived by combining object rendering parameters associated to the channels represented by the first audio signal or the second audio signal.

10 16. Multi-channel parameter transformer in accordance with claim 14, in which k is equal to zero, in which the first audio signal is a virtual signal and represents a group including a left front channel, a left surround channel, a right front channel, and a right surround channel, and in which the second audio signal is a virtual signal and represents a group including a center channel and a low frequency enhancement channel, or

20 in which k is equal to one, in which the first audio signal is a virtual signal and represents a group including a left front channel and a left surround channel, and in which the second audio signal is a virtual signal and represents a group including a right front channel and a right surround channel, or

25

in which k is equal to two, in which the first audio signal is a loudspeaker signal for the center channel and in which the second audio signal is a loudspeaker signal for the low frequency enhancement channel, or

30

in which k is equal to three, in which the first audio signal is a loudspeaker signal for the left front

channel and in which the second audio signal is a
loudspeaker signal for the left surround channel, or

5 in which k is equal to four, in which the first audio
signal is a loudspeaker signal for the right front
channel and in which the second audio signal is a
loudspeaker signal for the right surround channel, and

10 wherein the weighting parameters for the first audio
signal or the second audio signal are derived by
combining object rendering parameters associated to
the channels represented by the first audio signal or
the second audio signal.

15 17. Multi-channel parameter transformer in accordance with
claim 13, in which the parameter generator is adapted
to derive the level parameter CLD_k based on the
following equation:

20
$$CLD_k = 10 \log_{10} \left(\frac{P_{k,1}^2}{P_{k,2}^2} \right).$$

18. Multi-channel parameter transformer in accordance with
claim 13, in which the parameter generator is adapted
to derive the coherence parameter based on a cross
25 power estimation R_k associated to the first and the
second audio signals depending on the energy
parameters σ_i^2 and on the weighting parameters w_1
associated to the first audio signal and the weighting
parameters w_2 associated to the second audio signal,
30 wherein i is an index indicating an audio object of
the plurality of audio objects.

19. Multi-channel parameter transformer in accordance with claim 18, in which the parameter generator is adapted to use or derive the cross power estimation R_k based on the following equation:

5

$$R_k = \sum_i w_{1,i} w_{2,i} \sigma_i^2 .$$

20. Multi-channel parameter transformer in accordance with claim 18, in which the parameter generator is operative to derive the coherence parameter ICC based on the following equation:

10

$$ICC_k = \frac{R_k}{p_{k,1} p_{k,2}} .$$

15

21. Multi-channel parameter transformer in accordance with claim 1, in which the parameter provider is adapted to provide, for each audio object and for each or a plurality of frequency bands, an energy parameter, and

20

wherein the parameter generator is operative calculate the level parameter or the coherence parameter for each of the frequency bands.

22. Multi-channel parameter transformer in accordance with claim 1, in which the parameter generator is operative to use different object rendering parameters for different time-portions of the object audio signal.

30

23. Multi-channel parameter transformer in accordance with claim 8, in which the weighting factor generator is operative to derive, for each audio object i , the weighting factors $w_{r,i}$ for the r -th loudspeaker depending on object direction parameters α_i and loudspeaker parameters Θ_r , based on the following equations:

for an index s' ($1 \leq s' \leq M$) with

$$\theta_{s'} \leq \alpha_i \leq \theta_{s'+1} (\theta_{M+1} := \theta_1 + 2\pi)$$

$$\frac{\tan\left(\frac{1}{2}(\theta_{s'} + \theta_{s'+1}) - \alpha\right)}{\tan\left(\frac{1}{2}(\theta_{s'+1} - \theta_{s'})\right)} = \frac{v_{1,i} - v_{2,i}}{v_{1,i} + v_{2,i}} ; \quad \sqrt[p]{v_{1,i}^p + v_{2,i}^p} = 1 ; \quad 1 \leq p \leq 2$$

$$w_{r,i} = \begin{cases} \sqrt{g_i} \cdot v_{1,i} & \text{for } s = s' \\ \sqrt{g_i} \cdot v_{2,i} & \text{for } s = s'+1. \\ 0 & \text{otherwise} \end{cases}$$

15

24. Multi-channel parameter transformer in accordance with claim 8, in which the object parameter provider is adapted to provide parameters for a stereo object, the stereo object having a first stereo sub-object and a second stereo sub-object, the energy parameters having a first energy parameter for the first sub-object of the stereo audio object a second energy parameter for the second sub-object of the stereo audio object and a stereo correlation parameter, the stereo correlation parameter indicating a correlation between the sub-objects of the stereo object; and

in which the parameter generator is operative to derive the coherence parameter or the level parameter by additionally using the second energy parameter and the stereo correlation parameter.

5

25. Multi-channel parameter transformer in accordance with claim 24, in which the parameter generator is operative to derive the level parameter and the coherence parameter based on a power estimation $p_{0,1}$ associated to the first audio signal and a power estimation $p_{0,2}$ associated to the second audio signal and a cross power correlation R_0 , using the first energy parameter σ_i^2 , the second energy parameter σ_j^2 and the stereo correlation parameter $ICC_{i,j}$ such, that the power estimations and the cross correlation estimation can be characterized by the following equations:

10

15

20

$$R_0 = \sum_i \left(\sum_j ICC_{i,j} \cdot w_{1,i} w_{2,j} \sigma_i \sigma_j \right),$$

$$p_{0,1}^2 = \sum_i \left(\sum_j w_{1,i} w_{1,j} \sigma_i \sigma_j ICC_{i,j} \right),$$

$$p_{0,2}^2 = \sum_i \left(\sum_j w_{2,i} w_{2,j} \sigma_i \sigma_j ICC_{i,j} \right).$$

26. Method for generating a level parameter indicating an energy relation between a first audio signal and a second audio signal of a representation of a multi-channel spatial audio signal, comprising:

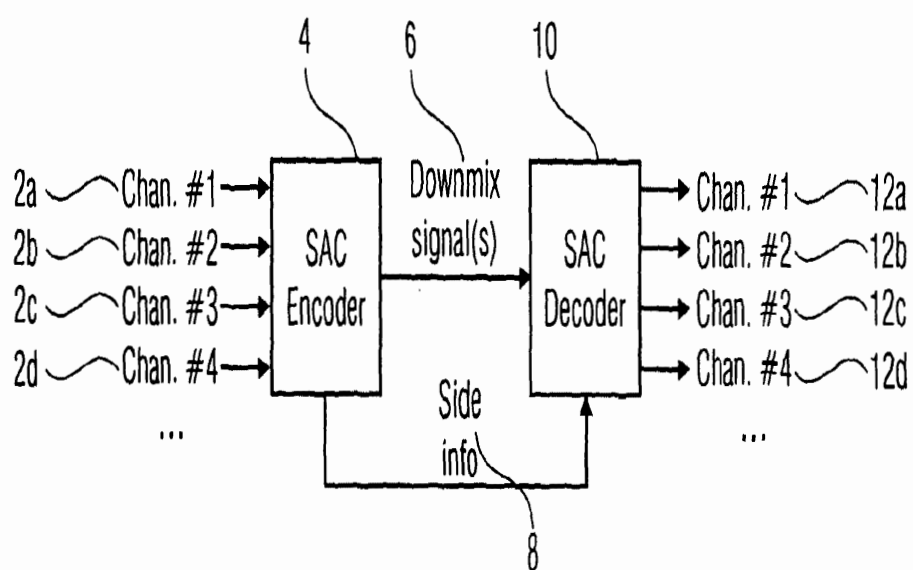
25

providing object parameters for a plurality of audio objects associated to a down-mix channel depending on the object audio signals associated to the audio objects, the object parameters comprising an energy parameter for each audio object indicating an energy information of the object audio signal; and

deriving the level parameter by combining the energy parameters and object rendering parameters related to a rendering configuration.

27. Computer program having a program code for performing, when running on a computer, a method for generating a level parameter indicating an energy relation between a first audio signal and a second audio signal of a representation of a multi-channel spatial audio signal, comprising: providing object parameters for a plurality of audio objects associated to a down-mix channel depending on the object audio signals associated to the audio objects, the object parameters comprising an energy parameter for each audio object indicating an energy information of the object audio signal; and deriving the level parameter by combining the energy parameters and object rendering parameters related to a rendering configuration.

FIG 1A

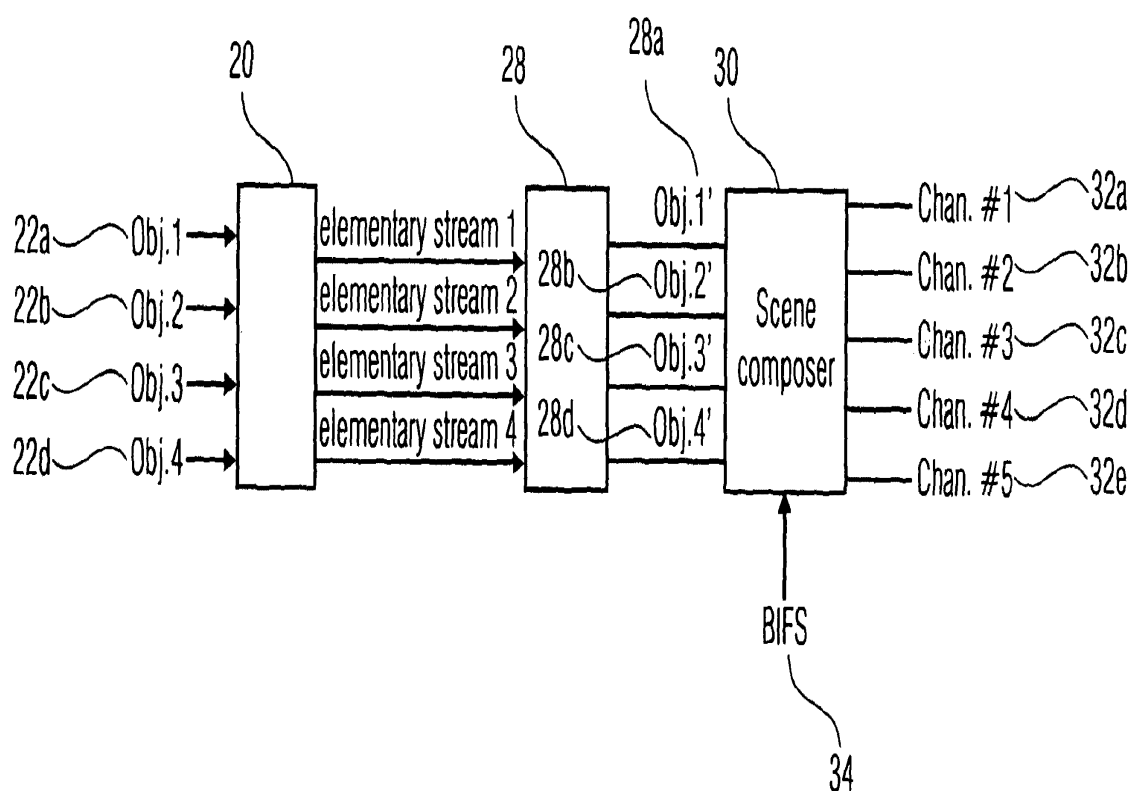


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FIG 1B

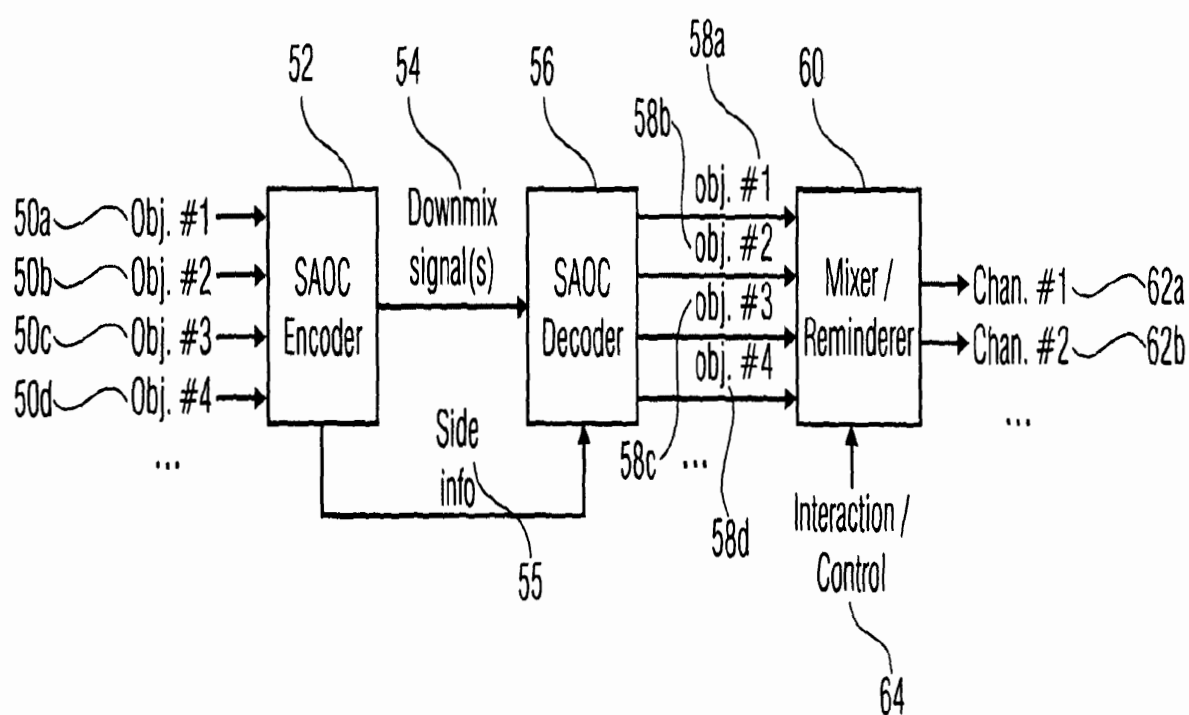
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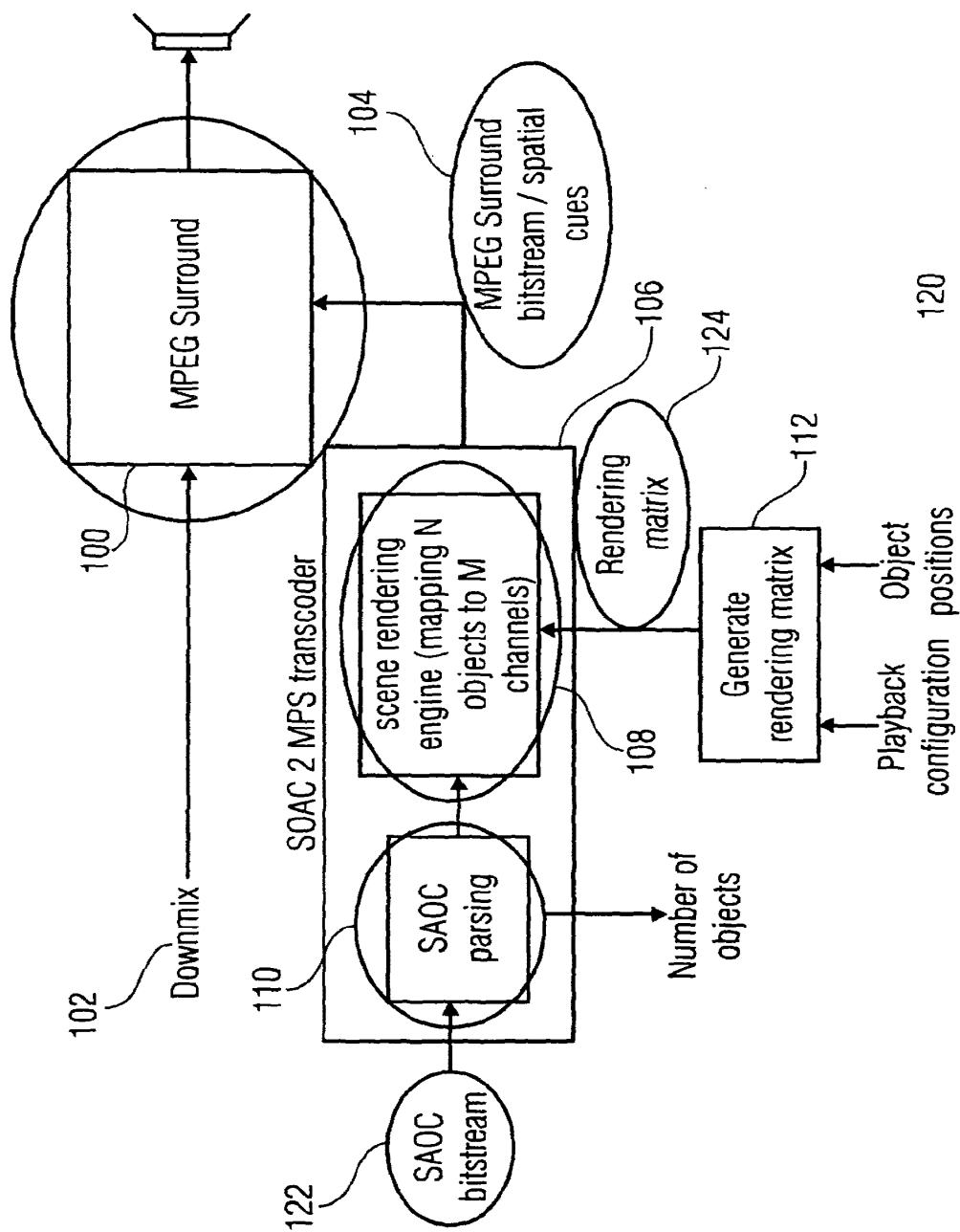
FIG 2

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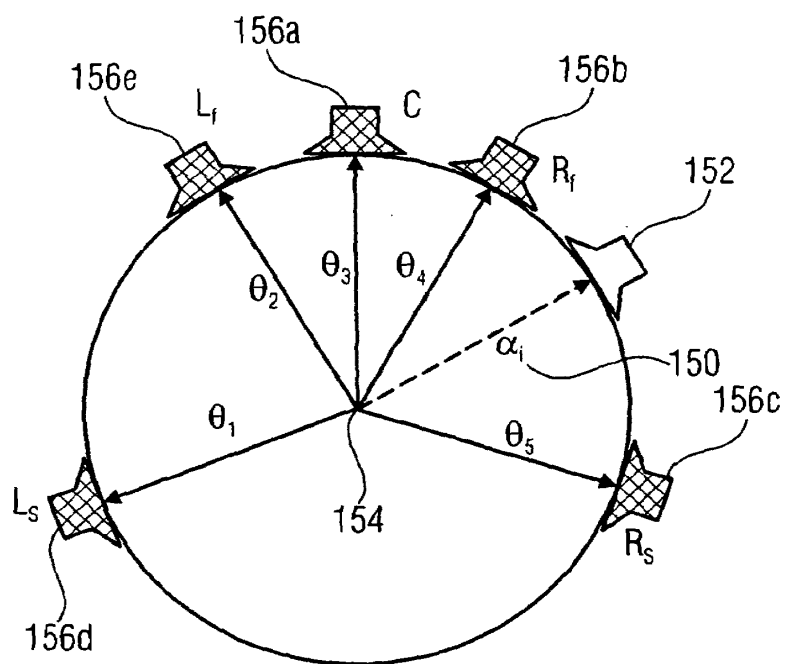
FIG 3



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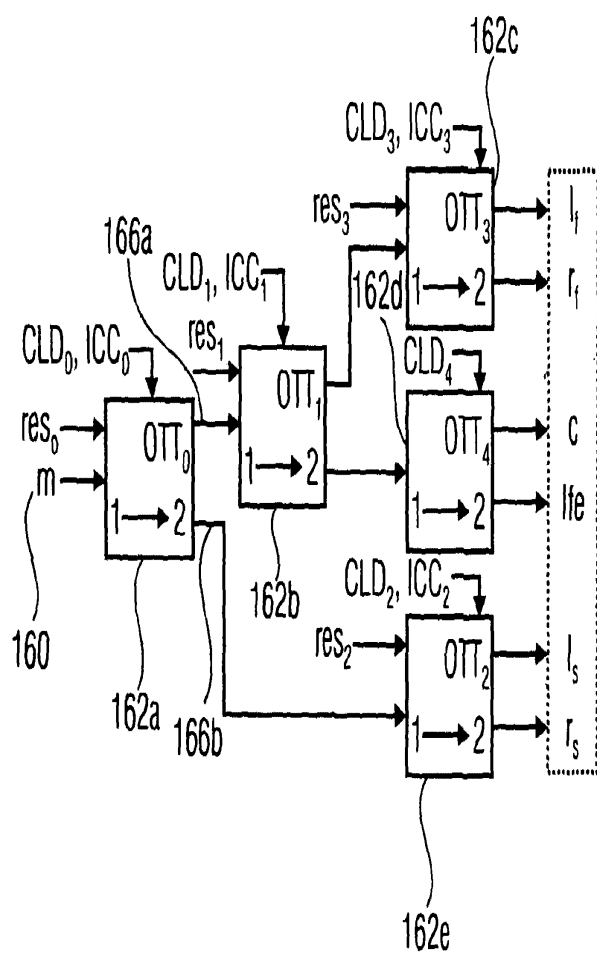
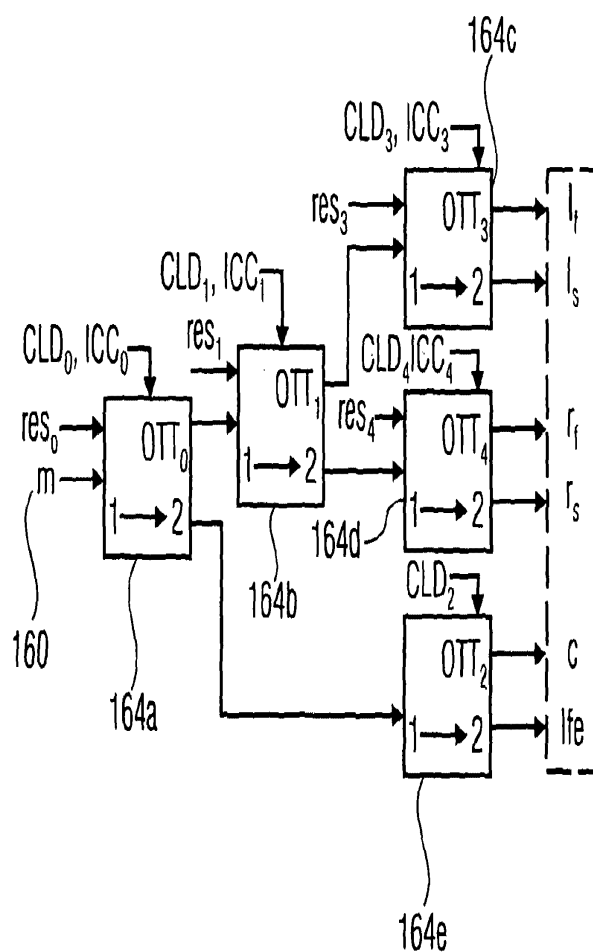
FIG 4



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FIG 5

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FIG 6A

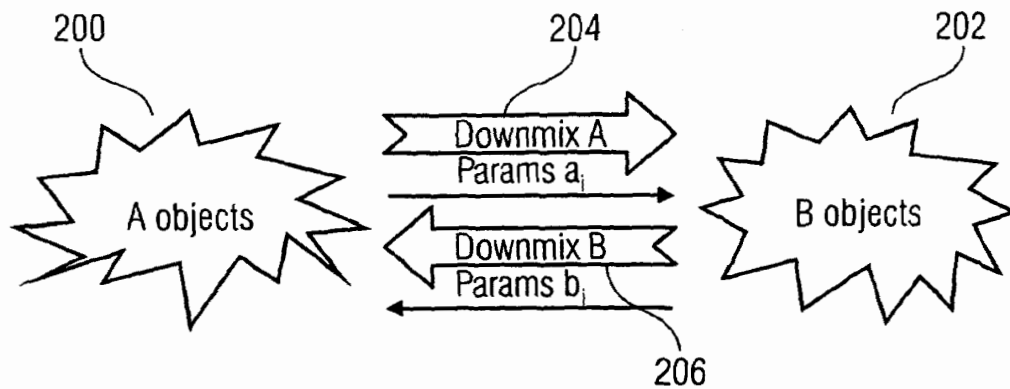
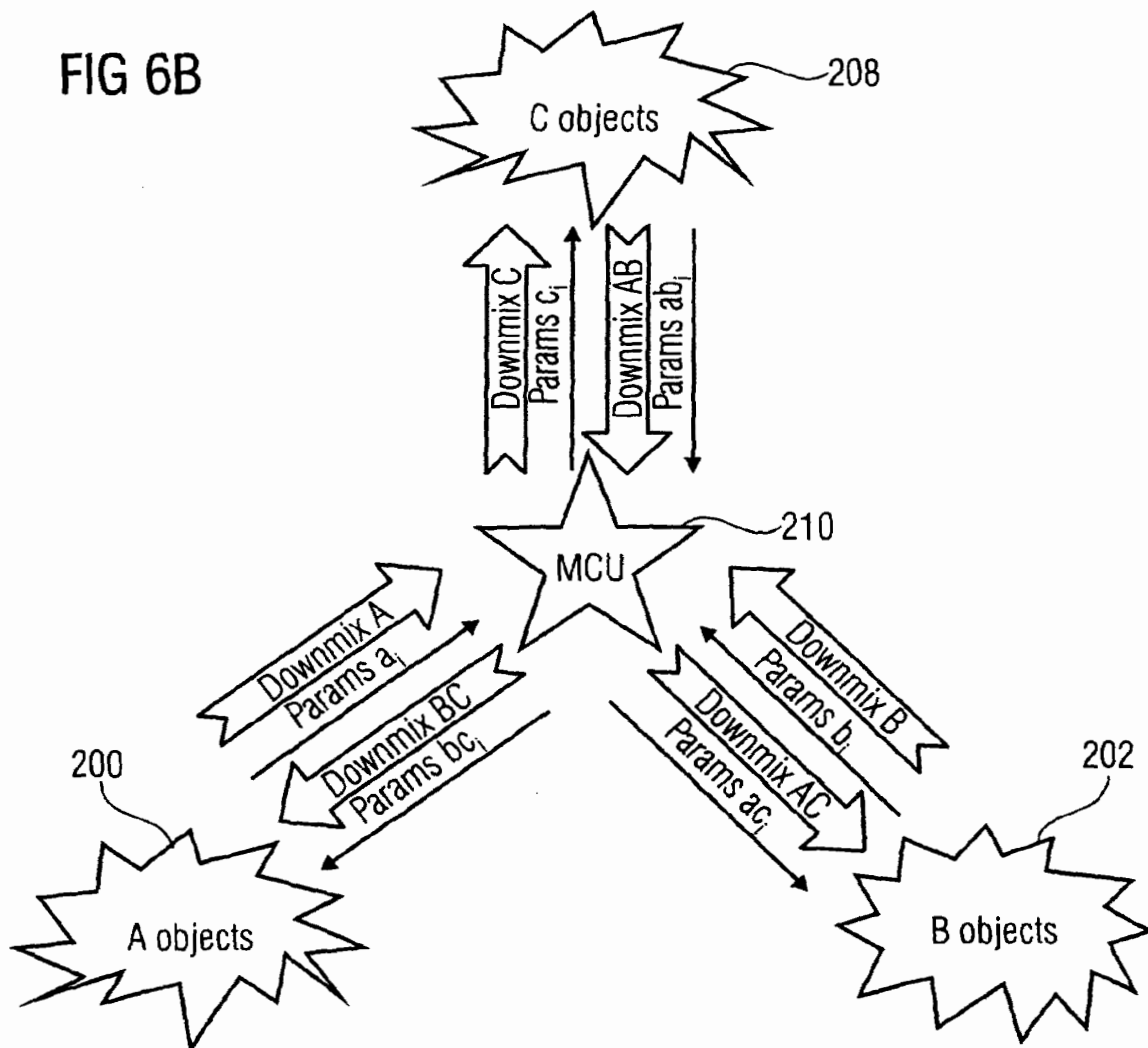


FIG 6B



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FIG 7

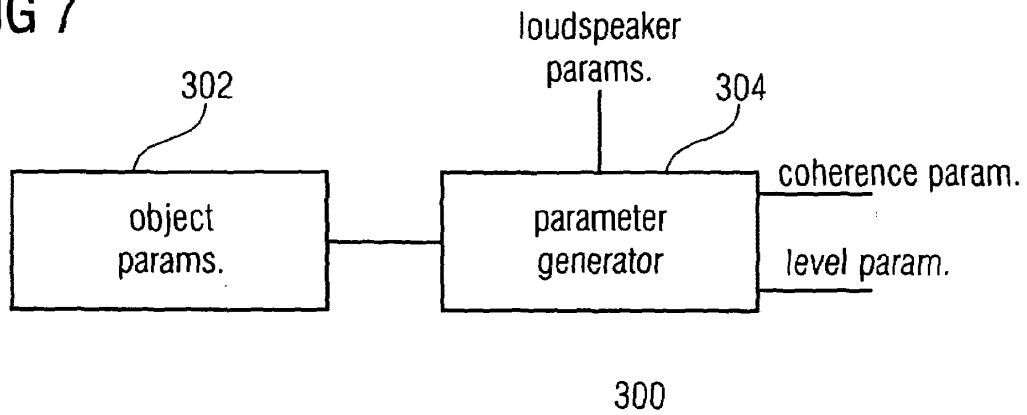
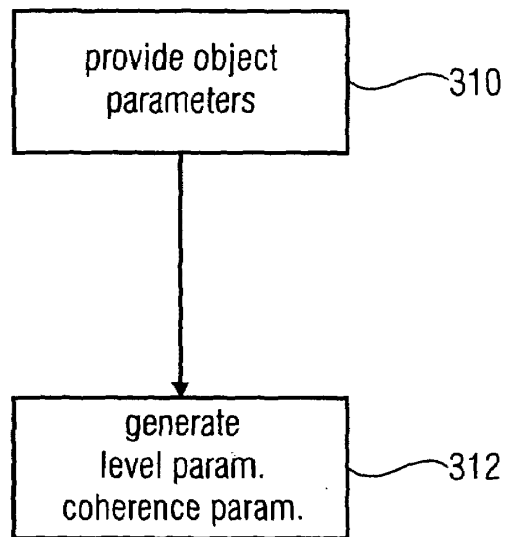


FIG 8



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Bibliographic data

Title: DEVICE FOR CONTROLLING OUTPUT POWER OF SPEAKERS
Pub/Pat no: KR20030011128A
Pub/Issue Date: 2003-02-06
Inventor(s): CHO KAP HOON[KR]|CHO KAP HOON
Applicant(s): CHO KAP HOON[KR]
Classification: H04R5/02AI; H04H20/61AI; H04R5/04AI
Application number: KR20030002238 2003-01-08
Priority number: KR20030002238 2003-01-08;

Abstract of KR20030011128A

PURPOSE: A device for controlling output power of speakers is provided to simultaneously control speakers separately, collectively or wholly, in buildings equipped with the speakers for notifying contents of lectures or public notices partly or wholly such as schools, institutes, government and public offices, and office buildings. CONSTITUTION: A control unit(10) controls at least one amplifier and at least one speaker(30) for outputting signals transmitted from the at least one amplifier. An amplifier connection part(50) is connected to an amplifier part(50) having the at least one amplifier operated according to a control operating signal of the control unit(10). An MSE(Multi Speaker Exchanger)(20) controls the wiring state between the speaker(30) and the amplifier connection part(50), to output at least one output signal transmitted through the amplifier connection part(50) via the at least one speaker(30) according to the control operating signal of the control unit(10). And the second control unit(12) outputs control operating commands simultaneously with the control unit(10) through a hub(40).

(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

(51) 。 Int. Cl. ⁷
H04H 1/00

(11) 공개번호 특2003- 0011128
(43) 공개일자 2003년02월06일

(21) 출원번호 10- 2003- 0002238
(22) 출원일자 2003년01월08일
(62) 원출원 실용신안실2002- 0023428
원출원일자 : 2002년08월01일

(71) 출원인 조갑훈
경기도 시흥시 대야동 늘푸른벽산아파트 101동 604호

(72) 발명자 조갑훈
경기도 시흥시 대야동 늘푸른벽산아파트 101동 604호

심사청구 : 있음

(54) 스피커의 출력제어장치

요약

본 발명은 스피커의 출력제어장치에 관한 것으로서, 더욱 구체적으로는 학교, 학원, 관공서, 빌딩 등과 같이 전체 또는 부분적으로 강의 또는 공지사항들을 전달하기 위하여 다수의 스피커들을 구비한 건물에서 각각의 스피커들을 개별적, 집단적 또는 전체적으로 제어할 수 있는 스피커의 출력제어장치에 관한 것이다.

상기한 본 발명의 스피커의 출력제어장치는, 적어도 하나 이상의 앰프와 상기 적어도 하나 이상의 앰프로부터 전송되는 신호를 출력하기 위한 적어도 하나 이상의 스피커(30)를 제어하기 위한 제어수단(10)과, 상기 제어수단(10)의 제어구동신호에 따라서 작동되는 적어도 하나 이상의 앰프를 구비한 앰프부(52)와 연결되는 앰프접속부(50)와, 상기 제어수단(10)의 제어구동신호에 따라서 상기 앰프접속부(50)를 통하여 전송되는 적어도 하나 이상의 출력신호를 상기 적어도 하나 이상의 스피커(30)를 통하여 출력하도록 스피커(30)와 앰프접속부(50)간의 배선상태를 제어하기 위한 스피커출력변환기(20)를 포함하는 것을 특징으로 한다. 본 발명의 다른 특징에 의하면 허브(40)를 이용하여 별도의 제2제어수단(12)을 추가하여 제어수단(10)과 동시에 다수의 스피커(30)들을 제어할 수 있다.

대표도

도 2

색인어

스피커, 다중, 출력, 제어, 시스템

명세서

도면의 간단한 설명

도 1은 종래 사용되는 스피커출력장치의 개략적인 개념도,

도 2는 본 발명에 의한 스피커의 출력제어장치의 개략적인 개념도,

도 3은 본 발명에 의한 스피커출력변환기의 블록구성도,

도 4는 하나의 스피커의 결선상태를 도시한 배선도,

도 5는 본 발명에 의한 제어부의 블록구성도,

도 6 및 도 7은 스피커제어를 위한 표시화면의 일실시에.

※도면의 주요부분에 대한 부호의 설명※

10, 12 : 제어수단 20 : 스피커출력변환기

22 : 구동부1 24, 24a, 24b : 절환접속부

26 : 접속단자부 30 : 스피커

40 : 허브 50 : 앰프접속부

52 : 앰프부 100 : 마이크

101 : 제어부 102 : 입력부

103 : 표시부 104 : 신호변환부

105 : 메모리부 200 : 앰프

242 : 스피커 접속단자 및 제어응작동부

244 : 온/오프작동부 300 : 스피커

400: 스피커선택기

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 스피커의 출력제어장치에 관한 것으로서, 더욱 구체적으로는 학교, 학원, 관공서, 빌딩 등과 같이 전체 또는 부분적으로 강의 또는 공지사항들을 전달하기 위하여 다수의 스피커들을 구비한 건물에서 각각의 스피커들을 개별적, 집단적 또는 전체적으로 제어할 수 있는 스피커의 출력제어장치에 관한 것이다.

학교, 학원, 관공서, 오피스 빌딩 등과 같은 대형건물에서는 강의나 공지사항의 전달을 위하여 각각 설치된 스피커들과 상기 스피커들을 구동시키기 위한 앰프를 구비하고 있다. 도 1은 종래 스피커 출력장치의 개념도로서, 학교의 방송실에 설치된 것으로 가정한다.

도시된 바와 같이, 방송실에 구비된 앰프(200)에 연결된 마이크(100)를 통하여 사용자가 음성방송을 하면, 앰프(200) (도시되지 않았지만 다수의 앰프를 병렬로 동시에 연결할 수 있다)와 스피커 선택기(400)에 연결된 다수의 스피커(300)를 통하여 동시 또는 개별적, 그룹으로 음성이 출력된다. 이 때 스피커(300)들은 다수대의 앰프(200)에 스피커선택기(400)의 선택에 의하여 연결되어 전체 학급 또는 개별, 그룹으로 강의실 또는 교실에 방송을 한다. 그러나 학교의 경우에는 매년 학년과 반을 재편성하여, 학년과 반이 변경되기 때문에 학년과 반을 맞추는 수단이 없는 문제점이 노출되었다.

또한 상기 앰프(200)와 스피커선택기(400), 스피커(300)는 일단 설치되면 배선의 변경이 매우 어렵기 때문에 직접 설치한 시공자에게 전적으로 의존하여야 하며 수리비용이 많이 소요된다. 이러한 사용상의 한계점으로 인하여 학년의 바뀔 또는 임대 건물의 임차인이 바뀔로 인하여 다양한 내용의 정보(학습정보, 공지사항)를 사용자가 맨처음의 사용 목적에 맞추어 제어하기 어려운 문제점이 있었다.

또한, 멀티미디어방송이 대중화되고 있으며, 각 학급마다 별도의 내용을 방송하여야 할 필요성이 점차 대두되고 있는 형편이다. 따라서 좀더 지능적이고 용이하게 제어가 가능하며 저렴한 비용으로 설치가 가능한 스피커의 출력제어장치에 요구되고 있다. 물론 이러한 스피커 출력관리의 필요성은 학교뿐만 아니라, 학원, 고층의 임대건물에도 모두 적용되는 문제점이다.

발명이 이루고자 하는 기술적 과제

본 발명은 상기한 문제점을 해결하기 위한 것으로서, 본 발명의 목적은 학교, 학원, 관공서, 오피스 빌딩 등과 같이 전체 또는 부분적으로 강의 또는 공지사항들을 전달하기 위하여 다수의 스피커들을 구비한 건물에서 각각의 스피커들을 개별적, 집단적, 또는 전체적으로 동시에 제어할 수 있는 스피커의 출력제어장치를 제공하는데 있다.

본 발명의 다른 목적은 사용자가 용이하게 앰프와 그것에 연결된 스피커(들)의 출력상태를 제어할 수 있으므로 작동상의 효율성이 제고되는 스피커의 출력제어장치를 제공하는데 있다.

상기와 같은 본 발명의 스피커의 출력제어장치는, 다수의 스피커의 출력을 제어하기 위한 장치에 있어서, 적어도 하나 이상의 앰프와 상기 적어도 하나 이상의 앰프로부터 전송되는 신호를 출력하기 위한 적어도 하나 이상의 스피커(30)를 제어하기 위한 제어수단(10)과, 상기 제어수단(10)의 제어구동신호에 따라서 작동되는 적어도 하나 이상의 앰프를 구비한 앰프부(52)와 연결되는 앰프접속부(50)와, 상기 제어수단(10)의 제어구동신호에 따라서 상기 앰프접속부(50)를 통하여 전송되는 적어도 하나 이상의 출력신호를 상기 적어도 하나 이상의 스피커(30)를 통하여 출력하도록 스피커(30)와 앰프접속부(50) 간에 배선상태를 제어하기 위한 스피커출력변환기(20)를 포함하는 것을 특징으로 한다.

본 발명의 다른 특징에 의하면 허브를 이용하여 별도의 제2제어수단을 추가하여 제어수단과 동시에 스피커와 앰프를 동시에 제어할 수 있으며, 상기 제어수단, 제2제어수단은 개인용 컴퓨터를 이용하여 구성할 수 있다.

본 발명의 또 다른 특징에 의하면 개인용 컴퓨터를 이용한 제어수단측에서 음향소스(마이크, 녹음/재생기, CD롬 재생기, 기타음향기기)를 직접 공급할 수 있다.

발명의 구성 및 작용

이하 첨부된 도면을 참고하여 본 발명의 스피커의 출력제어장치를 상세히 설명하면 다음과 같다.

도 2는 본 발명에 의한 스피커의 출력제어장치의 개념도이다.

도시된 바와 같이, 통상의 개인용 컴퓨터를 이용하여 구성되는 제어수단(10)과, 상기 제어수단(10)으로부터 출력되는 제어구동신호를 전송하기 위한 허브(40)와, 상기 제어수단(10)로부터 출력되는 제어구동신호에 따라서 그것에 연결된 다수의 스피커(30)의 출력상태를 개별적, 그룹적 또는 전체적으로 제어하기 위한 스피커출력변환기(20)와, 상기 제어수단(10)로부터 출력되는 앰프 제어구동신호에 따라서 작동되는 앰프부(52)에 설치된 앰프(미도시됨)를 통하여 음성신호를 증폭하여 상기 스피커출력변환기(20)로 전송하는 앰프접속부(50)를 구비하고 있다.

또한 본 발명의 스피커의 출력제어장치에는 상기 제어수단(10)과 병렬 연결되어 동시에 다수의 스피커(30)를 제어할 수 있는 제2제어수단(12)을 추가로 연결할 수 있다. 상기 제어수단(10)과 제2제어수단(12)은 허브(40)를 통하여 신호의 충돌없이 제어구동신호를 전송한다. 제2제어수단(12)의 작동상태는 본질적으로 제어수단(10)과 동일하므로 제2제어수단(12)에 대한 상세한 설명은 생략한다. 다만 제2제어수단(12)을 구동하기 위해서는 별도의 구동용 SOFTWARE가 필요함은 명백하다.

상기 제어수단(10)은 모니터와 같은 출력화면 표시부와, 명령 또는 제어신호를 입력하기 위한 것으로 키보드 또는 마우스와 같은 입력부와, 제어프로그램을 내장하고 실행하기 위한 제어부와, 상기 제어부로부터 출력되는 신호를 소정의 포맷으로 변환하여 출력하기 위한 신호변환부를 포함한다. 상기 제어수단(10)은 또한 종래 사용되는 개인용 컴퓨터를 이용하여 구성할 수 있으며, 앰프접속부(50)에 할당된 앰프(앰프부(52)에 설치됨)의 설정, 스피커(30)들의 출력설정 및 동작명령의 입력등과 같은 기능을 수행한다.

또한 제어수단(10)과 제2제어수단(12)은 마이크를 이용하여 음성신호를 입력시키거나, 제어수단들에 구비된 CD- ROM, DVD등을 통하여 재생되는 음향신호를 앰프부(52)로 출력시킬 수 있다.

도 5에 도시된 것은 제어수단(10)의 일실시예의 블럭구성도이다.

도시된 바와 같이, 제어부(101)와, 입력부(102)와, 표시부(103)와, 신호변환부(104)와, 메모리부(105)를 포함하고 있다. 상기 제어부(101)는 본 발명의 스피커의 출력제어장치를 제어하기 위한 것으로서, 메모리부(105)에 저장되어 있는 제어프로그램과 작동데이터를 이용하여 제어동작을 수행한다. 제어부(101)는 마이크로 프로세서를 이용하여 구성된다.

입력부(102)는 스피커 및 앰프의 제어구동명령을 입력하기 위한 것으로서, 키보드를 이용하거나 또는 도 7에 표시된 것과 같이 표시부(103)의 모니터화면상에 표시된 아이콘들을 작동시킬 수 있는 마우스를 이용하여 구성할 수 있다.

또한 표시부(103)는 각각의 스피커의 작동상태를 화면에 표시하며, 또한 앰프의 설정 또는 스피커의 작동명령입력을 위한 화면을 표시한다. 앰프의 설정상태는 도 6을 참고하면, 본 발명에 의한 스피커의 출력제어장치에 연결되는 각각의 앰프들을 표시하고, 도면에는 아무 것도 표시되지 않았지만, 하부에 표시된 빈 상자안에 앰프를 통하여 출력되기 위한

오디오소스를 연결시킨다. 소스는 예를 들어서 마이크, 녹음/재생기, CD롬 재생기 또는 기타 음향기기 등과 같은 오디오 장치가 될 수 있다.

도 7에 표시된 아이콘들을 마우스를 이용하여 눌러주면 해당 교실에 설치된 스피커의 작동명령이 입력된다. 작동명령이 입력된 아이콘은 색상을 비작동상태의 아이콘과 다른 것으로 변화시켜 표시할 수 있다. 또한 앰프의 볼륨과 앰프의 선택을 위한 아이콘이 하부에 표시되어 있다. 상기와 같이 제어수단(10)에서는 각 앰프와 각 스피커들을 개별적으로 제어하는 것이 가능하다.

상기 제어수단(10)으로부터 출력되는 제어구동신호에 따라서 앰프접속부(50)에 연결되는 각각의 앰프(앰프부(52)에 포함됨)가 개별적 또는 집단적으로 작동되고, 또한 앰프접속부(50)로부터의 신호출력용 인출선(A1,A2,A3,A4,A5)과 연계된 스피커출력변환기(20)의 회로가 작동(다수의 온/오프작동부에 의하여 작동됨)되어서 결과적으로 다수의 스피커(30)의 출력이 제어된다. 즉 필요에 따라서 회로의 온/오프 상태를 제어하여 출력회로를 구성한다.

상기 스피커(30)는 필요한 숫자만큼 추가하거나 제거할 수 있으며 앰프접속부(50)에 연결되는 앰프들도 마찬가지이다. 앰프와 스피커의 추가는 단순한 배선의 변경에 의하여 이루어지며, 충분한 인출선을 확보하면 별도의 배선변경 없이도 스피커(30)의 출력상태를 사용자가 임의로 조정할 수 있다.

상기 허브(40)는 제어수단(10 또는 12)으로부터 출력되는 제어구동신호를 앰프접속부(50)와 앰프부(50)와, 스피커 출력변환기(20)로 전송하기 위한 것이다. 허브(40)를 사용하여 네트워크를 구성함으로써 별도의 장치 없이 제어수단을 용이하게 더 추가할 수 있다. 이것은 허브(40)의 입/출력접속단자에 의존하며 제어수단(10 또는 12)과 허브(40)와의 연결을 위하여 전용 케이블을 이용할 수 있다.

상기 스피커출력변환기(20)는 제어수단(10 또는 12)으로부터 입력되는 제어구동신호에 따라서 내부에 설치된 온/오프작동부(244)를 제어하여 스피커(30)를 통하여 앰프의 전송신호가 출력되도록 제어한다.

도 3에는 상기 스피커출력변환기(20)와 앰프접속부(50)의 블럭구성도가 표시되어 있다. 도시된 바와 같이 스피커출력 변환기(20)는 앰프접속부(50)에 구비되어 있는 적어도 하나 이상의 앰프접속단자(AMP접속1, APM접속2, AMP접속3, AMP접속4, AMP접속5)와 접속하여 앰프부(50)에 포함되어 있는 각각의 앰프들로부터 연장되는 인출선(A1,A2, A3,A4,A5)을 끌고루 분배하기 위한 접속단자부(26)와, 상기 접속단자부(26)로부터 인출되는 각각의 앰프(설명의 편의를 위하여 5개의 앰프AMP1, AMP2, APM3, AMP4, AMP5를 포함한다고 가정함)들과 연결된 다수의 인출선(A1, A2,A3,A4,A5)과 다수의 스피커(30)들의 상호접속상태 즉 회로구분, 분리를 제어하는 절환접속부(24)와, 상기 절환 접속부(24)의 접속상태를 제어하여 스피커(30)를 통하여 출력되는 신호를 설정하기 위한 제어구동신호에 의하여 작동되는 구동부1(22)을 포함하고 있다. 도면에서는 5개의 앰프가 표시되어 있으며, 앰프의 숫자의 증가에 따라서 인출선(A1,A2,A3,A4,A5)의 숫자가 증가한다.

실제 절환접속부(24a,24b)에 스피커(30)와 구동부1(22)이 더 연결되어 있으나 도면에서는 설명의 편의를 위하여 생략하였다. 또한 절환접속부(24a,24b)의 작동상태는 절환접속부1(24)과 구동부1(22)과 스피커(30)의 연결에 의한 작동상태와 본질적으로 동일하기 때문에 역시 생략한다.

제어수단(10)으로부터 입력되는 앰프제어 구동신호에 의하여 앰프접속부(50)에 연결되는 앰프중의 하나 또는 다수가 작동된다. 앰프접속부(50)에 연결된 앰프부(52)에 포함된 앰프들(AMP1, APM2, AMP3, AMP4, AMP5)로부터 연장된 신호 출력선은 접속단자부(26)에 의하여 동일한 신호를 출력하는 인출선(A1,A2,A3,A4,A5)으로 동시에 각 절환접속부2,3(24a,24b)로 출력되도록 배선된다. 인출선(A1, A2, A3, A4, A5)들은 각각의 앰프들에 1 : 1 대응된다. 절환접속부2,3(24a, 24b)도 동일하게 적용된다.

상기와 같이 앰프접속부(50)에 연결된 작동앰프(예를 들어 AMP1 이라고 가정함)를 구동시킨 후에 관리자는 상기 작동앰프의 출력상태를 어느 스피커를 통하여 출력시킬 것인지 가를 결정한 후에 제어수단(10)을 통하여 해당 스피커가 작동앰프의 출력신호와 연결되도록 제어구동신호를 구동부1(22)에 출력시킨다. 구동부1(22)에서는 입력되는 스피커 제어구동신호에 따라서 특정 스피커를 온 연결시켜서 작동앰프로부터 음성신호를 출력시킨다.

이러한 작용을 수행하기 위하여 도면에서는 절환접속부1(24)을 3개의 부분으로 분리시켰지만 실제로는 하나의 절환접속부를 이용하여 실행할 수 있음은 명백하며, 분리의 이유는 장치를 모듈화 시킴으로서 회로의 증감과 스피커의 제어 상태를 용이하게 설계하도록 하는 이점을 주기 위한 것이다. 각각의 앰프와 다수의 스피커(30)를 연결하기 위한 절환접속부1(22)의 배선상태가 도 4에 표시되어 있다. 또한 각 앰프들에는 예를 들어서 마이크나 오디오 테이프로부터 출력되는 소스신호가 연결되어있다고 가정한다. 따라서 앰프를 작동시키면 연결된 소스에 의한 음성신호가 출력된다.

도 4에 도시된 것은 하나의 스피커(30)에 대한 배선상태로서 각각의 스피커(30)들은 모두 동일한 배선상태를 가진다. 도시된 바와 같이, 앰프접속부(50)로부터 연장된 전선과 연결되어 있는 인출선(A1,A2,A3,A4,A5)이 통과하고 있으며, 각각의 인출선으로부터 스피커(30)로 직접 연결되어 있으며, 그 사이에 온/오프 작동부(244)가 각각 설치되어 있다. 상기 온/오프 작동부(244)는 온/오프 구동신호에 의하여 작동되어서 인출선과 스피커 사이의 접점을 개폐한다. 미설명 부호 242는 스피커접속단자 및 제어용 작동부(242)로 각각의 온/오프 작동부(244)로부터 선택출력되는 음성신호를 스피커(30)와 연결하기 위한 것이다.

상기 온/오프 구동신호는 구동부1(22)로부터 출력되는 신호로서, 구동부1(22)은 제어수단(10)으로부터의 제어신호에 따라서 각각의 온/오프 작동부(244)를 온/오프 제어하는 것이다. 이렇게 함으로서 제어수단(10)을 통하여 각각의 스피커(30)를 통하여 출력되는 음성신호를 제어할 수 있다.

예를 들어서 제어수단(10)에서 앰프부(52)의 앰프1(AMP1)을 작동시키면 인출선(A1)을 통하여 음성신호가 출력된다. 이 때 제어수단(10)에서 스피커(30)와 인출선(A1) 사이에 설치된 온/오프 작동부(244)와 스피커 접속단자 및 제어용작동부(242)를 온 제어하면 전선이 연결됨으로서 인출선(A1)을 통하여 출력되는 음성신호가 스피커(30)를 통하여 출력되는 것이다.

이 때 나머지 앰프(AMP2- AMP5)들의 신호는 오프상태이기 때문에 스피커(30)를 통하여 출력되지 않는다. 하나의 앰프가 아니라 2개 또는 3개의 앰프를 동시에 온으로 제어한 상태에서도 역시 스피커(30)들을 통하여 출력의 제어가 가능하다.

예를 들어서 앰프1, 앰프2(AMP1,AMP2)가 온 되도록 제어신호를 출력하면 인출선(A1,A2)을 통하여 음성신호가 출력된다. 이 때 스피커(30)의 제어구동신호를 출력하지 않음으로서 어느 스피커에서도 음성이 출력되지 않는다. 이러한 상태에서 관리자는 제어수단(10)을 이용하여 특정 스피커가 작동되도록 온/오프 작동부(244)와 스피커접속단자 및 제어용 작동부(242)를 온 제어하는 제어구동신호를 출력한다. 출력된 신호에 의하여 온/오프 작동부(244)와 스피커접속단자 및 제어용 작동부(242)가 작동되면, 작동된 온/오프 작동부(244)와 스피커접속단자 및 제어용 작동부(242)에 의하여 연결되는 인출선(A1 또는 A2)을 통하여 전송되는 신호가 스피커(30)를 통하여 출력된다. 상기와 같이 하여 각각의 스피커들의 개별적인 제어가 가능하다. 이것을 학교에 적용하면, 각 반에 하나의 스피커를 설치하고 각 교실에 출력되는 음성신호를 제어할 수 있는 것이다.

또한 본 발명에 의한 스피커의 출력제어장치는 학년별, 주제별, 교과별로 각 교실을 그룹화(예를 들어서, 1학년 전체학급을 1그룹, 2학년 전체학급을 2그룹, 3학년 전체 학급을 3그룹) 시키고, 1그룹에 특정 앰프로부터 출력되는 신호를 출력하도록 제어신호를 입력하면, 해당앰프와 연결된 인출선과 접속되어 있는 온/오프 작동부(244)를 동시에 온 작동시

킴으로서 동일한 음성신호를 출력할 수 있는 것이다. 이러한 스피커제어구성은 학교뿐만 아니라 학원, 빌딩, 아파트 등과 같은 집단적 건물에 모두 적용될 수 있다.

또한 전체제어를 위한 제어신호를 입력하면, 해당 앰프와 연결된 인출선과 접속되어 있는 온/오프 작동부(244)와 스피커접속단자 및 제어용 작동부(242)를 동시에 온 작동시킴으로서 역시 동일한 음성의 출력이 가능하다. 상기 온/오프 작동부(244)와 스피커접속단자 및 제어용 작동부(242)는 온/오프 절환이 가능한 릴레이를 이용하여 구성하거나 또는 트랜지스터의 온/오프 기능을 이용하여 구성할 수 있다. 전자의 경우에는 후자에 비하여 부피가 커지는 단점이 있다.

발명의 효과

이와 같은 본 발명에 의하면 학교, 학원, 관공서, 오피스 빌딩 등과 같이 전체 또는 부분적으로 강의 또는 공지사항들을 전달하기 위하여 다수의 스피커들을 구비한 건물에서 각각의 스피커들을 개별적, 집단적, 또는 전체적으로 제어할 수 있으며, 작동상의 효율성이 제고되는 효과가 있다.

(57) 청구의 범위

청구항 1.

다수의 스피커의 출력을 제어하기 위한 장치에 있어서,

적어도 하나 이상의 앰프와 상기 적어도 하나 이상의 앰프로부터 전송되는 신호를 출력하기 위한 적어도 하나 이상의 스피커(30)를 제어하기 위한 제어수단(10)과, 상기 제어수단(10)의 제어구동신호에 따라서 작동되는 적어도 하나 이상의 앰프를 구비한 앰프부(52)와 연결되는 앰프접속부(50)와, 상기 제어수단(10)의 제어구동신호에 따라서 상기 앰프접속부(50)를 통하여 전송되는 적어도 하나 이상의 출력신호를 상기 적어도 하나 이상의 스피커(30)를 통하여 출력하도록 스피커(30)와 앰프접속부(50)간의 배선상태를 제어하기 위한 스피커출력변환기(20)를 포함하는 것을 특징으로 하는 스피커의 출력제어장치.

청구항 2.

제1항에 있어서,

상기 스피커의 출력제어장치가 제2제어수단(12)을 더 포함하며, 허브(40)를 통하여 제어수단(10)과 동시에 제어구동 명령을 출력하는 것을 특징으로 하는 스피커의 출력제어장치.

청구항 3.

제1항에 있어서,

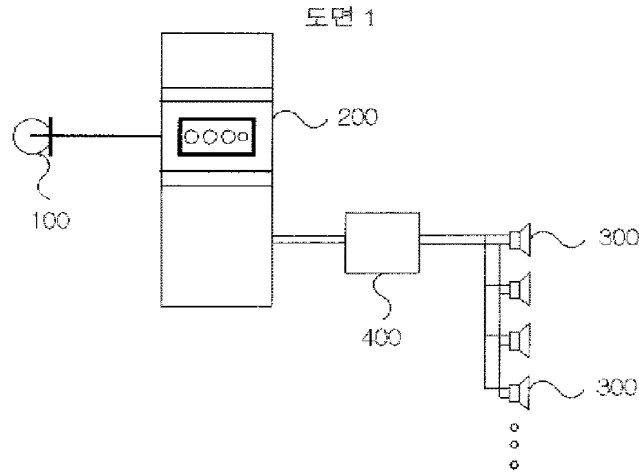
상기 스피커출력변환기(20)가 앰프접속부(50)에 구비되어 있는 적어도 하나 이상의 앰프접속단자(AMP접속1, APM접속2, AMP접속3, AMP접속4, AMP접속5)와 접속하여 각 앰프들로부터 연장되는 인출선(A1,A2,A3,A4,A5)을 골고루 분배하기 위한 접속단자부(26)와, 상기 접속단자부(26)로부터 인출되는 각각의 앰프들과 연결된 다수의 인출선(A1,A2,A3,A4,A5)과 다수의 스피커(30)들의 상호접속상태를 제어하는 절환접속부(24)와, 상기 절환접속부(24)의 접속상태를 제어하여 스피커(30)를 통하여 출력되는 신호를 설정하기 위한 제어구동신호에 의하여 작동되는 구동부(22)를 포함하는 것을 특징으로 하는 스피커의 출력제어장치.

청구항 4.

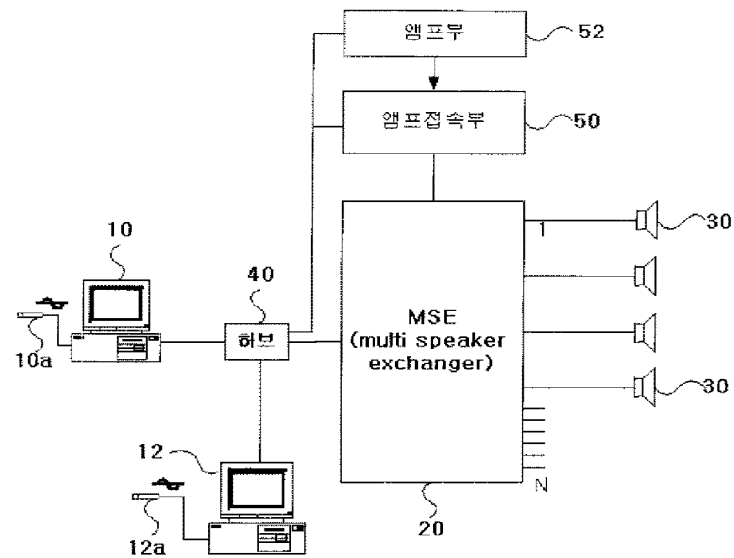
제3항에 있어서,

상기 절환접속부(24)가 앰프접속부(50)로부터 연장된 전선과 연결되어 있는 인출선(A1,A2,A3,A4,A5)이 통과하며 릴레이 또는 트랜지스터 스위치로 구성되는 온/오프 작동부(244)와, 상기 각각의 온/오프작동부(244)로부터 연장된 각각의 인출선들을 스피커(30)와 연결하는 스피커접속단자 및 제어용 작동부(242)를 포함하는 것을 특징으로 하는 스피커의 출력제어장치.

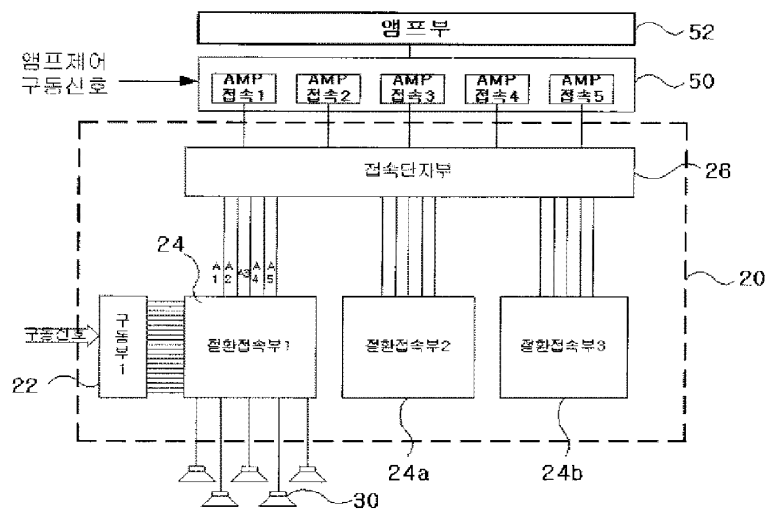
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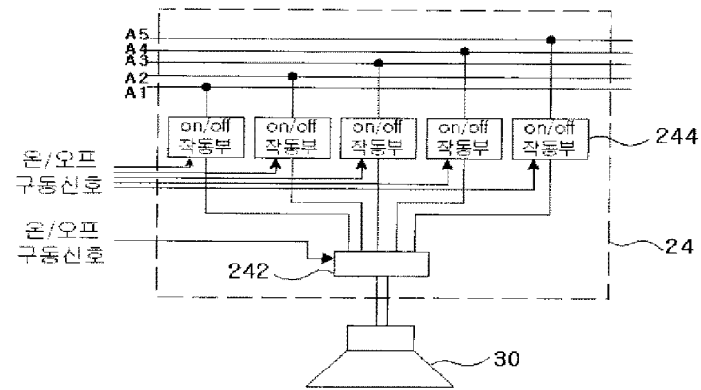
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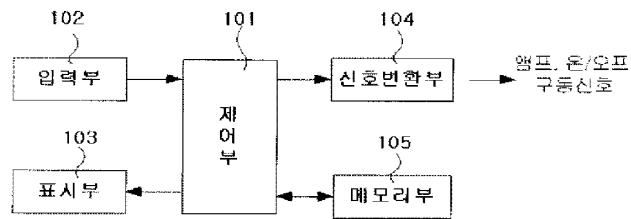
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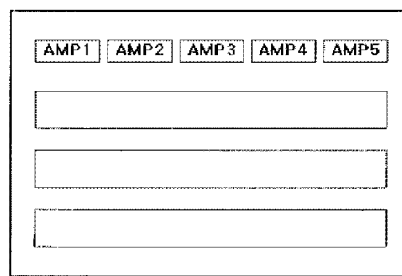
도면 4



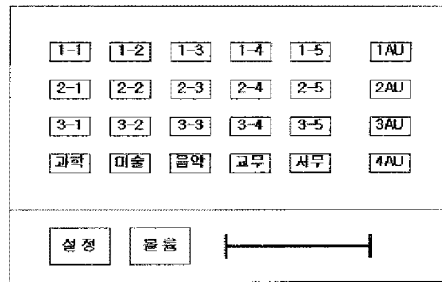
도면 5



도면 6



도면 7



Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		David Rittenhouse Grosby/Jaden Knosher		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
Total in USD (\$)				240

Electronic Acknowledgement Receipt	
EFS ID:	40085371
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	David Rittenhouse Grosby
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	24-JUL-2020
Filing Date:	17-APR-2013
Time Stamp:	18:36:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 240
RAM confirmation Number	E20207NI38224398
Deposit Account	506632
Authorized User	David Grosby
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.21 (Miscellaneous fees and charges) 37 CFR 1.20 (Post Issuance fees)	

37 CFR 1.19 (Document supply fees)					
37 CFR 1.17 (Patent application and reexamination processing fees)					
37 CFR 1.16 (National application filing, search, and examination fees)					
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1	Transmittal Letter	IDS_Transmittal.pdf	69728	no	1
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45	Non Patent Literature	Murph_Rocketfish_Cuts_the_Cord_10-23-09_9pages.pdf	3199318	no	9
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			b60dead27d29a871715b39033709890ff0f27edc		
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58	Non Patent Literature	NewsRoom_The_Age_9-7-01_3pages.pdf	1347183	no	3
			5e5392aa2b48d5ea4fff447bea21bd19c398b27		
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59	Non Patent Literature	Windows_XP_Chapter_19_6pages.pdf	3831663	no	6
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60	Non Patent Literature	NewsRoom_Slim_Devices_Into_Squeezebox_11-18-03_2pages.pdf	1134478	no	2
			c29e4507296d0c08344350cec4d0c26ff0ffa21f		
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61	Fee Worksheet (SB06)	fee-info.pdf	30904	no	2
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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Docket No. 13-0402)**

In re the Application of:	)	
	)	
Sonos, Inc.	)	
	)	Group Art Unit 2442
Serial No.: 13/864,249	)	
	)	
Filed: April 17, 2013	)	
	)	Examiner: Oleg Survillo
Confirmation No. 9806	)	
	)	
For: Concurrent Transmission and Playback	)	
Of Audio Information	)	

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

TRANSMITTAL WITH INFORMATION DISCLOSURE STATEMENT

Pursuant to 37 CFR § 1.34, the undersigned hereby confirms that the attached Information Disclosure Statement (IDS) is being filed in accordance with the undersigned's authority to act in a representative capacity on behalf of Applicant, Sonos, Inc., in connection with the preparation and filing of IDSs for the above-referenced matter.

Respectfully submitted,

Dated: July 23, 2020

By: /David R. Grosby/
David R. Grosby
Reg. No. 75,912
Lee Sullivan Shea & Smith LLP
656 W. Randolph St., Floor 5W
Chicago, Illinois 60661
(312) 754-9423
grosby@ls3ip.com

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	Examiner Name	SURVILLO, Oleg
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	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
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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 R. Grosby/	Date (YYYY-MM-DD)	2020-07-23
Name/Print	David R. Grosby	Registration Number	75912
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

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	Art Unit	2442
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	Attorney Docket Number	13-0402

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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See attached certification statement.

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

A certification statement is not submitted herewith.

SIGNATURE

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 R. Grosby/	Date (YYYY-MM-DD)	2020-07-23
Name/Print	David R. Grosby	Registration Number	75912

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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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.
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	Attorney Docket Number	13-0402

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Signature	/David R. Grosby/	Date (YYYY-MM-DD)	2020-07-23
Name/Print	David R. Grosby	Registration Number	75912

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	Examiner Name	SURVILLO, Oleg	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
<p>That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).</p>			
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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 R. Grosby/	Date (YYYY-MM-DD)	2020-07-23
Name/Print	David R. Grosby	Registration Number	75912
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

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	Attorney Docket Number	13-0402

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42	Howe et al. A Methodological Critique of Local Room Equalization Techniques, 5 pages [produced by Google in Inv. No. 337-TA-1191 on May 6, 2020].
43	IEEE Standards 802.3. Part 3: Carrier sense multiple access with collision detection CSMA/CD access method and physical layer specifications, 8 March 2002, 1562 pages.
44	LIVE. User's Guide IS809B Wireless Speaker System, Copyright 2010, 12 pages.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

	45	Intel Announces WS-Discovery Spec for Joining Devices and Web Services, Intel Developer Forum Spring 2004, 17 February 2004, 4 pages.	
	46	Intel Sees Unified Platform and Ecosystem as Key to Enabling the Digital Home, Intel Developer Forum, 17 February 2004, 4 pages.	
	47	Intel Tools Validate First Solutions that Enable Devices to Work Together in the Digital Home, Intel Developer Forum, 17 February 2004, 2 pages.	
	48	Intel. User's Manual, An Intel Socket 478 Processor Based Mainboard. 27 March 2003, 96 pages.	
	49	Introducing ROOMLINK Network Media Receiver - PCNA-MR10, Sony Vaio, 2003, 2 pages.	
	50	IPR Details - Apple Computer's Statement About IPR Claimed in draft-ietf-zeroconf-ipv4- linklocal, 26 April 2004, 3 pages.	

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¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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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 R. Grosby/	Date (YYYY-MM-DD)	2020-07-23
Name/Print	David R. Grosby	Registration Number	75912

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Electronic Acknowledgement Receipt	
EFS ID:	40086031
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	David Rittenhouse Grosby
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	24-JUL-2020
Filing Date:	17-APR-2013
Time Stamp:	18:39:09
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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National Stage of an International Application under 35 U.S.C. 371

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Electronic Acknowledgement Receipt	
EFS ID:	40085649
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	David Rittenhouse Grosby
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	24-JUL-2020
Filing Date:	17-APR-2013
Time Stamp:	18:38:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

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13	Non Patent Literature	Bose_Owners_Guide_12-20-01_19pages.pdf	6226336	no	19
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14	Non Patent Literature	NewsRoom_InfoComm_5-1-04_24pages.pdf	9512811	no	24
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18	Non Patent Literature	C-Media_CM102-A_102S_Data_Sheet_5-21-03_20pages.pdf	5397734	no	20
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33	Non Patent Literature	BridgeCo_Company_Overview_1page.pdf	368189	no	1
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59	Non Patent Literature	Creston_Adagio_AMS_Operation_Guide_08_114pages.pdf	17051524 d4137127ff733d66786e31fe6e985ec8e4375393	no	114
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Warnings:					
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806
107361	7590	07/21/2020	EXAMINER	
McDonnell Boehnen Hulbert & Berghoff LLP			SURVILLO, OLEG	
Sonos, Inc.				
300 South Wacker Drive			ART UNIT	
Chicago, IL 60606			PAPER NUMBER	
			2442	
			MAIL DATE	
			DELIVERY MODE	
			07/21/2020	
			PAPER	

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR/ PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
13/864,249	04/17/2013	Millington, Nicholas A. J.	13-0402 (MBHB 15-

McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606		EXAMINER	
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/OLEG SURVILLO/
Primary Examiner, Art Unit 2442

dated 07/07/2020

Doc code: IDS

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	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	1	7792311		2010-09-07	HOLMGREN; Steve F. et al.		
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	1	20090060219		2009-03-05	INOHARA; Yuichi.		
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

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	1	Anonymous, "Transmission Control Protocol," RFC: 793, USC/Information Sciences Institute, September 1981, 91 pages.	
	2	Notice of Allowance mailed on 29 May 2020, issued in connection with U.S. Patent Application No. 16/514280, filed on 17 July 2019, 8 pages.	
	3	Notice of Allowance mailed on June 2 2020, issued in connection with U.S. Patent Application No. 15/946660, filed on 5 April 2018, 5 pages.	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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

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See attached certification statement.

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Signature	/David R. Grosby/	Date (YYYY-MM-DD)	2020-07-07
Name/Print	David R. Grosby	Registration Number	75912

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107361 7590 07/10/2020
McDonnell Boehnen Hulbert & Berghoff LLP
Sonos, Inc.
300 South Wacker Drive
Chicago, IL 60606

EXAMINER	
SURVILLO, OLEG	
ART UNIT	PAPER NUMBER
2442	

DATE MAILED: 07/10/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806

TITLE OF INVENTION: CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	10/13/2020

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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)".

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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)

107361 7590 07/10/2020
McDonnell Boehnen Hulbert & Berghoff LLP
Sonos, Inc.
300 South Wacker Drive
Chicago, IL 60606

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.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806

TITLE OF INVENTION: CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	10/13/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
SURVILLO, OLEG	2442	709-219000

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.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518 CON)	9806
107361 7590 07/10/2020 McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606			EXAMINER SURVILLO, OLEG	
			ART UNIT 2442	PAPER NUMBER
DATE MAILED: 07/10/2020				

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. 13/864,249	Applicant(s) Millington, Nicholas A. J.	
	Examiner OLEG SURVILLO	Art Unit 2442	AIA (FITF) Status No

-- 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 amendment after Non-Final rejection, response dated 03/27/2020.
☐ 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 47-79. 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) 2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date <u>See Continuation Sheet</u> . 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☒ Interview Summary (PTO-413), Paper No./Mail Date. <u>20200630</u> .	5. ☒ Examiner's Amendment/Comment 6. ☐ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
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/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	
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Continuation of Attachment(s) 2. Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date: 09/30/19; 11/26/19; 05/05/20; 05/26/20; 05/26/20

EXAMINER'S AMENDMENT / COMMENT

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Response to Arguments

With regard to Applicant's remarks dated March 27, 2020:

Regarding the rejection of claims 47-73 under 35 U.S.C. 103(a), Applicant's amendment and arguments have been fully considered. Applicants argue at pages 19-20 of the Remarks, as filed, that *"Goldberg describes 'transmission of synchronization signals' in connection with synchronizing playback among multiple units. Goldberg, par. 201. But Goldberg's synchronization signals do not amount to 'timing information associated with the obtained audio information that is indicative of at least one future time that is relative to a reference clock time and denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information.'" Goldberg states "the synchronization signals can comprise many different forms," but Goldberg provides only three examples. Goldberg, par. 202. None of Goldberg's examples describe any synchronization signal(s) that is "indicative of at least one future time that is relative to a reference clock time and denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information," as recited in the claims. For the first example, Goldberg explains "the synchronization signal can be the time stamp from the beginning of the*

music file to the current position of the music file being played on the broadcast unit," i.e., a time stamp denoting the elapsed time from the beginning of the track. Goldberg, par. 202. However, a time stamp relating to an elapsed time from the start of a track on its own is neither a "future time that is relative to a reference clock time," nor does it "denote[] a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information."

For the second example, Goldberg explains the synchronization signal can alternatively be "the sample number that is currently being played on the broadcast unit 100."

Goldberg, par. 202. But a "sample number" on its own is not a "future time that is relative to a reference clock time," nor does such a sample number "denote[] a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information."

In view of Applicant's further amendment, as presented below, Examiner agrees. Therefore, the rejection has been withdrawn. Upon further search, no better prior art was discovered that would teach or suggest claimed features. Thus, no new grounds of rejection are made.

As to any arguments not specifically addressed, they are the same as those discussed above.

Examiner's Amendment

Examiner's amendment to the record appears below. Should the changes 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 filed no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a communication with Jeffrey P. Armstrong, Reg. No.: 54,967, on July 6, 2020.

Please amend claims 47, 53, 55, 56, 62, 64, 65, 71, and 73 in this application as follows:

1-46. (Canceled)

47. (Currently Amended) A first zone player comprising:

a network interface that is configured to communicatively couple the first zone player to at least one data network;

at least one processor;

a tangible, non-transitory computer-readable medium; and

program instructions stored on the tangible, non-transitory computer-readable medium that are executable by the at least one processor such that the first zone player is configured to perform functions comprising:

receiving, via the network interface, a request to engage in synchronous playback of audio content as part of a synchrony group that includes at least a second zone player that is communicatively coupled to the first zone player via the at least one data network;

after receiving the request to engage in synchronous playback of audio content as part of the synchrony group:

detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group; and

beginning to operate in the synchrony group in accordance with the indication;

wherein, while operating in the control-master mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, first control information for the synchrony group from a network device that is communicatively coupled to the first zone player; and

based on the first control information, cause, via the network interface, at least one playback action to be applied in the synchrony group; wherein, while operating in the control-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, second control information from another zone player; and

perform one or more playback actions in accordance with the second control information;

wherein, while operating in the audio-master mode for the synchrony group, the first zone player is configured to:

obtain audio information that is representative of the audio content;

generate playback timing information associated with the obtained audio information that is indicative of at least one future time that is relative to a reference clock time and denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information; and

transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player; and wherein, while operating in the audio-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, audio information and playback timing information associated with the received audio information from another zone player; and

engage in synchronous playback of the received audio information with at least the second zone player based on the received playback timing information associated with the received audio information while a local clock time of the first zone player differs from a local clock time of the second zone player.

48. (Previously Presented) The first zone player of claim 47, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-master mode for the synchrony group and (b) the audio-master mode for the synchrony group.

49. (Previously Presented) The first zone player of claim 47, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or

an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-slave mode for the synchrony group and (b) the audio-master mode for the synchrony group.

50. (Previously Presented) The first zone player of claim 47, wherein beginning to operate in the synchrony group in accordance with the indication comprises either (a) transitioning from operating in the audio-master mode to operating in the audio-slave mode or (b) transitioning from operating in the audio-slave mode to operating in the audio-master mode.

51. (Previously Presented) The first zone player of claim 47, wherein the first control information identifies particular audio content to be played back by the synchrony group that is available at an audio source outside of the at least one data network, and wherein causing the at least one playback action to be applied in the synchrony group comprises causing a zone player operating in the audio-master mode to obtain audio information that is representative of the particular audio content.

52. (Previously Presented) The first zone player of claim 47, wherein the at least one future time relative to the reference clock time comprise at least one first future time that is determined based on a local clock of a zone player other than the first zone player.

53. (Currently Amended) The first zone player of claim 47, wherein at least one future time relative to the reference clock time comprise at least one first future time that is determined based on [[a]] the local clock of the first zone player.

54. (Previously Presented) The first zone player of claim 47, wherein the second control information comprises information indicative of a volume adjustment, and wherein performing one or more playback actions in accordance with the second control information comprises adjusting a playback volume of the first zone player.

55. (Currently Amended) The first zone player of claim 47, wherein the playback timing information that is received while operating in the audio-slave mode comprises at least one future time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the received audio information, and wherein being configured while operating in the audio-slave mode to engage in synchronous playback of the received audio information with at least the second zone player comprises being configured to:

update the at least one future time to account for a differential between [[a]] the local clock time of the first zone player and a local clock time of another zone player; and

when the local clock time of the first zone player reaches the updated at least one future time, engage in synchronous playback of the corresponding portion of the received audio information with at least the second zone player.

56. (Currently Amended) A method performed by a first zone player, the method comprising:

receiving, via a network interface at the first zone player, a request to engage in synchronous playback of audio content as part of a synchrony group that includes at least a second zone player that is communicatively coupled to the first zone player via at least one data network;

after receiving the request to enter into the synchrony group:

detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group; and

beginning to operate in the synchrony group in accordance with the indication;

wherein, while operating in the control-master mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, first control information for the synchrony group from a network device that is communicatively coupled to the first zone player; and

based on the first control information, cause, via the network interface, at least one playback action to be applied in the synchrony group;

wherein, while operating in the control-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, second control information from another zone player; and

perform one or more playback actions in accordance with the second control information;

wherein, while operating in the audio-master mode for the synchrony group, the first zone player is configured to:

obtain audio information that is representative of the audio content;

generate playback timing information associated with the obtained audio information that is indicative of at least one future time relative to a reference clock time that denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information; and

transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player; and

wherein, while operating in the audio-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, audio information and playback timing information associated with the received audio information from another zone player; and

engage in synchronous playback of the received audio information with at least the second zone player based on the received playback timing information associated with the received audio information while a local clock time of the first zone player differs from a local clock time of the second zone player.

57. (Previously Presented) The method of claim 56, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-master mode for the synchrony group and (b) the audio-master mode for the synchrony group.

58. (Previously Presented) The method of claim 56, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-slave mode for the synchrony group and (b) the audio-master mode for the synchrony group.

59. (Previously Presented) The method of claim 56, wherein beginning to operate in the synchrony group in accordance with the indication comprises either (a) transitioning from operating in the audio-master mode to operating in the audio-slave mode or (b) transitioning from operating in the audio-slave mode to operating in the audio-master mode.

60. (Previously Presented) The method of claim 56, wherein the first control information identifies particular audio content to be played back by the synchrony group that is available at an audio source outside of the at least one data network, and wherein causing the at least one playback action to be applied in the synchrony group comprises causing a zone player operating in the audio-master mode to obtain audio information that is representative of the particular audio content.

61. (Previously Presented) The method of claim 56, wherein the at least one future time relative to the reference clock time comprise at least one first future time that is determined based on a local clock of a zone player other than the first zone player.

62. (Currently Amended) The method of claim 56, wherein the at least one future time relative to the reference clock time comprise at least one first future time that is determined based on the local clock of the first zone player.

63. (Previously Presented) The method of claim 56, wherein the second control information comprises information indicative of a volume adjustment, and wherein performing one or more playback actions in accordance with the second control information comprises adjusting a playback volume of the first zone player.

64. (Currently Amended) The method of claim 56, wherein the playback timing information that is received while operating in the audio-slave mode comprises at least one future time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the received audio information, and wherein operating in the audio-slave mode to engage in synchronous playback of the received audio information with at least the second zone player comprises:

updating the at least one future time to account for a differential between the local clock time of the first zone player and a local clock time of another zone player; and

when the local clock time of the first zone player reaches the updated at least one future time, engaging in synchronous playback of the corresponding portion of the received audio information with at least the second zone player.

65. (Currently Amended) Tangible, non-transitory computer-readable media having instructions stored therein, wherein the instructions, when executed, cause a first zone player to perform functions comprising:

receiving, via a network interface at the first zone player, a request to engage in synchronous playback of audio content as part of a synchrony group that includes at least a second zone player that is communicatively coupled to the first zone player via at least one data network;

after receiving the request to enter into the synchrony group:

detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group; and

beginning to operate in the synchrony group in accordance with the indication;

wherein, while operating in the control-master mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, first control information for the synchrony group from a network device that is communicatively coupled to the first zone player; and

based on the first control information, cause, via the network interface, at least one playback action to be applied in the synchrony group;

wherein, while operating in the control-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, second control information from another zone player; and

perform one or more playback actions in accordance with the second control information;

wherein, while operating in the audio-master mode for the synchrony group, the first zone player is configured to:

obtain audio information that is representative of the audio content;

generate playback timing information associated with the obtained audio information that is indicative of one or more future times relative to a reference clock time, wherein an individual future time denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information; and

transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player; and

wherein, while operating in the audio-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, audio information and playback timing information associated with the received audio information from another zone player; and

engage in synchronous playback of the received audio information with at least the second zone player based on the received playback timing information associated with the received audio information while a local clock time of the first zone player differs from a local clock time of the second zone player.

66. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group

comprises detecting an indication that the first zone player is to operate in (a) the control-master mode for the synchrony group and (b) the audio-master mode for the synchrony group.

67. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-slave mode for the synchrony group and (b) the audio-master mode for the synchrony group.

68. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein beginning to operate in the synchrony group in accordance with the indication comprises either (a) transitioning from operating in the audio-master mode to operating in the audio-slave mode or (b) transitioning from operating in the audio-slave mode to operating in the audio-master mode.

69. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein the first control information identifies particular audio content to be played back by the synchrony group that is available at an audio source outside of the at least one data network, and wherein causing the at least one playback action to be applied in the synchrony group comprises causing a zone player operating in the audio-master mode to obtain audio information that is representative of the particular audio content.

70. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein the at least one future time relative to the reference clock time comprise at least one first future time that is determined based on a local clock of a zone player other than the first zone player.

71. (Currently Amended) The tangible, non-transitory computer-readable media of claim 65, wherein the at least one future time relative to the reference clock time comprise at least one first future time that is determined based on [[a]] the local clock of the first zone player.

72. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein the second control information comprises information indicative of a volume adjustment, and wherein performing one or more playback actions in accordance with the second control information comprises adjusting a playback volume of the first zone player.

73. (Currently Amended) The tangible, non-transitory computer-readable media of claim 65, wherein the playback timing information that is received while operating in the audio-slave mode comprises at least one future time at which at least the first and second zone players are to engage in synchronous playback a corresponding portion of the received audio information, and wherein operating in the audio-slave mode to engage in synchronous playback of the received audio information with at least the second zone player comprises:

updating the at least one future time to account for a differential between [[a]] the local clock time of the first zone player and a local clock time of another zone player; and
when the local clock time of the first zone player reaches the updated at least one future time, engaging in synchronous playback of the corresponding portion the received audio information with at least the second zone player.

74. (Previously Presented) The first zone player of claim 48, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

75. (Previously Presented) The first zone player of claim 49, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

76. (Previously Presented) The method of claim 57, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

77. (Previously Presented) The method of claim 58, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

78. (Previously Presented) The tangible, non-transitory computer-readable media of claim 66, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

79. (Previously Presented) The tangible, non-transitory computer-readable media of claim 67, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

Allowed Claims

Claims 47-79 are allowed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to OLEG SURVILLO whose telephone number is (571)272-9691. The examiner can normally be reached on 9:00am - 5:00pm.

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, William Trost can be reached on 571-272-7872. 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

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to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/OLEG SURVILLO/
Primary Examiner, Art Unit 2442

<i>Applicant-Initiated Interview Summary</i>	Application No. 13/864,249	Applicant(s) Millington, Nicholas A. J.		
	Examiner OLEG SURVILLO	Art Unit 2442	AIA (First Inventor to File) Status No	Page 1 of 2

All participants (applicant, applicants representative, PTO personnel):

1. OLEG SURVILLO (Primary Examiner); Telephonic 2. Jeffrey Armstrong (Attorney of Record); Telephonic

Date of Interview: 30 June 2020

Claims Discussed: claim 47

Prior Art Discussed: Goldberg, Isely, and Edens

Amendment proposed: proposed amendments are included with the Office action

Issues Discussed:

Proposed Amendments:
Discussed teachings of Isely and Goldberg. Discussed amendments filed with the last response on 03/27/2020 . Discussed further changes necessary to avoid prior art references that teach synchronization of local clocks to a master clock, such as Edens. In the course of subsequent communication agreed on proposed changed and obtained authorization for the Examiner's amendment that is included with this Office action.

/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	
<p>Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04</p> <p>Please further see: MPEP 713.04 Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b) 37 CFR § 1.2 Business to be transacted in writing</p>	

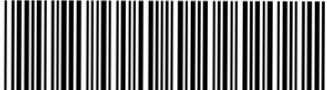
Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

<i>Index of Claims</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
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	42		✓	✓	=	-	-			

<i>Index of Claims</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

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<i>Search Notes</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CPC - Searched*		
Symbol	Date	Examiner
G06F 3/167, 17/00, 17/3074, 3/048, 3/0482, 3/0484, 3/126, 3/16	07/06/2020	OS
H04L 65/60, 12/2812	07/06/2020	OS

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
709	219, 220, 231	07/06/2020	OS

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Updated Inventor search	07/06/2020	OS
Updated Assignee search	07/06/2020	OS
Updated EAST search in USPAT, US-PGPUB, EPO, JPO, and FPRS databases	07/06/2020	OS

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	Text search in US-PGPUB database - See Interference search history printout	07/06/2020	OS

/OLEG SURVILLO/ Primary Examiner.Art Unit 2442	
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Issue Classification 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

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H04L	/	65	/	4076	I	2013-01-01
H04L	/	65	/	80	I	2013-01-01
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NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	33	
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	06 July 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	56	2

U.S. Patent and Trademark Office

Part of Paper No.: 20200706

Issue Classification 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CPC						
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CPC Combination Sets					
Symbol				Type	Set

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(Assistant Examiner)	(Date)	33	
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	06 July 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	56	2

U.S. Patent and Trademark Office

Part of Paper No.: 20200706

Issue Classification 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

INTERNATIONAL CLASSIFICATION			
CLAIMED			
G06F	/	15	/ 16
NON-CLAIMED			
	/		/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	33	
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	06 July 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	56	2

Issue Classification 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47																
CLAIMS																
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NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	33	
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	06 July 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	56	2

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Part of Paper No.: 20200706

dated 09/30/2019

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	6934300		2005-08-23	TOMASSETTI; Stephen Robert et al.			
	2	7095947		2006-08-22	VAN; Der Schaar Auke S.			
If you wish to add additional U.S. Patent citation information please click the Add button.							Add	
U.S.PATENT APPLICATION PUBLICATIONS							Remove	
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	20060156374		2006-07-13	HU; Carl C. et al.			
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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
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

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	CANADIAN PATENT OFFICE, Canadian Office Action mailed on 11 June 2019, issued in connection with Canadian Application No. 2982726, 4 pages.	
	2	Non-Final Office Action mailed on 22 July 2019, issued in connection with U.S. Patent Application No. 16/009182, filed on 14 June 2018, 23 pages.	
	3	Notice of Allowance mailed on 18 September 2019, issued in connection with U.S. Patent Application No. 16/459569, filed on 1 July 2019, 10 pages.	
	4	Notice of Allowance mailed on 21 May 2019, issued in connection with U.S. Patent Application No. 14/184522, filed on 19 February 2014, 9 pages.	
	5	Notice of Allowance mailed on 26 July 2019, issued in connection with U.S. Patent Application No. 14/184528, filed on 19 February 2014, 7 pages.	
	6	Patent Board Decision mailed on 31 May 2019, issued in connection with U.S. Patent Application No. 90/013959, filed on 16 June 2017, 9 pages.	
	7	Pro Tools Reference Guide Version 6.1 , 2003, 643 pages.	

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/OLEG SURVILLO/	Date Considered	07/06/2020
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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☒ A certification statement is not submitted herewith.

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Signature	/Brandon J. Kennedy/	Date (YYYY-MM-DD)	2019-09-27
Name/Print	Brandon J. Kennedy	Registration Number	67,894

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	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	1	5313524		1994-05-17	VAN HULLE; Steven T. F. et al.	
	2	6085236		2000-07-04	LEA; Rodger J.	
	3	6741708		2004-05-25	NAKATSUGAWA; Yoshinori.	
	4	7215649		2007-05-08	YU; Robert. et al.	
	5	7274761		2007-09-25	MULLER; Thomas. et al.	
	6	7690017		2010-03-30	STECYK; Polly. et al.	
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	3	20040203936		2004-10-14	OGINO; Minoru. et al.		
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	1	2485100	CA	A1	2003-11-13	GOLDBERG DAVID [US], et al.		
	2	1058985	EP	A2	2000-12-13	SONY ELECTRONICS INC [US]		
	3	1295420	EP	A1	2003-03-26	NOKIA CORP [FI]		
	4	03058965	WO	A1	2003-07-17	DIGEO INC [US]		

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	1	CANADIAN PATENT OFFICE, Canadian Office Action mailed on 3 March 2020, issued in connection with Canadian Application No. 3033268, 4 pages.	
	2	EUROPEAN PATENT OFFICE, European Extended Search Report mailed on 31 March 2020, issued in connection with European Application No. 19194999.9, 15 pages.	
	3	EUROPEAN PATENT OFFICE, European Search Report mailed on 27 January 2020, issued in connection with European Application No. 19194999.9, 16 pages.	
	4	Non-Final Office Action mailed on 13 November 2019, issued in connection with U.S. Patent Application No. 15/946660, filed on 5 April 2018, 6 pages.	
	5	Non-Final Office Action mailed on 30 April 2020, issued in connection with U.S. Patent Application No. 16/459605, filed on 1 July 2019, 25 pages.	
	6	Notice of Allowance mailed on 02 December 2019, issued in connection with U.S. Patent Application No. 16/514280, filed on 17 July 2019, 8 pages.	
	7	Notice of Allowance mailed on 06 December 2019, issued in connection with U.S. Patent Application No. 16/459565, filed on 1 July 2019, 8 pages.	
	8	Notice of Allowance mailed on 15 November 2019, issued in connection with U.S. Patent Application No. 16/544902, filed on 20 August 2019, 9 pages.	
	9	Notice of Allowance mailed on 26 December 2019, issued in connection with U.S. Patent Application No. 16/544900, filed on 20 August 2019, 20 pages.	

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10	Notice of Allowance mailed on 27 November 2019, issued in connection with U.S. Patent Application No. 14/184528, filed on 19 February 2014, 8 pages.
11	Notice of Allowance mailed on 28 April 2020, issued in connection with U.S. Patent Application No. 16/459569, filed on 1 July 2019, 8 pages.
12	Notice of Allowance mailed on 29 November 2019, issued in connection with U.S. Patent Application No. 16/459569, filed on 1 July 2019, 8 pages.
13	Sonos, Inc. v. Google LLC, Appendix A to Respondents' Response to the Complaint and Notice of Investigation, filed February 27, 2020, 2 pages. .
14	Sonos, Inc. v. Google LLC, Appendix B to Respondents' Response to the Complaint and Notice of Investigation, filed February 27, 2020, 176 pages. .
15	Sonos, Inc. v. Google LLC, Respondents' Response to the Complaint and Notice of Investigation, filed February 27, 2020, 46 pages.
16	Squeezebox by Logitech. Owner's Guide, 2007, 32 pages. .
17	Squeezebox Network Music Player. Owner's Manual, Slim Devices, 2003, 22 pages.

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Signature	/Brandon J. Kennedy/	Date (YYYY-MM-DD)	2020-05-05
Name/Print	Brandon J. Kennedy	Registration Number	67894

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dated 05/26/2020

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	2	20020083342		2002-06-27	WEBB; Brian T. et al.	
	3	20020112084		2002-08-15	DEEN; Gary D. et al.	
	4	20030023411		2003-01-30	WITMER; Don. et al.	
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	1	Amazon: Philips MCW770 WiFi Wireless PC Link AM/FM 5-CD Microsystem (Discontinued by Manufacturer): Home Audio & Theater, 5 pages [online]. [retrieved on 2020-02-24]. Retrieved from the Internet URL: https://www.amazon.com/gp/product/B000278KLC .	
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13	Connected Planet. Using PC Link. Streamium PC Link by Philips. Models MC-i200/250, SL300i, SL400i, MX6000i, last modified 5 August 2004, 2 pages. .
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27	Google's Answer to Complaint and Counterclaims filed with United States District Court Central District of California, Western Division on 2 March 2020, 50 pages. .
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40	Notice of Allowance mailed on 13 May 2020, issued in connection with U.S. Patent Application No. 16/544900, filed on 20 August 2019, 8 pages.

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	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

41	P4 0.3.1 software/source code available via link ("Download P4 0.3.1.") 1 page [online]. [retrieved on 2020-03-26]. Retrieved from the Internet URL: http://snarfed.org/p4 .
42	p4sync/player.cpp. GitHub. Copyright 2005, 4 pages [online]. [retrieved on 2020-03-26]. Retrieved from the Internet URL: http://github.com/snarfed/p4sync/blob/master/player.cpp .
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EXAMINER SIGNATURE			
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See attached certification statement.

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☒ A certification statement is not submitted herewith.

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Signature	/Brandon J. Kennedy/	Date (YYYY-MM-DD)	2020-05-21
Name/Print	Brandon J. Kennedy	Registration Number	67894

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SERIAL NUMBER 13/864,249	FILING or 371(c) DATE 04/17/2013 RULE	CLASS 709	GROUP ART UNIT 2442	ATTORNEY DOCKET NO. 13-0402 (MBHB 15-518-CON)		
APPLICANTS SONOS, INC., Santa Barbara, CA INVENTORS Nicholas A. J. Millington, Santa Barbara, CA; ** CONTINUING DATA ***** This application is a CON of 13/297,000 11/15/2011 PAT 9182777 which is a CON of 10/816,217 04/01/2004 PAT 8234395 which claims benefit of 60/490,768 07/28/2003 ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 05/21/2013						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and /OLEG SURVILLO/ Acknowledged Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY CA	SHEETS DRAWINGS 5	TOTAL CLAIMS 33	INDEPENDENT CLAIMS 3
ADDRESS McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606 UNITED STATES						
TITLE CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION						
FILING FEE RECEIVED 2800	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			☐ All Fees		
				☐ 1.16 Fees (Filing)		
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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	5	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) with (performance or latency) near2 (master or leader or broadcast or broadcaster or device or player) with based same (audio or video or streaming or music) and (@ad<"20040401" or @rlad<"20040401")	US-PGPUB; USPAT	OR	ON	2020/07/06 11:59
S2	5	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) with (performance or latency) near2 (master or leader or broadcast or broadcaster or device or player) with based same (audio or video or streaming or music) and (@ad<"20040401" or @rlad<"20040401")	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:00
S3	4,744	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) and sonos	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:02
S4	125	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) with (performance or latency) and sonos	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:03
S5	13	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) with (performance or latency) and sonos.as.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:04
S6	265	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) and millington-\$.in.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:04
S7	45	((select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server)).clm. and millington-\$.in.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:05

S8	23,209	G06F3/167.CPC.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:19
S9	8,635	G06F17/00.CPC.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:19
S10	19	G06F17/3074.CPC.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:19
S11	15,977	G06F3/048.CPC.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:19
S12	79,313	G06F3/0482.CPC.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:19
S13	29,703	G06F3/0484.CPC.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:19
S14	5,177	G06F3/126.CPC.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:19
S15	10,902	G06F3/16.CPC.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:19
S16	10,037	H04L65/60.CPC.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 12:20
S17	2,657	H04L12/281.CPC.	US- PGPUB; USPAT;	OR	ON	2020/07/06 12:20

			FPRS; EPO; JPO		
S18	3,090	H04L12/2812.CPC.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON
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EAST Search History (Interference)

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dated 05/26/2020

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	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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1	Philips. Media Manager Software - English version: PMM 3.3.12, software/ source code available via zip file ("Media Manager Software - English") published September 15, 2004, 3 pages [online], [retrieved on 2020-02-24]. Retrieved from the Internet URL : https://www.usa.philips.com/c-p/MCW770_37/-/support .
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3	Philips.Wireless PC Link Micro MCW770 Custom Installation, User Manual, published August 24, 2004, 61 pages.
4	Rocketfish Wireless Outdoor Speaker RF-RBWS02 User Guide, 2009, 33 pages. .
5	snarfed/p4sync. GitHub: A library and plugins for a few music players that (attempts to) synchronize playback across multiple computers, 2 pages [online]. [retrieved on 2020-03-26]. Retrieved online URL: https://github.com/snarfed/p4sync .
6	Software & drivers. Micro Audio System MCW770/37. Philips. Copyright 2004-2020, 3 pages [online]. [retrieved on 2020-02-24]. Retrieved from the Internet URL: https://www.usa.philips.com/c-p/MCW770_37/-/support .
7	Sonos v. Google. Exhibit A to Respondents' Initial Invalidity Contentions dated 29 April 2020, 194 pages.
8	Sonos v. Google. Respondents' Initial Invalidity Claim Charts for Patent US 10,439,896, Exhibits 1-16 and B, dated 29 April 2020, 1102 pages.
9	Sonos v. Google. Respondents' Initial Invalidity Claim Charts for US Patent 10,209,953, Exhibits 1-10 and B, dated 29 April 2020, 288 pages.
10	Sonos v. Google. Respondents' Initial Invalidity Claim Charts for US Patent 8,588,949, Exhibits 1-19 and B, dated 29 April 2020, 280 pages. .
11	Sonos v. Google. Respondents' Initial Invalidity Claim Charts for US Patent 9,195,258, Exhibits 1 - 10 and B, dated 29 April 2020, 345 pages. .

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14	Squeezebox Duet Network Music System by Logitech. User Guide English (North America), 2008, 45 pages.
15	Step-by-step P4 Connection. P4 Poster (without music), 5 pages [online], [retrieved on 2020-03-26]. Retrieved from the Internet URL: https://snarfed.org/p4_poster/index.html .
16	Structured Media Components. Leviton Integrated Networks, last modified 10 April 2006, 28 pages.
17	Support. Manuals & Documentation. Micro Audio System MCW770/37. Philips. Copyright 2004-2020, 3 pages. [online], [retrieved on 2020-02-24]. Retrieved from the Internet URL: https://www.usa.philips.com/c-p/MCW770_37/-/support .
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23	Weverka et al. Windows XP Gigabook for Dummies. Wiley Publishing, Inc. 2004, 915 pages.
24	Wireless Home Audio Director. Wireless N Music Player with Integrated Amplifier DMC250. Datasheet. Linksys by Cisco. Fill Your Home with Music, 2008, 2 pages. .
25	Yahoo Groups. Exstreamer. Barix Exstreamer. Access via Wayback Machine http://groups.yahoo.com/group/exstreamer/ December 22, 2013, 1 page. .
26	Yamaha DME Designer 3.0 Owner's Manual; Copyright 2008, 501 pages.

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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.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S934	130	(US-20070142944-\$ or US-20020062406-\$ or US-20040252400-\$ or US-20040078383-\$ or US-20140173432-\$ or US-20140181270-\$ or US-20140181173-\$ or US-20070299778-\$ or US-20020194309-\$ or US-20030073432-\$ or US-20120192071-\$ or US-20040019497-\$ or US-20130231765-\$ or US-20120191232-\$ or US-20070249295-\$ or US-20040093096-\$ or US-20040143852-\$ or US-20050011388-\$ or US-20030110329-\$ or US-20030061428-\$ or US-20040143368-\$ or US-20020177411-\$ or US-20050027821-\$ or US-20020173273-\$ or US-20050062637-\$ or US-20040098754-\$).did. or (US-20040213230-\$ or US-20040228367-\$ or US-20130097506-\$ or US-20030018797-\$ or US-20040208158-\$ or US-20020114354-\$ or US-20020080783-\$ or US-20060098936-\$ or US-20030200001-\$ or US-20030198257-\$ or US-20030198255-\$ or US-20030198254-\$ or US-20020124097-\$ or US-20100299639-\$ or US-20070043847-\$ or US-20040248601-\$ or US-20030035072-\$ or US-20020114359-\$ or US-20040048569-\$ or US-20030023741-\$ or US-20040224638-\$ or US-20040012620-\$ or US-20050166135-\$ or US-20050015551-\$ or US-20010047377-\$ or US-20020159596-\$ or US-20030219007-\$).did. or (US-20040141576-\$ or US-20050125222-\$ or US-20140075311-\$ or US-20020067909-\$ or US-20040058706-\$ or US-20040032421-\$ or US-20020131398-\$ or US-20060161742-\$ or US-20030063528-\$ or US-20130268104-\$ or US-20030123853-\$ or US-20020035621-\$ or US-20050146444-\$ or US-20040117491-\$ or US-20030050058-\$ or US-20020194260-\$ or US-20030182254-\$ or US-20020150053-\$ or US-20060049966-\$ or US-20030118158-\$ or US-20140181199-\$ or US-20140177875-\$ or US-20140052770-\$ or	US-PGPUB; USPAT	OR	ON	2019/09/27 14:19

		US-20130290419-\$ or US-20060041577-\$ or US-20080157991-\$ or US-20030210347-\$).did. or (US-20050102699-\$ or US-20040189363-\$ or US-20030164084-\$ or US-20130076651-\$ or US-20140075308-\$).did. or (US-6598172-\$ or US-6255961-\$ or US-7571014-\$ or US-7711774-\$ or US-6816818-\$ or US-5923869-\$ or US-6687664-\$ or US-5726989-\$ or US-6970482-\$ or US-7130368-\$ or US-6343028-\$ or US-6526325-\$ or US-6108485-\$ or US-8234395-\$ or US-6778493-\$ or US-8588949-\$ or US-7206367-\$ or US-7702403-\$ or US-7068596-\$ or US-6823225-\$ or US-6122668-\$ or US-8611559-\$ or US-8218790-\$ or US-7672470-\$ or US-7319764-\$ or US-7257398-\$).did. or (US-5596696-\$ or US-5198603-\$ or US-7945143-\$ or US-6917592-\$ or US-8483853-\$ or US-7710941-\$ or US-6032202-\$ or US-6611537-\$ or US-7006758-\$ or US-5838909-\$ or US-8131389-\$ or US-6446080-\$ or US-6526411-\$ or US-7167765-\$ or US-6639584-\$ or US-7756743-\$ or US-5732059-\$ or US-6910078-\$ or US-6934300-\$).did.				
S935	3	S934 and goldberg	US-PGPUB; USPAT	OR	ON	2019/09/27 14:20
S936	1	S934 and isely.in.	US-PGPUB; USPAT	OR	ON	2019/09/27 14:20
S937	1	S934 and edens.in.	US-PGPUB; USPAT	OR	ON	2019/09/27 14:21
S939	347	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster) near4 (performance or capability) and (@ad<"20130529" or @rlad<"20130529") not sonos.as.	US-PGPUB; USPAT	OR	ON	2019/09/29 17:25
S940	185	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster) near4 (performance or capability) and (@ad<"20040401" or @rlad<"20040401") not sonos.as.	US-PGPUB; USPAT	OR	ON	2019/09/29 17:49

S941	177	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player) with (performance or capability) near2 (master or leader or broadcast or broadcaster or device or player) with based and (@ad<"20040401" or @rlad<"20040401") not sonos.as.	US-PGPUB; USPAT	OR	ON	2019/09/29 17:52
S942	0	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster) with (performance or capability) near2 (master or leader or broadcast or broadcaster or device or player) with based and (@ad<"20040401" or @rlad<"20040401") not sonos.as.	US-PGPUB; USPAT	OR	ON	2019/09/29 17:58
S943	3	(select or selecting or selected or choose or choosing or chosen or determin\$3 or identif\$3) near2 (master or leader or broadcast or broadcaster) with (performance or capability) near2 (master or leader or broadcast or broadcaster or device or player) with based and (@ad<"20040401" or @rlad<"20040401") not sonos.as.	US-PGPUB; USPAT	OR	ON	2019/09/29 17:59
S944	35	exchang\$3 near2 clock adj2 (time or value) and (@ad<"20040401" or @rlad<"20040401") not sonos.as.	US-PGPUB; USPAT	OR	ON	2019/09/29 18:18
S945	1	"8942252".pn.	US-PGPUB; USPAT	OR	ON	2019/11/12 14:48
S946	1	"7391791".pn.	US-PGPUB; USPAT	OR	ON	2019/11/12 14:48
S947	8	("5642171" "6119239" "6122749" "6389057" "6703940" "6775246" "7269338" "7313384").pn.	US-PGPUB; USPAT	OR	ON	2019/11/12 14:51
S948	4	("8601394" "8688431" "9407385" "9628851").pn.	US-PGPUB; USPAT	OR	ON	2019/11/12 14:53
S949	6	"20020174269" "20030037125" "20070220150" "20080109852"	US-PGPUB; USPAT	OR	ON	2019/11/12 14:54
S950	1	"10063896".pn.	US-PGPUB; USPAT	OR	ON	2019/11/14 10:07

S951	1	"6389057".pn.	US-PGPUB; USPAT	OR	ON	2019/11/14 10:08
S952	1	"7095947".pn.	US-PGPUB; USPAT	OR	ON	2019/11/14 10:08
S953	1	"20030037125"	US-PGPUB; USPAT	OR	ON	2019/11/14 10:09
S954	1	"7089333".pn.	US-PGPUB; USPAT	OR	ON	2019/11/25 02:37
S955	1	"8588949".pn.	US-PGPUB; USPAT	OR	ON	2019/11/25 02:40
S956	1	"9195258".pn.	US-PGPUB; USPAT	OR	ON	2019/11/25 02:41
S957	1	"9219959".pn.	US-PGPUB; USPAT	OR	ON	2019/11/25 02:41
S958	1	"8868698".pn.	US-PGPUB; USPAT	OR	ON	2019/11/25 02:42
S959	1	"9883234".pn.	US-PGPUB; USPAT	OR	ON	2019/11/25 02:42
S960	1	"8938312".pn.	US-PGPUB; USPAT	OR	ON	2019/11/25 02:42
S961	1	"9252721".pn.	US-PGPUB; USPAT	OR	ON	2019/11/25 02:43
S962	1	"7391791".pn.	US-PGPUB; USPAT	OR	ON	2019/11/25 02:50
S963	1	"8942252".pn.	US-PGPUB; USPAT	OR	ON	2019/11/25 02:53
S964	1	"20140181199"	US-PGPUB; USPAT	OR	ON	2019/12/09 11:37
S965	19,313	(queue or playlist or play adj1 list) near2 (control or controlling or controlled) and (@ad<"20130529" or @rlad<"20130529")	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2019/12/09 13:08

S966	404	(queue or playlist or play adj1 list) near2 (control or controlling or controlled) with (music or song) and (@ad<"20130529" or @rlad<"20130529")	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2019/12/09 13:10
S967	24	(queue or playlist or play adj1 list) near2 (control or controlling or controlled) with (music or song) and (synchronous or synchronizing or synch or synchronize or synchronized) near3 (playback or play\$3) and (@ad<"20130529" or @rlad<"20130529")	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2019/12/09 13:11
S968	34	(queue or playlist or play adj1 list) near2 (shar\$3 or distribut\$3 or transmit\$3 or transmission) with (music or song) and (synchronous or synchronizing or synch or synchronize or synchronized) near3 (playback or play\$3) and (@ad<"20130529" or @rlad<"20130529")	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2019/12/09 13:16
S969	1,993	(queue or playlist or play adj1 list) near2 (shar\$3 or distribut\$3 or transmit\$3 or transmission) and (queue or playlist or play adj1 list) near2 (local) and (@ad<"20130529" or @rlad<"20130529")	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2019/12/09 13:45
S970	645	(queue or playlist or play adj1 list) near2 (shar\$3 or distribut\$3 or transmit\$3 or transmission) same (queue or playlist or play adj1 list) near2 (local) and (@ad<"20130529" or @rlad<"20130529")	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2019/12/09 13:47
S971	68	(queue or playlist or play adj1 list) near2 (shar\$3 or distribut\$3 or transmit\$3 or transmission) same (queue or playlist or play adj1 list) near2 (local) same (music or song or audio) and (@ad<"20130529" or @rlad<"20130529")	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2019/12/09 13:48
S972	85	(queue or playlist or play adj1 list) near2 (shar\$3 or distribut\$3 or transmit\$3 or transmission) same (queue or playlist or play adj1 list) near2 (local) same (music or song or audio or track) and (@ad<"20130529" or @rlad<"20130529")	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2019/12/09 13:49
S973	10	"10209953"	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2019/12/11 12:52
S974	4	"10209953".pn.	US-PGPUB; USPAT;	OR	ON	2019/12/11 12:52

			FPRS; EPO; JPO			
S975	1	"20140181199"	US- PGPUB; USPAT	OR	ON	2020/02/25 20:28
S976	19,345	(queue or playlist or play adj1 list) near2 (control or controlling or controlled) and (@ad<"20130529" or @rlad<"20130529")	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:03
S977	406	(queue or playlist or play adj1 list) near2 (control or controlling or controlled) with (music or song) and (@ad<"20130529" or @rlad<"20130529")	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:04
S978	24	(queue or playlist or play adj1 list) near2 (control or controlling or controlled) with (music or song) and (synchronous or synchronizing or synch or synchronize or synchronized) near3 (playback or play\$3) and (@ad<"20130529" or @rlad<"20130529")	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:04
S979	100	(queue or playlist or play adj1 list) near2 (shar\$3 or distribut\$3 or transmit\$3 or transmission) with (music or song or media) and (synchronous or synchronizing or synch or synchronize or synchronized) near3 (playback or play\$3) and (@ad<"20130529" or @rlad<"20130529")	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:05
S980	2,004	(queue or playlist or play adj1 list) near2 (shar\$3 or distribut\$3 or transmit\$3 or transmission) and (queue or playlist or play adj1 list) near2 (local) and (@ad<"20130529" or @rlad<"20130529")	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:06
S981	653	(queue or playlist or play adj1 list) near2 (shar\$3 or distribut\$3 or transmit\$3 or transmission) same (queue or playlist or play adj1 list) near2 (local) and (@ad<"20130529" or @rlad<"20130529")	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:06
S982	68	(queue or playlist or play adj1 list) near2 (shar\$3 or distribut\$3 or transmit\$3 or transmission) same (queue or playlist or play adj1 list) near2 (local) same (music or song or audio) and (@ad<"20130529" or @rlad<"20130529")	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:07
S983	89	(queue or playlist or play adj1 list) near2 (shar\$3 or distribut\$3 or transmit\$3 or transmission) same (queue or playlist or play adj1 list) near2 (local) same (music	US- PGPUB; USPAT;	OR	ON	2020/02/26 21:10

		or song or audio or track) and (@ad<"20130529" or @rlad<"20130529")	FPRS; EPO; JPO			
S984	20,539	G06F3/167.cpc.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:11
S985	8,381	G06F17/00.cpc.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:11
S986	14	G06F17/3074.cpc.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:11
S987	15,164	G06F3/048.cpc.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:12
S988	74,918	G06F3/0482.cpc.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:12
S989	27,945	G06F3/0484.cpc.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:12
S990	5,049	G06F3/126.cpc.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:12
S991	10,336	G06F3/16.cpc.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:12
S992	9,655	H04L65/60.cpc.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:12

S993	3,019	H04L12/2812.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:12
S994	15,723	709/219.ccls.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:12
S995	7,657	709/231.ccls.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/02/26 21:13
S1000	1	"9195258".pn.	US-PGPUB; USPAT	OR	ON	2020/04/27 00:19
S1001	1	"10209953".pn.	US-PGPUB; USPAT	OR	ON	2020/04/27 00:20
S1002	1	"8588953".pn.	US-PGPUB; USPAT	OR	ON	2020/04/27 00:20
S1003	1	"8588949".pn.	US-PGPUB; USPAT	OR	ON	2020/04/27 00:21
S1004	1	"9219959".pn.	US-PGPUB; USPAT	OR	ON	2020/04/27 00:21
S1005	1	"10439896".pn.	US-PGPUB; USPAT	OR	ON	2020/04/27 00:21
S1006	6	"5313524".pn. or "6085236".pn. or "7274761".pn. or "7690017".pn. or "8134650".pn. or "6741708".pn.	US-PGPUB; USPAT	OR	ON	2020/04/27 00:32
S1007	6	S1006 and volume	US-PGPUB; USPAT	OR	ON	2020/04/27 00:33
S1008	1	S1006 and volume near3 (control\$4 or adjust\$4)	US-PGPUB; USPAT	OR	ON	2020/04/27 00:33
S1009	3	S1006 and (synchronize or synchrony or sync or synch or synchronization or synchronized)	US-PGPUB; USPAT	OR	ON	2020/04/27 00:34

S1010	8	"20020129128" "20040203936" "20020083172" "20020083342" "20020112084" "20030023411" "20030046703"	US- PGPUB; USPAT	OR	ON	2020/04/27 00:37
S1011	1	S1010 and volume near3 (control\$4 or adjust\$4)	US- PGPUB; USPAT	OR	ON	2020/04/27 00:37
S1012	2	S1010 and (synchronize or synchrony or sync or synch or synchronization or synchronized)	US- PGPUB; USPAT	OR	ON	2020/04/27 00:52
S1013	348	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster) near4 (performance or capability) and (@ad<"20130529" or @rlad<"20130529") not sonos.as.	US- PGPUB; USPAT	OR	ON	2020/04/27 01:12
S1014	348	S1013	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/04/27 01:12
S1015	186	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster) near4 (performance or capability) and (@ad<"20040401" or @rlad<"20040401") not sonos.as.	US- PGPUB; USPAT	OR	ON	2020/04/27 01:12
S1016	186	S1015	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/04/27 01:12
S1017	177	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player) with (performance or capability) near2 (master or leader or broadcast or broadcaster or device or player) with based and (@ad<"20040401" or @rlad<"20040401") not sonos.as.	US- PGPUB; USPAT	OR	ON	2020/04/27 01:12
S1018	177	S1017	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/04/27 01:12
S1019	3	(select or selecting or selected or choose or choosing or chosen or determin\$3 or identif\$3) near2 (master or leader or broadcast or broadcaster) with	US- PGPUB; USPAT	OR	ON	2020/04/27 01:12

		(performance or capability) near2 (master or leader or broadcast or broadcaster or device or player) with based and (@ad<"20040401" or @rlad<"20040401") not sonos.as.				
S1020	3	S1019	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/04/27 01:12
S1021	35	exchang\$3 near2 clock adj2 (time or value) and (@ad<"20040401" or @rlad<"20040401") not sonos.as.	US-PGPUB; USPAT	OR	ON	2020/04/27 01:13
S1022	35	S1021	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/04/27 01:13
S1027	1	"7215649".pn.	US-PGPUB; USPAT	OR	ON	2020/05/09 19:17
S1028	1	"9977561".pn.	US-PGPUB; USPAT	OR	ON	2020/05/09 19:20
S1029	6	"20030100335"	US-PGPUB; USPAT	OR	ON	2020/05/09 19:22
S1030	2	"20060281409"	US-PGPUB; USPAT	OR	ON	2020/05/09 19:24
S1031	468	(synchrony or synchroniz\$3) near3 (playback or playing) with (audio or music or sound or song) and clock and (@ad<"20040401" or @rlad<"20040401")	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2020/05/09 22:12
S1032	33	(synchrony or synchroniz\$3) near3 (playback or playing) with (audio or music or sound or song) with (transition\$3 or switch\$3) and (@ad<"20040401" or @rlad<"20040401")	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2020/05/10 00:12
S1033	204	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) with (performance or capability) near2 (master or leader or broadcast or broadcaster or device or player) with based and	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 10:47

		(@ad<"20040401" or @rlad<"20040401") not sonos.as.				
S1034	45	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) with (performance) near2 (master or leader or broadcast or broadcaster or device or player) with based and (@ad<"20040401" or @rlad<"20040401") not sonos.as.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 10:49
S1035	52	(select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) with (performance or latency) near2 (master or leader or broadcast or broadcaster or device or player) with based and (@ad<"20040401" or @rlad<"20040401") not sonos.as.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2020/07/06 10:50
S1038	33	(synchrony or synchroniz\$3) near3 (playback or playing) with (audio or music or sound or song) with (transition\$3 or switch\$3) and (@ad<"20040401" or @rlad<"20040401")	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2020/07/06 14:19
S1039	2	sonos.as. and survillo and mode.clm.	US-PGPUB; USPAT	OR	ON	2020/07/06 14:20

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S938	1	"Term Removed"	US-PGPUB	OR	ON	2019/09/27 14:19
S996	0	((queue or playlist or play adj1 list) near2 (control or controlling or controlled) with (music or song) and (synchronous or synchronizing or synch or synchronize or synchronized) near3 (playback or play\$3)).clm.	US-PGPUB	OR	ON	2020/02/26 21:05
S997	9	((queue or playlist or play adj1 list) with (music or song) and (synchronous or synchronizing or synch or synchronize or synchronized) near3 (playback or play\$3)).clm.	US-PGPUB	OR	ON	2020/02/26 21:05
S998	76	((queue or playlist or play adj1 list) with (music or song or media) and (synchronous or synchronizing or synch or synchronize or	US-PGPUB	OR	ON	2020/02/26 21:05

		synchronized) near3 (playback or play\$3)).clm.				
S999	5	((queue or playlist or play adj1 list) near2 (share\$3 or distribute\$3 or transmit\$3 or transmission) same (queue or playlist or play adj1 list) near2 (local) same (music or song or audio)).clm.	US-PGPUB	OR	ON	2020/02/26 21:07
S1025	41	(volume near3 (adjustment) with (slave or other or peer or second) near3 (player or device)).clm.	US-PGPUB	OR	ON	2020/04/27 01:14
S1026	11	(volume near3 (control or controlling or controlled or adjust\$3) with (slave or other or peer) near3 (player or device)).clm.	US-PGPUB	OR	ON	2020/04/27 01:14
S1036	58	((select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) with (performance or latency) near2 (master or leader or broadcast or broadcaster or device or player) with based).clm.	US-PGPUB	OR	ON	2020/07/06 11:51
S1037	1	((select or selecting or selected or choose or choosing or chosen) near2 (master or leader or broadcast or broadcaster or device or player or server) with (performance or latency) near2 (master or leader or broadcast or broadcaster or device or player) with based with (audio or music)).clm.	US-PGPUB	OR	ON	2020/07/06 11:53
S1040	1	((synchrony or synchronous\$3) near2 (play or playing or playback) and clock near3 (transmit\$4 or provide\$3 or send\$3) near3 network).clm.	US-PGPUB	OR	ON	2020/07/06 14:24
S1041	89	((playback or playing) with (audio or music or sound or song) with (transition\$3 or switch\$3) near3 (state or mode)).clm.	US-PGPUB	OR	ON	2020/07/06 14:24
S1042	0	((playback or playing) with (audio or music or sound or song) with (transition\$3 or switch\$3) near3 (state or mode) and master with slave).clm.	US-PGPUB	OR	ON	2020/07/06 14:32

7/6/2020 2:34:54 PM

C:\Users\osurvillo\Documents\EAST\Workspaces\14186850.wsp

dated 11/26/2019

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	5642171		1997-06-24	BAUMGARTNER; Donn M. et al.	
	2	6119239		2000-09-12	FUJII; Kazuo	
	3	6122749		2000-09-19	GULICK; Dale A.	
	4	6389057		2002-05-14	HAARTSEN; Jacobus C.	
	5	6703940		2004-03-09	ALLEN; William A. et al.	
	6	6775246		2004-08-10	KURIBAYASHI; Hirotaka et al.	
	7	7089333		2006-08-08	MARINESCU; Marian et al.	
	8	7269338		2007-09-11	JANEVSKI; Angel	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

	9	7313384		2007-12-25	MEENAN; Patrick et al.	
	10	8601394		2013-12-03	SHEEHAN; Conor et al.	
	11	8688431		2014-04-01	LYONS; Kenneth S. et al.	
	12	9407385		2016-08-02	SPURGAT; Jeffrey Jonathan et al.	
	13	9628851		2017-04-18	HU; Carl Chun-Hei et al.	

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U.S.PATENT APPLICATION PUBLICATIONS

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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	20020174269		2002-11-21	SPURGAT; Jeffrey Jonathan et al.	
	2	20030037125		2003-02-20	LUMAN; David J. et al.	
	3	20070220150		2007-09-20	GARG; Gopal K.	
	4	20080109852		2008-05-08	KRETZ; Martin H. et al.	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

FOREIGN PATENT DOCUMENTS								Remove
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	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	02091596	WO	A2	2002-11-14	M & S SYSTEMS INC [US]		
	2	9709756	WO	A2	1997-03-13	BUCALO BRIAN D [US], et al.		

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NON-PATENT LITERATURE DOCUMENTS								Remove
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	Non-Final Office Action mailed on 01 October 2019, issued in connection with U.S. Patent Application No. 16/516567, filed on 19 July 2019, 11 pages.						
	2	Notice of Allowance mailed on 01 October 2019, issued in connection with U.S. Patent Application No. 16/544902, filed on 20 August 2019, 23 pages.						
	3	Notice of Allowance mailed on 25 September 2019, issued in connection with U.S. Patent Application No. 16/459565, filed on 1 July 2019, 14 pages.						
	4	Notice of Allowance mailed on 26 September 2019, issued in connection with U.S. Patent Application No. 16/514280, filed on 17 July 2019, 16 pages.						
	5	Sonos, Inc. v. Implicit, LLC: Declaration of Roman Chertov in Support of the Inter Partes Review of U.S. Patent No. 7,391,791 dated March 9, 2018, 92 pages.						
	6	Sonos, Inc. v. Implicit, LLC: Declaration of Roman Chertov in Support of the Inter Partes Review of U.S. Patent No. 8,942,252 dated March 9, 2018, 81 pages.						

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
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	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

7	Sonos, Inc. v. Lenbrook Industries Limited et al., Defendants' Answer to Plaintiff's Complaint - Exhibit A, filed October 14, 2019, 3 pages.
8	Sonos, Inc. v. Lenbrook Industries Limited et al., Defendants' Answer to Plaintiff's Complaint - Exhibit C, filed October 14, 2019, 16 pages.
9	Sonos, Inc. v. Lenbrook Industries Limited et al., Defendants' Answer to Plaintiff's Complaint - Exhibit D, filed October 14, 2019, 36 pages.
10	Sonos, Inc. v. Lenbrook Industries Limited et al., Defendants' Answer to Plaintiff's Complaint - Exhibit E, filed October 14, 2019, 21 pages.
11	Sonos, Inc. v. Lenbrook Industries Limited et al., Defendants' Answer to Plaintiff's Complaint, filed October 14, 2019, 66 pages.
12	Sonos, Inc. v. Lenbrook Industries Limited et al., Defendants' First Amended Answer and Counterclaims to Plaintiff's Complaint, filed November 14, 2019, 66 pages.

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Examiner Signature	/OLEG SURVILLO/	Date Considered	07/06/2020
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
<p>That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).</p>			
OR			
<p>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).</p>			
<p>☐ See attached certification statement.</p>			
<p>☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.</p>			
<p>☒ A certification statement is not submitted herewith.</p>			
SIGNATURE			
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	/Brandon J. Kennedy/	Date (YYYY-MM-DD)	2019-11-25
Name/Print	Brandon J. Kennedy	Registration Number	67894
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
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.
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4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	7792311		2010-09-07	HOLMGREN; Steve F. et al.		
	2	7907736		2011-03-15	YUEN; Thomas C. K. et al.		

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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	20090060219		2009-03-05	INOHARA; Yuichi.		
	2	20090169030		2009-07-02	INOHARA; Yuichi.		

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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	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	None						

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	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

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NON-PATENT LITERATURE DOCUMENTS			Remove
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	Anonymous, "Transmission Control Protocol," RFC: 793, USC/Information Sciences Institute, September 1981, 91 pages.	
	2	Notice of Allowance mailed on 29 May 2020, issued in connection with U.S. Patent Application No. 16/514280, filed on 17 July 2019, 8 pages.	
	3	Notice of Allowance mailed on June 2 2020, issued in connection with U.S. Patent Application No. 15/946660, filed on 5 April 2018, 5 pages.	
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Examiner Signature			Date Considered
<p>*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.</p>			
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	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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See attached certification statement.

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

☒ A certification statement is not submitted herewith.

SIGNATURE

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 R. Grosby/	Date (YYYY-MM-DD)	2020-07-07
Name/Print	David R. Grosby	Registration Number	75912

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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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)).
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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.

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Docket No. 13-0402)**

In re the Application of:	)	
	)	
Sonos, Inc.	)	
	)	Group Art Unit 2442
Serial No.: 13/864,249	)	
	)	
Filed: April 17, 2013	)	
	)	Examiner: Oleg Survillo
Confirmation No. 9806	)	
	)	
For: Concurrent Transmission and Playback	)	
Of Audio Information	)	

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P.O. Box 1450
Alexandria, Virginia 22313-1450

TRANSMITTAL WITH INFORMATION DISCLOSURE STATEMENT

Pursuant to 37 CFR § 1.34, the undersigned hereby confirms that the attached Information Disclosure Statement (IDS) is being filed in accordance with the undersigned's authority to act in a representative capacity on behalf of Applicant, Sonos, Inc., in connection with the preparation and filing of IDSs for the above-referenced matter.

Respectfully submitted,

Dated: July 7, 2020

By: /David R. Grosby/
David R. Grosby
Reg. No. 75,912
Lee Sullivan Shea & Smith LLP
656 W. Randolph St., Floor 5W
Chicago, Illinois 60661
(312) 754-9423
grosby@ls3ip.com

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		David Rittenhouse Grosby/Jaden Knosher		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
Total in USD (\$)				240

Electronic Acknowledgement Receipt	
EFS ID:	39935580
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	David Rittenhouse Grosby
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	07-JUL-2020
Filing Date:	17-APR-2013
Time Stamp:	17:57:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 240
RAM confirmation Number	E202077H57330941
Deposit Account	506632
Authorized User	David Grosby
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37 CFR 1.19 (Document supply fees)					
37 CFR 1.17 (Patent application and reexamination processing fees)					
37 CFR 1.16 (National application filing, search, and examination fees)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	Anonymous_Trans_Control_Protocol_RFC_793.pdf	3636288	no	91
			a71530bbd7acf6c2262df2f01d5274e0e11aa5cd		
Warnings:					
Information:					
2	Non Patent Literature	16514280_NOA_04-0401-CON0719C_5-29-20_8pages.pdf	422574	no	8
			394d0da917b3a7af9cbf9b02f1a7ddd87e77d97b		
Warnings:					
Information:					
3	Non Patent Literature	15946660_NOA_13-0411-CON0418_6-2-20_5pages.pdf	352470	no	5
			6325c7b897cb04c3303de0f21535aa521f51e1765		
Warnings:					
Information:					
4	Information Disclosure Statement (IDS) Form (SB08)	13-0402_0_IDS_20200707172740.pdf	1053491	no	4
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5	Transmittal Letter	IDS_Transmittal.pdf	68895	no	1
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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

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Electronic Acknowledgement Receipt	
EFS ID:	39523002
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Brandon Jacob Kennedy
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	26-MAY-2020
Filing Date:	17-APR-2013
Time Stamp:	18:17:02
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	Non Patent Literature	HP_Deskjet_5850_User_Guide_217pages.pdf	24275225 3f67f2c98b08d9dff0c4383f86f1891ac63deacd	no	217

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Information:					
3	Non Patent Literature	AudioPoint_Welcome_to_the_coolest_2002_2pages.pdf	919776	no	2
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Information:					
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21	Non Patent Literature	Google_Initial_Invalidity_Claim_Charts_Patent_949_Ex_1-19_and_B_280pages.pdf	6452121	no	280
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22	Non Patent Literature	Google_Initial_Invalidity_Claim_Charts_Patent_953_Ex_1-10_andB_288pages.pdf	8966492	no	288
			e36ab20810c7e3380aad060cea28334558d5845d		
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23	Non Patent Literature	Google_Initial_Invalidity_Claim_Charts_Patent_896_Ex_1-16_B_1102pages.pdf	23657734	no	1102
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24	Non Patent Literature	Yamaha_DME_3_Owners_Manual_501pages_Part1.pdf	23079753	no	375
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25	Non Patent Literature	Yamaha_DME_3_Owners_Manual_501pages_Part2.pdf	16744757	no	126
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Total Files Size (in bytes):			192768872		
<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	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

1	Philips. Media Manager Software - English version: PMM 3.3.12, software/ source code available via zip file ("Media Manager Software - English") published September 15, 2004, 3 pages [online], [retrieved on 2020-02-24]. Retrieved from the Internet URL : https://www.usa.philips.com/c-p/MCW770_37/-/support .
2	Philips. PC Software version: V.12.1, software/ source code available via zip file ("PC Software") published September 15, 2004, 3 pages [online], [retrieved on 2020-02-24]. Retrieved from the Internet URL : https://www.usa.philips.com/c-p/MCW770_37/-/support .
3	Philips.Wireless PC Link Micro MCW770 Custom Installation, User Manual, published August 24, 2004, 61 pages.
4	Rocketfish Wireless Outdoor Speaker RF-RBWS02 User Guide, 2009, 33 pages. .
5	snarfed/p4sync. GitHub: A library and plugins for a few music players that (attempts to) synchronize playback across multiple computers, 2 pages [online]. [retrieved on 2020-03-26]. Retrieved online URL: https://github.com/snarfed/p4sync .
6	Software & drivers. Micro Audio System MCW770/37. Philips. Copyright 2004-2020, 3 pages [online]. [retrieved on 2020-02-24]. Retrieved from the Internet URL: https://www.usa.philips.com/c-p/MCW770_37/-/support .
7	Sonos v. Google. Exhibit A to Respondents' Initial Invalidity Contentions dated 29 April 2020, 194 pages.
8	Sonos v. Google. Respondents' Initial Invalidity Claim Charts for Patent US 10,439,896, Exhibits 1-16 and B, dated 29 April 2020, 1102 pages.
9	Sonos v. Google. Respondents' Initial Invalidity Claim Charts for US Patent 10,209,953, Exhibits 1-10 and B, dated 29 April 2020, 288 pages.
10	Sonos v. Google. Respondents' Initial Invalidity Claim Charts for US Patent 8,588,949, Exhibits 1-19 and B, dated 29 April 2020, 280 pages. .
11	Sonos v. Google. Respondents' Initial Invalidity Claim Charts for US Patent 9,195,258, Exhibits 1 - 10 and B, dated 29 April 2020, 345 pages. .

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

12	Sonos v. Google. Respondents' Initial Invalidity Claim Charts for US Patent 9,219,959, Exhibits 1-9 and B, dated 29 April 2020, 344 pages. .
13	Sonos v. Google. Respondents' Initial Invalidity Contentions dated 29 April 2020, 200 pages.
14	Squeezebox Duet Network Music System by Logitech. User Guide English (North America), 2008, 45 pages.
15	Step-by-step P4 Connection. P4 Poster (without music), 5 pages [online], [retrieved on 2020-03-26]. Retrieved from the Internet URL: https://snarfed.org/p4_poster/index.html .
16	Structured Media Components. Leviton Integrated Networks, last modified 10 April 2006, 28 pages.
17	Support. Manuals & Documentation. Micro Audio System MCW770/37. Philips. Copyright 2004-2020, 3 pages. [online], [retrieved on 2020-02-24]. Retrieved from the Internet URL: https://www.usa.philips.com/c-p/MCW770_37/-/support .
18	Synchronizing mp3 playback. 3 pages [online]. [retrieved on 2020-03-26]. Retrieved from the Internet URL: https://snarfed.org/synchronizing_mp3_playback .
19	Teirikangas, Jussi. HAVi: Home Audio Video Interoperability. Helsinki University of Technology, 2001, 10 pages.
20	TOA Electronics, Inc. DP-0206 Digital Signal Processor. DACsys 2000, 2001, 12 pages. .
21	UPnP AV Architecture:0.83 For UPnP Version 1.0, 12 June 2002, copyright 2000, 22 pages. .
22	UPnP Forum. UPnP Device Architecture 1.0. October 15, 2008, 80 pages.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

	23	Weverka et al. Windows XP Gigabook for Dummies. Wiley Publishing, Inc. 2004, 915 pages.
	24	Wireless Home Audio Director. Wireless N Music Player with Integrated Amplifier DMC250. Datasheet. Linksys by Cisco. Fill Your Home with Music, 2008, 2 pages. .
	25	Yahoo Groups. Exstreamer. Barix Exstreamer. Access via Wayback Machine http://groups.yahoo.com/group/exstreamer/ December 22, 2013, 1 page. .
	26	Yamaha DME Designer 3.0 Owner's Manual; Copyright 2008, 501 pages.

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EXAMINER SIGNATURE

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

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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.

☒ A certification statement is not submitted herewith.

SIGNATURE

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	/Brandon J. Kennedy/	Date (YYYY-MM-DD)	2020-05-21
Name/Print	Brandon J. Kennedy	Registration Number	67894

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Brandon Jacob Kennedy/Jaden Knosher		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
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Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
Total in USD (\$)				240

Electronic Acknowledgement Receipt	
EFS ID:	39522842
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Brandon Jacob Kennedy
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	26-MAY-2020
Filing Date:	17-APR-2013
Time Stamp:	18:12:55
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 240
RAM confirmation Number	E20205PI16418637
Deposit Account	506632
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The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

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File Listing:					
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4	Non Patent Literature	13864249_FOA_13-0402_7-11-18_13pages.pdf	475651	no	13
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			23eea77a92c4cf040d01acd89d1fe8ed9cc2c3ba		
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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Docket No. 13-0402)**

In re the Application of:	)	
	)	
Sonos, Inc.	)	
	)	Group Art Unit 2442
Serial No.: 13/864,249	)	
	)	
Filed: April 17, 2013	)	
	)	Examiner: Oleg Survillo
Confirmation No. 9806	)	
	)	
For: Concurrent Transmission and Playback	)	
Of Audio Information	)	

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

TRANSMITTAL WITH INFORMATION DISCLOSURE STATEMENT

Pursuant to 37 CFR § 1.34, the undersigned hereby confirms that the attached Information Disclosure Statement (IDS) is being filed in accordance with the undersigned's authority to act in a representative capacity on behalf of Applicant, Sonos, Inc., in connection with the preparation and filing of IDSs for the above-referenced matter.

Respectfully submitted,

Dated: May 21, 2020

By: / Brandon J. Kennedy/
Brandon J. Kennedy
Reg. No. 67,894
Lee Sullivan Shea & Smith LLP
656 W. Randolph St., Floor 5W
Chicago, Illinois 60661
(312) 754-9315
kennedy@ls3ip.com

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	Filing Date		2013-04-17	
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	Art Unit	2442		
	Examiner Name	SURVILLO, Oleg		
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	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit		2442
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number		13-0402

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	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
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	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
<p>That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).</p>			
OR			
<p>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).</p>			
<p>☐ See attached certification statement.</p>			
<p>☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.</p>			
<p>☒ A certification statement is not submitted herewith.</p>			
SIGNATURE			
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	/Brandon J. Kennedy/	Date (YYYY-MM-DD)	2020-05-21
Name/Print	Brandon J. Kennedy	Registration Number	67894
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	1	5313524		1994-05-17	VAN HULLE; Steven T. F. et al.	
	2	6085236		2000-07-04	LEA; Rodger J.	
	3	6741708		2004-05-25	NAKATSUGAWA; Yoshinori.	
	4	7215649		2007-05-08	YU; Robert. et al.	
	5	7274761		2007-09-25	MULLER; Thomas. et al.	
	6	7690017		2010-03-30	STECYK; Polly. et al.	
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	1	20020129128		2002-09-12	GOLD; Stephen. et al.		
	2	20030100335		2003-05-29	GASSHO; Kazuhito. et al.		
	3	20040203936		2004-10-14	OGINO; Minoru. et al.		
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	1	2485100	CA	A1	2003-11-13	GOLDBERG DAVID [US], et al.		
	2	1058985	EP	A2	2000-12-13	SONY ELECTRONICS INC [US]		
	3	1295420	EP	A1	2003-03-26	NOKIA CORP [FI]		
	4	03058965	WO	A1	2003-07-17	DIGEO INC [US]		

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	1	CANADIAN PATENT OFFICE, Canadian Office Action mailed on 3 March 2020, issued in connection with Canadian Application No. 3033268, 4 pages.	
	2	EUROPEAN PATENT OFFICE, European Extended Search Report mailed on 31 March 2020, issued in connection with European Application No. 19194999.9, 15 pages.	
	3	EUROPEAN PATENT OFFICE, European Search Report mailed on 27 January 2020, issued in connection with European Application No. 19194999.9, 16 pages.	
	4	Non-Final Office Action mailed on 13 November 2019, issued in connection with U.S. Patent Application No. 15/946660, filed on 5 April 2018, 6 pages.	
	5	Non-Final Office Action mailed on 30 April 2020, issued in connection with U.S. Patent Application No. 16/459605, filed on 1 July 2019, 25 pages.	
	6	Notice of Allowance mailed on 02 December 2019, issued in connection with U.S. Patent Application No. 16/514280, filed on 17 July 2019, 8 pages.	
	7	Notice of Allowance mailed on 06 December 2019, issued in connection with U.S. Patent Application No. 16/459565, filed on 1 July 2019, 8 pages.	
	8	Notice of Allowance mailed on 15 November 2019, issued in connection with U.S. Patent Application No. 16/544902, filed on 20 August 2019, 9 pages.	
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	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number		13-0402

10	Notice of Allowance mailed on 27 November 2019, issued in connection with U.S. Patent Application No. 14/184528, filed on 19 February 2014, 8 pages.
11	Notice of Allowance mailed on 28 April 2020, issued in connection with U.S. Patent Application No. 16/459569, filed on 1 July 2019, 8 pages.
12	Notice of Allowance mailed on 29 November 2019, issued in connection with U.S. Patent Application No. 16/459569, filed on 1 July 2019, 8 pages.
13	Sonos, Inc. v. Google LLC, Appendix A to Respondents' Response to the Complaint and Notice of Investigation, filed February 27, 2020, 2 pages. .
14	Sonos, Inc. v. Google LLC, Appendix B to Respondents' Response to the Complaint and Notice of Investigation, filed February 27, 2020, 176 pages. .
15	Sonos, Inc. v. Google LLC, Respondents' Response to the Complaint and Notice of Investigation, filed February 27, 2020, 46 pages.
16	Squeezebox by Logitech. Owner's Guide, 2007, 32 pages. .
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Name/Print	Brandon J. Kennedy	Registration Number	67894
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Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Brandon Jacob Kennedy/Jaden Knosher		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
Total in USD (\$)				240

Electronic Acknowledgement Receipt	
EFS ID:	39358894
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Brandon Jacob Kennedy
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	05-MAY-2020
Filing Date:	17-APR-2013
Time Stamp:	18:07:34
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 240
RAM confirmation Number	E202055I08144615
Deposit Account	506632
Authorized User	Brandon Kennedy
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

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Information:					
2	Foreign Reference	EP1058985.pdf	16524008	no	92
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Information:					
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Information:					
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Total Files Size (in bytes):			92530306		
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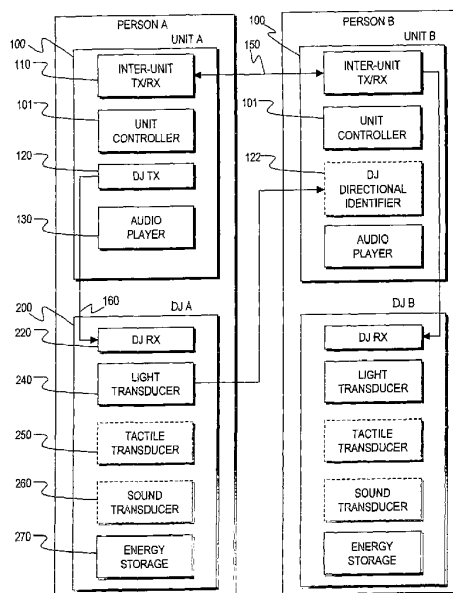
(19)  Canadian Intellectual Property Office An Agency of Industry Canada	Office de la Propriété Intellectuelle du Canada Un organisme d'Industrie Canada	(11) CA 2 485 100 (40) 13.11.2003 (43) 13.11.2003	(13) A1
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(12) (21) 2 485 100 (22) 06.05.2003	(51) Int. Cl. 7: H04L 9/00 (85) 02.11.2004 (86) PCT/US03/014154 (87) WO03/093950
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(30) 60/378,415 US 06.05.2002 60/388,887 US 14.06.2002 60/452,230 US 04.03.2003 (71) GOLDBERG, DAVID, 4055 Pinion Drive, BOULDER, XX (US). GOLDBERG, BENJAMIN M., 4055 Pinion Drive, BOULDER, XX (US). GOLDBERG, MIRIAM D., 4055 Pinion Drive, BOULDER, XX (US). GOLDBERG, MARTHA B., 4055 Pinion Drive, BOULDER, XX (US).	SIMON, NEIL R., 3084 4th Street, BOULDER, XX (US). (72) GOLDBERG, DAVID (US). GOLDBERG, BENJAMIN M. (US). GOLDBERG, MIRIAM D. (US). GOLDBERG, MARTHA B. (US). SIMON, NEIL R. (US). (74) PARLEE MCLAWS LLP
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(54) RESEAUX RADIO LOCALISES ET ACCESSOIRES NUMERIQUES ASSOCIES
 (54) LOCALIZED AUDIO NETWORKS AND ASSOCIATED DIGITAL ACCESSORIES

(57) Individuals share music through portable audio devices (100) that synchronously play music by transmitting music signals from one device (unit A) to the other (unit B). Upon request, other individuals can join such a sharing group as a member, and these new members can either be accepted automatically, or through voting by existing group members. So that members of a group can converse, the fraction of ambient sound admitted by the earphones of the portable device (100) can be manually set. In order to enhance the enjoyment of the music, wearable transducers (240, 250, 260), such as light emitting diodes, respond to signals related to the beat of the music. Signals can be automatically generated, or manually specified, and signals thereafter stored for playback with the music to which it is related. Wearable transducers associated with individuals at a large music event can be set to receive common signals such that the transducers (240, 250, 260) respond in synchrony with one another.





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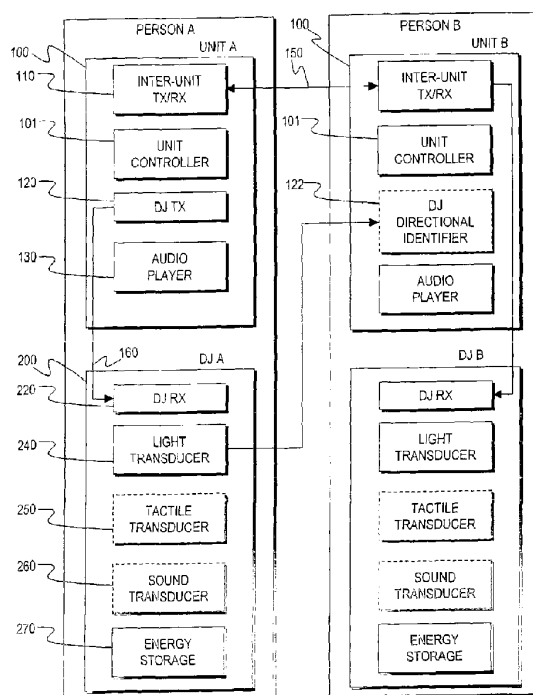
(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(86) Date de dépôt PCT/PCT Filing Date: 2003/05/06
(87) Date publication PCT/PCT Publication Date: 2003/11/13
(85) Entrée phase nationale/National Entry: 2004/11/02
(86) N° demande PCT/PCT Application No.: US 2003/014154
(87) N° publication PCT/PCT Publication No.: 2003/093950
(30) Priorités/Priorities: 2002/05/06 (60/378,415) US;
2002/06/14 (60/388,887) US; 2003/03/04 (60/452,230) US

(51) Cl.Int.⁷/Int.Cl.⁷ H04L 9/00
(71) Demandeurs/Applicants:
GOLDBERG, DAVID, US;
SIMON, NEIL R., US;
GOLDBERG, MARTHA B., US;
GOLDBERG, MIRIAM D., US;
GOLDBERG, BENJAMIN M., US
(72) Inventeurs/Inventors:
GOLDBERG, DAVID, US;
SIMON, NEIL R., US;
GOLDBERG, MARTHA B., US;
GOLDBERG, MIRIAM D., US;
GOLDBERG, BENJAMIN M., US
(74) Agent: PARLEE MCLAWS LLP

(54) Titre : RESEAUX RADIO LOCALISES ET ACCESSOIRES NUMERIQUES ASSOCIES
(54) Title: LOCALIZED AUDIO NETWORKS AND ASSOCIATED DIGITAL ACCESSORIES



(57) Abrégé/Abstract:

Individuals share music through portable audio devices (100) that synchronously play music by transmitting music signals from one device (unit A) to the other (unit B). Upon request, other individuals can join such a sharing group as a member, and these new

Canada

<http://opic.gc.ca> · Ottawa-Hull K1A 0C9 · <http://cipo.gc.ca>

OPIC · CIPQ 191



(57) **Abrégé(suite)/Abstract(continued):**

members can either be accepted automatically, or through voting by existing group members. So that members of a group can converse, the fraction of ambient sound admitted by the earphones of the portable device (100) can be manually set. In order to enhance the enjoyment of the music, wearable transducers (240, 250, 260), such as light emitting diodes, respond to signals related to the beat of the music. Signals can be automatically generated, or manually specified, and signals thereafter stored for playback with the music to which it is related. Wearable transducers associated with individuals at a large music event can be set to receive common signals such that the transducers (240, 250, 260) respond in synchrony with one another.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
13 November 2003 (13.11.2003)

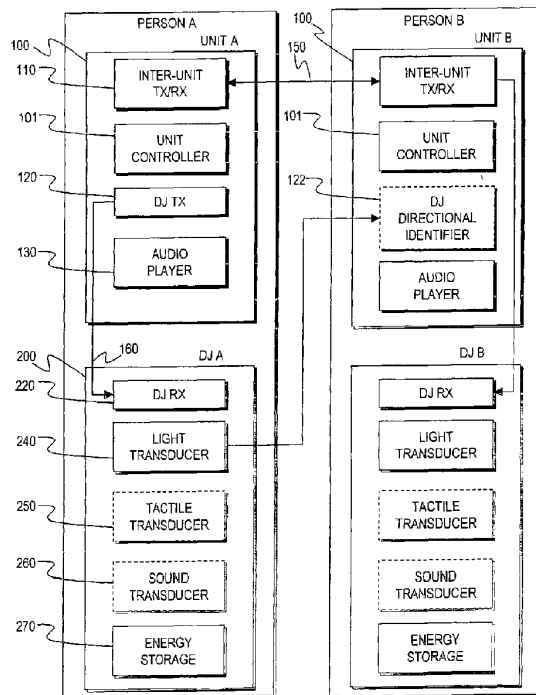
PCT

(10) International Publication Number
WO 2003/093950 A3

- (51) International Patent Classification⁷: **H04L 9/00** (71) Applicants and
(72) Inventors: **GOLDBERG, David** [US/US]; 4055 Pinion Drive, Boulder, CO 80303 (US). **SIMON, Neil, R.** [US/US]; 3084 4th Street, Boulder, CO 80304 (US). **GOLDBERG, Martha, B.** [US/US]; 4055 Pinion Drive, Boulder, CO 80303 (US). **GOLDBERG, Miriam, D.** [US/US]; 4055 Pinion Drive, Boulder, CO 80303 (US). **GOLDBERG, Benjamin, M.** [US/US]; 4055 Pinion Drive, Boulder, CO 80303 (US).
- (21) International Application Number: PCT/US2003/014154
- (22) International Filing Date: 6 May 2003 (06.05.2003)
- (25) Filing Language: English
- (26) Publication Language: English (74) Agent: **McINTOSH, Michael, D.**; 8000 E. Prentice Avenue, Suite B-6, Greenwood Village, CO 80111 (US).
- (30) Priority Data:
60/378,415 6 May 2002 (06.05.2002) US
60/388,887 14 June 2002 (14.06.2002) US
60/452,230 4 March 2003 (04.03.2003) US
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GI, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE,

[Continued on next page]

(54) Title: LOCALIZED AUDIO NETWORKS AND ASSOCIATED DIGITAL ACCESSORIES



(57) Abstract: Individuals share music through portable audio devices (100) that synchronously play music by transmitting music signals from one device (unit A) to the other (unit B). Upon request, other individuals can join such a sharing group as a member, and these new members can either be accepted automatically, or through voting by existing group members. So that members of a group can converse, the fraction of ambient sound admitted by the earphones of the portable device (100) can be manually set. In order to enhance the enjoyment of the music, wearable transducers (240, 250, 260), such as light emitting diodes, respond to signals related to the beat of the music. Signals can be automatically generated, or manually specified, and signals thereafter stored for playback with the music to which it is related. Wearable transducers associated with individuals at a large music event can be set to receive common signals such that the transducers (240, 250, 260) respond in synchrony with one another.

WO 2003/093950 A3

WO 2003/093950 A3



SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,
VC, VN, YU, ZA, ZM, ZW.

Declaration under Rule 4.17:

— *of inventorship (Rule 4.17(iv)) for US only*

Published:

— *with international search report*

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(88) Date of publication of the international search report:

22 January 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

LOCALIZED AUDIO NETWORKS AND ASSOCIATED DIGITAL ACCESSORIES**Cross Reference To Related Patent Applications**

This application is related to and claims priority from Provisional Patent Application No. 60/378,415, filed May 6, 2002, titled "Localized Audio Networks and Associated Digital Accessories," and from Provisional Patent Application No. 60/388,887, filed June 14, 2002, titled "Localized Audio Networks and Associated Digital Accessories," and from Provisional Patent Application No. 60/452,230, filed March 4, 2003, titled "Localized Audio Networks and Associated Digital Accessories," the contents of each of which are incorporated herein by reference.

10 Technical Field

The present invention relates to localized wireless audio networks for shared listening of recorded music, and wearable digital accessories for public music-related display, which can be used in conjunction with one another.

Background

15 Portable audio players are popular consumer electronic products, and come in a variety of device formats, from cassette tape "boom boxes" to portable CD players to digital flash-memory and hard-disk MP3 players. While boom boxes are meant to make music to be shared among people, most of the portable audio players are designed for single person use. While some of this orientation to personal music listening is due to personal preference, other
20 important considerations are the technical difficulties of reproducing music for open area listening with small, portable devices, as well as the social imposition of listening to music in public places with other people who do not wish to listen to the same music, or who are listening to different music that would interfere with one's own music.

There are numerous audio devices that are designed to allow the transfer of music
25 from one portable audio device to another, especially through those that store music in the MP3 audio format. These devices suffer from two main difficulties: firstly, listeners still do not hear the music simultaneously, which is the optimal manner to share music, and secondly, there are serious copyright issues associated with the transfer of music files. Thus, it would be preferable for the transfer of the music for simultaneous enjoyment, and which did not

result in a permanent transfer of the music files between the devices, so as not to infringe on the intellectual property rights of the music owners.

Given the sharing of music, listeners will on occasion want to purchase the music for themselves. In such case, it would be beneficial for the user to have a way to obtain the
5 music with minimal effort. It would further be desirable for there to be a way to keep track of the person from whom the listener heard the music, so that the person could be in some way encouraged or compensated.

The earphones associated with a portable music player admit a relatively constant fraction of ambient sound. If listening to music with a shared portable music device,
10 however, one might at times want to talk with a friend, and at times listen to music without outside audible distraction. In such case, it would be desirable to have an earphone for which the amount of external ambient sound could be manually set.

Furthermore, many people like to show their individual preferences, to exhibit themselves, and to demonstrate their group membership. Furthermore, music preferences and
15 listening to music together are among the more important means by which individuals express their individual and group identities. It would be beneficial for there to be a way for individuals to express themselves through their music, and for groups of individuals listening to music together, to be able to demonstrate their group enjoyment of the music.

One means for a person to express their identity through motion would be through
20 having wearable transducers wherein the transduction signal is related to the music. If the transducer were a light transducer, this would result in a display of light related to the music that was being listened to. It would be further beneficial if there were means by which a person could generate control signals for the transducer so that instead of a wholly artificial response to the music, the transducer showed a humanly interpreted display. It would be
25 preferable if these signals could be shared between people along with music files, so that others could entertain or appreciate the light display so produced.

At popular music concerts, there is often a "light show" that pulsates in rough relation to the music. In contrast to the generally vigorous light show, the patrons at the concerts often have light bracelets or other such static displays which are used to join with the displays
30 on the stage. It would be beneficial for there to be a way in which patrons could participate in the light show in order to enhance their enjoyment of the concert.

It is to the solution of these and other problems that the present invention is directed.

Summary of the Invention

It is an object of the present invention to provide users a means of listening to music together using mobile devices.

It is also an object of the present invention to provide users a means of choosing with
5 whom to listen to music.

It is additionally an object of the present invention to provide users the ability to monitor the people that are listening together.

It is furthermore an object of the present invention to provide users a means of expressing their enjoyment of the music they are listening to through visual displays of
10 wearable accessories.

It is yet another object of the present invention to provide users a means of demonstrating their identity with other people they are listening to music with.

It is still further an object of the present invention to provide users to provide users with means to choreograph the visual displays.

15 Additional objects, advantages and novel features of this invention shall be set forth in part in the description that follows, and will become apparent to those skilled in the art upon examination of the following specification or may be learned through the practice of the invention. The objects and advantages of the invention may be realized and attained by means of the instrumentalities, combinations, and methods particularly pointed out in the
20 appended claims.

To achieve the foregoing and other objects and in accordance with the purposes of the present invention, as embodied and broadly described therein, the present invention is directed to a method for sharing music from stored musical signals between a first user with a first music player device and at least one second user with at least one second music player
25 device. The method includes the step of playing the musical signals for the first user on the first music player device while essentially simultaneously wirelessly transmitting the musical signals from the first music player device to the at least one second music player device. The method additionally includes receiving the musical signals by the at least one second player device, such that the musical signals can be played on the at least one second player device
30 essentially simultaneously with the playing of the musical signals on the first music player device. In this method, the first and the at least one second users are mobile and maintain less than a predetermined distance.

The present invention is also related to a system of music sharing for a plurality of users. The system includes a first sharing device and at least one second sharing device, each comprising a musical signal store, a musical signal transmitter, a musical signal receiver, and a musical signal player. Furthermore, the system comprises a broadcast user operating the first sharing device and at least one member user operating the at least one second sharing device. The broadcast user plays the musical signal for his own enjoyment on the first sharing device and simultaneously transmits the musical signal to the receiver of the at least one second sharing device of the at least one member user, on which the musical signal is played for the at least one member user. The broadcast user and the at least one member user hear the musical signal substantially simultaneously.

The present invention yet further is related to a wireless communications system for sharing audio entertainment between a first mobile device and a second mobile device in the presence of a non-participating third mobile device. The system includes an announcement signal transmitted by the first mobile device for which the second mobile device and the third mobile device are receptive. In addition, the system includes a response signal transmitted by the second mobile device in response to the announcement signal for which the first mobile device is receptive and for which the third mobile device is not receptive. Also, the system includes an identifier signal transmitted by the first mobile device to the second mobile device in response to the response signal, and which is not receptive to the third mobile device. Finally, the system includes a broadcast signal comprising audio entertainment that is transmitted by the first mobile device, and which is receptive by the second mobile device on the basis of the reception of the identifier signal.

The present invention additionally is related to an audio entertainment device. The device includes a signal store that stores an audio entertainment signal, a transmitter that can transmit the stored audio entertainment signal, a receiver that can receive the transmitted audio entertainment signal from a transmitter of another such device, and a player that can play audio entertainment from a member selected from the group of stored audio entertainment signals or audio entertainment signals transmitted from the transmitter of another such device.

The present invention yet still is related to a system for identifying a first device that introduces a music selection to a second device. The system includes a mobile music transmitter operated by the first device and a mobile music receiver operated by the second device. In addition, the system includes a music signal comprising the music selection transmitted by the transmitter and received by the receiver, an individual musical identifier

that is associated with the music selection, and an individual transmitter identifier that identifies the transmitter. The transmitter identifier and the individual music identifier are stored in association with each other in the receiver.

The present invention is still further related to an audio entertainment device. The device includes a wireless transmitter for the transmission of audio entertainment signals and a wireless receiver for the reception of the transmitted audio entertainment signals from a transmitter of audio entertainment signals. A first manually-separable connector for electrically connecting with an audio player allows transfer of audio entertainment signals from the player to the device. The device also includes a second connector for connecting with a speaker and a control to manually switch between at least three states. In the first state the speaker plays audio entertainment signals from the audio player and the transmitter does not transmit the audio entertainment signals. In the second state the speaker plays audio entertainment signals from the audio player and the transmitter essentially simultaneously transmits the audio entertainment signals. In the third state the speaker plays audio entertainment signals received by the receiver.

The present invention also still is related to a system for the sharing of stored music between a first user and a second user. The system includes a first device for playing music to the first user, comprising a store of musical signals. A first controller prepares musical signals from the first store for transmission and playing, and a first player takes musical signals from the first controller and plays the signals for the first user. A transmitter is capable of taking the musical signals from the controller and transmitting the musical signals via wireless broadcast. A second device for playing music to the second user comprises a receiver receptive of the transmissions from the transmitter of the first device, a second controller that prepares musical signals from the receiver for playing, and a second player that takes musical signal from the second controller and plays the signals for the second user. The first user and the second user hear the musical signals at substantially the same time.

The present invention also is related to an earphone for listening to audio entertainment allowing for the controlled reception of ambient sound by a user. The earphone includes a speaker that is oriented towards the user's ear and an enclosure that reduces the amount of ambient noise perceptible to the user. In addition, a manually-adjustable characteristic of the enclosure adjusts the amount of ambient sound perceptible to the user.

The present invention is further related to a mobile device for the transmission of audio entertainment signals. The mobile device includes an audio signal store for the storage

of the audio entertainment signals, and an audio signal player for the playing of the audio entertainment signals. The device also includes a wireless transmitter for the transmission of the audio entertainment signals and a transmitter control to manually switch between two states consisting of the operation and the non-operation of the audio transmitter.

5 The present invention yet still is related to a mobile device for the reception of digital audio entertainment signals. The mobile device includes an audio signal store for the storage of the digital audio entertainment signals and an audio receiver for the reception of external digital audio entertainment signals from a mobile audio signal transmitter located within a predetermined distance of the audio receiver. The device also includes a receiver control with
10 at least a first state and a second state. An audio signal player plays digital audio entertainment signals from the audio signal store when the receiver control is in the first state, and plays digital audio entertainment signals from the audio receiver when the receiver control is in the second state.

 The present invention furthermore relates to a method for the shared enjoyment of
15 music from stored musical signals between a first user with a first music player device and at least one second user with at least one second music player device. The method includes the step of playing the musical signals for the first user on the first music player device while essentially simultaneously wirelessly transmitting synchronization signals from the first music player device to the at least one second music player device. The method also includes
20 receiving the synchronization signals by the at least one second player device. The synchronization signals allow the musical signals on the at least one second player device to be played essentially simultaneously with the playing of the musical signals on the first music player device. The first and the at least one second users are mobile.

 The present invention yet furthermore relates to a wireless communications system
25 for sharing audio entertainment between a first mobile device and a second mobile device. The system includes a broadcast identifier signal transmitted by the first mobile device to the second mobile device. A personal identifier signal is transmitted by the second mobile device to the first mobile device. A broadcast signal comprising audio entertainment is transmitted by the first mobile device of which the second device is receptive. The first
30 mobile device and the second mobile device have displays which can display the identifier signal that they receive and the second mobile device can play the audio entertainment from the broadcast signal that it receives.

 The present invention also relates to a method for enhancing enjoyment of a musical selection. The method includes the steps of obtaining control signals related to the musical

selection, transmitting the control signals wirelessly, receiving the control signals, and converting the control signals to a humanly-perceptible form.

The present invention further yet relates to a method for generating and storing control signals corresponding to musical signals. The method includes the steps of playing
5 musical signals for a user and receiving manual input signals from the user that are produced substantially in synchrony with the music. The method also includes the steps of generating control signals from the input signals, and storing the control signals so that they can be retrieved with the musical signals.

The present invention still additionally relates to a wearable personal accessory. The
10 accessory includes an input transducer taken from the group consisting of a microphone and an accelerometer. The transducer generates a time-varying input transduction signal. The accessory also includes a controller that accepts the input transduction signal, and generates an output transducer signal whose signal varies in amplitude with time. An output transducer receptive of the output transducer signal provides a humanly-perceptible signal. An energy
15 source powers the input transducer, controller and output transducer.

The present invention also still relates to a wearable personal accessory controlled via wireless communications. The accessory includes a wireless communications receiver that is receptive of an external control signal. The accessory also includes a controller that accepts the external control signal and that generates a time-varying visual output transducer signal.
20 A visual output transducer is receptive of the output transducer signal, and provides a humanly-perceptible visual signal. An energy store powers the receiver, controller and output transducer. The visual output transducer generates visually-perceptive output.

The present invention still further relates to a device for converting user tactile responses to stored music into a stored control signal. The device includes a player that plays
25 stored music audible to the user and a manually-operated transducer that outputs an electrical signal. The transducer is actuated by the user in response to the music. A controller receives the electrical signal and outputs a control signal and a store receives the control signal and stores it.

The present invention furthermore relates to a music player that wirelessly transmits
30 control signals related to the music, wherein the control signals control a wearable electronic accessory. The music player includes a store of music signal files and a controller that reads a musical signal file from the store and generates audio signals. The controller further generates the control signals. A transducer converts the audio signals into sound audible to

the user and a wireless transmitter transmits the control signal to the wearable electronic accessory.

The present invention yet relates to a music player that wirelessly transmits control signals related to the music, wherein the control signals control a wearable electronic accessory. The music player includes a store of music signal files and a second store of control signal files associated with the music signal files. A controller reads a musical signal file from the store and generates audio signals. The controller further reads an associated control signal file. A transducer converts the audio signals into sound audible to the user, and a wireless transmitter transmits the control signals from the associated control signal file to the wearable electronic accessory.

The present invention also relates to a system for exhibition of music enjoyment. The system includes a source of music signals, a controller that generates control signals from the music signals, and a transmitter of the control signals. The transmission of the control signals is synchronized with the playing of the music signals. In addition, the system includes a receiver of the control signals and a transducer that responds to the control signals.

The present invention further relates to a method for transferring a wearable-accessory control file stored on a first device to a second device in which an associated music file is stored. The method includes the steps of storing on the first device the name of the music file in conjunction with the control file with which it is associated and requesting by the second device of the first device for a control file stored in conjunction with the name of the music file. In addition, the method includes the step of transferring the control file from the first device to the second device. The control file is stored on the second device in conjunction with the name of the associated music file.

The present invention also relates to a device for transmitting control signals to a wearable accessory receptive of such control signals. The device includes a manually-separable input connector for connecting to an output port of an audio player. Audio signals are conveyed from the audio player to the device across the connector. The device also includes a controller for generating control signals from the audio signals and a transmitter for transmitting the control signals.

Brief Description Of The Drawings

Figure 1 is a schematic block diagram of a local audio network comprised of two linked audio units operated by two persons, and associated digital jewelry conveyed by the two persons.

Figure 2A is a schematic block diagram of a DJ with multiple independently controlled LED arrays.

Figure 2B is a schematic block diagram of a DJ with an LED array with independently controlled LEDs.

5 Figures 3A-C are schematic block diagrams of unit elements used in inter-unit communications.

Figure 4 is a schematic flow diagram of DJ entraining.

Figures 5A-B are schematic block diagrams of DJs associated with multiple people bound to the same master unit.

10 Figure 6 is a schematic block diagram of a cluster comprising a broadcast unit and multiple receive units, with an external search unit.

Figure 7 is a schematic diagram of a broadcast unit transmission.

Figure 8A is a schematic block diagram of audio units with self-broadcast so that audio output is highly synchronized.

15 Figure 8B is a schematic flow diagram for synchronous audio playing with multiple rebroadcast.

Figures 9A and 9B are schematic block diagrams of hierarchically-related clusters.

Figure 10 is a top perspective view of an earphone with manually adjustable external sound ports.

20 Figures 11 A and B are cross-sectional diagrams of a earpiece with an extender to admit additional ambient sound.

Figure 12A is a schematic diagram of a modular audio unit.

Figure 12B is a schematic diagram of modular digital jewelry.

25 Figure 12C is a schematic block diagram of a modular transmitter that generates and transmits control signals for digital jewelry from an audio player.

Figure 13A is a schematic cross-section through a search unit and a broadcast unit in which communications are provided via visible or infrared LED emission in search transmission mode.

30 Figure 13B is a schematic cross-section through a search unit and a broadcast unit in which communications are provided via a visible or infrared laser in search transmission mode.

Figure 13C is a schematic cross-section through a search unit and a broadcast unit in which communications are provided via visible or infrared emission from a digital jewelry element in broadcast transmission mode.

Figure 13D is a schematic cross-section through a search unit and a broadcast unit in which communications are provided via contact in mutual transmission mode.

Figure 13E is a schematic cross-section through a search unit and a broadcast unit in which communications are provided via sonic transmissions in broadcast transmission mode.

5 Figure 13F is a schematic cross-section through a search unit and a broadcast unit in which communications are provided via radio frequency transmissions in broadcast transmission mode.

Figure 14A is a schematic block diagram of the socket configurations on the broadcast unit and the receive unit.

10 Figure 14B is a schematic block flow diagram of using IP sockets for establishing and maintaining communications between a broadcast unit and the receive unit, according to the socket diagram of Figure 14A.

Figure 15 is a schematic block diagram of the IP socket organization used with clusters comprising multiple members.

15 Figure 16 is a schematic block flow diagram of transfer of control between the broadcast unit and the first receive unit.

Figure 17 is a matrix of DJ and searcher preferences and characteristics, illustrating the matching of DJ and searcher in admitting a search to a cluster.

Figure 18A is a screenshot of an LCD display of a unit, taken during normal operation.

20 Figure 18B is a screenshot of an LCD display of a unit, taken during voting for a new member.

Figure 19 is a table of voting schemes for the acceptance of new members into a cluster.

25 Figure 20 is a time-amplitude trace of an audio signal automatically separated into beats.

Figure 21A is a block flow diagram of a neural network method of creating DJ transducer control signals from an audio signal as shown in Figure 20.

30 Figure 21B is a block flow diagram of a deterministic signal analysis method of creating DJ transducer control signals from an audio signal as shown in Figure 20.

Figure 21C is a schematic flow diagram of a method to extract fundamental musical patterns from an audio signal to create DJ control signals.

Figure 21D is a schematic flow diagram of an algorithm to identify a music model resulting in a time signature.

Figure 22A is a top-view diagram of an audio unit user interface, demonstrating the use of buttons to create DJ control signals.

Figure 22B is a top-view diagram of a hand-pad for creating DJ control signals.

Figure 22C is a schematic block diagram of a set of drums used for creating DJ control signals.

Figure 23A is a schematic block flow diagram of the synchronized playback of an audio signal file with a DJ control signal file, using transmission of both audio and control signal information.

Figure 24 is a schematic block diagram of a DJ unit with associated input transducers.

Figure 25 is a schematic flow diagram indicating music sharing using audio devices, providing new means of distributing music to customers.

Figure 26 is a schematic diagram of people at a concert, in which DJs conveyed by multiple individuals are commonly controlled.

Figure 27 is a schematic block flow diagram of using a prospective new member's previous associations to determine whether the person should be added to an existing cluster.

Figure 28 is a block flow diagram indicating the steps used to maintain physical proximity between the broadcast unit and the receive unit via feedback to the receive unit user.

Figure 29A is a schematic block diagram of the connection of an Internet-enabled audio unit with an Internet device through the Internet cloud, using an Internet access point.

Figure 29B is a schematic block diagram of the connection of an Internet-enabled audio unit with an Internet device through the Internet cloud, with an audio unit directly connected to the Internet cloud.

Figure 30 comprises tables of ratings of audio unit users.

Figure 31 is tables of DJ, song and transaction information according to the methods of Figure 25.

Figure 32A is a schematic block diagram of maintaining privacy in open transmission communications.

Figure 32B is a schematic block diagram of maintaining privacy in closed transmission communication.

Figure 33 is a schematic block diagram of a hierarchical cluster, as in Figure 9A, in which communications between different units is cryptographically or otherwise restricted to a subset of the cluster members.

Figure 34A is a schematic block flow diagram of the synchronization of music playing from music files present on the units 100.

Figure 34B is a schematic layout of a synchronization record according to Figure 34A.

5 Figure 35 is a schematic block diagram of DJ switch control for both entraining and wide-area broadcast.

Figure 36 is a schematic block diagram of mode switching between peer-to-peer and infrastructure modes.

Best Mode for Carrying-Out the Invention

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Overview

Figure 1 is a schematic block diagram of a local audio network comprised of two linked audio units 100 operated by two persons, and associated digital jewelry 200 conveyed by the two persons. The persons are designated Person A and Person B, their audio units 100 are respectively Unit A and Unit B, and their digital jewelry 200 are denoted respectively DJ A and DJ B. In this patent specification, "DJ" is used to denote either the singular "digital jewel" or the plural "digital jewelry".

Each unit 100 is comprised of an audio player 130, and an inter-unit transmitter/receiver 110. In addition, each unit 100 comprises a means of communication with the digital jewelry, which can be either a separate DJ transmitter 120 (Unit A), or which
20 can be part of the inter-unit transmitter/receiver 110 (Unit B). Furthermore, unit 100 can optionally comprise a DJ directional identifier 122, whose operation will be described below. Also, unit 100 will generally comprise a unit controller 101, which performs various operational and executive functions of intra-unit coordination, computation, and data transfers. The many functions of the controller 101 will not be discussed separately below,
25 but will be described with respect to the general functioning of the unit 100.

In operation, Unit A audio player 130 is playing recorded music under the control of a person to be designated User A. This music can derive from a variety of different sources and storage types, including tape cassettes, CDs, DVDs, magneto-optical disks, flash memory, removable disks, hard-disk drives or other hard storage media. Alternatively, the
30 audio signals can be received from broadcasts using analog (e.g. AM or FM) or digital radio receivers. Unit A is additionally broadcasting a signal through DJ transmitter 120, which is received by DJ 200 through a DJ receiver 220 that is worn or otherwise conveyed by User A.

It should be noted that the audio signals can be of any sound type, and can include spoken text, symphonic music, popular music or other art forms. In this specification, the terms audio signal and music will be used interchangeably.

The DJ 200 transduces the signal received by the DJ receiver 220 to a form perceptible to the User A or other people near to him. This transduced form can include audio, visual or tactile elements, which are converted to their perceptible forms via a light transducer 240, and optionally a tactile transducer 250 or an audio transducer 260. The transducers 240, 250 and 260 can either directly generate the perceptible forms directly from the signals received by the DJ receiver 220, or can alternatively incorporate elements to filter or modify the signals prior to their use by the transducers.

When a second individual, User B, perceives the transduced forms produced by User A DJ 200, he can then share the audio signal generated by the audio player 130 of Unit A, by use of the inter-unit transmitter/receiver 110 of Unit A and a compatible receiver 110 of Unit B. Audio signals received by Unit B from Unit A are played using the Unit B audio player 130, so that User A and User B hear the audio signals roughly simultaneously. There are a variety of means by which the Unit B can select the signal of Unit A, but a preferred method is for there to be a DJ directional identifier 122 in Unit B, which can be pointed at the DJ of User A and which receives information needed to select the Unit A signal from the User A DJ, whose transduced signal is perceptible to User B.

Given the audio signal now being exchanged between Unit A and Unit B, User A and User B can experience the same audio signal roughly simultaneously. Within the spirit of the present invention, it is preferable for the two users to hear the audio signals within 1 second of one another, and more preferable for the users to hear the audio signals within 200 milliseconds of one another, and most preferable for the users to hear the audio signals within 50 milliseconds of one another. Furthermore, DJs 200 being worn by User A and User B can receive signals from their respective units, each emitting perceptible forms of their signals. Preferably, the transduced forms expressed by the DJs 200 are such as to enhance the personal or social experience of the audio being played.

Unit 100 Structure

Units 100 comprise a device, preferably of a size and weight that is suited for personal wearing or transport, which is preferably of a size and format similar to that of a conventional portable MP3 player. The unit can be designed on a "base" of consumer electronics products

such as cell phones, portable MP3 players, or personal digital assistants (PDAs), and indeed can be configured as an add-on module to any of these devices.

In general, the unit 100 will comprise, in addition to those elements described in Figure 1, other elements such as a user interface (e.g. an LCD or OLED screen, which can be combined with a touch-sensitive screen, keypad and/or keyboard), communications interfaces (e.g. Firewire, USB, or other serial communications ports), permanent or removable digital storage, and other components.

The audio player 130 can comprise one or more modes of audio storage, which can include CDs, tape, DVDs, removable or fixed magnetic drives, flash memory, or other means. Alternatively, the audio can be configured for wireless transmission, including AM/FM radio, digital radio, or other such means. Output of the audio signal so generated can comprise wireless or wired headphones or wired or wireless external speakers.

It is also within the spirit of the present invention that the unit 100 can have only receive capabilities, without having separate audio information storage or broadcast capabilities. In concept, such a device can have as little user interface as an on/off button, a button to cause the unit 100 to receive signals from a new "host", and a volume control. Such devices can be very small and be built very inexpensively.

Unit 100 Audio Output

One of the goals of the present invention is to assist communications between groups of people. In general, with mobile audio devices, the music is listened to through headphones. Many headphones are designed so as to reduce to the extent possible the amount of sound which is heard from outside of the headphones. This, however, will have the general effect of reducing the verbal communications between individuals.

In order to avoid this potential problem, it is within the teachings of the present invention that headphones or earphones be provided that allow ambient sound, including a friend's voice, to be easily perceptible to the wearer of the headphones, and that such headphones can be provided that variably allow such sound to be accessible for the headphone's wearer. Such arrangement of the headphones can be obtained either through physical or electronic means. If through electronic means, the headphones can have a microphone associated with them, through which signals received are played back in proportion through the headphone speakers, said proportion being adjustable from substantially all sound being from the microphone to substantially no sound being from the microphone. This microphone can also be a part of a noise cancellation system, such that the

phase of the playback is adjustable -- if the phase is inverted relative to the ambient sound signal, then the external noise is reduced, whereas if the phase is coincident with the ambient sound signal, then the ambient sounds are enhanced.

Figure 10 is a top perspective view of an earphone 900 with adjustable external sound ports. A speaker element 940 is centrally located, and the outside circumferential surface is a rotatable sound shield 910 in which sound ports 930 are placed. The sound ports 930 are open holes to admit sound. Beneath the sound shield 930 is a non-rotatable sound shield in which fixed sound ports 920 are placed in a similar arrangement. As the sound shield 910 is rotated manually by the user, the sound ports 930 and the fixed sound ports 920 come into registration, so that open ports between sources of ambient noise and the outer ear chamber is created, increasing the amount of ambient sound that the user perceives.

Figures 11 A and B are cross-sectional diagrams of an earpiece with an extender 980 that admits additional ambient sound. In Figure 11A, the face of a speaker 960 with a cord 970 is covered with a porous foam block 950 that fits snugly into the ear. While some ambient sound is accessible to the ear through the foam block 950, the majority of the sound is input is impeded. In Figure 11B, the foam extender 980 is placed over the foam block 950 so that a formed shape at the distal end of the extender 980 fits snugly into the ear. A hollow cavity 982 can be allowed in the extender 980 so as to reduce the sound impedance from the speaker 960 to the ear. Ambient sound is allowed into the space between the speaker 960 and the distal end of the extender 980 (shown by the arrows).

Many other arrangements are allowed within the spirit of the present invention to allow ambient sound to more easily access the user's ear, including adjustable headphones or earplugs as in Figure 10, or accessories that can modify the structure of existing earphones and headphones, as in Figure 11B. Such effects can include increasing the number of apertures admitting ambient sound, increasing the size of an aperture (e.g. by adjusting the overlap between two larger apertures), changing the thickness or number of layers in the enclosure, or by placing a manually detachable cup that covers the earphone and ear channel so as to reduce ambient sound.

DJ 200 Transducers

DJs 200 will have a number of common elements, including communications elements, energy storage elements, and control elements (e.g. a manual ON/OFF switch or a switch to signal DJ entraining, as will be described below). In this section, the structure and function of transducers will be described.

Light Transducers 240

The DJ 200 transducers are used to create perceptible forms of the signals received by the receiver 220. Light transduction can include the use of one or more light-emitting devices, which can conveniently be colored LEDs, OLEDs, LCDs, or electroluminescent displays, which can be supplemented with optical elements, including mirrors, lenses, gratings, and optical fibers. Additionally, motors, electrostatic elements or other mechanical actuators can be used to mechanically alter the directionality or other properties of the light transducers 240. There can be either a single device or an array of devices, and if more than a single device, can display in synchrony, or can be "choreographed" to display in a temporal and/or spatial pattern.

Figure 2A is a schematic block diagram of a DJ 200 with multiple independently controlled LED arrays, wherein the number of LED arrays is preferably between 2 and 8, and is even more preferably between 2 and 4. The signal received from unit 100 via the DJ receiver 220 is passed to a multi-port controller 242 with two ports 294 and 296 connected respectively with two separate arrays 290 and 292 of LEDs 246. These arrays 290 and 292 can be distinguished by spatial placement, color of emitted light, or the temporal pattern of LED illumination. The signal is converted via analog or digital conversion into control signals for the two arrays 290 and 292, which are illuminated in distinct temporal patterns.

It should be noted that the signal received by receiver 220 from the unit 100 can comprise either a signal already in the form required to specify the array and temporal pattern of LED 246 activity, or it can alternatively be converted from a differently formatted signal into temporal pattern signals. For example, the unit 100 can transmit a modulated signal whose amplitude specifies the intensity of LED light amplitude. For multiple LED arrays, signals for the different arrays can be sent together and decoded by the DJ receiver 220, such as through using time multiplexing, or transmission on different frequencies.

Alternatively, the signal could be not directly related to the transduction intensity, such as in the direct transmission of the audio signal being played by the unit 100. In such case, the controller 242 can modify the signal so as to generate appropriate light transduction signals. For example, low frequency bandpass filters could provide the signals for the first array 290, whereas high-frequency bandpass filters could provide the signals for the second array 292. Such filtering could be accomplished by either analog circuitry or digital software within a microprocessor in the controller 242. It is also within the spirit of the present

invention for the different arrays to respond differently to the amplitude of the signal within a frequency band or the total signal.

An alternative control of LED arrays is presented in Figure 2B, a schematic block diagram of a DJ 200 with an LED array with independently controlled LEDs. In this case, the control signal received by the receiver 200 is passed through a single-port, multiple ID controller 243 to a single array of LEDs, each responsive only to signals with a particular characteristic or identifier. One or more of the LEDs 246 can have the same identifier or be responsive to the same characteristic so as to constitute a virtual array of LEDs.

As mentioned above, the transduced light signal can alternatively or additionally comprise multi-element arrays, such as an LED screen. In such case, the signal received by the receiver 220 can be either a specification of image elements to be displayed on the LED screen, or can be as before, a signal unrelated to the light transduction output. For example, many audio players on computers (e.g. Windows Media player) come with pattern generators that are responsive to the frequency and amplitude of the audio signal. Such pattern generators could be incorporated into the controllers 242 or 243.

Alternatively, the light transducer 240 can be a single color illuminated panel, whose temporal pattern of illumination was similar to that of the LEDs of Figures 2A and 2B. In such case, users can partially cover the panel with opaque or translucent patterns, such as a dog or a skull or a representation of a favorite entertainer.

Whereas the receiver 220 and the light controllers 242 or 243 can be hidden from view, either behind the light transducers or separated from the transducers by a wire, for example, the light transducers are meant to be perceptible to other people. For this purpose, the light transducers can be fashioned into fashion accoutrements such as bracelets, brooches, necklaces, pendants, earrings, rings, hair clips (e.g. barrettes), ornamental pins, netting to be worn over clothing, belts, belt buckles, straps, watches, masks, or other objects. Additionally, the light transducers can be fashioned into clothing, such as arrays of lighting elements sewn onto the outside of articles of clothing such as backpacks, wallets, purses, hats, or shoes. For those articles of clothing that are normally washed, however, the lighting transducers and associated electronics will preferably be able to withstand cleaning agents (e.g. water or dry cleaning chemicals), or will be used in clothing such as scarves and hats that do not need to be washable.

It is also convenient for there to be modular lighting arrangements in which the configuration can easily changed by a user. One example of such a modular arrangement is a light pipe made of a flexible plastic cable or rod, at one or both ends of which is positioned

a light source that directs light into the rod. At predetermined locations along the rod, the rod surface can be roughened so as to allow a certain amount of light to escape, on which transparent glass or plastic pieces can be clipped, and that are lighted when the pipe is lighted. Alternatively, the light can be uniformly smooth, and transparent pieces of roughly
5 index of refraction matching material can be clipped onto the rod, allowing some fraction of the light to be diverted from the rod into the pieces. The light sources and associated energy sources used in such an arrangement can be relatively bulky and be carried in a backpack, pouch or other carrying case, and can brightly illuminate a number of separate items.

It should be noted that the transducers require an energy store 270, which is
10 conveniently in the form of a battery. The size of the battery will be highly dependent on the transduction requirements, but can conveniently be a small "watch battery". It is also convenient for the energy store 270 to be rechargeable. Indeed, all of the electric devices of the present invention will need energy stores or generators of some sort, which can comprise non-rechargeable batteries, rechargeable batteries, motion generators that can convert energy
15 from the motion of the user into electrical energy that can be used or stored, fuel cells or other such energy stores or converters as are convenient.

Sound Transducers 260

Sound transducers 260 can supplement or be the primary output of the audio player of the unit 100. For example, the unit 100 can wirelessly transmit the audio signal to DJ 200
20 comprising a wireless headphone sound transducer. This would allow a user to listen to the audio from the audio player without the need for wires connecting the headphones to the unit 100. Such sound transducers can comprise, for example, electromagnetic or piezoelectric elements.

Alternative to headphone or earphone audio production, external speakers, which can
25 be associated with light transducers 240 or tactile transducers 250, can be used to enhance audio reproduction from external speakers associated with the unit 100. In addition or alternative to simple reproduction of the audio signal output by the audio player 130, the sound transducers 260 can play modified or accompanying signals. For example, frequency filters can be used to select various frequency elements from the music (for low bass), so as
30 to emphasize certain aspects of the music. Alternatively, musical elements not directly output from the audio player 130 can be output to complete all instrumental channels of a piece of music, for example.

Tactile Transducers 250

DJs 200 can be configured with tactile transducers, which can provide vibrational, rubbing, or pressure sensation. As before, signals of a format that control these transducers can be sent directly from the DJ transmitter 120, or can be filtered, modified or generated from signals of an unrelated format that are sent from the transmitter 120. As before, the signal can be the audio signal from the audio player 130, which can, for example, be frequency filtered and possibly frequency converted so that the frequency of tactile stimulation is compatible with the tactile transducer. Alternatively, signals that are of the sort meant for light transduction can be modified so as to be appropriate for tactile transduction. For example, signals for light of a particular color can be used to provide vibrational transduction of a particular frequency, or light amplitudes can be converted into pressure values.

The tactile transducer can comprise a pressure cuff encircling a finger, wrist, ankle, arm, leg, throat, forehead, torso, or other body part. The tactile transducer can alternatively comprise a rubbing device, with an actuator that propels a tactile element tangentially across the skin. The tactile transducer can also alternatively comprise a vibrational device, with an actuator that drives an element normally to the skin. The tactile transducer can further alternatively comprise elements that are held fixed in relation to the skin, and which comprise moving internal elements that cause the skin to vibrate or flex in response to the movement of the internal element.

The tactile transducer can lack any moveable element, and can confer tactile sensation through direct electrical stimulation. Such tactile elements are best used where skin conductivity is high, which can include areas with mucus membranes.

Tactile transduction can take place on any part of the body surface with tactile sensation. In addition, tactile transduction elements can be held against the skin overlying bony structures (skull, backbone, hips, knees, wrists), or swallowed and conveyed through the digestive tract, where they can be perceived by the user.

Input Transducers

It should also be understood that the DJ 200 can comprise input transducers in order to create control signals from information or stimuli in the local environment. Figure 24 is a schematic block diagram of a DJ unit 200 with associated input transducers. The input-enabled DJ 1320 comprises energy storage 270, a controller 1322, output transducers 1324, a

DJ receiver 220 and input transducers 1326. The input transducers 1326 can comprise one or more of a microphone 1328 and an accelerometer 1330.

In operation, the energy storage 270 provides energy for all other functions in the DJ 1320. The controller 1322 provides control signals for the output transducers 1324, which
5 can comprise tactile transducers 250, sound transducers 260, and/or light transducers 240. Input to the controller can be provided via the input transducers 1326, optionally along with input from the DJ receiver 220.

For example, on a dance floor, the microphone 1328 can provide electrical signals corresponding to the ambient music. These signals can be converted into transducer 1324
10 control signals in a manner similar to that described below for the automatic generation of control signals according to Figures 21 A-C, as will be described below. This allows the use of the DJ functionality in the absence of an accompanying audio unit 100, expanding the applications of the DJ 200. An automatic gain filter can be applied so as to compensate for the average volume level – because the user can be close or far from the sources of ambient
15 music and the music can vary in volume, the strength of the DJ 200 transduction can be normalized. In addition, it can also be preferable for there to be a manual amplitude control 1323, such as a dial or two position rocker switch, by which the average intensity of the DJ 200 control signals can be varied to suit the taste of the user. The amplitude control 1323 can operate through modulating the input transducer 1326 output or as an input to the controller
20 1322 as it generates the signals for the output transducers 1324.

Alternatively, the accelerometer 1330 can track the movement of the person wearing the DJ 100, such that a signal indicating acceleration in one direction can be converted by the controller 1322 into signals for a channel of output transducers 1324. The accelerometer
25 1330 can be outfitted with sensors for monitoring only a single axis of motion, or alternatively for up to three independent directions of acceleration. Thus, the controller 1322 can convert sensed acceleration in each direction into a separate channel, horizontal axes of acceleration could be combined into a single channel and the vertical axis into a second channel, or other such linear or non-linear combination of sensed acceleration can be combined in aesthetic fashion.

30 It is also within the spirit of the present invention that multiple input signals be combined by the controller 1322 to create control signals for aesthetic output from the output transducers 1324. For example, one channel can be reserved for control signals generated from accelerometer signals, another channel for control signals generated from microphone signals, and yet a third channel from control signals generated from DJ receiver 220 input. In

general, the information from the DJ receiver 220 and from the microphone 1328 will be of the same type (i.e. generated from audio signals), so that the most common configurations will be control signals from a combination of the microphone 1328 and accelerometer 1330, and signals from a combination of the DJ receiver 220 and the accelerometer 1330.

5 The input transducers 1326 can further comprise a light sensor, such that the DJ would mimic light displays in its environment, making it appear that the DJ is part of the activity that surrounds it. In this case, the controller 1322 would preferably generate control signals based on rapid changes in the ambient lighting, since it would be less aesthetic to have the DJ transducers provide constant illumination. Furthermore, slowly changing light
10 (on the order of tens or hundreds of milliseconds) will be created naturally by the movement of the user, whereas changes in the lighting (e.g. strobes, laser lights, disco balls) will be of much faster change (on the order of milliseconds). Thus, to match the ambient dance lighting, it is aesthetic for the DJ 200 to respond most actively to ambient light that is changing in intensity a predetermined percentage in a predetermined time, wherein the
15 predetermined percentage is at least 20% and the predetermined time is 20 milliseconds or less, and even more preferably for the predetermined percentage to be at least 40% and the predetermined time is 5 milliseconds or less.

Unit to Unit Communication

Units 100 transfer audio signals from the audio player in one unit 100 to the audio
20 player 130 of another unit 100. Figures 3A-C are schematic block diagrams of unit 100 elements used in inter-unit communications. Each diagram presents communications between a Unit A and a Unit B, with Unit A transmitting audio signals to Unit B. Dashed connectors and elements indicate elements or transfers that are not being utilized in that unit 100, but are placed to indicate the equivalence of the transmitting and receiving units 100.

25 In Figure 3A, compressed audio signals (e.g. in MP3 format or MPEG4 format for video transfers, as described below) stored in a compressed audio storage 310 are transferred to a signal decompressor 302, where the compressed audio signal is converted into an uncompressed form suitable for audio output. In Unit A, this decompressed signal is passed both to the local speaker 300, as well as to the inter-unit transmitter/receiver 110. The Unit B
30 inter-unit transmitter-receiver 110 receives the uncompressed audio signal, which is sent to its local speaker for output. Thus, both Unit A and Unit B play the same audio from the Unit A storage, in which uncompressed audio is transferred between the two units 100.

In Figure 3B, compressed audio signals from the Unit A compressed audio storage 310 are sent both to the local signal decompressor 302 and to the inter-unit transmitter/receiver 110. The Unit A decompressor 302 conditions the audio signal so that it is suitable for output through the Unit A speaker 300. The compressed audio signal is sent
5 via Unit A transmitter-receiver 110 to the Unit B transmitter/receiver 110, where it is passed to the Unit B decompressor 302 and thence to the Unit B speaker 300. In this embodiment, because compressed audio signals are transmitted between the units 100 transmitter/receivers 302, lower bandwidth communications means can be used in comparison with the embodiment of Figure 3A.

10 In Figure 3C, compressed audio signals from the Unit A compressed audio storage 310 are sent to the Unit A signal decompressor 302. These decompressed signals are sent to both the local speaker 300 as well as to a local compressor 330, which recompresses the audio signal to a custom format. In addition to decompressed audio signal input, the compressor also optionally utilizes information from a DJ signal generator 320, which
15 generates signals to control DJ transducers 240, 250 and 260, which can be sent in conjunction with the audio signal. The signal generator 320 can include analog and/or digital filtering or other algorithms that analyze or modify the audio signals, or can alternatively take manually input transducer control signals input as described below. The custom compression can include multiplexing of the audio signals with the transducer control signals.

20 The custom compressed audio signals, are then passed to the Unit A inter-unit transmitter/receiver 110, which are then transferred to the Unit B inter-unit transmitter/receiver 110, and thence to the Unit B signal decompressor 302 and speaker 300.

Given the time delays in signal transfer between the units 100, custom compression that takes place in the sending unit, and any subsequent decompression that takes place in the
25 receiving unit 100, it can be convenient to place a delay on the local (i.e. Unit A) speaker output of tens of milliseconds, so that both units 100 play the audio through their speakers at roughly the same time. This delay can include limited local digital storage between the local signal decompression and speaker 300 output.

Various hardware communications protocols will be discussed below with respect to
30 unit-to-unit communications, but in general it is required that the distance between the units that must be maintained be preferably at least 40 feet, and more preferably at least 100 feet, and most preferably 500 feet, in order to allow units 100 sharing music to be able to move reasonably with respect to one another (e.g. for a user to go to the bathroom without losing contact), or to find each other in a large venue such as a shopping mall.

Communications Protocols

Communication between the inter-unit transmitter/receivers 110 can involve a variety of protocols within the teachings of the present invention, and can include IP protocol-based transmissions mediated by such physical link layers as 802.11a, b or g, WDCT, HiperLAN, 5 ultra-wideband, 2.5 or 3G wireless telephony communications, custom digital protocols such as Bluetooth or Millennial Net i-Beams. Indeed, it is not even necessary for the transmissions to be based on Internet protocol, and conventional analog radio-frequency or non-IP infrared transmissions are also within the spirit of the present invention. Each unit 100 will generally have both transmission and reception capabilities, though it is possible for a unit to have only 10 reception capabilities. While the bandwidth of the broadcast is dependent on the compression of the audio signal, it is preferable for the transmission bandwidth to be larger than 100 kb/sec, and even more preferable for the transmission bandwidth to be greater than 250 kb/sec.

While the distance of transmission/reception is not bounded within the teachings of 15 the present invention, it will generally be less than a few hundred meters, and often less than 50 meters. The distance of communication is limited in general by the amount of power required to support the transmission, the size of antennae supported by portable devices, and the amount of power allowed by national regulators of broadcast frequencies. Preferably, however, the range of transmission will be at least 10 meters, and even more preferably at 20 least 30 meters, in order to allow people sharing communications to move some distance from one another without communications being lost.

The unit 100 is characterized generally by four sets of roughly independent characteristics: playing audio or not playing audio, transmitting or not transmitting, receiving or not receiving, searching or not searching.

25 Units 100 will often function in conditions with large numbers of other units 100 within the communications range. For example, in a subway car, a classroom, bicycling, or at a party, a unit 100 can potentially be within range of dozens of other units. A unit 100 that is playing audio from local compressed audio storage 310 can, at the user's prerogative, choose to broadcast this audio to other units 100. A unit 100 that is currently "listening" to a 30 broadcast or is searching for a broadcast to "listen" to will require a specific identifier roughly unique to a broadcaster in order to select that broadcaster signal from among the other possible broadcasters. Some of the communications protocols listed above, such as those based on IP protocols, 2.5G or 3G wireless, or Bluetooth communications, have such

identifiers as part of the protocols. Custom radio frequency based protocols will require protocols to allow signals to be tagged with specific identifiers.

A unit 100 that is transmitting signals can, within the spirit of the present invention, be prevented from simultaneously receiving signals. Preferably, however, units 100 can both
 5 transmit and receive simultaneously. One example of the use of simultaneous transmission and reception is for a unit 100 that is receiving a signal to send a signal indicating its reception to the transmitting unit 100. This allows the transmitting unit to determine the number of units 100 that are currently receiving its broadcast. In return, this information could be sent, along with the audio signal, so that all of the users with units 100 receiving the
 10 broadcast can know the size of the current reception group. Alternatively, a user with a unit 100 that is currently broadcasting can be searching for other broadcasting units, so that the user can decide whether to continue broadcasting or whether to listen to the broadcast of another unit.

Unit to DJ Communication

15 Communication between the unit 100 and the DJ 200 can be either through the inter-unit transmitter/receiver 110, or through a separate system. In general, the requirement of the DJ 200 is for reception only, although it is permissible for the DJ 200 to include transmission capabilities (e.g. to indicate to the unit 100 when the DJ 200 energy storage 270 is near depletion).

20 The signals for which the DJ 200 is receptive is dependent on how the transduction control signals are generated. For example, for a controller 242 that incorporates a filter or modifier that takes the audio signal as its input, the DJ receiver 220 would receive all or a large fraction of the audio signal. In this case, the communication between the unit 100 and the DJ 200 would require a bandwidth comparable to that of inter-unit communication, as
 25 described above.

However, if the signals are either generated in the unit 100, or pre-stored along with the stored compressed audio signal, then the communications bandwidth can be quite modest. Consider a DJ 200 with 2 arrays 290 and 292 of LEDs 246, which flash with a frequency of no more than 10 Hertz, and that the LEDs are in either an ON or an OFF state, without
 30 intermediate amplitudes. In such case, the maximum bandwidth required would be only 20 bits/second, in addition to the DJ control signals.

The range of unit to DJ communications need not be far. In general, the unit 100 and the DJ 200 will be carried by the same user, so communications ranges of 10 feet can be

adequate for many applications. Some applications (see below) can require, however, somewhat larger ranges. On the other hand, longer communications ranges will tend to confer the possibility of overlap and interference between two different units 100 to their respective DJs 200. In general, for the application of unit to DJ communications, it is preferable for the minimum range of communications to be at least 1 foot, and more preferably for the minimum range of communications to be at least 10 feet, and most preferably for the minimum range of communications to be at least 20 feet. Also, for the application of unit to DJ communications, it is preferable for the maximum range of communications to be no more than 500 feet, and more preferably for the maximum range of communications to be no more than 100 feet, and most preferably for the maximum range of communications to be no more than 40 feet. It should be noted that these communications ranges refer primarily to the transmission distance of the units 100, especially with regard to the maximum transmission distance.

Because there can be multiple unit 100/DJ 200 ensembles within a relatively short distance, communications between a unit 100 and a DJ 200 preferably comprise both a control signal as well as a unit identification signal, so that each DJ 200 receives its control signals from the correct unit 100. Because the unit 100 and the DJ 200 will not, in general, be purchased together, or that a user can buy a new unit 100 to be compatible with already owned DJs 200, it is highly useful to have a means of "entraining" a DJ 200 to a particular unit 100, called its "master unit", and a DJ 200 entrained to a master unit is "bound" to that unit.

Figure 4 is a schematic flow diagram of DJ entraining. To entrain a DJ 200, the DJ is set into entraining mode, preferably by a physical switch on the DJ 200. The master unit 100 to which the DJ 200 is to be entrained is then placed within communications range, and the unit 100 transmits through the DJ transmitter 120 an entraining signal that includes the master unit 100 identifier. Even should there be other units 100 transmitting in the vicinity, it is unlikely that they would be transmitting the entraining signal, so that entraining can often take place in a location with other active units 100. Verification that the entraining took place can involve a characteristic sequence of light output (for light transduction), audio output (for sound transduction) or motion (for tactile transduction). After verification, the DJ 100 is reset to its normal mode of operation, and will respond only to control signals accompanied by the identifier of its master unit 200.

It should be noted that there can be multiple DJ's 200 bound to the same master unit 100. Thus, a single person can have multiple light transducing DJs 200, or DJs 200 of various modes (light, sound, tactile) transduction.

While DJs 200 will generally be bound to a master unit associated with the same person, this is not a requirement of the present invention. Figures 5A-B are schematic block diagrams of DJs 200 associated with multiple people bound to the same master unit. In Figure 5A, DJ A 200 and DJ B 200 are both bound to the same DJ transmitter 120, even though DJ A 200 and DJ B 200 are carried by different persons. This is particularly useful if the control signals are choreographed manually or through custom means by one person, so that multiple people can then share the same control signals. Such a means of synchronization is less necessary if the DJ 200 control signals are transmitted between units 100 through the inter-unit transmitter/receiver 110 along with the audio signals. Furthermore, in this case, it is better for the range of unit-to-DJ communication to be in the range of the inter-unit communication described above.

In the case of sound transducers 260, the DJ B 200 can comprise a wireless audio earpiece, allowing users to share music, played on a single unit 100, privately. Consider Figure 5A, configured with sound transducers 260 (see, for example, Figure 1) in DJ A 200 and DJ B 200. Signals from the audio player 130 are transmitted by the DJ transmitter 120, where they are received by DJs 200 – DJ A and DJ B – that are carried by Person A and Person B, respectively. In this case, both persons can listen to the same music.

Figure 5B shows the operation of a wide-area broadcast unit 360, which is used primarily to synchronize control of a large number of DJs 200, such as might happen at a concert, party or rave. In this case, the audio player 130 is used to play audio to a large audience, many of whom are wearing DJs 200. In order to synchronize the DJ output, a relatively high-power broadcast transmitter 125 broadcasts control signals to a number of different DJs 200 carried by Person A, Person B and other undesigned persons. The entraining signal can be automatically sent on a regular basis (e.g. whenever music is not being played, such as between songs, or interspersed within compressed or decompressed songs) so that patrons or partygoers could entrain their DJs 200 to the broadcast unit 360. The broadcast unit 360 can also transmit inter-unit audio signals, or can only play the audio through some public output speaker that both Person A and Person B can enjoy.

Figure 26 is a schematic diagram of people at a concert, in which DJs 200 conveyed by multiple individuals are commonly controlled. At a concert venue 1370, music is produced on a stage 1372, and concert patrons 1376 are located on the floor of the venue.

Many of the patrons have DJs 200 which are receptive to signals generated by a broadcast DJ controller 1374. The broadcast DJ controller creates signals as described below, in which the music is automatically converted into beats, where microphones are used to pick up percussive instruments, and/or where individuals use a hand-pad to tap out control signals.

5 These control signals are either broadcast directly from the area of the broadcast DJ controller 1374, or alternatively are broadcast from a plurality of transmitters 1380 placed around the venue 1370, and which are connected by wires 1378 to the controller 1374 (although the connection can also be wireless within the spirit of the present invention). It should be understood that the protocol for transmitting DJ control signals can be limited either by

10 hardware requirements or by regulatory standards to a certain distance of reception. Thus, to cover a sufficiently large venue, multiple transmitters can be necessary to provide complete coverage over the venue 1370. In general, it is preferable for the maximum transmission distance of transmission from the transmitters to be at least 100 feet, and more preferably at least 200 feet, and most preferably at least 500 feet, so as to be able to cover a reasonable

15 venue 1370 size without needing too many transmitters 1380.

An alternative embodiment of unit 100 to DJ 200 communications is the use of radio frequency transmitters and receivers, such as those used in model airplane control, which comprise multi-channel FM or AM transmitters and receivers. These components can be very small (e.g. the RX72 receivers from Sky Hooks and Riggings, Oakville, Ontario,

20 Canada), and are defined by the crystal oscillators that determine the frequency of RF communications. Each channel can serve for a separate channel of DJ control signals. In such cases, an individual can place a specific crystal in their audio unit 100, and entraining the DJ 200 is then carried out through the use of the same crystal in the DJ 200. Because of the large number of crystals that are available (e.g. comprising approximately 50 channels in

25 the model aircraft FM control band), interference with other audio units 100 can be minimized. Furthermore, control of many DJs 200 within a venue, as described above, can take place by simultaneously transmitting over a large number of frequencies.

As described above, the wide-area broadcast transmitter 125 can transmit entraining signals to which the DJs 200 can be set to respond. However, there are a number of other

30 preferred means by which DJs 200 can be used to respond to control signals to which they have not been entrained. For example, the DJs 200 can be set to respond to controls signals to which they have not been entrained should there be no entrained control signals present (e.g. the corresponding unit 100 is not turned on).

Figure 35 is a schematic block diagram of DJ 200 switch control for both entraining and wide-area broadcast. The DJ 200 comprises a three-way switch 1920. In a first state 1922, the DJ 200 is entrained to the current control signal as described above. Thereafter, in a second state 1924, the DJ 200 responds to control signals corresponding to the entraining signal encountered in the step 1922. In a third state 1926, the DJ 200 responds to any control signal for which its receiver is receptive, and can therefore respond to a wide-area broadcast, thereby providing the user with manual control over the operational state of the DJ 200. It should be noted that the switch 1920 can be any physical switch with at least three discreet positions, or can alternatively be any manual mechanism by which the user can specify at least three states, including a button presses that have a visible user interface or a voice menu.

Figure 12B is a schematic drawing of modular digital jewelry 201. The modular jewelry 201 is comprised of two components: an electronics module 1934 and a display module 1932. These modules 1934 and 1932 can be electrically joined or separated through an electronics module connector 1936 and a display module connector 1938. The value of the modular arrangement is that the electronics module 1934 comprises, in general, relatively expensive components, whose combined price can be many-fold that of the display module 1932. Thus, if a user wants to change the appearance of the jewelry 201 without having to incur the cost of additional electronics components such as the energy storage 270, receiver 220 or controller 1322, they can simply replace the display module 1932 with its arrangement of output transducers 1324 with an alternative display module 1933 with a different arrangement of output transducers 1325.

The transmitter for DJ 200 control signals has been previously discussed primarily in terms of its incorporation within a unit 100. It should be understood, however, that the transmitter can be used in conjunction with a standard audio player unrelated to unit-to-unit communications. Figure 12C is a schematic block diagram of a modular digital jewelry transmitter 143 that generates and transmits control signals from an audio player 131. The modular transmitter 143 is connected to the audio player 131 via audio output port 136 through the cable 134 to the audio input port 138 of the modular transmitter 143. The modular transmitter 143 comprises the DJ transmitter 120, which can send unit-to-DJ communications. The output audio port 142 is connected to the earphone 901 via cable 146. The earphone 901 can also be a wireless earphone, perhaps connected via the DJ transmitter 120.

The audio output from the player 131 is split both to the earphone 901 and to the controller 241 (except, perhaps where the DJ transmitter transmits to a wireless earphone).

The controller 241 automatically generates control signals for the DJ 200 in a manner to be described in detail below. These signals are then conveyed to the DJ transmitter 120. It should be understood that this arrangement has the advantage that the digital jewelry functionality can be obtained without the const of the components for the audio player 131, and in addition, that the modular transmitter 143 can then be used in conjunction with multiple audio players 131 (either of different types or as the audio players are lost or broken).

Inter-unit Audio Sharing

Overview

Inter-unit communication involves the interactions of multiple users, who may or may not be acquaintances of each other. That is, the users can be friends who specifically decide to listen to music together, or it can be strangers who share a transient experience on a subway train. The present invention supports both types of social interaction.

An important aspect of the present invention is the means by which groups of individuals join together. Figure 6 is a schematic block diagram of a cluster 700 of units 100, indicating the nomenclature to be used. The cluster 700 is comprised of a single broadcast unit 710, and its associated broadcast DJ 720, as well as one or more receive units 730 and their associated DJs 740. The broadcast unit 710 transmits music, while the receive unit 730 receives the broadcasted music. A search unit 750 and its associated search DJ 760 are not part of the cluster 700, and comprise a unit 100 that is searching for a broadcast unit 710 to listen to or a cluster 700 to become associated with.

It should be noted that many communications systems can be operated alternatively in two modes: one that supports peer-to-peer communications and one that requires a fixed infrastructure such as an access point. Figure 35 is a schematic block diagram of mode switching between peer-to-peer and infrastructure modes. A mode switch 1950 is made by the user, either manually, or automatically – for example, that the user chooses between different functions (listening or broadcasting, file transfers, browsing the Internet) and the system determine the optimal mode to use. A peer-to-peer mode 1952 is well configured for mutual communications between mobile units 100 that are within a predetermined distance, and is well-suited for short-range wireless communications and audio data streaming 1954. Alternatively, the mode switch 1950 enables an infrastructure mode 1956, which is of particular usefulness in gaining access to a wide area network such as the Internet, through

which remote file transfer 1958 (e.g. downloading and uploading) and remote communications such as Internet browsing can be made through access points to the fixed network.local wireless audio streaming.

It should be noted, however, that certain communications systems, such as many modes of telephony, do not distinguish between mobile communications and communications through fixed access points, and that both file transfer 1958 and audio streaming 1954 can be available through the same mode. Even in those cases, however, it can be convenient to have two modes in order to make optimal use of the advantages of the different modes. In such cases, however, the two modes can alternatively be supported by multiple hardware and software systems within the same device – for example, for remote communications to be made through a telephony system (e.g. GSM or CDMA), while the local audio streaming 1954 can be made through a parallel communications system (e.g. Bluetooth or 802.11) – indeed, the two systems can operate simultaneously with one another.

Inter-unit Transmission Segmentation

Preferably, the broadcast unit 710 and the receive units 730 exchange information in addition to the audio signal. For example, each user preferably has indications as to the number of total units (broadcast units 710 and receive units 730) within a cluster, since the knowledge of cluster 700 sizes is an important aspect of the social bond between the users. This also will help search units 750 that are not part of the cluster determine which of the clusters 700 that might be within their range are the most popular.

The additional information shared between members of a cluster 700 would include personal characteristics that a person might allow to be shared (images, names, addresses, other contact information, or nicknames). For example, the broadcast unit 710 will preferably, along with the music, transmit their nickname, so that other users will be able to identify the broadcast unit 710 for subsequent interactions, and a nickname is significantly easier to remember than a numerical identifier (however, such numerical identifier can be stored in the unit 100 for subsequent searching).

Such additional information can be multiplexed along with the audio signal. For example, if the audio signal is transferred as an MP3 file, assuming that there is additional bandwidth beyond that of the MP3 file itself, the file can be broken into pieces, and can be interspersed with other information. Figure 7 is a schematic diagram of a broadcast unit 710 transmission 820. The transmission is comprised of separate blocks of information, each represented in the figure as a separate line. In the first line, a block code 800 is transmitted,

which is a distinctive digital code indicating the beginning of a block, so that a search unit 750 receiving from the broadcast unit 710 for the first time can effectively synchronize itself to the beginning of a digital block. Following the block code 800 is a MP3 block header 802, which indicates that the next signal to be sent will be from a music file (in this case an MP3 file). The MP3 block header 802 includes such information as is needed to interpret the following block of MP3 file block 804, including such information as the length of the MP3 block 804, and characteristics of the music (e.g. compression, song ID, song length, etc.) that are normally located at the beginning of a MP3 file. By interspersing this file header information at regular intervals, a user can properly handle music files that are first received in the middle of the transmission of an MP3 file. Next, the MP3 block 804 containing a segment of a compressed music file is received.

Dependent on the amount of music compression and the bandwidth of the inter-unit communications, other information can be sent, such as user contact information, images (e.g. of the user), and personal information that can be used to determine the "social compatibility" of the user with the broadcast unit 710 and the receive unit 730. This information can be sent between segments of MP3 files or during "idle" time, and is generally preceded by a block code 800, that is used to synchronize transmission and reception. Next, a header file is transmitted, which indicates the type of information to follow, as well as characteristics that will aid in its interpretation. Such characteristics could include the length of information, descriptions of the data, parsing information, etc. In Figure 7, an ID header 806 is followed by an ID block 808, which includes nicknames, contact information, favorite recording artists, etc. Later, an image header 810 can be followed by an image block with an image of the user. The image header 810 includes the number of rows and columns for the image, as well as the form of image compression.

It should be understood that the communications format described in Figure 7 is only illustrative of a single format, and that a large number of different formats are possible within the present invention. Also, the use of MP3 encoding is just an example, and other forms of digital music encoding are within the spirit of the present invention, and can alternatively comprise streaming audio formats such as Real Audio, Windows Media Audio, Shockwave streaming audio, QuickTime audio or even streaming MP3 and others. Furthermore, these streaming audio formats can be modified so as to incorporate means for transmitting DJ 200 control signals and other information.

Transmitting Dynamic Data and Control Information

As described above, there are benefits to two-way communications between the broadcast unit 710 and the receive unit 730. There are many methods of carrying out this communication, even if the inter-unit transmitter/receiver 110 does not permit simultaneous transmission and reception. For example, additional transmission and reception hardware could be included in each unit 100. Alternatively, in the transmission 820 above, specific synchronization signals such as the block code 800 can be followed by specific intervals during which the inter-unit transmitter/receiver 110 that is transmitting switches into receive mode, while the inter-unit transmitter/receiver 110 that was receiving switches to transmit mode. This switch in communications direction can be for a specific interval, or can be mediated through conventional handshake methods of prior art communications protocols.

It should be noted that in addition to transfer of static information (e.g. identifiers, contact information, or images), dynamic information and control information can also be transferred. For example, the user at the receive unit 730 can be presented with a set of positive and negative comments (e.g. "Cool!" "This is awful!") that can be passed back to the broadcast unit 710 with the press of a button. Such information can be presented to the user of the broadcast unit 710 either by visual icon on, for example, an LCD screen, by a text message on this screen, or by artificial voice synthesis generated by the broadcast unit 710 and presented to the user in conjunction with the music.

Alternatively, the user of the receive unit 730 can speak into a microphone that is integrated into the receive unit 730, and the user voice can be sent back to the broadcast unit 710. Indeed, the inter-unit communications can serve as a two-way or multi-way communications method between all units 100 within range of one another. This two-way or multi-way voice communication can be coincident with that of the playing of the audio entertainment, and as such, it is convenient for there to be separate amplitude control over the audio entertainment and the voice communication. This can be implemented either as two separate amplitude controls, or alternatively as an overall amplitude control, with a second control that sets the voice communications amplitude as a ratio to that of the audio entertainment. In this latter mode, the overall level of audio output by the unit is relatively constant, and the user then selects only the ability to hear the voice communication over the audio entertainment.

In order to express their feelings and appreciation about the music they are hearing, users within a cluster 700 can also press buttons on their units 100 that will interrupt or

supplement the control signals being sent to their respective DJs 200, providing light shows that can be made to reflect their feelings. For example, it can be that all lights flashing together (and not in synchrony with the music) can express dislike for music, whereas intricate light displays could indicate pleasure.

5 It is also possible to send control requests between units 710. For example, a receive unit 730 can make song requests (e.g. "play again", "another by this artist") that can show on the broadcast unit 710 user interface. Alternatively, the user of a receive unit 730 can request that control be switched, so that the receive unit 730 becomes the broadcast unit 710, and the broadcast unit 710 becomes a receive unit 730. Such requests, if accepted by the initial
10 broadcast unit 710 user, will result in the memory storage of the identifier of the broadcast unit 710 being set in all units in the cluster 700 to that of the new broadcast unit 730. Descriptions of the communications resulting in such a transfer of control will be provided below.

Additionally, it is also possible for users of units 100 to privately "chat" with other
15 users while they are concurrently receiving their audio broadcasts. Such chat can be comprised of input methods including keyboard typing, stylus free-form writing/sketching, and quickly selectable icons.

It should be understood that within the spirit of the present invention that the functional configuration can be supported by the extension of certain existing devices. For
20 example, the addition of certain wireless transmitter and receiver, as well as various control and possibly display functionality to a portable audio player would satisfy some embodiments of the present invention. Alternatively, by the addition of music storage and some wireless transmitter and receiver functionality, a mobile telephone would also allow certain embodiments of the present invention. In such case, the normal telephony communications,
25 perhaps supported by expanded 3G telephony capabilities, could serve to replace aspects of the IP communications described elsewhere in this specification.

IP Socket Communication Embodiments

A standard set of protocols for inter-unit communications is provided through IP socket communications, which is widely supported by available wireless communications
30 hardware, including 802.11a, b and g (Wi-Fi). An embodiment of inter-unit communications is provided in Figures 14A-B. Figure 14A is a schematic block diagram of the socket configurations on the broadcast unit 710 and the receive unit 730.

In the discussion below, transfer of the different messages and audio information are provided, generally but not always, through an Internet protocol. At the transport layer of such protocols, there will generally be used either a connectionless protocol or a connection-oriented protocol. Among the most common of these protocols are respectively the User
 5 Datagram Protocol (UDP) and the Transmission Control Protocol (TCP), and wherever these protocols are used below, it should be noted that any like protocol (connectionless or connection-oriented), or the entire class of protocol can generally be substituted in the discussion.

The broadcast unit 710, prior to the membership of the receive unit 730, broadcasts
 10 the availability of the broadcast on a broadcast 1050, which is generally a TCP socket. The annunciator 1050 broadcasts on a broadcast address with a predetermined IP address and port. The receive unit 730 has a client message handler 1060 that is also a TCP socket that is looking for broadcasts on the predetermined IP address and port. When it receives the broadcast, a handshake creates a private server message handler 1070 on a socket with a new
 15 address and port on the broadcast unit 710. The broadcast unit 710 and the receive unit 730 can now exchange a variety of different messages using the TCP protocol between the server message handler 1070 and the client message handler 1060. This information can comprise personal information about the users of the broadcaster unit 710 and the receive unit 730. Alternatively or additionally, the broadcast unit 710 can transfer a section of the audio signal
 20 that is currently being played, so that the user of the receive unit 730 can "sample" the music that is being played on the broadcast unit 710. It should be noted that, in general, the broadcast unit 710 continues its broadcast on the broadcast annunciator 1050 for other new members.

Once it is established that the broadcast unit 710 and the receiver unit 730 are
 25 mutually desirous of providing and receiving an audio broadcast, respectively, sockets optimized for broadcast audio are created both on the broadcast unit 710 and the receiver unit 730. These sockets will often be UDP sockets – on the broadcast unit 710, a multicast out socket 1080 and on the receiver unit 730, a multicast in socket 1090.

Figure 14B is a schematic block flow diagram of using IP sockets for establishing
 30 and maintaining communications between a broadcast unit 710 and the receive unit 730, according to the socket diagram of Figure 14A. In a step 1100, the broadcast annunciator 1050 broadcasts the availability of audio signals. In a step 1102, the receiver unit 730 searches for a broadcast annunciator 1050 on the client message handler 1060 socket. Once a connection is initiated in a step 1104, the broadcast unit 710 creates the message handler

socket 1070 in a step 1106, and the receiver unit 730 retasks the message handler socket 1060 for messaging with the broadcast unit 730. The broadcast annunciator 1050 continues to broadcast availability through the step 1100.

In a step 1110, the broadcast unit 710 and the receiver unit 730 exchange TCP
 5 messages in order to establish the mutual interest in audio broadcasting and reception. Should there not be mutual acceptance, then the system returns to the original state in which the broadcast unit 710 is transmitting the broadcast annunciation in the step 1100, and the receive unit 730 searches for broadcasts in the step 1102. Given that the receive unit 730 and the broadcast unit 710 will be within communications distance, and that the broadcast unit
 10 710 is transmitting an annunciation for which the receive unit 730 is receptive, the broadcast unit 710 will be set into a state where it will not establish communications with the receive unit 730 in the step 1106. This can occur either by not creating the message socket in the step 1106 when connection is made with the receiver unit 730, or that the annunciator 1050 remains silent for a predetermined period, perhaps for a period of seconds.

15 If the broadcast unit 710 and the receiver unit 730 do mutually accept a multicasting relationship, the broadcast unit 710 creates the multicast out UDP socket 1080 in a step 1112 and the receiver unit 730 creates the multicast in UDP socket 1090 in the step 1114, and multicast audio transmission and reception is initiated in a step 1116. It should be noted that should the broadcast unit 710 already be multicasting audio to a receiver unit 730 prior to the
 20 step 1112, the multicast out socket 1080 is not created, but that the address of this existing socket 1080 is communicated to the new cluster member.

Given that a cluster can comprise many members, the system of Figures 14A-B must be able to expand to include multiple members. Figure 15 is a schematic block diagram of the IP socket organization used with clusters comprising multiple members. The broadcast
 25 unit 710 includes a broadcast annunciator 1050 indicating broadcast availability for new members. For each member in the cluster, the broadcast unit further comprises a message handler 1070 dedicated to the specific member, whose receive unit 730 in turn comprises a message handler 1060, generally in a one-to-one relationship. The broadcast unit comprises N messaging sockets 1070 for the N receive units of the cluster, while each member has only
 30 a single socket 1060 connected to the broadcast unit. Thus, when a member wishes to send a message to the other members of the cluster, the message is sent via the receive unit message handler 1060 to the broadcast unit message handler 1070, and which is then multiply sent to the other receive unit message handlers 1060. It is also within the teachings of the present invention for each member of the cluster to have direct messaging capabilities with each

other member, assisted in the creation of the communications by the broadcast unit 710, which can share the socket addresses of each member of the cluster, such that each member can assure that it is making connections with other members of the cluster rather than units of non-members. The broadcast unit 710 also comprises a multicast out socket 1080 which
 5 transfers audio to individual receiver sockets 1090 on each of the members of the cluster.

Members of the cluster may come and go, especially since members will frequently move physically outside of the transmission range of the broadcast unit 710. In order for the broadcast unit 710 to determine the current number of members of its cluster, it is within the teachings of the present invention for the broadcast unit 710 to use the messaging sockets
 10 1060 and 1070 to "ping" the receive units 730 from time to time, or otherwise attempt to establish contact with each member of the cluster 700. Such communications attempts will generally be done at a predetermined rate, which will generally be more frequent than once every ten seconds. Information about the number of members of a cluster can be sent by the broadcast unit 710 to the other members of the cluster, so that the users can know how many
 15 members there are. Such information is conveniently placed on a display on the unit (see, for example, Figures 18A-B).

Music Synchronization

It will be generally desirable that the synchronicity of the audio playback on the broadcast unit 710 and the receive units 730 be highly synchronized, preferably within 1
 20 second (i.e. this provides a low level functionality of listening to music together), more preferably within 100 milliseconds (i.e. near-simultaneous sharing of music, but an observer would be able to hear – or see through DJ 200 visible cues – the non-synchronicity), and most preferably within 20 milliseconds of one another. In a simple embodiment of the present invention, all members of a cluster 700 must communicate directly with the broadcast unit
 25 710, without any rebroadcast. In such cases, making playback on the two units 710 and 730 as similar as possible will tend to synchronize their audio production.

Figure 8A is a schematic block diagram of audio units 100 with self-broadcast so that audio output is highly synchronized. Two audio units 100 are depicted, including a broadcast unit 710 and a receive unit 730. The organization of audio unit 100 elements is chosen to
 30 highlight the self-broadcast architecture. The audio media 1500, which can be compressed audio storage 310, stores the audio signals for broadcast. The output port 1502, which can comprise the inter-unit transmitter/receiver 110, transmits a broadcast audio signal, provided by the audio media 1500. The audio media comprise a variety of different storage protocols

and media, including mp3 files, .wav files, or .au files which are either compressed or uncompressed, monoaural or stereo, 8-bit, 16-bit or 24-bit, and stored on tapes, magnetic disks, or flash media. It should be understood that the spirit of the present invention is applicable to a wide variety of different audio formats, characteristics, and media, of which
 5 the ones listed above are given only by way of example. This broadcast audio signal transmitted from the output port 1502 is received at the input port 1504, which can also comprise aspects of the inter-unit transmitter/receiver 110. The signal so received is then played to the associated user via the audio output 1508.

It should be noted that the audio output is normally connected to the audio media
 10 1500 for audio playing when the unit 710 is not broadcasting to a receive unit 730. In such case, there is no need for the audio signals to go to the output port 1502 and thence to the input port 1504. Indeed, even when broadcasting, the audio signal within the broadcast unit 710 can go both directly to the audio output 1508 as well as to be broadcast from the output port 1502.

However, in order to assure the synchronicity of the audio output on the broadcast
 15 unit 710 and the receive unit 730, the broadcast unit 710 can present all audio signal from the audio media 1500 for output on the output port 1502. The signal will be received not only on the receiver 730 input port 1504, but also on the input port 1504 of the broadcast unit 710. This can take place either through the physical reception of the broadcast audio signal on a
 20 radio frequency receiver, or through local feedback loops within the audio unit 100 (e.g. through employment of IP loopback addresses).

In the receive unit 730, the audio signal received at the input port 1504 goes directly to the audio output 1508, and the other elements of the unit 100 depicted are not active. In the broadcast unit 710, however, if means are used to transfer audio signal between the output
 25 port 1502 and the input port 1504 are utilized, and if such transfer means requires less time than that taken for transmitting signal from the output port 1502 of the broadcast unit 710 to the input port 1504 of the receive unit 730, then a delay means 1506 is introduced to provide a constant delay between the input port 1504 and the audio output 1508. This delay can comprise a digital buffer if the signal is digitally encoded, or an analog delay circuit if the
 30 signal is analog. Generally, the delay introduced into the audio playback will be a predetermined amount based on the characteristics of the unit hardware and software.

Alternatively, in the case of a digital signal, the delay can be variably set according to the characteristics of the communications system. For example, if there are IP-based communications between the units, the units can "ping" one another in order to establish the

time needed for a "round-trip" communications between the systems. Alternatively, each receive unit 730 of a cluster 700 can transmit to the broadcast unit 710 a known latency of the unit based on its hardware and transmission characteristics. It should be noted that in order to handle different delays between multiple members of a cluster, a delay can be introduced into
 5 both the broadcast unit 710 and the receive unit 730, should a new member to the cluster have a very long latency in communications.

Note that the delay 1506 can serve a second purpose, which is to buffer the music should there be natural interruptions in the connections between the members of the cluster 700 (for example, should the receive units 730 move temporarily outside of the range of the
 10 broadcaster unit 710). In such case, should enough audio signal be buffered in the delay 1506, there would not be interruption of audio signal in the receive unit 730. Even in such cases, however, in order to accommodate the differences in time to play audio between units and within a unit, the delays in the broadcast unit 710 can be larger than those in the receive unit 730.

15 If the music compression and the bandwidth of the inter-unit communications are large enough, it can be that the broadcast unit 710 will broadcast less than half of the time. This will generally allow the receive unit 730 to rebroadcast the information from an internal memory store, allowing the effective range of the broadcast signal to potentially double. This can allow, through multiple rebroadcasts, for a very large range even if each individual unit
 20 100 has a small range, and therefore for a potentially large number of users to listen to the same music.

In order to synchronize those that listen to the music through first, second and Nth rebroadcast, a scheme for multi-broadcast synchronization is presented in Figure 8B, a schematic flow diagram for synchronous audio playing with multiple rebroadcast. In such a
 25 case, the cluster 700 is considered to be all units 100 that synchronize their music, whether from an original broadcast or through multiple rebroadcasts. In a first step 780, a unit 100 receives a music broadcast along with two additional data. The first data is the current "N", or "hop" of the broadcast it receives, where "N" represents the number of rebroadcasts from the original broadcast unit 710. Thus, a unit 100 receiving music from the original broadcast
 30 unit 710 would have an "N" of "1" (i.e. 1 hop), while a unit 100 that received from that receiving unit 100 would have an "N" of "2" (2 hops), and so on. A second piece of information would be the "largest N" that was known to a unit 100. That is, a unit 100 is in contact generally with all units 100 with which it either receives or transmits music, and each send the "largest N" with which it has been in contact.

In a second step 782, the unit 100 determines the duration between signals in the broadcasts it is receiving. Then, two actions are taken. In a step 786, the unit 100 rebroadcasts the music it has received, marking the music with both its "N" and the largest "N" it knows of (either from the unit from which it received its broadcast or from a unit to
5 which it has broadcast).

Also, in a step 784, the music that has been received is played after a time equal to the duration between signals and the "largest N" minus the unit's "N". This will allow for all units 100 to play the music simultaneously. Consider, for example the original broadcast unit 710. It's "N" is "0", and its "largest N" is the maximum number of rebroadcasts in the
10 network. It will store music for a period of "largest N" (equals "largest N" minus "0") times the duration of a rebroadcast cycle, and then play it. For a unit 100 at the furthest rebroadcast, it's "N" and "largest N" will be equal to one another, so that it will store music for no time (i.e. "largest N" minus "N" = 0), but will play it immediately. This will allow all units 100 in the cluster to play music simultaneously. The limitation, however, is that there is
15 memory in each unit 100 to store the music for a sufficient period of time. The units 100 on the system, however, can transfer the amount of storage that is available with the other information, and the number of rebroadcasts can be limited to the amount of memory available within the units 100 that comprise the cluster 700.

As the size of this multi-broadcast cluster 700 changes, the "largest N" can vary, and
20 it will take generally on the order of "largest N" steps for the system to register "largest N". In such cases, there can be temporary gaps in the music on the order of the duration between signals, which will generally be on the order of tens of milliseconds, but which can be longer.

It should be noted that the synchronization of music does not need to accompany the transfer of an actual music signal. Figure 34A is a schematic block flow diagram of the
25 synchronization of music playing from music files present on the units 100. In this embodiment, in a step 1900, the broadcast unit establishes the presence or absence of the music file comprising the music signals to be played on the receive unit. The music file can be referenced either with respect to the name of the file (e.g. "Oops.mp3"), or a digital identifier that is associated with the music file.

30 If the music file is not present, then transfer of the music file from the broadcast unit to the receive units can automatically proceed through a file transfer mechanism such as peer-to-peer transfer in a step 1904. If the file was already present, or if the file has been transferred, or alternatively, if the file transfer has begun and enough of the file is present to

allow the simultaneous playing of music between the two units 100, transmission of synchronization signals between the two units 100 can commence in a step 1902.

These synchronization signals can comprise many different forms. For example, the synchronization signal can be the time stamp from the beginning of the music file to the current position of the music file being played on the broadcast unit. Alternatively, the broadcast unit can send the sample number that is currently being played on the broadcast unit 100. In order to allow receiving units to begin synchronous playing in the middle of a transmission from a broadcast unit, the synchronization signals will preferably include information about the song being played, such as the name of the file or the digital identifier associated with the file.

Transmission of this synchronization signal continues until the termination of the song, or until a manual termination (e.g. by actuating a Pause or Stop key) is caused (the frequency of transmission of the synchronization signal will be discussed below). At this point, the broadcast unit can send a termination, pause or other signal in a step 1906. Note that this method of synchronization can operate when the receiving unit establishes connection with the broadcast unit even in the middle of a song.

Figure 34B is a schematic layout of a synchronization signal record 1910 according to Figure 34A. The order and composition of the fields can vary according to the types of music files used, the means of establishing position, the use of digital jewelry, the desire for privacy, and more.

The position field 1912 (SAMPLE#) which contains an indicator of position in a music file – in this case the sample number within the file. The music file identifier field 1914 (SONGID) comprises a textual or numerical identifier of the song being played. The third field is the sample rate field 1916 (SAMPLERATE), and is primarily relevant if the position field 1912 is given in samples, which allows a conversion into time. Given that the same audio entertainment can be recorded or saved at different sample rates, this allows the conversion from a potentially relative position key (samples) to one independent of sample rate (time). The jewelry signal field 1918 (JEWEL SIGNAL) is used to encode a digital jewelry 200 control signal for controlling the output of the digital jewelry 200, should the receiver unit be associated with jewelry 200. The order and composition of the fields can vary according to the types of music files used, the means of establishing position, the use of digital jewelry, the desire for privacy, and more.

The frequency with which the record 1910 is broadcast can vary. The time of reception of the record 1910 sets a current time within the song that can adjust the position of

the music playing on the receiver unit. It is possible for the record to be broadcast only once, at the beginning of the song, to establish synchronization. This, however, will not allow others to join in the middle of the music file. Furthermore, if the record 1910 is received or processed at different times for the single record, the music can be poorly synchronized.

5 With multiple synchronization signals, the timing can be adjusted to account for the most advanced reception of the signal – that is, the music playing will be adjusted forward for the most advanced signal, but not be adjusted back for a more laggard signal.

If the record further contains a jewelry signal field 1918, the frequency with which the record 1910 should be sent should be comparable or faster than the rate with which these signals change, and should be preferably at least 6 times a second, and even more preferably at least 12 times a second. If less frequent record 1910 transmission is desired, then multiple jewel signal fields 1918 can be included in a single record 1910.

It should be noted that given units 100 of different design or manufacture, there can be different intrinsic delays between reception of music and/or synchronization signals and the playing of the music. Such delays can result from different speeds of MP3 decompression, different sizes of delay buffers (such as delay 1506), different speeds of handling wireless transmission, differing modes of handling music (e.g. directly from audio media 1500 to audio output 1508 on the broadcast unit, but requiring transmission through an output port 1502 and input port 1504 for the receiver unit), and more. In such cases, it is preferable for receiver units to further comprise a manual delay switch that can adjust the amount of delay on the receiver unit. This switch will generally have two settings: to increase the delay and to decrease the delay, and can conveniently be structured as two independent switches, a rocker switch, a dial switch or equivalent. It is useful for the increments of delay determined by the switch be adjustable so as to allow users to sense the music from the broadcast unit and the receiver unit as being synchronous, and it is preferable for the increments of delay to be less than 50 milliseconds, and even more preferable for the increments of delay to be less than 20 milliseconds, and most preferable for the units of delay to be less than 5 milliseconds.

Creation and Maintenance of Clusters

30 Search units 750 can be playing music themselves, or can be scanning for broadcast units 710. Indeed, search units 750 can be members of another cluster 700, either as broadcast unit 710 or receive unit 730. To detect a different cluster 700 in which it might desire membership, the search unit 750 can either play the music of the broadcast unit 710 to

the search unit 750 user, or it can scan for personal characteristics of the broadcast unit 710 user that are transmitted in the ID block 808. For example, a user can establish personal characteristic search criteria, comprising such criteria as age, favorite recording artists, and interest in skateboarding, and respond when someone who satisfies these criteria approaches.

5 Alternatively, the search unit 750 user can also identify a person whose cluster he wishes to join through visual contact (e.g. through perceiving the output of the person's light transducer 240).

Before a search unit 750 user can establish contact, it is preferable for a broadcast unit 710 user, or a receive unit 730 user, to provide permissions for others to join the cluster. For
10 example, each unit 100 will generally be able to changeably set whether no one can join with their unit 100, whether anyone can join with their unit 100, or whether permission is manually granted for each user who wishes to join with their unit into a cluster. For a cluster 700, membership in the cluster can be provided either if any one member of the cluster 700 permits a search unit 750 user to join, or it can be set that all members of a cluster 700 need
15 to permit other users to join, or through a variety of voting schemes. The permissions desired by each member will generally be sent between units 100 in a cluster as part of the ID block 808 or other inter-unit communications. Furthermore, these permissions can be used to establish the degree to which others can eavesdrop on a unit 100 transmission. This can be enforced either through the use of cryptography, which can only provide decryption keys as
20 part of becoming a cluster 700 member, through provision of a private IP socket address or password, through standards agreed by manufacturers of unit 100 hardware and software, or by unit 100 users limiting the information that is sent through the ID block 808 through software control.

The search unit 750 user can then establish membership in the group in a variety of
25 ways. For example, if the search unit 750 is scanning music or personal characteristics of the unit 100 user, it can alert the search unit 750 user about the presence of the unit 100. The search unit 750 user can then interact with the search unit 750 interface to send the unit 100 user a message requesting membership in the cluster 700, which can be granted or not. This type of request to join a cluster 700 does not require visual contact, and can be done even if
30 the search unit 750 and cluster are separated by walls, floors, or ceilings.

Another method of establishing contact between a search unit 750 user and a cluster 700 member is for the search unit 750 user to make visual contact with the cluster 700 member. In such case that physical contact or physical proximity is easily made between the unit 100 of the cluster member and the search unit 750, digital exchange can be easily made

either through direct unit 100 contact through electrical conductors, or through directional signals through infra-red LEDs, for example. For example, the search unit 750 user can point his unit 100 at the cluster 700 member unit, and then if the cluster member wishes the search unit 750 user to join the cluster, could point his unit 100 at the search unit 100, and with both pressing buttons, effect the transfer of IDs, cryptography keys, IP socket addresses or other information that allows the search unit 750 user to join the cluster 700.

Alternatively, the broadcast DJ 720 (or the receive DJ 740) can present digital signals through the light transducer. For example, most DJ 720 light transduction will be modulated at frequencies of 1-10 Hz, with human vision not being able to distinguish modulation at 50 Hz or faster. This means that digital signals can be displayed through the light transducer 240 at much higher frequencies (kHz) that will not be perceived by the human eye, even while lower frequency signals are being displayed for human appreciation. Thus, the broadcast DJ 720 can receive a signal from the broadcast unit 710 DJ transmitter 120 containing information needed for a search unit 750 to connect to the broadcast unit's cluster 700. This information will be expressed by the light transducer 240 of the broadcast DJ 720 in digital format. The search unit 750 can have an optical sensor, preferably with significant directionality, that will detect the signal from the light transducer 240, so that the search unit 750 is pointed in the direction of the broadcast DJ 720, and the identifier information required for search unit 750 to become a member of cluster 700. This optical sensor serves as the DJ directional identifier 122 of Figure 1. At this point, if desired, the broadcast unit 710 user can determine if they want the search unit 750 user to join the cluster 700.

A summary of means to effect joining of a cluster is provided in Figures 13A through E, which display means for a search unit 750 to exchange information prior to joining a cluster 700 via a broadcast unit 710. It is also within the teachings of the present invention for the search unit 750 to institute communications with a receive unit 730 for the purposes of joining a cluster in a similar fashion, particularly since it may be difficult for a person outside of the cluster 700 to determine which of the cluster 700 members is the broadcast unit 710, and which is a receiver unit 730.

If should be noted in the Figures 13A-G that limited range and directionality are preferred. That is, there can be a number of broadcast units 710 within an area, and being able to select that one broadcast unit 710 whose cluster one wishes to join requires some means to allow the search unit 750 user to select a single broadcast unit 710 among many. This functionality is generally provided either by making a very directional communication between the two devices, or by depending on the physical proximity of the search unit 750

and the desired broadcast unit 710 (i.e. in a greatly restricted range, there will be fewer competing broadcast units 710). In the following description, the “broadcaster” denotes the user using the broadcast unit 710, and the “searcher” denotes the user using the search unit 750.

5 In the Figures 13A-G, the selection of the cluster by the searcher occurs in three ways, that will referred to as “search transmission mode”, “broadcast transmission mode”, and “mutual transmission mode”, according to the entity that is conveying information. In search transmission mode, the searcher sends an ID via the search unit 750 to the broadcast unit 710. This ID can comprise a unique identifier, or specific means of communication (e.g. an IP
10 address and port for IP-based communication). With this ID, the broadcast unit can either request the searcher to join, or can be receptive to the searcher when the searcher makes an undifferentiated request to join local units within its wireless range. In broadcast transmission mode, the broadcaster sends an ID via the broadcast unit 710 to the search unit 750. With this ID, the searcher unit can then make an attempt to connect with the broadcast
15 unit 710 (e.g. if the ID is an IP address and port), or the search unit can respond positively to a broadcast from the broadcast unit 710 (e.g. from a broadcast annunciator 1050), wherein the ID is passed and checked between the units early in the communications process. Mutual transmission mode comprises a combination of broadcast transmission mode and search transmission mode, in that information and communication is two way between the
20 broadcaster and the searcher.

Figure 13A is a schematic cross-section through a search unit 750 and a broadcast unit 710 in which communications are provided via visible or infrared LED emission in search transmission mode. On the right of the figure, a LED 1044 with an associated lens 1046 (the two of which can be integrated) transmits a directional signal from the unit case 1000. This
25 light can optionally pass thorough a window 1048 that is transparent to the light. On the left of the figure, a lens element 1040 collects light through a broad solid angle and directs it onto a light sensing element 1042, which is conveniently a light-sensing diode or resistor. The directionality of the communication is conferred by the transmitting lens 1046 and the collecting lens 1040.

30 Alternatively, the LED 1044 can be replaced by a visible laser. Figure 13B is a schematic cross-section through a search unit 750 and a broadcast unit 710 in which communications are provided via a visible or infrared laser in search transmission mode. The search unit 750 comprises a diode laser 1041 that is conditioned by a lens 1043 to form a beam that is sensed by the light sensing element 1042 on the broadcast unit 710. Because a

collimated laser beam can be difficult to aim with precision at a photosensing element carried by a person, the optics can comprise a two focus lens 1043 that has a portion that produces a collimated beam 1045, and a second portion that produces a diverging beam 1047. The collimated beam is used by the user of the search unit 750 as a guide beam to direct the pointing of the unit 750, while the divergent beam provides a spread of beam so that the human pointing accuracy can be relatively low. The means for creating the two focus lens 1043 can include the use of a lens with two different patterns of curvature across its surface, or the use of an initial diverging lens whose output intersects a converging lens across only a part of its diameter, where the light that encounters the second lens is collimated, and the light that does not encounter the second lens remains diverging. It is also within the teachings of the present invention for the lens to be slowly diverging without a collimating portion, such that the user does not get visible feedback of their pointing accuracy. In such case, the laser can emit infrared rather than visible wavelengths.

Figure 13C is a schematic cross-section through a search unit 750 and a broadcast unit 710 in which communications are provided via visible or infrared emission from a digital jewelry element 200 in broadcast transmission mode. The digital jewelry 200 is carried by the broadcaster on a chain 1033, with the digital jewelry 200 visible. The digital jewelry is emitting through a light transducer 1031 a high frequency signal multiplexed within the visible low frequency signal. The search unit 750 is pointed in the direction of the digital jewelry 200, and receives a signal through the light-sensing element 1042. This manner of communication is convenient because the searcher knows, via the presence of the visible signal on the digital jewelry 200, that the broadcaster is receptive to cluster formation.

Figure 13D is a schematic cross-section through a search unit 750 and a broadcast unit 710 in which communications are provided via contact in mutual transmission mode. In this case, the broadcast unit 710 and the search unit 750 both comprise a contact transmission terminus 1030, and electronic means by which contact transmission is performed. This means can operate either inductively (via an alternative current circuit), through direct electrical contact with alternating or direct current means, or other such means that involves a direct physical contact (indicated by the movement of the search unit 750 to the position of the unit depicted in dotted lines). The search unit 750 or the broadcast unit 710 can, via automatic sensing of the contact or manual control, initiate communications transfer. Given the mutuality of contact as well as the physical equivalence of the two units 710 and 750, information transfer is possible in both directions. It should be noted that in the case of direct

current connection, the termini 1030 will comprise two contact points, both of which must make electrical contact in order for communications to occur.

Figure 13E is a schematic cross-section through a search unit 750 and a broadcast unit 710 in which communications are provided via sonic transmissions in broadcast transmission mode. The broadcaster (or receivers) will be listening to the audio information generally through headphones 1020 or earphones, all of which comprise speakers 1022 that, to one extent or another, leak sonic energy. The use of audio output devices as depicted in Figure 10 and Figures 11A and 11B that admit external sound, will also increase the amount of sound energy lost. This sound energy can be detected by the searcher via a directional speaker comprising a sound collector 1024 and a microphone 1026. This system requires that the sound output of the broadcast unit 710 and the receiver unit 750 also output an ID encoded in the sound. Such sound can be conveniently output at inaudible frequencies, such as 3000-5000 Hz, which carry sufficient bandwidth to encode short messages or identifiers (e.g. an IP address and port number can be carried in 5 bytes). Sound energy, especially at higher frequencies, can be quite directional, depending on the shape of the collector 1024 and the structure of the microphone 1024, allowing good directional selection by the searcher.

Figure 13F is a schematic cross-section through a search unit 750 and a broadcast unit 710 in which communications are provided via radio frequency transmissions in broadcast transmission mode. The radio frequency transmissions are not strongly directional (and for the purposes of the broadcast of audio information, are designed to be as directionless as possible). In order to distinguish a desired cluster 700 to join and an undesired cluster 700, a number of strategies can be employed. For example, the strengths of the various signals can be measured and the strongest chosen for connection. Alternatively, if there are multiple broadcast connections available, the search unit 750 can sequentially attempt a connection with each broadcast unit 710. When the attempt is made, the broadcast unit 710 can, prior to alerting the broadcaster of the attempted joining by a new member, cause the digital jewelry 200 associated with the broadcast unit 710 to visibly flash a characteristic signal. The searcher can then verify by pressing the appropriate button on the search unit 750 his desire to join the cluster 700 of the broadcast digital jewelry 200 that had just flashed. If the searcher decided not to join that cluster 700, the search unit 750 could search for yet another unit broadcast unit 750 within range, and attempt to join.

At any time, the members of a cluster 700 can share personal characteristics (nickname, real name, address, contact information, face or tattoo images, favorite recording artists, etc.) through selection of choices of the unit 100 interface, with all such characteristics

or a subset thereof to be stored on the units 100. In order to assist cluster 700 members in determining whether or not to accept a person into their cluster 700, a search unit 750 member can display either the total number of people with whom he has shared personal characteristics, or he can alternatively allow the cluster members to probe his store of persons
 5 with whom personal characteristics have been stored to see whether a particular trusted person or group of common acquaintances are present therein. It is also within the spirit of the present invention for individuals to rate other individual members of their cluster, and such ratings can be collated and passed from person to person or cluster to cluster, and can be used for a cluster 700 to determine whether a search unit 750 person should be added to the
 10 cluster 700.

Figure 17 is a matrix of broadcaster and searcher preferences and characteristics, illustrating the matching of broadcaster and searcher in admitting a searcher to a cluster. A broadcaster preference table 1160 includes those characteristics that the broadcaster wishes to see in a new member of a cluster. These characteristics can include gender, age, musical
 15 "likes" and "dislikes", the school attended, and more. The searcher similarly has a preference table 1166. The searcher preference table 1166 and broadcaster preference table 1160 are not different in form, as the searcher will at another time function as the broadcaster for another group, and his preference table 1166 will then serve as the broadcaster preference table.

20 The broadcaster preference table 1160 can be automatically matched with a searcher characteristics table 1162. This table 1162 comprises characteristics of the searcher, wherein there will be characteristics that overlap in type (e.g. age, gender, etc.) which can then be compared with the parameters in the broadcaster preference table. This matching occurs during the period when the searcher is interrogating the cluster with interest in joining.
 25 Similarly, there is a broadcaster characteristics table 1164 indicating the characteristics of the broadcaster, which can be matched against the searcher preferences table 1166.

The algorithm used in approving or disapproving of an accord between a preference table and a characteristics table can be varied and set by the user – whether by the broadcaster to accept new members into a cluster, or by a searcher to join a new cluster. For example, the
 30 user could require that the gender be an exact match, the age within a year, and the musical preferences might not matter. The user can additionally specify that an accord is acceptable if any one parameter matches, specify that an accord be unacceptable if any one parameter does not match, specify an accord be acceptable based on the overlap of a majority of the individual matches, or other such specification.

It should be noted that the broadcaster preferences table 1160 and the broadcaster characteristics table 1164 (and likewise with the searcher tables 1162 and 1166) can be a single table, according to the notion that a person will prefer people who are like themselves. Each user could then express the acceptable range of characteristics of people with which to
 5 join as a difference from their own values. For example, the parameter "same" could mean that the person needs to match closely, whereas "similar" could indicate a range (e.g. within a year) and "different" could mean anyone. In this way, there would not be the burden on the user to define the preference table 1160 or 1166 in a very detailed manner.

In the case of a cluster, the transfer of information between the searcher and the
 10 cluster can, as mentioned above, involve not only the broadcaster, but also other members of the cluster (especially since the searcher may not know the identity of a cluster's broadcaster from external observation). The cluster can also make communal decisions about accepting a new member. That is, if there are 4 members of a cluster, and a searcher indicates an interest in joining the cluster, there can be voting among the members of a cluster regarding the
 15 acceptance of the new member. The procedure of voting will normally be done by messaging among the members, which can be assisted by structured information transfer as will be described below.

A number of such voting schemes are described in Figure 19, a table of voting schemes for the acceptance of new members into a cluster. The first column is the name of
 20 the rule, and the second column describes the algorithm for evaluation according to the rule. In the "BROADCASTER" rule, the broadcaster decides whether or not the new member will be accepted. The new member is accepted when the broadcaster indicates "yes" and is otherwise rejected.

In the "Majority" rule, the members are polled, and whenever a majority of the
 25 members vote either acceptance or rejection, the new member is accordingly accepted or rejected. It should be noted that this rule (as well as the rules to follow) depends on the broadcaster or other member of the cluster having knowledge of the number of members in the cluster, which will generally be the case (e.g. in an IP socket based system, the broadcaster can simply count the number of socket connections). Thus, if the number of
 30 members in a cluster is given as N_{mem} , as soon as $(N_{\text{mem}}/2) + 1$ members have indicated the same result, that result is then communicated to the broadcaster, the members and the prospective new member. If the number of members is even, and there is a split vote, the result goes according to the broadcaster's vote.

According to the “Unanimous” rule, a new member is accepted only on unanimous decision of the members. Thus, the prospective new member is rejected as soon as the first “no” vote is received, and is accepted only when the votes of all members of the cluster are received, and all of the votes are positive.

5 The “Timed Majority” rule is similar to that of the “Majority” rule, except that a timer is started when the vote is announced, the timer being of a predetermined duration, and in a preferred embodiment, is indicated as a count down timer on the unit 100 of each member of the cluster 700. The vote is completed when $(N_{\text{mem}}/2)+1$ members vote with the same indication (“yes” or “no”) if the timer has not completed its predetermined duration. If all of
10 the members have voted, and the vote is a tie, the result goes in accordance with that of the broadcaster. If the timer has expired, and the vote has not been decided, the number of members that have voted is considered a quorum of number Q . If $(Q/2)+1$ members have voted in some fashion, that is the result of the vote. Otherwise, in the case of a tie, the result goes according to the vote of the broadcaster. If the broadcaster has not voted, the vote goes
15 according to the first vote received.

The “Synchronized Majority” rule is similar to the Timed Majority rule, but instead of initiating the vote, and then waiting a predetermined period for members to vote, the vote is announced, and then there is a predetermined countdown period to the beginning of voting. The voting itself is very limited in time, generally for less than 10 seconds, and preferably for
20 less than 3 seconds. Counting votes is performed only for the quorum of members that vote, and is performed according to the rules for the Timed Majority.

There are many different voting schemes consistent with creating, growing and maintaining clusters within the spirit of the present invention. For instance, in cases where there are close votes, the voting can be reopened for individuals to change their vote. In
25 cases, members can request a new round of voting. Furthermore, the voting can be closed ballot, in which the votes of individuals are not known to the other members, or open voting, in which the identity of each member’s vote is publicly displayed on each unit 100.

In addition, the voting can be supported and enhanced by information made available to each member through displays on the units 100. Figure 18A is a screenshot of an LCD
30 display 1170 of a unit 100, taken during normal operation. The display 1170 is comprised of two different areas, an audio area 1172 and a broadcaster area 1174. The audio area 1172 includes information about the status of the audio output and the unit 100 operation, which can include battery status, the name of the performer, the title of the piece of music, the time the audio has been playing, the track number and more. The broadcaster area 1174 comprises

information about the status of the cluster 700. In the example given, the broadcaster area includes the number "5", which represents the number of people current in the cluster, the text "DJ", which indicates that the unit 100 on which the display 1170 is shown is currently the broadcaster of the cluster 700, and the text "OPEN", which indicates that the cluster is open for new members to join (the text "CLOSED" would indicate that no new members are being solicited or allowed).

Figure 18B is a screenshot of an LCD display 1170 of a unit 100, taken during voting for a new member. The audio area 1172 is replaced by a new member characteristics area 1176, in which characteristics of the prospective new member are displayed. Such characteristics can include the name (or nickname) of the prospective new member, their age, and their likes (hearts) and dislikes (bolts). In the broadcaster area 1174, the digit "3" indicates that there are three current members of the cluster 700, and an ear icon indicates that the current unit 100 is being used to receive from the broadcaster rather than being a broadcaster, and the name [ALI] indicates the name of the current broadcaster. The text "VOTE-MAJ" indicates that the current vote is being done according to the Majority rule. The broadcaster area 1174 and the new member characteristics areas 1176 provide the information needed by the existing member to make a decision about whether to allow the prospective new member to join.

The displays 1170 of Figures 18A-B are indicative only of the types of information that can be placed on a display 1170, but it should be appreciated that there are many pieces of information that can be placed onto the displays 1170 and that the format of the display can be very widely varied. Furthermore, there need not be distinct audio areas 1172 and broadcaster areas 1174, but the information can be mixed together. Alternatively, especially with very small displays 1170, the display 1170 can be made to cycle between different types of information.

It is also within the spirit of the present invention for individuals to rate other individual members of their cluster, and such ratings can be collated and passed from person to person or cluster to cluster, and can be used for a cluster 700 to determine whether a search unit 750 person should be added to the cluster 700. Figure 27 is a schematic block flow diagram of using a prospective new member's previous associations to determine whether the person should be added to an existing cluster.

In a step 1400, from a search unit 750, the prospective new member places an external communication request with an operational broadcast annunciator 1050 by a broadcast unit 710. In a step 1402, a temporary message connection is established through which

information can be passed mutually between the search unit 750 and the broadcast unit 710. The broadcast unit 710 requests personal and cluster ID's from the search unit 750. The personal ID is a unique identifier that can be optionally provided to every audio unit 100, and which can further be optionally hard-encoded into the hardware of the unit 100. The cluster

5 IDs represent the personal ID's of other units 100 with which the search unit 750 has been previously associated in a cluster. In a step 1406, the broadcast unit 710 matches the incoming personal IDs and cluster IDs with personal ID's and cluster IDs that are stored in the memory of the broadcast unit 710. If there exist a sufficient number of matches, which can be computed as a minimum number or as a minimum fraction of the IDs stored in the

10 broadcast unit 710, the new member of the search unit 750 can be accepted into the cluster. In a step 1412, the search unit 750 can then store the ID of the broadcast unit 710 and the other members of the existing cluster 700 into his cluster IDs, and the broadcast unit 750 and the other receive units 730 of the cluster can then store the personal ID of the search unit 750 into their cluster IDs. If there does not exist a sufficient number or quality of matches, the

15 broadcast unit 710 will reject the prospective new member, optionally send a message of rejection, and then close the socket connection (or other connection that had been created) between the broadcast unit 710 and the search unit 750. No new IDs are stored on either unit 710 or 750.

It is also within the spirit of the present invention for other information associated

20 with the personal and cluster IDs to be shared and used in the algorithm for determining whether to accept or reject a prospective new member into a cluster 700. This information can include rating information, the duration of association with another cluster 700 (i.e. the longer the association, the more suitable the social connection of that person with the cluster 700 would have been), the size of the cluster 700 when the searcher was a member of a

25 particular cluster 700, the popularity of a cluster 700 (measured by the number of cluster IDs carried by the broadcast unit 710), and more. The matching program, likewise, would weight the existence of a match by some of these quality factors in order to determine the suitability of the searcher to join the cluster.

While the comparisons can be made between a search unit 750 personal and cluster

30 IDs and those from the broadcast unit 710, representing the personal experience of the owners of the respective units, it is also possible that the reputation or desirability of individuals with a given personal ID can be posted to or retrieved from trusted people. For example, two friends can swap the information of which IDs are to be trusted or not between two units 100, or alternatively, can be posted onto or retrieved from the Internet. For

example, after a bad personal experience with a unit 100 with a personal ID of 524329102, a person could post that ID on the Internet to share with friends, so that the friends could avoid allowing that person to join, or avoid joining a cluster with that person.

It should be noted that publishing a list of personal IDs allows people to establish the
 5 breadth of their contacts. By posting their contacts on web sites, people can demonstrate their activity and popularity. This also encourages people to join clusters, in order to expand the number of people with whom they have been associated. Furthermore, the personal ID serves as a “handle” by which people can further communicate with one another. For
 10 example, on the Internet, a person can divulge a limited amount of information (e.g. an email address) that would allow other people with whom they have been in a cluster together to contact them.

It should be noted that the formation and maintenance of a cluster 700 requires the initial and continued physical proximity of the broadcast unit 710 and the receive unit 730. In order to help maintain such physical proximity conducive to cluster maintenance, feedback
 15 mechanisms can be used to alert the users to help them maintain the required physical proximity, as will be discussed below.

Figure 28 is a block flow diagram indicating the steps used to maintain physical proximity between the broadcast unit 710 and the receive unit 730 via feedback to the receive unit user. In a step 1530, the wireless connection between the broadcast unit 710 and the
 20 receive unit 730 is established. In a step 1532, the connection between the two units 710 and 730 is tested. There are a number of different means by which this testing can take place. For example, in IP-based communications, the receive unit 730 can from time to time – though generally less than every 10 seconds, and even more preferably less than every 1 second – use the “ping” function to test the presence and speed of connection with the
 25 broadcast unit 710. Alternatively, the receive unit 730 will be receiving audio signals wirelessly almost continuously from the broadcast unit 710, and a callback alert function can be instituted such that loss of this signal determined at a predetermined repeat time – which is conveniently less than 5 seconds, and even more preferably less than every 1 second – and which is then reported to the system.

30 While the methods above determine the absolute loss of a signal, they do not anticipate loss of signal. A method that does anticipate signal issues prior to loss is the measurement of signal strength. This can be done directly in the signal reception hardware by measuring the wireless signal induced current or voltage.

In a step 1534, the results of the connection testing performed in the step 1532 is analyzed in order to determine whether the signal is adequate. It should be noted that a temporary loss of signal, lasting even seconds, may or may not be of importance. For example, the broadcast unit 710 user and receive unit 730 users could walk on opposite sides
5 of a metallic structure, enter a building at different times, change their body posture such that the antennae are not optimally situated with respect to one another, etc. Thus, an algorithm is generally used to time average the results of the step 1532, with the results conveniently time averaged over a matter of seconds.

Whatever the results of the signal test of the step 1534, the step 1532 is continuously
10 repeated as long as the connection between the broadcast unit 710 and the receive unit 730 is present. If the signal is deemed inadequate, however, feedback to that effect is provided to the receive unit 730 user in a step 1536. The user feedback can occur through a variety of mechanisms, including visual (flashing lights) and tactile (vibration) transducers, emanating either from the audio unit 100 or the digital jewelry 200. For example, the receiver unit 730
15 can send a signal to the associated digital jewelry 200 to effect a special sequence of light transducer output.

It is most convenient, however, for the audio output of the receiver unit 730 as heard by the user to be interrupted or overlain with an audio signal to alert the user to the imminent or possible loss of audio signal. This audio signal can include clicks, beeps, animal sounds,
20 closed doors, or other predetermined or user selected signals heard over silence or the pre-existing signal, with the signal possibly being somewhat reduced in volume such that the combination of the pre-existing signal and the feedback signal is not unpleasantly loud.

It should be noted that the flow diagram of Figure 28 refers specifically to alerting the receive unit 730 user of potential communications issues. Such alerting can also be usefully
25 transferred to or used by the broadcast unit 710. For example, with knowledge of the communications issues, the broadcast unit 710 user can move more slowly, make sure that the unit is not heavily shielding, that any changes in posture that could relate to the problems are reversed, etc. The broadcast unit 710 can perform communications tests (as in the step 1532) or analyze the tests to determine if the communications are adequate (as in the step
30 1534) – particularly through use of the messaging TCP channels. Given that there can be multiple receive units 730 connected to a single broadcast unit 710, it is generally preferable for the tests to be performed on the receive units 730, and problems to be communicated to the broadcast unit 710 – provided, however, that communications still exist for such communication.

In order to overcome this deficiency, it is possible for the receiver unit 730 to communicate potential problems in communications to the broadcast unit 710 at an early indication. The broadcast unit 710 then starts a timer of predetermined length. If the broadcast unit 710 does not receive a "release" from the receive unit 730 before the timer has
5 completed its countdown, it can then assume that communications with the receive unit 730 have been terminated, and it can then send feedback to the broadcast unit 710 user.

It is also within the teachings of the present invention for both the broadcast unit 710 and the receive unit 730 to independently monitor the connections with each other, and alert their respective users of communications problems.

10 It should be noted that the use of audio alerts can be used more generally within the user interface of the audio units 100. Thus, audio alerts can be conveniently used to inform the user of the joining of new members to the cluster 700, the initiation of communications with search units 750 outside of the group, the leaving of the group by existing cluster 700 members, the request by a receive unit 730 to become the broadcast unit 710, the transfer of
15 cluster control from a broadcast unit 710 to a receive unit 730, and more. These alerts can be either predetermined by the hardware (e.g. stored on ROM), or can be specified by the user. Furthermore, it can be convenient for the broadcast unit 710 to temporarily transfer to new members of the cluster custom alerts, so that the alerts are part of the experience that the broadcast unit 710 user shares with the other members of the cluster. Such alerts would be
20 active only as long as the receive units were members of the cluster 700, and then would revert back to the alerts present before becoming cluster members.

Cluster Hierarchy

A receive unit 730 can also be the broadcast unit 710 of a separate cluster 700 from the cluster 700 of which it is a member. This receive unit is called a broadcasting receiver
25 770. In such case, it is convenient for the receive units 730 that are associated with the broadcasting receiver 770 to become associated with the cluster 700 of which the broadcasting receiver 770 is a member. This can conveniently be accomplished in two different ways. In a first manner, the receive units 730 that are associated with the broadcasting receiver 770 can become directly associated with the broadcast unit 710, so that
30 they are members only of the cluster 700, and are no longer associated with the broadcasting receiver 770. In a second manner, the receive units 730 associated with the broadcasting receiver 770 can remain primarily associated with the broadcasting receiver 770, as shown in Figures 9A and 9B, which are schematic block diagrams of hierarchically-related clusters. In

Figure 9A, the receive units 730 that are members of a sub-cluster 701 of which the broadcast unit is a broadcast receive unit 770, can receive music directly from the broadcast receive unit 710, while retaining their identification with the broadcasting receiver 770, such that if the broadcasting receiver 770 removes itself or is removed from the cluster 700, these receive units 730 similarly are removed from the cluster 700. In order to provide this form of hierarchical control, the sub-cluster 701 receive units 730 can obtain an identifier, which can be an IP socket address, from the broadcast receive unit 770, indicating the desired link to the broadcast unit 710. The sub-cluster receive units 730, however, maintain direct communications with the broadcast receive unit 770, such that on directive from the unit 770, they break their communications with the unit 710, and reestablish normal inter-unit audio signal communications with the broadcast receive unit 770. In an embodiment using IP addressing and communications, this can involve the maintenance of TCP messaging communications between the sub-cluster 701 receive units 730 with the broadcast receive unit 770, during the time that the sub-cluster 701 is associated with the cluster 700.

In Figure 9B, the receive units 730 of the sub-cluster 701 receive music directly from the broadcasting receiver 770, which itself receives the music from the broadcast unit 710. In such case, as the broadcasting receiver 770 is removed from the cluster 700, the receive units 730 of the sub-cluster 701 would also not be able to hear music from the cluster 700.

It would be apparent that such an arrangement can be hierarchically arranged, such that the receive unit 730 of the sub-cluster 701 can itself be the broadcast receiver 770 of another sub-cluster 701, and so forth. The advantage of this arrangement is that people that are associated with one another, forming a cluster 700, can move as a group from cluster to cluster, maintaining a separate identity.

It should be also noted that the configuration of communications between members of a hierarchical cluster can be variously arranged, not only as shown in Figures 9A and 9B. For example, every member of the cluster 700 can have a direct link between every other member of the cluster 700, such that no re-broadcast of messages needs to take place. Furthermore, given that there are different inter-unit communications (for example, messaging versus audio broadcast), it is within the teachings of the present invention that the configuration for the different modes of communication can be different – for example direct communications between the broadcast unit 710 for audio broadcast, but peer-to-peer communications between individual units for messaging.

Maintaining Private Communications

In order to restrict membership in a cluster 700, either the information transfer must be restricted, such as by keeping private the socket IP addresses or passwords or other information that is required for a member to receive the signal, or the signal can be transmitted openly in encrypted form, such that only those members having been provided with the encryption key can properly decode the signal so sent. Both of these mechanisms are taught within the present invention, and are described at various points within this specification.

Figure 32A is a schematic block diagram of maintaining privacy in open transmission communications. In this case, the transmission is freely available to search units 750 in a step 1830, such as would occur with a digital RF broadcast, or through a multicast with open a fixed, public socket IP address available in certain transmission protocols. In this case, the broadcast audio signal or information signal is made in encrypted form, and membership in the cluster is granted through transfer of a decoding key in a step 1832.

Figure 32B is a schematic block diagram of maintaining privacy in closed transmission communication. In a step 1834, the broadcast unit 710 makes a closed transmission broadcast, such as through a socket IP address, that is not publicly available. In a step 1836, the broadcast unit 710 provides the private address to the search unit 750, which can now hear the closed transmission from the step 1834, which is not encrypted. Alternatively, or in addition to the provision of the private address in the step 1836, the establishment of the connection through the private, closed transmission is effected via a password provided in a step 1838. This password can, for example, be used in the step 1110 (e.g. see Figure 14B) to determine whether the broadcast unit 710 accepts the search unit 750 for audio multicasting.

In this section, the encryption of the musical signal and/or associated information about personal characteristics of members of the cluster 700 is described. The custom compressor 330 of the unit 100 can perform the encryption. In such a case, before joining a cluster, the search unit 750 can only receive some limited information, such as characteristics of the music being heard or some limited characteristics of the users in the cluster 700. If the search unit 750 user requests permission to join the cluster 700 and it is granted, the broadcast unit 710 can then provide a decryption key to the search unit 750 that can be used to decrypt the music or provide a private IP address for multicasting, as well as supply additional information about the current members of cluster 700.

It should be noted that in certain cases, it can be useful to have multiple forms of privacy protection. For example, a broadcast unit 710 can provide a search unit 750 access to audio signals and information for the cluster 700, but can reserve certain information based on encryption to only some members of the cluster 700. For example, if a group of friends
5 comprise a cluster 700, and accept some new members into the cluster 700, access to more private information about the friends, or communications between friends, can be restricted on the basis of shared decryption keys.

Figure 33 is a schematic block diagram of a hierarchical cluster, as in Figure 9A, in which communications between different units is cryptographically or otherwise restricted to
10 a subset of the cluster members. Thus, there are three types of communication that are used in the communication: channel A, which takes place between the members of the original cluster; channel B, which takes place between the members of the original cluster (mediated through the broadcast unit 710) and members of the sub-cluster 701; and channel C, which takes place between the members of the sub-cluster 701. Thus, a communications originating
15 from the broadcast unit 710 can be directed either through channel A or channel B, and likewise, a communications originating from the broadcast receive unit 770 can be directed either at members only of the sub-cluster 701 through channel C, or to all members of the cluster 700 through both channels C and B, which is then communicated through channel A.

A number of means can be used to maintain such independent channels. For example,
20 separate socket communications can be established, and the originators of the communications can determine that information which is carried on each separate channel. For example, given an open transmission scheme such as digital RF signal, the information can be encoded with separate keys for the different channels of communication – thus, the cryptographic encoding determines each channel. A given unit 100 can respond to more than
25 one encoding. Indeed, a channel identifier can be sent with each piece of information indicating the ID of the decoding key. If a unit 100 does not have the appropriate decoding key, then it is not privy to that channel communications.

Alternatively, if the communications is IP socket based, then each channel is determined by IP socket addresses. Furthermore, access to those addresses can be, for
30 example, password controlled. Also, the socket communications can be broadcast so that any unit 100 can receive such broadcast, but that decoding of the broadcast can be mediated through cryptographic decoding keys.

It should be noted that there can be multiple forms of communication, which can comprise messaging communications using the TCP/IP protocols, versus multicasting using

UDP protocols, and also DJ 200 control signals using yet another protocol. The access to each of these communications can be controlled via different privacy hierarchies and techniques. For example, the audio multicasting will be available to all members within a cluster, while the messaging may retain different groupings of privacy (e.g. hierarchical),
5 while the DJ control signals will generally be limited to communications between a given unit 100 and its corresponding DJs 200.

Broadcast Control Transfer

The dynamics of cluster 700 can be such that it will be desirable for a receive unit 730 to become the broadcast unit for the cluster. Such a transfer of broadcast control will
10 generally require the acquiescence of the broadcast unit 710 user. To effect such a transfer, the user of the receiver unit 730 desiring such control will send a signal to the broadcast unit 710 expressing such intention. If the user of the broadcast unit 710 agrees, a signal is sent to all of the members of the cluster indicating the transfer of broadcast control, and providing the identifier associated with the receive unit 730 that is to become the broadcast unit 710.
15 The broadcast unit 710 that is relinquishing broadcast control now becomes a receive unit 730 of the cluster 700.

It should be noted that the transfer of control as described above requires the manual transfer of control, such as actuation of a DJ switch. This switch can be limited to this function, or can be part of a menu system, in which the switch is shared between different
20 functions. It is also within the spirit of the present invention that there be voice-activated control of the unit 100, in which the unit 100 further comprises a microphone for input of voice signals to a suitable controller within the unit 100, wherein the controller has voice-recognition capabilities.

In the case of a cluster 700 whose broadcast unit 710 is no longer broadcasting (e.g. it
25 is out of range of the receive units 730, or it is turned off), the cluster can maintain its remaining membership by selecting one of the receive units 730 to become the new broadcast unit 710. Such a choice can happen automatically, for example by random choice, by a voting scheme, or by choosing the first receive unit 730 to have become associated with the broadcast unit 710. If the users of the cluster-associated units deem this choice to be wrong,
30 then they can change the broadcast unit 710 manually as described above.

The receive unit 730 that is chosen to become the broadcast unit 710 of the cluster 700 will generally prompt its user of the new status, so that the newly designated broadcast unit 710 can make certain that it is playing music to the rest of the cluster 700. It can be

further arranged so that a newly-designated broadcast unit 710 will play music at random, from the beginning, or a designated musical piece in such case.

An embodiment of a transfer of broadcast control using IP socket communications protocols is described here. Figure 16 is a schematic block flow diagram of transfer of control between the broadcast unit 710 and the first receive unit 730. In a step 1130, the receive unit 730 requests broadcast control (designated here as "DJ" control). In a step 1132, the user of the broadcast unit 710 decides whether control will be transferred. The decision is then transferred back to the first receive unit 730 via the TCP messaging socket. If the decision is affirmative, the first receive unit 730 severs its UDP connection to the broadcast unit 710 multicast. The reason for this is to allow the receive unit 730 opportunity to prepare the beginning of its broadcast, if such time is required, and the user cannot both listen to the multicast as well as prepare its own audio selections, which occurs in a step 1136. In a step 1138, the receive unit 730 creates a multicast UDP socket with which it will later broadcast audio to other members of the cluster, while in a step 1140, the receive unit 730 creates a broadcast annunciator TCP socket with which to announce availability of the cluster, as well as to accept transfers of members from the broadcast unit 710 to itself as the new broadcast unit.

When the two new sockets (multicast and annunciator) are created, the receive unit 730 transmits the new socket addresses to the broadcast unit 710 in a step 1142. Since the other members of the cluster are guaranteed to be in contact with the broadcast unit, they can get addresses of the new, soon-to-be broadcast unit from the existing broadcast unit. In a step 1144, the original broadcast unit 710 transmits to the other cluster members (receive units 730 numbers 2-N) the addresses of the sockets on the receive 1 unit 730 that is now the new broadcast unit 710, and terminates its own multicast. The termination is performed here because the other receive units will be transferring to the new multicast, and because the original broadcast unit 710 is now becoming a receive unit 730 in the reconstituted cluster. In the step 1148, multicast of audio is now provided by the receive 1 unit 730 that has now become the new broadcast unit 710), and the original broadcast unit is listening to audio provided not by itself, but rather by the new broadcast unit.

In a step 1146, performed roughly synchronously with the step 1144, the original broadcast unit 710 transmits the socket addresses of the message handler TCP sockets of the other members of the cluster 700 (i.e. the receive units 730 numbers 2-N). In the subsequent step 1150, the original broadcast unit 710 and the receive units 730 numbers 2-N establish new messaging connections with the receive 1 unit 730 that is now the new broadcast unit

710. While there can be a set of criteria for the acceptance of a new member to a cluster, because the receive 1 unit 730 has received the message socket addresses of the other members of the cluster in the step 1144, the receive 1 unit 730 accepts new members with the socket addresses received. It should be noted that instead of socket addresses being the
 5 identifiers passed, the identifiers can also be unique machine IDs, random numbers, cryptographically encoded numbers, or other such identifiers that can be transmitted from one member of the cluster to another.

It should be noted in certain embodiments, that there can be insufficient time for the new broadcast unit 710 to determine a set of music to broadcast to the members of its cluster.
 10 It is within the spirit of the present invention for a user to set a default collection of music that is broadcast when no other music has been chosen. This set of music can comprise one or more discrete audio files.

Audio and DJ Choreography

One of the attractions of the present invention is that it allows users to express
 15 themselves and share their expressions with others in public or semi-public fashion. Thus, it is highly desirable for users to be able to personalize aspects of both the audio programming as well as the displays of their DJs 200.

Audio

Audio personalization comprises the creation of temporally linked collections of
 20 separate musical elements in "sets." These sets can be called up by name or other identifier, and can comprise overlapping selections of music, and can be created either on the unit 100 through a visual or audio interface, or can be created on a computer or other music-enabled device for downloading to the unit 100.

In addition, the unit 100 or other device from which sets are downloaded can
 25 comprise a microphone and audio recording software whereby commentary, personal music, accompaniment, or other audio recordings can be recorded, stored, and interspersed between commercial or pre-recorded audio signals, much in the manner that a radio show host or "disc jockey" might alter or supplement music. Such downloads can be accessible from a variety of sources including Internet web sites and private personal computers.

Automatic Generation of DJ 200 Control Signals

In this section, we will describe the automatic and manual generation of control signals for the DJ 200 transducers. The control signals are generally made to correspond to

audio signals played on the units 100, although it is within the spirit of the present invention for such control signals to be made separate from audio signals, and to be displayed on the digital jewelry independently of audio signals played on the unit 100. Figure 20 is a time-amplitude trace of an audio signal automatically separated into beats. Beats 1180, 1182 and 1183 are denoted by vertical dashed and dotted lines and, as described below, are placed at locations on the basis of their rapid rise in low-frequency amplitude relative to the rest of the trace. As can be seen, the beats 1180 are generally of higher amplitude than the other beats 1182 and 1183, and represent the primary beats of a 4/4 time signature. The beat 1183 is of intermediate nature between the characteristics of the beats 1180 and 1182. It represents the third beat of the second measure. Overall, the audio signal thus displayed can be orally represented as ONE-two-Three-four-ONE-two-Three-four ("one" is heavily accented, and the "three" is more lightly accented), which is common in the 4/4 time signature.

Processing of this data can proceed via a number of different methods. Figure 21A is a block flow diagram of a neural network method of creating DJ 200 transducer control signals from an audio signal as shown in Figure 20. In a step 1200, audio data is received either at the unit 100 or the DJ 200. It should be noted that the creation of control signals from audio signals can, within the present invention, take place at either the unit 100 or the DJ 200, or even at a device or system not part of or connected to the unit 100 or DJ 200 (as will be described in more detail below). In an optional step 1202, the data is low pass filtered and/or decimated so that the amount of data is reduced for computational purposes. Furthermore, the data can be processed for automatic gain to normalize the data for recording volume differences. Furthermore, the automatic gain filtering can provide control signals of significant or comparable magnitude throughout the audio data.

In general, the creation of the audio signal depends on audio representing a period of time, which can be tens of milliseconds to tens of seconds, depending on the method. Thus, the audio data from the step 1202 is stored in a prior data array 1204 for use in subsequent processing and analysis. At the same time, the current average amplitude, computed over an interval of preferably less than 50 milliseconds, is computed in a step 1208. In broad outline, the analysis of the signal compares the current average amplitude against the amplitude history stored in the prior data analysis. In the embodiment of Figure 21A, the comparison takes places through neural network processing in a step 1206, preferably with a cascading time back propagation network which takes into account a slowly varying time signal (that is, the data in the prior data array changes only fractionally at each computation, with most of the data remaining the same). The use of prior steps of neural network processing in the

current step of neural network processing is indicated by the looped arrow in the step 1206. The output of the neural network is a determination whether the current time sample is a primary or a secondary beat. The neural network is trained on a large number of different music samples, wherein the training output is identified manually as to the presence of a beat.

5 The output of the neural network is then converted into a digital jewelry signal in a step 1210, in which the presence of a primary or secondary beat determines whether a particular light color, tactile response, etc., is activated. This conversion can be according to either fixed, predetermined rules, or can be determined by rules and algorithms that are externally specified. Such rules can be according to the aesthetics of the user, or can
10 alternatively be determined by the specific characteristics of the transducer. For example, some transducers can have only a single channel or two or three channels. While light transducers will generally work well with high frequency signals, other transducers, such as tactile transducers, will want signals that are much more slowly varying. Thus, there can be algorithm parameters, specified for instance in configuration files that accompany DJ 200
15 transducers, that assist in the conversion of beats to transducer control signals that are appropriate for the specific transducer.

Figure 21B is a block flow diagram of a deterministic signal analysis method of creating DJ 200 transducer control signals from an audio signal as shown in Figure 20. The data is received in the step 1200. In this case, a running average over a time sufficient to
20 remove high frequencies, and preferably less than 50 milliseconds, is performed in a step 1212. Alternatively, a low pass filter and/or data decimation as in the step 1202 can be performed.

In a step 1214, the system determines whether there has been a rise of X-fold in average amplitude over the last Y milliseconds, where X and Y are predetermined values.
25 The value of X is preferably greater than two-fold and is even more preferably three-fold, while the value of Y is preferably less than 100 milliseconds and is even more preferably less than 50 milliseconds. This rise relates to the sharp rises in amplitude found in the signal at the onset of a beat, as shown in Figure 20 by the beat demarcations 1180, 1182, and 1183. If there has not been a rise meeting the criteria, the system returns to the step 1200 for more
30 audio input.

If the signal does meet the criteria, it is checked to ensure that the rise in amplitude is not the "tail end" of a previously identified beat. For this, in a step 1216, the system determines whether there has been a previous beat in the past Z milliseconds, where Z is a predetermined value preferably less than 100 milliseconds, and even more preferably less

than 50 milliseconds. If there has been a recent beat, the system returns to the step 1200 for more audio input. If there has not been a recent beat, then a digital jewelry signal is used to activate a transducer. The level of transduction can be modified according to the current average amplitude which is determined in a step 1208 from, in this case, the running average
 5 computed in the step 1212.

The embodiment of Figure 21B provides transducer activation signals at each rapid rise in amplitude, with the activation signal modulated according to the strength of the amplitude. This will capture much of the superficial musical quality of the audio signal, but will not capture or express more fundamental patterns within the audio signal.

10 Figure 21C is a schematic flow diagram of a method to extract fundamental musical patterns from an audio signal to create DJ 200 control signals. In the step 1200, the audio data is received into a buffer for calculations. In a step 1220, a low pass filter is applied to remove high frequency signal. Such high frequency signals can alternatively be removed via decimation, running averages, and other means as set forth in the embodiments of Figures
 15 21A and B. As in the embodiment of Figure 21B, beat onsets are extracted from the audio signal in the steps 1214 and 1216, and a current average amplitude is computed in a step 1208.

The amplitudes and times of the onsets of beats are placed into an array in a step 1222. From this array, a musical model is created in a step 1224. This model is based on the
 20 regularity of beats and beat emphasis – as seen in the amplitudes – that is independent of the beats and amplitudes in any one short section of music (corresponding, for instance, to a measure of music).

In general, music is organized into repeating patterns, as represented in a time signature such as 3/4, 4/4, 6/8 and the like. Within each time signature, there are primary and
 25 secondary beats. In general, the downbeat to a measure is the first beat, representing the beginning of the measure. The downbeat is generally the strongest beat within a measure, but in any given measure, another beat may be given more emphasis. Indeed, there will be high amplitude beats that may not be within the time signature whatsoever (such as an eighth note in $\frac{3}{4}$ time that is not on one of the beats). Thus, by correlating the beats to standard
 30 amplitude patterns, the output to the music model identifies the primary (down) beats, secondary beats (e.g. the third beat in 4/4 time) and the tertiary beats (e.g. the second and fourth beats in 4/4 time).

Figure 21D is a schematic flow diagram of an algorithm to identify a music model, resulting in a time signature. In a step 1600, the minimum repeated time interval is

determined, using the array of beat amplitude and onset 1222. This is, over a period of time, the shortest interval for a quarter note equivalent is determined, wherein the time signature beat frequency (i.e. the note value of the denominator of the time signature, such as 8 in 6/8) is preferably limited to between 4 per second and one every two seconds, and even more preferably limited to between 3 per second and 1.25 per second. This is considered the beat time.

From the array of beat amplitudes and onsets 1222, the average and maximum amplitudes over a time period of preferably 3-10 seconds is computed in a step 1604. For the beginning of the audio signal, shorter periods of time can be used, though they will tend to give less reliable DJ 200 control signals. Indeed, in this embodiment, the initial times of an audio signal will tend to follow audio signal amplitude and changes in amplitude more than fundamental musical patterns until the patterns are elicited.

In a step 1606, the amplitude of a beat is compared with the maximum amplitude determined in the step 1604. If the beat is within a percentage threshold of the maximum amplitude, wherein the threshold is preferably 50% and more preferably 30% of the maximum amplitude, the beat is designated a primary beat in a step 1612. In a step 1608, the amplitude of non-primary beats is compared with the maximum amplitude determined in the step 1604. If the beat is within a percentage threshold of the maximum amplitude, wherein the threshold is preferably 75% and more preferably 50% of the maximum amplitude, and the beat is greater than a predetermined fraction of the average amplitude, wherein the fraction is preferably greater than 40% and even more preferably greater than 70% of the average beat amplitude, the beat is designated a secondary beat in a step 1614. The remaining beats are denoted tertiary beats in the step 1610.

In a step 1616, the sequence of the three types of beats is compared with that of established time signatures, such as 4/4, 3/4, 6/8, 2/4 and others, each with their own preferred sequence of primary, secondary and tertiary beats, in order to determine the best fit. This best fit is identified as the time signature in a step 1618.

Returning to Figure 21C, the channels of the DJ are pre-assigned to four different beats in a step 1225. Thus, if there are four channels, each channel is given a separate assignment. With a smaller number of channels, a single channel is assigned multiple beats. Some beats can also be unassigned, thus not being represented in a DJ 200 transducer output. Thus, a high jewelry signal, medium jewelry signal, low jewelry signal and an amplitude dependent signal are each assigned to a channel for DJ 200 transduction.

In a step 1226, a beat determined to be a primary/down beat is assigned to a high jewelry signal 1228. In a step 1230, a beat determined to be a secondary beat is assigned to a medium jewelry signal 1232. In a step 1234, a beat determined to be a tertiary beat is assigned to a low jewelry signal 1236. Beats which are then unassigned, and which will
5 generally be beats that occur not within the music model of the step 1224 (e.g. rapid beats not falling on beats of the time signature) are then assigned in a step 1238 to an amplitude dependent (and not music model dependent) signal 1240.

It should be noted that the computations performed in the flow methods of Figures 21A-C may take time on the order of milliseconds, such that if the computations are made in
10 real time during the playing of music, the activation of the transducers in the DJ 200 are "behind" in time relative to the audio playing of the corresponding music in the audio unit 100. This can be compensated for by carrying out the computations while the audio signal is still in buffers prior to being played in the unit 100, as is described above for numerous embodiments of the present invention. Thus, signals to the DJ 200 can then be made
15 simultaneously with respect to the audio signal to which it corresponds.

It should be noted that many of the parameters described above can conveniently be affected by manual controls either on the DJ 200 or the unit 100 that transmits signals to the DJ 200. For example, it can be convenient for the user to be able to set, for a given DJ 200 response amplitude, the threshold audio amplitude level at which the output transducer (e.g.
20 light transducer 240) responds, or to set the output transducer amplitude corresponding to a maximum audio amplitude, or to set the frequency bands for which different DJ 200 channels respond, or to set other similar parameters. The manual controls for such parameters can comprise dials, rocker switches, up/down button, voice or display menu choices, or other such controls as are convenient for users. Alternatively, these choices can be set on a
25 computer or other user input device, for download onto the unit 100 or DJ 200.

A preferable means of setting the parameters is for the parameters to be stored in a configuration file that can be altered either on the unit 100, the DJ 200 or a computer, so that the same DJ 200 can take on different characteristics dependent on the configuration settings within the file. The configuration settings can then be optimized for a particular situation, or
30 set to individual preference, and be traded or sold between friends or as commercial transactions, for instance over the Internet. For a most preferable use of these configuration files, each file with its set of configurations can be considered to represent a "mode" of operation, and multiple configuration files can be set on the DJ 200 or the unit 100, depending on where the automatic generation of control signals is performed. The user can

then select from the resident configuration files, appearing to the user as different modes, for use of his system, and can change the mode at will. This can be arranged as a series of choices on a voice or display menuing system, as a list toggled through by pressing a single button, or through other convenient user interfaces.

5 Manual Generation of DJ 200 Control Signals

In the description above, the use of filtering and digital modification of audio signals can be used to create control signals for DJ 200 transducers 240, 250, and 260. In addition, manual choreography of DJ 200 signals can be accomplished. For example, buttons or other interface features (e.g. areas on a touch-screen) on the unit 100 can correspond to different
10 arrays of transducers, such as the LED arrays 290 and 292 of Figure 2A. While playing the audio signal, the user can press the buttons, where pressing of the buttons can correspond to a control signal for a transducer being ON, and otherwise the signal can be off. To aid in choreography where rapid changes in transducers are desired, the audio can be played at less than normal speed.

15 Figure 22A is a top-view diagram of an audio unit 100 user interface 1250, demonstrating the use of buttons to create DJ 200 control signals. The interface 1250 comprises a display screen (e.g. LCD or oLED), which can display information to the user, such as shown in Figures 18 A-B. Standard music control buttons 1254 for playing, stopping, pausing, and rewinding allow the user to control the audio signal musical output. Buttons
20 1252 further control aspects of the music output, such as volume control, musical tracks, and downloading and uploading of music. The number of buttons 1252 is conveniently three as shown, but can be more or less than three.

In addition, buttons are provided to allow the user to input DJ 200 control signals, comprising a record button 1256, a first channel button 1258, a second channel button 1260
25 and a third channel button 1262. The channel buttons 1258, 1260 and 1262 are prominent and accessible, since the user will want to easily depress the buttons. A record button 1256 allows the user to activate the channel buttons 1258, 1260 and 1262, and has a low profile (even below the nominal surface of the interface 1250) so that it is not accidentally activated. The record button can serve various purposes, including recording into a permanent storage
30 file the sequence of DJ control signals relative to music being played, or controlling the DJ transducers in realtime, synchronously with music being played on the audio unit 100.

Pressing the buttons 1258, 1260 and 1262 create DJ control signals for the corresponding channels. The number of buttons is conveniently three as shown, but can also

be two or four or more buttons. If a telephone is being used as the unit 100, keys on the telephone keypad can alternatively be used. The channel buttons will generally be used with thumbs, and the buttons are spaced so that two of the buttons can be depressed with a single thumb, so that all three buttons can be activated with only two fingers. In is also convenient
 5 for the two secondary buttons 1260 and 1262 to be spaced more closely together, as it will be a preferred mode of operation that the secondary buttons be operated together from time to time.

To further aid in the choreography of the DJs 200, a separate "keyboard" with the number of keys related to the number of possible arrays can be used. The amplitude of the
 10 corresponding transducer signal can be modified either according to the pressure on the keys, according to the length of time that a key is depressed, or according to a foot pedal. Figure 22B is a top-view diagram of a hand-pad 1270 for creating DJ control signals. The hand-pad 1270 comprises a platform 1271, a primary transducer 1272, a secondary transducer 1274 and a tertiary transducer 1276. The platform 1271 has a generally flat top and bottom, and can
 15 conveniently be placed on a table, or held in the user's lap. The size of the platform is such that two hands are conveniently placed across it, being preferably more than 6 inches across, and even more preferably more than 9 inches across. The pressure transducers 1272, 1274 and 1276 respond to pressure by creating a control signal, with said control signal preferably capturing both the time and amplitude of the pressure applied to the corresponding
 20 transducer. The primary transducer 1272 creates a primary control signal, the secondary transducer 1274 creates a secondary control signal and the tertiary transducer 1276 creates a tertiary control signal. The sizes and placements of the transducers can be varied within the spirit of the present invention, but it is convenient for the primary transducer 1272 to be larger and somewhat separate from that of the other transducers 1274 and 1276. In one more
 25 method of user interaction, both hands can be rapidly and alternately used to make closely spaced control signals on the primary transducer 1272. In addition, it can be convenient on occasion for the user to activate both the secondary transducer 1274 and the tertiary transducer 1276 with different fingers on one hand, and thus these can be conveniently placed relatively near to one another. In general, while a single transducer will provide minimal
 30 function, it is preferable for there to be at least two transducers, and even more preferable that there be three transducers.

The control signals can be transferred to the audio unit 100 for playing and/or storage, or to the DJ 200 unit directly for playing, either wirelessly, or through wired communication. In addition, the hand-pad can also be configured to create percussive or other sounds, either

directly through the incorporation of hollow chambers in the manner of a drum, or preferably by the synthesis of audio waveform signals that can be played through the audio unit 100 (and other audio units 100 participating in a cluster 700), or directly through speakers within the hand-pad 1270 or attached to the hand-pad 1270 through wired or wireless
5 communications. Such audible, percussive feedback can aid the user in the aesthetic creation of control signals.

It is within the spirit of the present invention for the hand-pad to take on various sizes and configurations. For instance, it is also convenient for the hand-pad 1270 to be configured for the use of index and middle fingers, being of dimensions as small as two by four inches or
10 less. Such a hand-pad is highly portable, and can be battery powered.

Additionally, DJ 200 control signals can also be manually generated live, during broadcast at a party, for example, by a percussionist playing a set of digital drums. Figure 22C is a schematic block diagram of a set of drums used for creating DJ control signals. The set of drums comprises four percussive instruments 1280, 1282, 1284 and 1286, which can
15 include snare drums, foot drums, cymbals, foot cymbals and other percussive musical instruments, such as might be found with a contemporary musical "band". Microphones 1290 are positioned so as to receive audio input primarily from instruments to which they are associated. One microphone can furthermore be associated with multiple instruments, as with the drums 1282 and 1284. The microphones 1290 are connected with a controller 1292
20 that takes the input and creates DJ control signals therefrom. For example, the drums 1282 and 1284 can be associated with the primary channel, the drum 1280 can be associated with the secondary channel, and the drum 1286 can be associated with the tertiary channel. The association of the microphone input with the channel can be determined in many ways. For example, the jack in the controller 1292 to which each microphone 1290 attaches can
25 correspond to a given channel. Alternatively, the user can associate the jacks in the controller to different channels, with such control being manual through a control panel with buttons or touch control displays, or even through prearranged "sets". That is, a set is a pre-arranged configuration of associations of microphones to channels, and thus a set can be chosen with a single choice that instantiates a group of microphone-channel associations.

30 In general, the inputs from the microphones 1290 will be filtered in frequency and also to enhance audio contrast. For instance, control signals can be arranged to be the highest when the low-frequency envelope is rising the quickest (i.e. the beat or sound onset). The algorithms for conversion of audio signal to DJ control signal can be pre-configured in the controller 1292, or can be user selectable.

It should be noted that the methods and systems of Figures 22 A-C need to synchronize the control signals so generated with the audio files to which they correspond. This can be accomplished in many ways. For example, the first control signal can be understood to correspond to the first beat within the audio file. Alternatively, the audio unit
 5 100 or other device that is playing the audio signal to which the control signal is to correspond can send a signal to the device that is creating the control signals indicating the onset of playing of the audio file. The control signal can then be related to the time from the onset of the audio file. In addition, with regards to this synchronization, the user manually inputting the control signals will always be listening to the music during the control signal
 10 input. If the device on which control signals are being input is the same as the device that is playing the music, a control signal input can be easily related to the sound that is currently being played by the audio output – many such devices allow information to within less than a millisecond of what sample or time within the audio files is currently being output by the audio device. With the arrangement of the control signal input device being also an audio
 15 player, close calibration of the control signals and the audio output is easily accomplished.

DJ 200 Control Signal Files

The control signals can be in a variety of formats within the spirit of the present invention. Such formats include pairs of locations within the associated music file and the corresponding amplitudes of the various DJ channels, and pairs of locations and the
 20 amplitudes of those DJ channels which are different from before. The locations can be either time from the start of the song (e.g. in milliseconds) or in terms of sample number. If the location is given in terms of sample number, the sample rate of the music will generally also be provided, since the same song can be recorded at different sample rates, and the invariant in terms of location will generally be time from onset of the music.

25 Other formats include an amplitude stream, corresponding to each DJ channel, provided in a constant stream with a fixed sample rate, which may be equal to or different from that of the corresponding music file. This format can be stored, for example, as additional channels into the music file, such that one channel corresponds to monoaural sound, two channels correspond to stereo sound, three channels correspond to stereo sound
 30 and one channel of control signals, and additional channels correspond to stereo sound plus additional channels of DJ control signals. Another arrangement is to allow for only a small number of states of the transduction in the control signal, so that multiple channels of control signal can be multiplexed into a single transmitted channel for storage and transmission with

the audio signal. For example, if the audio is stored as a 16-bit signal, 3 channels of 5 bit DJ 200 control signal could be stored in a single channel along side the one or two audio channels normally used.

It should be appreciated that these different control signal storage formats are largely
5 interchangeable. For instance, as described above, control signals can be stored as if they are additional audio channels within a music file, but then be extracted from the file for separate transfer (e.g. over the Internet), and then be reintegrated into an audio file at the destination location.

It should be appreciated that there are a number of means by which DJ 200 control
10 signals can be generated, either automatically or manually, and can include the use of devices other than the unit 100 that can have sophisticated digital or analog filtering and modification hardware and software. The control signals so created can be stored in files that are associated with the music files (e.g. MP3) that the control signals are meant to accompany. To aid in their distribution, particularly in reference to limitations on the commercial and
15 private distribution of the corresponding music files, the signal files will generally be separate from the music files, and transferable between units 100 either through inter-unit communication mediated by the inter-unit transmitter/receiver 110, or alternatively through computers or computer networks to which the unit 100 can be connected.

The audio signals and the DJ control signals should also be well synchronized during
20 playback. Figure 23 is a schematic block flow diagram of the synchronized playback of an audio signal file with a DJ control signal file, using transmission of both audio and control signal information. For purposes of convenience in discussion, the audio signal file will be called a "song file" and the "control signal file" will be called a "dance file." In a step 1300, the user is provided a list of song files for display, preferably on the display 1170. In a step
25 1302, the user then selects a song from the display to play. In a step 1304, the dance files that are associated with the selected song file from the step 1302 are displayed for the user. These song files can be either locally resident on the unit 100, or can alternatively be present on other audio units 100 to which the audio unit 100 is connected, as in a cluster, or can alternatively be on the Internet, if the audio unit 100 is connected to the Internet. If there is a
30 dance file that has been previously preferred in association with the song file, this file can be more prominently displayed than other associated dance files.

In a step 1306, the user selects the dance file to play along with the song file. This association is stored in a local database of song file/dance file associations in a step 1307, to be later used in a subsequent step 1304, should such an association not have been previously

made, or if the preferred association is different from the previously preferred association. If the dance file is not locally resident, it can be copied to the audio unit 100 to ensure that the dance file is available throughout the duration of the song file playback.

In a step 1308, a timer is initialized at the beginning of the song file playback. In the step 1310, the song file is played on the local unit 100, and is also streamed to the other units 100 within the cluster 700. The corresponding DJ control signal accompanies the streaming song, either multiplexed within the song file audio signal, on another streaming socket, or through other communications (e.g. a TCP socket) channels between the two units. In a step 1312, the time advances along with the playback of the music. In a step 1314, this timer information is used to obtain current control signals from the dance file – that is, the dance file is arranged so that at each moment, the status of the different transducer channels can be determined. The control signals to be streamed along with the song file information can be either the current status of each transducer, or alternatively, can only send changes from the current transducer state.

The matching of the files in the database of song file and dance file associations of the step 1307 can be performed both within a machine, but also over a local or wide area network. In such cases, the association can either be external to the file – that is, using the name of the file, that is available the normal system file routines – or can use information internal to one or both files. For example, the dance file can have stored within it a reference to the song to which it is associated, either as the name of the song file, the name and/or other characteristics of the song (such as the recording artist, year of publication, music publisher) or alternatively as a numerical or alphanumeric identifier associated with the song. Then, given a song file, the relationship of the dance file with the song file can be easily determined.

For ease in creating an association, it is convenient for the names of the song files and the associated dance files to have a relationship with one another that is easily understood by casual users. For example, given a song file with the name “oops.mp3”, it is convenient for an associated dance file to share the same root (in this case “oops”) with a different extension, creating for example the dance file name “oops.dnc”. Because of the multiplicity of dance files that will often be associated with a particular song file, the root itself can be extended to allow for either a numerical or descriptive filename, which can be preferably done in conjunction with a known punctuation mark to separate the song file root from the dance file description, such as the file names “oops.david2.dnc” or “oops\$wild.dnc”. It is

preferable to use a punctuation mark that is allowed within a range of different operating systems.

Dance files can be stored on the Internet or other wide area network in a store for access by users who want dance files associated with a particular song file. In such case, if the storage is through the root of the filename, the user, requesting dance files corresponding to "oops.mps" would then be returned the names of related files such as "oops\$wild.dnc". If the dance file internally carries the relationship with "oops.mps" as described above, either through the name or other characteristics, or alternatively, through a numerical or alphanumeric identifier, it is preferable to store the information in a database on the storage computer or unit 100, so that it is not necessary to open the file each time for perusal of the dance file information. Thus, if the music file has a substantially unique identifier associated with it internally, it is also useful for the dance file to also have the same identifier associated internally as well. In such case, the identifier is conveniently used to reference both files within a database.

In operation, a remote user would request a dance file for a particular song file by providing the name of the song file, along possibly with other information about the song file, which could include the name of the choreographer, the number of channels of DJ 200 transduction, the specific brand or type of DJ 200, or other information. The database would then return a listing of the various dance file that met the criteria requested. The remote user would then choose one or more of the files to download to the remote computer, and then the database would retrieve the dance files from storage and then transmits the dance file over the wide area network. On the remote computer or unit 100, the dance file would become associated with the corresponding song file through means such as naming the dance file appropriately or making an association between the song file and the dance file in a database or indexing file. Alternatively, the dance file can be integrated into the song file as mentioned elsewhere within this specification.

It can be useful to preview a dance file for its desirability or suitability. Since the dance files can be retrieved from a wide area network such as the Internet, it is convenient for such an emulator to operate on a computer that may not be portable or have the proper transmitter that allows communications with a DJ 200. In such case, it is preferable to have an emulator which places an image or drawing of a DJ 200 on the screen, and which is provided the name of a song file and a dance file, and which then plays the song file through the audio of the computer and displays appropriate images or drawings of transducers being activated within the emulator image or drawing. The characteristics of the DJ 200 being

emulated (e.g. colors of lights, frequency responses, levels of illumination, arrangement of lights, response to amplitude, etc.) can be simulated by a number of means. For example, the user can move slider controls, set checkboxes and radio boxes, enter numerical values, click-and-drag icons and use other standard user interface controls to make the DJ 200 operate as desired. Alternatively, manufacturers of DJ 200s can create configuration files (including, for example, bitmaps of photos of the actual DJ 200) that can be downloaded for this purpose (and which can also be used by prospective purchasers to view the "virtual" operation of the DJ 200 prior to purchase, for example, through an Internet merchant). The configuration files would contain the information necessary for the emulator to properly display the operation of the specific DJ.

Alternatively, as described above, the dance file information can be stored within the song file as, for example, another channel in place of an audio channel, or alternatively within MP3 header or other file information. In such case, the step 1307 would have the alternative function of looking through song files to find the song file with the particular desired embedded dance file within.

In addition to sending dance files from computers to units 100 or between units 100, the dance files can be streamed from unit 100 to unit 100 through the normal unit-to-unit communications, in the manners described above for audio communications. This is particularly convenient given that DJ 200 displays can be used to show group identification, and such displays can be more effective if the DJs for each user are nearly identical (which might not be the case if the users were using, for example, different dance files). The dance file control signal information can be transmitted in a variety of ways, including multiplexing the control signals into the same packets as the audio information as if it were a different audio channel, alternating packets of control signals with packets of the audio information, or broadcasting control signals on a different UDP socket as the audio. Alternatively, if the receiving unit has a copy of the dance file corresponding to the song file being transferred by unit-to-unit communication, the receiving unit can determine the current time being played, and to extract from the local dance file the control signals for the receiving unit DJ 200.

It should be known that most streaming protocols have relatively small data packets that are communicated, due to the fact that reception at the source is not guaranteed and it is not desirable to lose a large amount of information in any one stream. Thus, it is possible with smaller transmission buffers and higher data rates to send a single DJ control signal in each transmission. For example, with a buffer size of 600 bytes, and an audio rate of 22,050 Hz with two single byte channels, each transmission covers only about 12 milliseconds, and

any signal would therefore be at most 13 milliseconds from its correct time. Alternatively, each control signal can be accompanied by an offset in time from the beginning of the transmitted audio signal. Also, the time or packet number of each transmission buffer can be sent, as well as the time or packet number of the DJ audio signals, so that the audio unit 100
 5 can compute the proper offset.

Stationary Transducers

DJs 200 that have been previously described are portable devices, usually associated with a particular user and unit 100. Figures 5A and 5B indicate the ways in which DJs 200 associated with multiple users can be controlled by a single unit 100.

10 It is also convenient for transducers to be non-portable and stationary. Consider, for example, a user who is at home listening to music. Instead of a DJ 200 worn by the user, the user can alternatively have a bank of lights or other transducers in fixed locations through the room that operate under the same or similar control signals as to which DJs respond. Such fixed transducers can operate at far higher power than portable DJs 200, and can each
 15 incorporate a large number of separate transducers.

Furthermore, in a party, concert or other large social gathering, the effects of portable DJs worn by guests can be supplemented by large transducers that are generally perceptible by most guests. For example, such transducers can include spark or smoke generators, strobe lights, laser painters, arrays of lights similar to Christmas light strings, or mechanical devices
 20 with visible (e.g. a flag waving device) or tactile effects (e.g. a machine that pounds the floor). In general, transducers for large gatherings will not communicate with a unit 100, but will be directed by a wide-area broadcast unit 360, as in Figure 5B.

Because of the large area over which such stationary transducers can operate, the communications between the unit 100 and the stationary transducers can be through wired
 25 rather than wireless transmission. Furthermore, there can be mixed communication, such as wireless transmission of control signals from a portable unit 100 to a stationary receiver, and thence wired transmission to one or multiple transducers.

Modular Configurations

In the embodiments above, the audio player 130 is directly integrated with the inter-
 30 unit and unit-to-DJ communications. This requires both a re-engineering of existing audio players (e.g. CD, MP3, MO and cassette players), and furthermore does not allow the communications functionality to be reused between players.

An alternative embodiment of the present invention is to place the communications functions external to the audio playing functions, and to adjustably connect the two via the audio output port of the audio player. Figure 12A is a schematic diagram of a modular audio unit 132. Audio player 131 is a conventional audio player (e.g. CD or MP3 player) without the functionality of the present invention. Analog audio output is sent via audio output port 136 through the cable 134 to the audio input port 138 of the modular audio unit 132. The modular audio unit 132 comprises the inter-unit transmitter/receiver 110 and the DJ transmitter 120, which can send and receive inter-unit and unit-to-DJ communications in a manner similar to an audio unit 100. A switch 144 chooses between audio signals from the audio player 131 and from the inter-unit transmitter/receiver 110 for output to the output audio port 142 to the earphone 901 via cable 146 (the earphone 901 can also be a wireless earphone, wherein the output port 142 can be a wireless transmitter, which can also be a DJ transmitter 120). A convenient configuration for the switch 144 is a three way switch. In an intermediate position, the unit 132 acts simply as a pass-through, in which output from the audio player 131 is conveyed directly to the earphone 901, and the transmitter/receiver functions of the unit 132 do not operate. In another position, the unit 132 operates as a receiver, and audio from the inter-unit transmitter/receiver 110 is conveyed to the earphone 901.

When the combined system operates as a broadcast unit 710, audio input from the audio unit 131 is directed to the inter-unit transmitter/receiver 110 for transmission to receive units 730, as well as for output to the earphone 901 (which can be direct to the earphone 901 through the switch, or indirectly through the inter-unit transmitter/receiver 110).

When the combined system operates as a conventional audio player, the switch directs audio signals from the input port 138 directly through to the output port 142. In this mode of operation, it can be arranged for the audio output to traverse the modular audio unit 132 without the unit being powered up. In case there is a transmission delay to the receive unit 730 such that audio played locally through the earphone 901 and audio played remotely on the receive unit 730 are not in synchrony, the system can incorporate a time delay in the output port 142 such that the local and remote audio output play with a common time delay, and are thus in synchrony.

When the combined system operates as a receiver unit 730, audio input from the input port 138 is ignored, and signals to the audio output port are delivered solely through the inter-unit transmitter/receiver 110.

It is convenient for the modular audio unit 132 to be able to operate independently of the associated audio player 131. In such a case, the unit 132 must have an independent energy store, such as one or more batteries, which can be rechargeable. In that case, the unit 132 has no audio signals locally to listen to through the earphone 901 or to transmit over the transmitter/receiver 110. However, the unit 132 can in that case receive external audio signals sent by other units 132 or units 100 for listening.

The audio player 131 can be placed in a backpack, purse, or other relatively inaccessible storage location, while the modular audio unit is, like a "remote control", accessible for interaction with other users.

10 **Video**

While the units 100 described above have comprised audio players 130, within the spirit of the present invention, such units can also comprise video or audio/visual players (both of which are referred to below as video players). Such video players would be used generally for different entertainment and educational purposes, not limited to films, television, industrial training and music videos. Such video enabled units can operate similarly to audio units, including the capability of sharing video signals, synchronously played, with nearby units through inter-unit communication, as well as the use of DJ's that can produce human-perceptible signals (such as light transduction for accompaniment of audio signals in music videos). It should be noted, however, that there is a larger bandwidth requirement for the inter-unit transmitter/receiver 110 for the communication of video signals as compared with audio signals. In the case of shared video, wire connections (e.g. FireWire) between two units can allow simultaneous viewing of a single video signal.

In addition, text, including language-selectable closed caption and video subtitling, can accompany such video, as well as chat or dubbing to allow the superposition of audio over the audio normally accompanying such video.

Music Distribution Using Audio Units

The music industry is suffering from reduced sales due to the advent of Internet-based music file sharing; in addition, the manufacturers of personal audio devices are bringing to market audio devices that can wirelessly transfer music files between the devices. Such sharing-enabled devices could significantly reduce the sales of music. Audio units of the present invention, however, can be used to provide new means of music distribution and thereby increase the sales of music.

Figure 25 is a schematic flow diagram indicating music sharing using audio devices, providing new means of distributing music to customers. Three entities are involved in the transactions – the DJ (operating a broadcast unit 710), the cluster member (operating a receive unit 730), and the music distributor, and their actions are tracked in separate columns.

5 In this case, the term DJ is used to indicate the person operating a broadcast unit 710, and has no meaning with respect to a DJ unit 200. Indeed, the DJ unit 200 is a part of the system only inasmuch as it provides for heightened pleasure of the DJ and the member in enhancing their experience of the music. For the rest of this section, DJ will refer specifically to the person operating the broadcast unit 710.

10 In a first step 1340, the DJ registers with the distributor, who places information about the DJ into a database in a step 1342. Part of this information is a DJ identifier (the DJ ID), which is unique to the DJ, and which DJ ID is provided to the DJ as part of the registration process. This ID is stored in the unit 100 for later retrieval. The DJ at some later time broadcasts music of the type distributed by the distributor, in a step 1344. The broadcast of
15 the music by the DJ can be adventitious (that is, without respect to the prior registration of the DJ with the distributor), or the distributor can provide the music to the DJ either free of charge, at a reduced charge, or free of charge for a limited period of time.

In a step 1346, the member becomes a part of the cluster 700 of which the DJ is the broadcaster broadcasting the distributor's music, and has thereby an opportunity to listen to
20 the music. Along with the transfer of the audio signal of the music, in a step 1348, the DJ can send information about the song, which can include a numerical identifier of the music or album from which the music is derived. Furthermore, the DJ ID is provided to the member, and is associated with the music ID and stored in a database on the member unit 100 in a step 1350. In order to prevent this database from becoming too sizable, music IDs and DJ IDs can
25 be purged from it on a regular basis (for example, IDs which are older than 60 or 120 days can be removed).

If the member requests purchase of the music from the distributor in a step 1352, in a step 1354, the distributor stores the member information, the music ID, and the DJ ID associated with the music (i.e. the person who introduced the member to the music). The
30 distributor then completes the transaction with the member, providing a copy of the music in exchange for money, in a step 1356. As the member receives the music copy, he also becomes registered as a DJ as well in a step 1358. Thus, if the member now becomes the DJ of his own cluster, and introduces people to this music, he will also be known to the distributor as an introducer of the music.

In a step 1360, the distributor provides points to the DJ who introduced the member to the music and facilitated the sale of the music. In a step 1362, the DJ accumulates points related to the sale of the music to the member, as well as points related to the sale of other music to other members. These points can at that point or later be redeemed for money,
 5 discounted music, free music, gifts, access to restricted activities (e.g. seats at a concert) or other such real or virtual objects of value to the DJ.

In a step 1364, the DJ is optionally further linked to the music and member for whom he has received points. If this member introduces the music to yet other members, who are induced to buy the music from the distributor, the DJ is further awarded points in a step 1366,
 10 given that the "chain" of members introduced directly or indirectly to the music includes the original DJ.

This set of interactions does not decrease music sales as does file sharing, but rather increases sales of music, as the DJ has incentives to encourage others to buy the music, and the offering of the music by the DJ through his broadcasts introduces music to people who
 15 may not have already had the opportunity to hear the music.

Figure 31 contains tables of DJ, song and transaction information according to the methods of Figure 25. A USER table 1810 comprises information about the USER, which can include the name of the person (Alfred Newman), their nickname/handle ("WhatMeWorry"), their email address (AEN@mad.com), and the machine ID of their unit
 20 100 (B1B25C0). This information is permanently stored in the audio unit 100. A second set of information relates to music that the USER has heard while in other clusters 700 that the USER liked, and which is indicated as the USER's "wish list". This set of information includes a unique ID associated with the song (or other music or audio signal), which is transmitted by the broadcast unit 710 of the cluster 700. This information can alternatively or
 25 additionally include other information about the music, such as an album name, an artist name, a track number, or other such information that can uniquely identify the music of interest.

Along with each song ID is a DJ identifier, indicating the unique ID associated with the DJ who introduced the desired music to the USER. Additionally or alternatively, the
 30 information can comprise the DJ's email address, personal nickname/handle, name, or other uniquely identifying information.

The Wish List can either be permanent, or it can be that each song entry is dated, and that after a predetermined amount of time, which can be set by the user, the songs that are still on the Wish List are removed. It is also convenient that songs that are purchased

according to the methods of the present invention, such as Figure 25, are also removed from the list automatically.

A DISTRIBUTOR table 1812 comprises information about purchases made by USERS with the DISTRIBUTOR. The table 1812 has numerous records keyed according to
5 unique USER identifiers, which in this case is the MAC ID of the unit 100. A single record from the table is provided, of which there can be hundreds of thousands or millions of such records stored.

The record can include contact information about the USER, including name, email address, or other business related information such as credit card number. In addition, each
10 record comprises a list of all of the songs known to have been purchased through the DISTRIBUTOR, as identified by a unique song ID. In addition, the DJ associated with the purchase of the given song by the USER is also noted. This information was previously transmitted from the USER table 1810, which includes the associated DJ identifier along with the song identifier, at the time of purchase of the song. This association allows the
15 DISTRIBUTOR to compensate the DJ for his part in introducing the USER to the song.

It should also be noted that such an arrangement of information allows the compensation, if desired, of the individual who introduced the DJ to the song, prior to the DJ introducing the USER to the song. For example, when the user purchased the song with song ID 230871C40, points were credited with the DJ whose ID is 42897DD. Looking in the
20 record for the DJ 42897DD, one can determine whether there is another individual (DJ) associated with the purchase of the song 230871C40 by the DJ. If so, that individual can also receive compensation for the purchase of the song by the USER.

Use of Internet Connections

It is within the teachings of the present invention to allow normal Internet connections
25 of the audio unit 100 with non-mobile devices connected with the Internet. Figure 29A is a schematic block diagram of the connection of an Internet-enabled audio unit 100 with an Internet device through the Internet cloud 1708, using an Internet access point 1704. An Internet-enabled audio unit 1700, unit A, is wirelessly connected to an audio unit 100, denoted unit B, as members in a cluster 700. The dashed line connecting the two units A and
30 B indicates that the connection is wireless, whereas the solid connecting lines indicate wired connections. The unit A is connected to a wireless access point 1704, such as an 802.11 access point, which is connected to an Internet device 1706 via wired connections through the Internet cloud 1708.

Figure 29B is a schematic block diagram of the connection of an Internet-enabled audio unit 1702 with an Internet device through the Internet cloud, with an audio unit 1702 directly connected to the Internet cloud 1708. In this case the audio unit 1702 is capable of directly connecting to the Internet cloud 1708, and thence to the Internet device 1706, through a wired connection. This could be through a high speed connection (such as a twisted wire Ethernet connection) or through a lower speed connection (e.g. a serial port connection, or a dial-up modem).

The connection of the unit 1700 or unit 1702 is illustrated in Figure 30, tables of ratings of audio unit 100 users. As described above, members of a cluster can decide whether or not to admit a new member to the cluster using a variety of automatic or manual methods. One method of determining the suitability of a user to become a member of the cluster 700 is to determine the user's ratings by members of other clusters to which the user has previously been a member. In this case, the Internet device 1706 is a computer hosting a database, which can be queried and to which information can be supplied by the unit A (either 1700 or 1702). On the Internet device 1706 are stored ratings of units 100, as indicated by the table 1802. The left hand column is the primary key of the database, and is a unique identifier associated with each unit 100. This ID can be a numerical MAC ID, associated with the hardware and software of each unit 100, a unique nickname or word handle (e.g. "Jen412smash") associated with each audio unit user, or other such unique identifier.

The second and third columns, indicated as numbers with dollar signs, are the total summed positive ratings (column two) and the negative ratings (column three) registered with each user by another member of a cluster 700 with which the user has been associated, and in which the user was operating the broadcast unit 710. This rating can, for example, reflect the perceived quality of music provided by the user. The fourth and fifth columns are the total, summed ratings of the user by other members of clusters 700 with which the user has been associated, in which the user was the operator of a receive unit 730. This rating can, for example, indicate the good spirits, friendliness, dress or other characteristics of the user as perceived by other members of the cluster. The sixth column indicates the largest cluster 700 for which the user has been the broadcaster. This is a good indicator of a broadcaster's popularity, since a poor or unpopular broadcaster would not be able to attract a large group of members for a cluster.

There are many other characteristics that can be stored in such a database, and can also include IDs of other members of groups with which the user has been associated (so that members can accept new members who have been associated with friends of those in the

cluster), specific music that the user has played (in order to determine musical compatibility), information on the individuals making each rating (in order to determine rating reliability), and gradations of ratings (rather than simply a positive or negative response).

The cluster members can access the ratings of the user requesting membership in the cluster 700 in order to determine their desirability and suitability. This would require a connection with the Internet device 1706 at the time that the user was requesting to join, and would preferably involve a wireless connection through an access point, as in Figure 29A. The information from the database on the device 1706 can either be displayed to the members of the cluster 700, or can be used by an automatic algorithm to determine whether the person can join.

The table 1800 represents the ratings of a cluster 700 of 5 total members (comprising a broadcaster with ID 12089AD, and four additional members with IDs E1239AC, F105AA3, B1B25C0, and ED5491B). The ratings are supplied by ED5491B (whose ID is preceded by a zero), and then specific ratings of each member are made. The DJ is indicated by a dollar sign preceding his ID. These ratings can be made by putting the nicknames/handles of the cluster members on a screen, and allowing the member to indicate positive or negative ratings by pressing one of two buttons. A plus in the first column indicates a positive response, and a minus sign indicates a negative response. These ratings can then be sent during either wired communications directly to the Internet device 1706 or via the access point 1704. It should be noted that the ratings, once made, can be stored on the unit 1700 or 1702 indefinitely, until connection with the Internet cloud 1708 can be made. As indicated by the arrow, the information for B1B25C0 can be added to the table 1802 -- in this case, by incrementing the value in the fourth column (a positive rating for a user who is not the broadcaster).

Other applications of connections to Internet devices 1706 include exchanging (via uploading and downloading) dance files with distant individuals, and obtaining music via downloading, which can include transactions with distributors similar to that seen in Figure 25. Such connections also allow the integration of other connectivity, such as telephone and messaging capabilities, expanding the usefulness and attractiveness of audio units 100.

Many Embodiments Within the Spirit of the Present Invention

It should be apparent to one skilled in the art that the above-mentioned embodiments are merely illustrations of a few of the many possible specific embodiments of the present invention. For example, the elements of a unit 100, including the inter-unit transmitter/receiver 110 protocol and hardware, the DJ transmitter 120 and the audio player

130 can be chosen from a range of available technologies, and can be combined with user interface elements (keyboards, keypads, touch screens, and cursor buttons, without significantly affecting the operation of the unit 100. Furthermore, many different transducers can be combined into DJs 200, which can further comprise many decorative and functional pieces (e.g. belt clasps, functional watches, microphones, or wedding rings) within the spirit
5 of the present invention. Indeed, the unit 100, itself, can comprise transducers 240, 250 or 260.

It should also be appreciated that communications protocols provide a nearly uncountable number of arrangements of communications links between units in a cluster, that
10 the links can be of mixed software protocols (e.g. comprising both TCP and UDP protocols, and even non-IP protocols) over a variety of hardware formats, including DECT, Bluetooth, 802.11 a, b, and g, Ultra-Wideband, 3G/GPRS, and i-Beams, and that communications can include not only digital but also analog communications modes. Furthermore, communications between audio units and digital jewelry can further comprise analog and
15 digital communications, and a variety of protocols (both customized as well as well-established IP protocols).

It is important, as well, to note that the inter-unit communication and the unit-to-DJ communication can operate and provide significant benefits independently of one another. For example, members listening to music together gain the benefits of music sharing, even
20 without the use of DJs 200. Alternatively, an individual's appreciation of music and personal expression can be augmented through use of a DJ 200, even in the absence of music sharing. However, the combination of music sharing along with enhanced personal expression through a DJ 200 provides a synergistic benefit to all members sharing the music.

Numerous and varied other arrangements can be readily devised by those skilled in
25 the art without departing from the spirit and scope of the invention. Moreover, all statements herein reciting principles, aspects and embodiments of the present invention, as well as specific examples thereof, are intended to encompass both structural and functional equivalents thereof. Additionally, it is intended that such equivalents include both currently known equivalents as well as equivalents developed in the future, i.e. any elements developed
30 that perform the same function, regardless of structure.

In the specification hereof any element expressed as a means for performing a specified function is intended to encompass any way of performing that function. The invention as defined by such specification resides in the fact that the functionalities provided by the various recited means are combined and brought together in the manner which the

specification calls for. Applicant thus regards any means which can provide those functionalities as equivalent as those shown herein.

Claims

What is claimed is:

1. A method for sharing music from stored musical signals between a first user with a first music player device and at least one second user with at least one second music player device, comprising:
 - playing the musical signals for the first user on the first music player device while essentially simultaneously wirelessly transmitting the musical signals from the first music player device to the at least one second music player device; and
 - receiving the musical signals by the at least one second player device, wherein the musical signals can be played on the at least one second player device essentially simultaneously with the playing of the musical signals on the first music player device; wherein the first and the at least one second users are mobile and maintain less than a predetermined distance.
2. The method of claim 1 wherein the predetermined distance is 40 feet.
3. The method of claim 1 wherein the predetermined distance is 100 feet.
4. The method of claim 1 wherein the predetermined distance is 500 feet.
5. The method of claim 1 wherein the transmitting and receiving involve the use of an Internet protocol.
6. The method of claim 5 wherein the Internet protocol uses a connection-less transport layer.
7. The method of claim 5 wherein the Internet protocol uses a link layer involving a protocol chosen from the group consisting of 802.11, Bluetooth, ultrawideband, HiperLAN and WDCT.
8. The method of claim 1 wherein the transmitting and receiving use analog radio frequency transmission.
9. The method of claim 1 wherein the transmitted music signals are digital.
10. The method of claim 9 wherein the transmitted digital music signals are compressed.
11. The method of claim 1 wherein the first music player device is carried by the first user.
12. The method of claim 1, additionally comprising displaying by the first user a humanly-perceptible light display that is roughly synchronized with the beat of the musical signals.

13. The method of claim 1, additionally comprising communicating an identifier of the at least one second user to the first music player device, and indicating the identifier to the first user on a display located on the first music player device.

14. The method of claim 1, additionally comprising transferring a substantially
5 unique music identifier of the musical signal wherein the personal identifier is stored on the at least one second music player device in association with the musical identifier.

15. The method of claim 14 wherein the user of the at least one second music player device retrieves the musical signal from a remote system by using the music identifier.

16. The method of claim 15 wherein the remote system is located on the Internet.

10 17. The method of claim 15, additionally comprising a substantially unique personal identifier of the first user wherein the personal identifier is transferred to the at least one second music player device and stored in association with the music identifier of the music transmitted by the first music player device to the at least one second music player device.

15 18. The method of claim 1, additionally comprising monitoring the strength of the musical signal received by the at least one second music player device and communicating with the at least one second user the strength of the musical signal.

19. A system of music sharing for a plurality of users, comprising:

20 a first sharing device and at least one second sharing device, each comprising a musical signal store, a musical signal transmitter, a musical signal receiver, and a musical signal player;

a broadcast user operating the first sharing device; and

25 at least one member user operating the at least one second sharing device, wherein the broadcast user plays the musical signal for his own enjoyment on the first sharing device and simultaneously transmits the musical signal to the receiver of the at least one second sharing device of the at least one member user, on which the musical signal is played for the at least one member user, wherein the broadcast user and the at least one member user hear the musical signal substantially simultaneously.

30 20. The system of claim 19, additionally comprising a manual switch on at least one second sharing device, wherein actuation of the switch causes the first sharing device to cease transmitting the musical signal and for the second sharing device to begin transmitting musical signal from the musical signal store of the second sharing device, wherein the broadcast user and the at least one member user hear the musical signal from the second sharing device substantially simultaneously.

21. The system of claim 19 wherein the first sharing device and the at least one second sharing device additionally comprise a substantially unique identifier, wherein the first sharing device communicates its substantially unique identifier to the at least one second sharing device and the at least one second sharing device communicates its substantially
5 unique identifier to the first sharing device.

22. The system of claim 21, wherein the identifier includes a least one piece of information about the user of the sharing device taken from the group consisting of the name of the user, the nickname of the user, a numerical identifier, an alphanumerical identifier, the musical preferences of the user, the age of the user, and the educational institution that the
10 user attends.

23. The system of claim 22 wherein the first sharing device and the at least one second sharing device additionally comprise a visual display on which the substantially unique identifiers which have been communicated to the respective device are displayed.

24. The system of claim 19 additionally comprising at least one requesting
15 member user operating an at least one requesting sharing device, wherein the at least one requesting member user requests to receive transmission of the musical signal from the first sharing device.

25. The system of claim 24 wherein the at least one requesting sharing device is associated with a substantially unique identifier which is communicated by the requesting
20 sharing device to the first sharing device and wherein the first sharing device additionally comprises a display on which the identifier is displayed.

26. The system of claim 25 wherein the broadcast user elects whether to transmit the musical signal from the first sharing device to the requesting sharing device.

27. The system of claim 25 wherein the broadcast user and the at least one
25 member user elect through voting whether to transmit the musical signal from the first sharing device, wherein a majority vote is determinative.

28. The system of claim 25 wherein the broadcast user and the at least one member user elect through voting whether to transmit the musical signal from the first sharing device, wherein a unanimous vote is required for transmitting.

29. The system of claim 25 wherein the identifier of the requesting sharing device
30 is compared with identifiers stored in the first device, such that the match of the identifier of the requesting sharing device with a stored identifier allows the first sharing device to transmit the musical signal to the requesting sharing device.

30. The system of claim 29 wherein the stored identifiers are retrieved from the Internet.

31. The system of claim 19 wherein the first sharing device additionally comprises a visual display.

5 32. The system of claim 31 wherein the visual display indicates the number of member users receiving the musical signal.

33. The system of claim 31 wherein the visual display can display whether the musical being played by the sharing device comes from the musical signal store of the same device, or from the musical signal store another sharing device.

10 34. The system of claim 19 wherein the first sharing device is mobile.

35. The system of claim 19 wherein the first sharing device is carried by the user.

36. The system of claim 19 wherein the first sharing device and at least one sharing device maintain less than a predetermined distance.

37. The system of claim 36 wherein the predetermined distance is 40 feet.

15 38. The system of claim 36 wherein the predetermined distance is 100 feet.

39. The system of claim 36 wherein the predetermined distance is 500 feet.

40. The system of claim 19, additionally comprising a substantially unique user identifier associated with the broadcast user and a substantially unique musical signal identifier associated with each musical signal, wherein the user identifier and the musical signal identifier are transmitted from the first sharing device to the at least one second sharing device and stored in association with one another on the at least one second sharing device.

41. A wireless communications system for sharing audio entertainment between a first mobile device and a second mobile device in the presence of a non-participating third mobile device, comprising:

25 an announcement signal transmitted by the first mobile device for which the second mobile device and the third mobile device are receptive;

a response signal transmitted by the second mobile device in response to the announcement signal for which the first mobile device is receptive and for which the third mobile device is not receptive;

30 an identifier signal transmitted by the first mobile device to the second mobile device in response to the response signal, and which is not receptive to the third mobile device; and

a broadcast signal comprising audio entertainment that is transmitted by the first mobile device, and which is receptive by the second mobile device on the basis of the reception of the identifier signal.

42. The system of claim 41 wherein the announcement signal is transmitted via an Internet protocol.

43. The system of claim 42 wherein the Internet protocol is a connection-oriented transport protocol.

5 44. The system of claim 43 wherein the connection-oriented protocol is TCP.

45. The system of claim 42 wherein the Internet protocol further comprises a link layer protocol selected from the group consisting of 802.11, Bluetooth, ultrawideband, HiperLAN and WDCT.

10 46. The system of claim 41 wherein the broadcast signal is transmitted via an Internet protocol.

47. The system of claim 46 wherein the Internet protocol is a connectionless transport protocol.

48. The system of claim 47 wherein the connectionless transport protocol is UDP.

15 49. The system of claim 46 wherein the Internet protocol further comprises a link layer protocol selected from the group consisting of 802.11, Bluetooth, ultrawideband, HiperLAN and WDCT.

50. The system of claim 41 wherein the broadcast signal is an analog radio frequency signal.

20 51. The system of claim 41 wherein the broadcast signal is transmitted via telephony.

52. The system of claim 41 wherein the broadcast signal is compressed.

53. The system of claim 52 wherein the compression is MP3.

54. The system of claim 41 wherein the broadcast signal is encrypted.

55. The system of claim 41 wherein the identifier signal is an IP socket address.

25 56. The system of claim 41 wherein the identifier signal is a decryption code.

57. The system of claim 41 wherein the identifier signal is a digital password.

58. The system of claim 41 wherein the announcement signal and the broadcast signal use different IP transport protocols.

30 59. The system of claim 41 additionally comprising a transfer signal that is transmitted by the first mobile device upon halting the transmission of its broadcast signal, and which transfer signal is receptive by the second mobile device, such that reception by the second mobile device causes the device to transmit a second broadcast signal comprising audio entertainment for which the first unit is receptive.

60 The system of claim 41 wherein the broadcast signal is transmitted via peer-to-peer communications.

61 The system of claim 60, additionally comprising a switch, wherein actuation of the switch causes the device to toggle between peer-to-peer communications and
5 infrastructure-based communications.

62 The system of claim 41 wherein the broadcast signal is transmitted via infrastructure-based communications.

63. An audio entertainment device, comprising:
a signal store that stores an audio entertainment signal;
10 a transmitter that can transmit the stored audio entertainment signal;
a receiver that can receive the transmitted audio entertainment signal from a transmitter of another such device; and
a player that can play audio entertainment from a member selected from the group of stored audio entertainment signals or audio entertainment signals transmitted from the
15 transmitter of another such device.

64. The device of claim 63 wherein the transmitter transmits to the receiver of the same device in order to play through the player of that device.

65. The device of claim 63 wherein the player can play audio entertainment from signals obtained from either the receiver or from the audio store.

20 66. The device of claim 63 additionally comprising a visual display that is perceptive to the user of the device, indicating information about the audio entertainment signal.

67. The device of claim 66 wherein a third device can receive the transmitted audio signal, wherein all such devices transmitting and receiving the same audio
25 entertainment signal constitute a sharing group.

68. The device of claim 67 additionally comprising a substantially unique identifier that identifies the user of the device, wherein at least one device of the sharing group displays the identifier of the user of another device within the sharing group.

69. The device of claim 68 wherein the identifier includes a least one piece of
30 information about the user taken from the group consisting of the name of the user, the nickname of the user, the musical preferences of the user, a numerical identifier, an alphanumerical identifier, the age of the user, or the educational institution that the user attends.

70. The device of claim 68 wherein the identifier is interspersed within the transmitted audio entertainment signal.

71. The device of claim 66 wherein the visual display can display the number of devices in the sharing group.

5 72. The device of claim 66 wherein the visual display can display whether the audio entertainment being played by a device comes from the audio store of the device of which the display is a part, or from another device.

73. The device of claim 63 wherein the second device provides information to the second user about the strength of the audio signal received by the receiver.

10 74. The device of claim 73 additionally comprising a visual display, wherein the signal strength information is provided in the visual display

75. The device of claim 73 wherein the signal strength information is provided secondary audio signals played substantially simultaneously with the audio entertainment signal through the player of the device.

15 76. The device of claim 63 wherein the signal store stores a compressed audio signal.

77. The device of claim 63 wherein the compressed audio signal is transmitted through the transmitter.

20 78. The device of claim 63 wherein the compressed audio signal is decompressed prior to being transmitted through the transmitter.

79. The device of claim 63 wherein the identifier is interspersed within the transmitted audio signal.

80. The device of claim 63 additionally comprising a delay circuit.

25 81. The device of claim 80 wherein the playing of the audio entertainment signal is delayed in each device so that the audio entertainment signal in all devices playing from the same stored audio entertainment signal is played substantially simultaneously.

82. The device of claim 63 additionally comprising a manual control with at least three states, wherein in the first state the player plays a stored audio entertainment signal and does not transmit the stored entertainment signal, wherein in the second state the player plays a stored audio entertainment signal and substantially simultaneously transmits the same audio entertainment signal, and wherein in the third state the player plays an audio entertainment signal received by the receiver.

83. The device of claim 63 wherein the ambient sound admitted by the earphone can be manually controlled.

84. The device of claim 63 additionally comprising a microphone wherein the device can transmit vocal sounds from the user of the device.

85. The device of claim 63 additionally comprising a manual control such that actuation transmits a message.

5 86. The device of claim 63 wherein the device can connect with the telephone network.

87. The device of claim 63 wherein the device is mobile and can be carried by a user.

88. The device of claim 63 additionally comprising a control signal transmitter
10 that transmits control signals that controls a humanly-perceptible display in a wearable accessory.

89. The device of claim 88 wherein the control signal transmitter is the same as the transmitter that transmits stored audio entertainment signals.

90. The device of claim 88, additionally comprising a store of control signals.

15 91. The device of claim 88, additionally comprising a generator wherein the generator converts stored audio entertainment signals into control signals.

92. An audio entertainment device comprising:

a wireless transmitter for the transmission of audio entertainment signals;

20 a wireless receiver for the reception of the transmitted audio entertainment signals from a transmitter of audio entertainment signals;

a first manually-separable connector for electrically connecting with an audio player, wherein the connector allows transfer of audio entertainment signals from the player to the device;

a second connector for connecting with a speaker; and

25 a control to manually switch between at least three states, wherein in the first state the speaker plays audio entertainment signals from the audio player and the transmitter does not transmit the audio entertainment signals, wherein in the second state the speaker plays audio entertainment signals from the audio player and the transmitter essentially simultaneously transmits the audio entertainment signals, and wherein in the third state the speaker plays
30 audio entertainment signals received by the receiver.

93. The device of claim 92 wherein the first connector connects to the audio player through the audio output jack.

94. The device of claim 92 wherein the speaker is chosen from the group consisting of earphone and headphone.

95. The device of claim 92 wherein the device additionally comprises a control signal generator that converts audio entertainment signals into control signals that control a humanly-perceptible display in a wearable accessory.

96. The device of claim 92 additionally comprising a second transmitter that
5 transmits control signals that control a humanly-perceptible display in a wearable accessory.

97. The device of claim 92 additionally comprising a display that indicates the state of the device.

98. The device of claim 92 wherein the receiver is receptive of the audio entertainment signals transmitted by the transmitter.

10 99. The device of claim 92 wherein the receiver is operational when the first connector is manually separated from the audio player.

100. A system for the sharing of stored music between a first user and a second user, comprising:

a first device for playing music to the first user, comprising a store of musical signals,
15 a first controller that prepares musical signals from the first store for transmission and playing, a first player that takes musical signals from the first controller and plays the signals for the first user, and a transmitter, that is capable of taking the musical signals from the controller and transmitting the musical signals via wireless broadcast; and

a second device for playing music to the second user, comprising a receiver receptive
20 of the transmissions from the transmitter of the first device, a second controller that prepares musical signals from the receiver for playing, and a second player that takes musical signal from the second controller and plays the signals for the second user;

wherein the first user and the second user hear the musical signals at substantially the same time.

25 101. The system of claim 100 wherein the store of musical signals comprises compressed digital audio files.

102. The system of claim 100 wherein the compressed digital audio files are in formats taken from the group consisting of mp3, wav, cda, wma, and au.

103. The system of claim 100 wherein the preparation of the musical signals by the
30 first controller comprises decompression of compressed binary files.

104. The system of claim 100 wherein the transmitter transmits via an Internet protocol.

105. The system of claim 104 wherein the Internet protocol has a link level selected from the group consisting of 802.11, Bluetooth, ultrawideband, HiperLAN and WDCT.

106. The system of claim 100 wherein the first device is a telephone.

107. The system of claim 100 wherein the first device transmits compressed musical signals and the second controller decompresses the compressed musical signals received by the receiver.

5 108. The system of claim 100 wherein the transmitter additionally transmits an annunciator signal indicating the presence of a transmitter of musical signals.

109. The system of claim 100 wherein the second device receiver becomes receptive of transmissions from the first device by obtaining an identifier from the first device.

10 110. The system of claim 109 wherein the first device additionally comprises an associated visual transducer and the second device additionally comprises a visual receiver, wherein the visual transducer outputs a visual identifier signal that is received by the visual receiver.

111. The system of claim 109 wherein the first device additionally comprises a first electrical connector and the second device additionally comprises a second electrical connector, wherein the identifier is communicated via an electrical signal passed from the first electrical connector to the second electrical connector.

112. The system of claim 111 wherein the communication of the identifier signal occurs via an inductive coupling between the first connector and the second connector.

20 113. The system of claim 109 wherein the second device additionally comprises a microphone, wherein the identifier is communicated in an audio signal that is produced by the first player and which is received by the microphone.

114. The system of claim 109 wherein the identifier is transmitted by the transmitter and received by the receiver.

25 115. The system of claim 100 wherein the second device receiver becomes receptive of transmissions from the first device by transmitting an identifier to the first device.

30 116. The system of claim 115 wherein the second device additionally comprises a visual transducer and the first device additionally comprises a visual receiver, wherein the visual transducer outputs a visual identifier signal that is received by the visual receiver.

117. The system of claim 115 wherein the first device additionally comprises a first electrical connector and the second device additionally comprises a second electrical connector, wherein the identifier is communicated via an electrical signal passed from the second electrical connector to the first electrical connector.

118. The system of claim 117 wherein the communication of the identifier signal occurs via an inductive coupling between the first connector and the second connector.

119. The system of claim 115 wherein the first device additionally comprises a microphone, wherein the identifier is communicated in an audio signal that is produced by the second player and which is received by the microphone.

120. The system of claim 115 wherein the identifier is transmitted by the transmitter and received by the receiver.

121. The system of claim 100 wherein the first controller additionally generates control signals related to the musical signals.

122. The system of claim 121 wherein the store additionally comprises stored control signals that are used by the first controller.

123. The system of claim 121 wherein the controller generates control signals from the musical signals.

124. The system of claim 123 wherein the controller performs frequency analysis of the musical signals in order to generate the control signals.

125. The system of claim 121 wherein the first device additionally transmits the control signals to the second device using the first transmitter.

126. The system of claim 125 wherein the control signals and the musical signals transmitted by the first device are interspersed within a single digital stream.

127. The system of claim 125 wherein the control signals and the musical signals are transmitted in two digital streams.

128. The system of claim 121 wherein the first device additionally comprises a second transmitter that transmits control signals.

129. The system of claim 128 wherein the second transmitter uses an IP protocol.

130. The system of claim 129 wherein the Internet protocol uses a link layer selected from the group consisting of 802.11, Bluetooth, and ultrawideband.

131. The system of claim 121 wherein the second transmitter uses analog radio frequency transmissions.

132. The system of claim 100, additionally comprising a wearable accessory, comprising a control signal receiver that is receptive of control signals transmitted by the first device, an accessory controller that generates transducer signals from the received control signals, and a transducer that generates humanly-perceptive music accompaniment signals from the transducer signals.

133. The system of claim 132 wherein the music accompaniment signals are visual signals.

134. The system of claim 133 wherein the visual signals are generated by a light emitting diode

5 135. The system of claim 132 wherein the music accompaniment signals are tactile signals.

136. The system of claim 132 wherein the accessory controller performs frequency analysis on the received control signals.

137. The system of claim 132 wherein the wearable accessory additionally
10 comprises a switch, wherein actuation of the switch causes the accessory to be receptive to an entraining signal from the first device, such that the accessory will accept signals from the first device.

138. An earphone for listening to audio entertainment allowing for the controlled reception of ambient sound by a user, comprising

15 a speaker that is oriented towards the user's ear;
an enclosure that reduces the amount of ambient noise perceptible to the user; and
a manually-adjustable characteristic of the enclosure that adjusts the amount of ambient sound perceptible to the user.

139. The earphone of claim 138 wherein the manually-adjustable characteristic is
20 the size of apertures in the enclosure that admit ambient sound.

140. The earphone of claim 138 wherein the manually-adjustable characteristic is the number of apertures in the enclosure that admit ambient sound.

141. The earphone of claim 138 wherein the manually-adjustable characteristic is the surface area of the enclosure.

25 142. The earphone of claim 138 wherein the manually-adjustable characteristic is the thickness of the enclosure.

143. The earphone of claim 138, additionally comprising a spacer that attaches to the earphone and which increases the distance between the speaker and the user's ear.

144. The earphone of claim 138, additionally comprising a secondary enclosure
30 that encloses the enclosure and the speaker, and which is detachable from the earphone.

145. A mobile device for the transmission of audio entertainment signals comprising

an audio signal store for the storage of the audio entertainment signals;
an audio signal player for the playing of the audio entertainment signals;

an wireless transmitter for the transmission of the audio entertainment signals; and
a transmitter control to manually switch between two states consisting of the operation and the non-operation of the audio transmitter.

146. The device of claim 145 wherein the transmitter is connected to the audio jack
5 of the audio signal player.

147. The device of claim 146 wherein the audio signal that is transmitted via the audio jack is subsequently divided between the transmitter and the headphone.

148. The device of claim 146 wherein the transmitter additionally comprises a second jack to which the earphone plug can connect, such that the insertion of the earphone
10 plug into the second jack allows the audio signal to be heard in the earphone

149. A mobile device for the reception of digital audio entertainment signals comprising:

an audio signal store for the storage of the digital audio entertainment signals;

an audio receiver for the reception of external digital audio entertainment signals from
15 a mobile audio signal transmitter located within a predetermined distance of the audio receiver;

a receiver control with at least a first state and a second state; and

an audio signal player that plays digital audio entertainment signals from the audio signal store when the receiver control is in the first state, and that plays digital audio
20 entertainment signals from the audio receiver when the receiver control is in the second state.

150. The device of claim 149, additionally comprising a jack to which a listening device chosen from the group consisting of earphone and headphone can be connected.

151. A method for the shared enjoyment of music from stored musical signals between a first user with a first music player device and at least one second user with at least
25 one second music player device, comprising:

playing the musical signals for the first user on the first music player device while essentially simultaneously wirelessly transmitting synchronization signals from the first music player device to the at least one second music player device; and

receiving the synchronization signals by the at least one second player device,
30 wherein the synchronization signals allow the musical signals on the at least one second player device to be played essentially simultaneously with the playing of the musical signals on the first music player device;

wherein the first and the at least one second users are mobile.

152. The method of claim 151 wherein the same musical signals are stored on the first music player device and the at least one second music player device.

153. The method of claim 152 wherein the musical signals are stored as compressed audio files.

5 154. The method of claim 151 wherein the synchronization signals comprise the current sample number being played on the first music player device.

155. The method of claim 154 wherein the synchronization signals further comprise the sample rate of the musical signal being played on the first music player device.

156. The method of claim 151 wherein the synchronization signals comprise the
10 current time relative to the beginning of the musical signal being played on the first music player device.

157. The method of claim 151, additionally comprising transferring the musical signals from the first music player device to the at least one second music player device.

158. A wireless communications system for sharing audio entertainment between a
15 first mobile device and a second mobile device, comprising:

a broadcast identifier transmitted by the first mobile device to the second mobile device;

a personal identifier transmitted by the second mobile device to the first mobile device; and

20 a broadcast signal comprising audio entertainment that is transmitted by the first mobile device of which the second device is receptive;

wherein the first mobile device and the second mobile device have displays which can display the identifier signal that they receive and the second mobile device can play the audio entertainment from the broadcast signal that it receives.

25 159. The system of claim 158 wherein the identifier signals are transmitted via an Internet protocol.

160. The system of claim 159 wherein the Internet protocol is a connection-oriented transport protocol.

30 161. The system of claim 159 wherein the Internet protocol further comprises a link layer protocol selected from the group consisting of 802.11, Bluetooth, ultrawideband, HiperLAN and WDCT.

162. The system of claim 158 wherein the broadcast signal is transmitted via an Internet protocol.

163. The system of claim 162 wherein the Internet protocol is a connectionless transport protocol.

164. The system of claim 162 wherein the Internet protocol further comprises a link layer protocol selected from the group consisting of 802.11, Bluetooth, ultrawideband, 5 HiperLAN and WDCT.

165. The system of claim 158 wherein the broadcast signal is an analog radio frequency signal.

166. The system of claim 158 wherein the broadcast signal is transmitted via telephony.

10 167. The system of claim 158 wherein the broadcast signal is compressed.

168. The system of claim 158 wherein the broadcast signal is encrypted.

169. The system of claim 158, additionally comprising a transfer signal that is transmitted by the first mobile device upon halting the transmission of its broadcast signal, and which transfer signal is receptive by the second mobile device, such that reception by the 15 second mobile device causes the device to transmit a second broadcast signal comprising audio entertainment for which the first unit is receptive.

170. The system of claim 158 wherein the broadcast signal is transmitted via peer-to-peer communications.

171. The system of claim 170 additionally comprising a switch, wherein actuation 20 of the switch causes the device to toggle between peer-to-peer communications and infrastructure-based communications.

172. The system of claim 158 wherein the broadcast signal is transmitted via infrastructure-based communications.

173. The system of claim 158 wherein the personal identifier includes a least one 25 piece of information about the user of the second mobile device taken from the group consisting of the name of the user, the nickname of the user, a numerical identifier, an alphanumerical identifier, the musical preferences of the user, the age of the user, and the educational institution that the user attends.

174. The system of claim 158 additionally comprising a third mobile device whose 30 user requests to receive the broadcast signal and additionally comprising a requester identifier signal transmitted by the third mobile device to the first mobile device.

175. The system of claim 174 wherein the requester identifier signal is additionally transmitted by the third mobile device to the second mobile device.

176. The system of claim 174 wherein the requester identifier signal is additionally transmitted by the first mobile device to the second mobile device.

177. The system of claim 174 wherein the requester identifier is displayed on the display of the first mobile device.

5 178. The system of claim 174 wherein the third mobile device receives the broadcast signal without the affirmative action of the first mobile device.

179. The system of claim 174 wherein the third mobile device must receive the affirmative action of the first mobile device in order to receive the broadcast signal.

180. The system of claim 174 wherein the third mobile device must receive the
10 affirmative action of the first mobile device and all other mobile devices receptive of the broadcast signal.

181. The system of claim 180 wherein the affirmative action is a unanimous vote.

182. The system of claim 180 wherein the affirmative action is a majority vote.

183. The system of claim 158, additionally comprising a substantially unique
15 musical identifier related to the audio entertainment, wherein the musical identifier is transmitted by the first mobile device to the second mobile device in association with the broadcast signal, and the musical identifier is stored on the second mobile device in association with the broadcast identifier.

184. A system for identifying a first device that introduces a music selection to a
20 second device, comprising:

a mobile music transmitter operated by the first device;

a mobile music receiver operated by the second device;

a music signal comprising the music selection transmitted by the transmitter and
received by the receiver;

25 an individual musical identifier that is associated with the music selection; and

an individual transmitter identifier that identifies the transmitter, wherein the
transmitter identifier and the individual music identifier are stored in association with each
other in the receiver.

185. A method for enhancing enjoyment of a musical selection, comprising:

30 obtaining control signals related to the musical selection;

transmitting the control signals wirelessly;

receiving the control signals; and

converting the control signals to a humanly-perceptible form.

186. The method of claim 185 wherein the distance over which the control signals are transmitted has a minimum range of at least 1 foot.

187. The method of claim 185 wherein the distance over which the control signals are transmitted has a maximum range of less than 500 feet.

5 188. The method of claim 185 wherein the humanly-perceptible form is a visually-perceptible form.

189. The method of claim 185 wherein the humanly-perceptible form is a tactilely-perceptible form.

10 190. The method of claim 185 wherein the transmitting and receiving use radio frequency communications.

191. The method of claim 185 wherein the radio frequency communications use an Internet protocol.

15 192. The method of claim 185 wherein the Internet protocol involves a link layer chosen from the group consisting of 802.11, Bluetooth, ultrawideband, HiperLAN and WDCT.

193. The method of claim 185 wherein obtaining additionally comprises extracting the musical beat from the musical selection.

194. The method of claim 185 wherein obtaining additionally comprises retrieving the control signals from a store of control signals.

20 195. The method of claim 185 wherein the control signals are divided into multiple channels.

196. The method of claim 195 wherein the step of converting comprises a step of demultiplexing the control signals.

25 197. The method of claim 185 wherein the steps of transmitting and receiving are performed using means conveyed by a single person.

198. The method of claim 197 wherein the user is mobile.

199. The method of claim 185 wherein the step of transmitting is performed by a stationary user and the step of receiving is performed by a mobile user.

30 200. The method of claim 185 wherein the musical selection is provided by musicians in concert playing essentially simultaneously with obtaining control signals.

201. The method of claim 185 wherein the control signals are transmitted with a substantially unique identifier.

202. The method of claim 185 wherein the control signals control the appearance of a wearable device.

203. A method for generating and storing control signals corresponding to musical signals, comprising:

playing musical signals for a user;

5 receiving manual input signals from the user that are produced substantially in synchrony with the music;

generating control signals from the input signals; and

storing the control signals so that they can be retrieved with the musical signals.

204. The method of claim 203 wherein receiving comprises transducing tactile
10 input from the user.

205. The method of claim 204 wherein the tactile input is produced using a user appendage selected from the group consisting of hand, finger and foot.

206. The method of claim 203 wherein receiving comprises transducing sound output produced by the user.

15 207. The method of claim 203 wherein storing comprises interleaving control signals within the musical signals.

208. The method of claim 203 wherein storing additionally comprises creating a digital file.

209. The method of claim 203 wherein storing additionally comprises associating
20 the digital file with the musical signals.

210. A wearable personal accessory, comprising:

an input transducer taken from the group consisting of a microphone and an accelerometer, said transducer generating a time-varying input transduction signal;

25 a controller which accepts the input transduction signal, and which generates an output transducer signal whose signal varies in amplitude with time;

an output transducer receptive of the output transducer signal, and which provides a humanly-perceptible signal; and

an energy source for powering the input transducer, controller and output transducer.

211. The accessory of claim 210 wherein the accelerometer responds to the
30 movements of the user in one axis of movement.

212. The accessory of claim 210 wherein the accelerometer responds to the movements of the user in more than one axis of movement.

213. The accessory of claim 210 wherein the controller performs automatic gain control on the signal from the input transducer.

214. The accessory of claim 210 wherein the output transducer is a light transducer.

215. The accessory of claim 214 wherein the output transducer comprises a light emitting diode.

216. The accessory of claim 214 wherein the output transducer comprises a liquid crystal display.

217. The accessory of claim 214 wherein the output transducer comprises an organic light emitting diode.

218. The accessory of claim 210 wherein the output transducer is a tactile transducer.

219. The accessory of claim 210 wherein the output transducer comprises a first and a second transduction element.

220. The accessory of claim 219 wherein the first transduction element responds preferentially to a first band of frequencies of the input transduction signal and the second transduction element responds preferentially to a second band of frequencies of the input transduction signal.

221. The accessory of claim 219 wherein the first transduction element responds preferentially to a first band of amplitudes of the input transduction signal and the second transduction element responds preferentially to a second band of amplitudes of the input transduction signal.

222. A wearable personal accessory controlled via wireless communications, comprising:

a wireless communications receiver, receptive of an external control signal;

a controller that accepts the external control signal and that generates a time-varying visual output transducer signal;

a visual output transducer that is receptive of the output transducer signal, and which provides a humanly-perceptible visual signal; and

an energy store for powering the receiver, controller and output transducer;

wherein the visual output transducer generates visually-perceptive output.

223. The accessory of claim 222 wherein the external control signal is a time-varying amplitude signal.

224. The accessory of claim 223 wherein the amplitude signal is analog.

225. The accessory of claim 223 wherein the amplitude signal is digital.

226. The accessory of claim 223 wherein the amplitude signal is substantially a musical signal.

227. The accessory of claim 226 wherein the controller performs frequency filtering of the external control signal.

228. The accessory of claim 226 wherein the controller determines the primary beat of the music.

5 229. The accessory of claim 228 wherein the primary beat of the music is determined according to the positions in the music where the amplitude rises at least a predetermined factor over less than a predetermined time.

230. The accessory of claim 222 wherein the external control signal is a digital signal of pairs comprising positions within the music and the amplitudes to which the output
10 transducers are set at such times.

231. The accessory of claim 230 wherein the positions are chosen from the group of characteristics consisting of samples and times.

232. The accessory of claim 222 wherein the receiver is an analog radio frequency receiver.

15 233. The accessory of claim 232 wherein the analog radio frequency communications are at a frequency set by a crystal oscillator, wherein the crystal oscillator can be manually exchanged in order to change the frequency of operation.

234. The accessory of claim 222 wherein the receiver receives Internet protocol signals.

20 235. The accessory of claim 234 wherein the Internet protocol further comprises a link layer selected from the group consisting of Bluetooth, 802.11 and ultrawideband.

236. The accessory of claim 222 wherein the visual output transducer comprises a first light transducer and a second light transducer.

237. The accessory of claim 236 wherein the external control signal comprises a
25 multiplexed first signal and second signal, and wherein the first signal relates to the first light transducer and the second signal relates to a second light transducer.

238. The accessory of claim 237 wherein the controller comprises at least two ports, wherein the first port relates to the first light generating element and the second port related to the second light generating element.

30 239. The accessory of claim 236 wherein the first light transducer responds preferentially to a first range of frequency in the musical signal, and the second light transducer responds preferentially to a second range of frequency in the musical signal.

240. The accessory of claim 236 wherein the first light transducer responds preferentially to a first range of amplitude in the musical signal, and the second light transducer responds preferentially to a second range of amplitude in the musical signal.

241. The accessory of claim 222 wherein the visual output transducer comprises a light emitting diode.

242. The accessory of claim 222 wherein the visual output transducer comprises an organic light emitting diode.

243. The accessory of claim 222 wherein the visual output transducer comprises a liquid crystal display.

244. The accessory of claim 222 additionally comprising a tactile transducer responsive to the external control signal.

245. The accessory of claim 222 additionally comprising a sound transducer responsive to the external control signal.

246. The accessory of claim 222 wherein the external control signal additionally comprises a digital identifier.

247. The accessory of claim 246 wherein the visual output transducer additionally provides an identifier signal that corresponds to the digital identifier, wherein such identifier signal is higher frequency than is humanly perceptible, and wherein the identifier signal is output substantially simultaneously with the humanly-perceptible visual signal.

248. The accessory of claim 222 additionally comprising a manually-separable electrical connection, wherein the connection connects the receiver to the controller.

249. The accessory of claim 222 additionally comprising a manually-separable electrical connection, wherein the connection connects the controller to the output transducer.

250. The accessory of claim 222 wherein the accessory functions as an accoutrement selected from the group consisting of a ring, a pendant, a hair clip, an earring, a necklace, a brooch, a belt buckle, watches, and a bracelet.

251. The accessory of claim 222 wherein the accessory is incorporated into an article of clothing selected from the group consisting of a backpack, a wallet, a purse, a hat and a shoe.

252. The accessory of claim 222 additionally comprising a manual control whose operation sets either a first state and a second state and wherein in the first state the accessory responds exclusively to external control signals comprising a substantially unique identifier.

253. The accessory of claim 252 wherein the identifier to which the accessory responds in the first state is received by the receiver when the accessory is set to the second state.

254. The accessory of claim 253 additionally comprising a third state which is manually set, wherein in the third state, the accessory responds to external control signals in the absence of a substantially unique identifier.

255. A device for converting user tactile responses to stored music into a stored control signal, comprising:

a player that plays stored music audible to the user;

10 a manually-operated transducer that outputs an electrical signal, wherein the transducer is actuated by the user in response to the music;

a controller that receives the electrical signal and outputs a control signal; and

a store that receives the control signal and stores it.

256. The device of claim 255 wherein the control signal comprises a list of positions, wherein the positions are chosen from the set of characteristics consisting of samples and time relative to the beginning of the stored music.

257. The device of claim 255 wherein the control signal further comprises a list of amplitudes corresponding to the positions.

258. The device of claim 257 additionally comprising a second manually-operated transducer that outputs a second electrical signal, wherein the controller additionally receives the second electrical signal.

259. The device of claim 255 wherein the transducer comprises a musical drum operated by the user whose audible output is received by a microphone that generates the electrical signal received by the controller.

25 260. The device of claim 255 wherein the controller performs frequency filtering on the electrical signal.

261. The device of claim 255 wherein the transducer is a tactile transducer that is operated by an appendage of the user selected from the group consisting of finger, hand, and foot.

30 262. The device of claim 255 wherein the store is a file system and the control signal is stored as control file and the stored music is stored as a music file, wherein the control file and the music file are stored in association with each other.

263. The device of claim 255 wherein the control signals are stored in an interleaved fashion with the stored music.

264. The device of claim 71 additionally comprising a visual display on which a visual representation of the control signals is displayed.

265. A music player that wirelessly transmits control signals related to the music, wherein the control signals control a wearable electronic accessory, comprising:

- 5 a store of music signal files;
a controller that reads a musical signal file from the store and generates audio signals and that further generates the control signals;
a transducer that converts the audio signals into sound audible to the user; and
a wireless transmitter that transmits the control signal to the wearable electronic
10 accessory.

266. The player of claim 265 wherein the music signal files comprise compressed audio files.

267. The player of claim 265 wherein the controller performs frequency filtering of the external control signal.

15 268. The player of claim 265 wherein the controller determines the primary beat of the music.

269. The player of claim 268 wherein the primary beat of the music is determined according to the positions in the music where the amplitude rises at least a predetermined factor over less than a predetermined time.

20 270. The player of claim 265 wherein the control signals are pairs comprising positions within the music and the amplitudes to which the output transducers are set at such times.

271. The player of claim 265 wherein the positions are chosen from the set of characteristics consisting of samples and times.

25 272. The player of claim 265 wherein the transmitter is an analog radio frequency transmitter.

273. The player of claim 265 wherein the transmitter transmits according to an Internet protocol.

274. The player of claim 273 wherein the Internet protocol has a link layer selected
30 from the group consisting of 802.11, Bluetooth, ultrawideband, HiperLAN and WDCT.

275. The player of claim 265 additionally comprising a visual transducer that generates visually-preceptive output in response to the control signal, wherein the visual transducer receives the control signal from the controller.

276. The player of claim 275 wherein the visual transducer is a light emitting diode.

277. The player of claim 275 wherein the visual transducer is a liquid crystal display.

278. The player of claim 265 additionally comprising a store of configuration files wherein the configuration files include parameters read by the controller that affect the generation of control signals from the musical signals.

279. A music player that wirelessly transmits control signals related to the music, wherein the control signals control a wearable electronic accessory, comprising:

a store of music signal files;

a second store of control signal files associated with the music signal files;

a controller that reads a musical signal file from the store and generates audio signals and that further reads an associated control signal file;

a transducer that converts the audio signals into sound audible to the user, and

a wireless transmitter that transmits the control signals from the associated control signal file to the wearable electronic accessory.

280. The player of claim 279 wherein the music signal files comprise compressed audio files.

281. The player of claim 279 wherein the transmitter is an analog radio frequency transmitter.

282. The player of claim 279 wherein the transmitter transmits according to an Internet protocol.

283. The player of claim 282 wherein the Internet protocol has a link layer selected from the group consisting of 802.11, Bluetooth, ultrawideband, HiperLAN and WDCT.

284. The player of claim 279 wherein the store of control information comprises at least one binary data file that relates to a single music signal file.

285. The player of claim 279 wherein the store of control information is interleaved with a related music signal file in binary data format.

286. The player of claim 279 additionally comprising a visual transducer that generates visually-preceptive output in response to the electrical control signal, wherein the visual transducer receives the electrical control signal from the controller.

287. A system for exhibition of music enjoyment, comprising:
a source of music signals;
a controller that generates control signals from the music signals;
a transmitter of the control signals, wherein the transmission of the control signals is synchronized with the playing of the music signals;

a receiver of the control signals; and
a transducer that responds to the control signals.

288. The system of claim 287 wherein the source of music signals are stored binary music files.

5 289. The system of claim 288 wherein the stored binary data files are compressed audio files.

290. The system of claim 288 wherein the music signals are stored on a medium selected from the group consisting of compact disk, digital video disk, hard disk drive, removable disks, flash memory, magneto-optical disk, and audio tape.

10 291. The system of claim 287 wherein the source of music signals are musicians playing live music.

292. The system of claim 287 wherein the receiver and transducer are worn by a user.

293. The system of claim 287 wherein the receiver and the transducer are
15 physically separated from the transmitter by more than 5 feet.

294. The system of claim 287 wherein the transducer is a visual transducer that generates humanly-perceptible visual signals.

295. The system of claim 294 wherein the visual transducer is a light emitting diode

20 296. The system of claim 294 wherein the visual transducer is a liquid crystal display

297. The system of claim 287 wherein the transducer is a tactile transducer.

298. The system of claim 287 wherein the minimum range of the transmitter for which the receiver is receptive is at least 1 foot.

25 299. The system of claim 287 wherein the maximum range of the transmitter for which the receiver is receptive is less than 500 feet.

300. The system of claim 287 wherein the controller determines the primary beat of the music.

301. The system of claim 287 wherein the controller performs frequency filtering.

30 302. The system of claim 287, additionally comprising a second controller that is electrically connected to the receiver, and which generates transducer control signals from the control signals received by the receiver, wherein the transducer control signals directly control the transducer.

303. The system of claim 302 wherein the control signals are time-varying amplitude signals and wherein the second controller performs frequency filtering.

304. The system of claim 302 additionally comprising a switch that is electrically connected to the second controller such that actuation of the switch places the second
5 controller into entraining mode, wherein the receiver becomes receptive of entraining signals from the transmitter.

305. The system of claim 304 wherein a receiver that is entrained will receive control signals other than from the transmitter in the absence of signals from the transmitter.

306. The system of claim 304 wherein additional actuation of the switch will allow
10 reception of control signals by the receiver from a transmitter to which it is not entrained.

307. The system of claim 287 wherein the transmitter and receiver communicate via an Internet protocol.

308. The system of claim 287 wherein the transmitter and receiver communicate via digital radio frequency communications.

15 309. The system of claim 287 wherein the transmitter and receiver communicate via analog radio frequency communications.

310. The system of claim 309 wherein the analog radio frequency communications are at a frequency set by a crystal oscillator and wherein the crystal oscillator can be manually replaced.

20 311. The system of claim 287 additionally comprising a transferror for the transmission of music signals.

312. The system of claim 311 wherein the transmitter and the transferror are the same.

25 313. The system of claim 311 wherein the transmitter and the transferror are different, and communicate via different communications protocols.

314. The system of claim 287 additionally comprising a second receiver for the reception of music signals, wherein the music signals that are received are played by the music player.

30 315. A method for transferring a wearable-accessory control file stored on a first device to a second device in which an associated music file is stored, comprising:

storing on the first device the name of the music file in conjunction with the control file with which it is associated;

requesting by the second device of the first device for a control file stored in conjunction with the name of the music file; and

transferring the control file from the first device to the second device, wherein the control file is stored on the second device in conjunction with the name of the associated music file.

316. The method of claim 315 additionally comprising the step of extracting,
5 wherein the control file is stored on the first device interspersed with the music file as a combined file, and the control file is extracted from the music file prior to being transferred to the second device.

317. The method of claim 315 wherein the requesting is performed over a wide area network.

10 318. The method of claim 315 wherein the name of the control file comprises the root of the name of the associated music file appended with a predetermined extension that is different from that of the music file.

319. The method of claim 315 wherein the control file and the associated music file both comprise the same substantially unique identifier.

15 320. A device for transmitting control signals to a wearable accessory receptive of such control signals, comprising:

a manually-separable input connector for connecting to an output port of an audio player, wherein audio signals are conveyed from the audio player to the device across the connector;

20 a controller for generating control signals from the audio signals; and
a transmitter for transmitting the control signals.

321. The device of claim 320 additionally comprising a second connector, wherein a portion of the audio signal conveyed to the device is conveyed to the second connector, and wherein an earphone can connect to the second connector.

25 322. The player of claim 320 wherein the controller performs frequency filtering of the audio signal.

323. The player of claim 320 wherein the controller determines the primary beat of the audio signal.

30 324. The player of claim 320 additionally comprising a visual transducer that generates visually-preceptive output in response to the control signals, wherein the visual transducer receives the control signals from the controller.

325. The system of claim 320 wherein the transmitter transmits via an Internet protocol.

326. The system of claim 320 wherein the transmitter transmits via digital radio frequency communications.

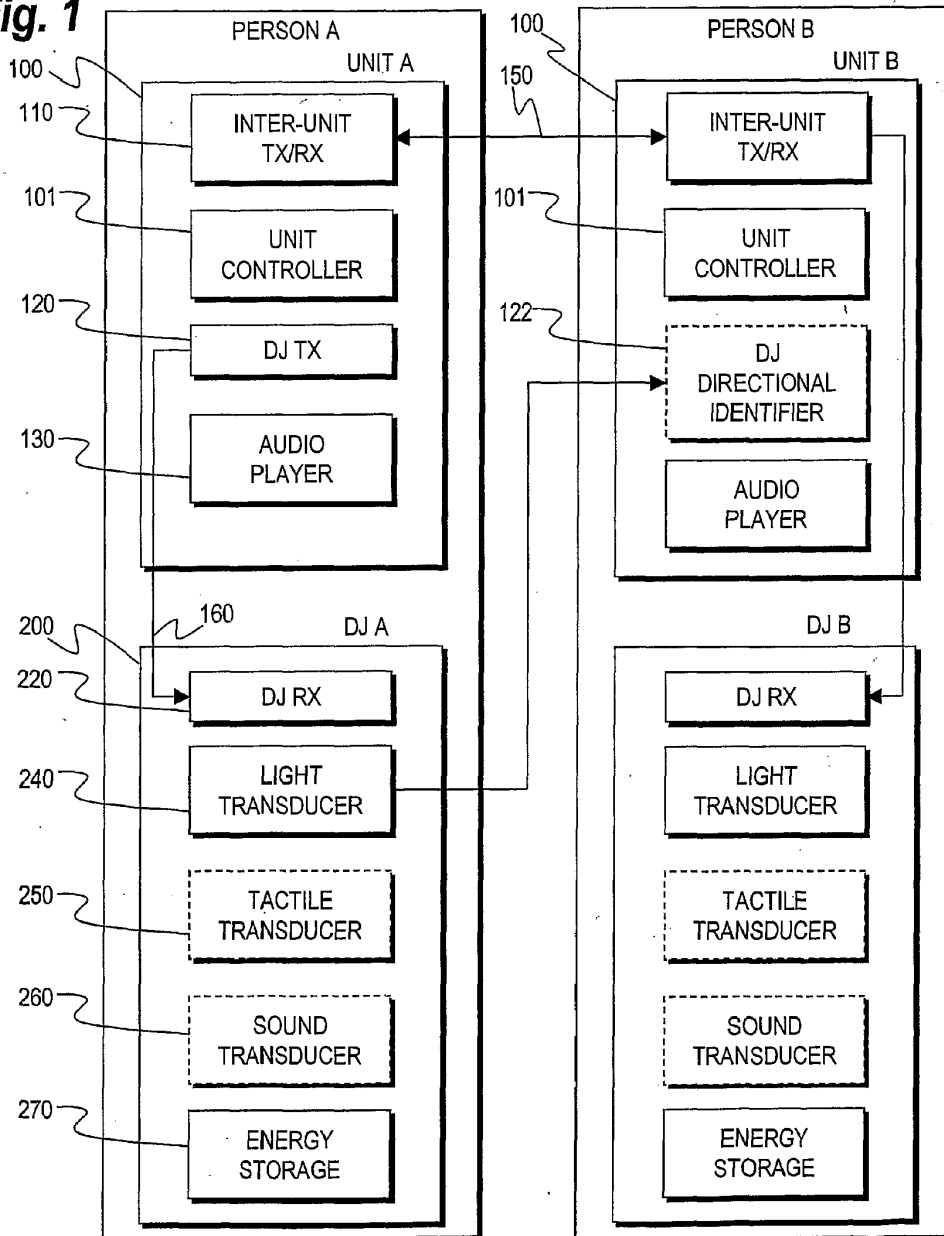
327. The system of claim 320 wherein the transmitter transmits via analog radio frequency communications.

5 328. The system of claim 327 wherein the analog radio frequency communications are at a frequency set by a crystal oscillator and wherein the crystal oscillator can be manually replaced.

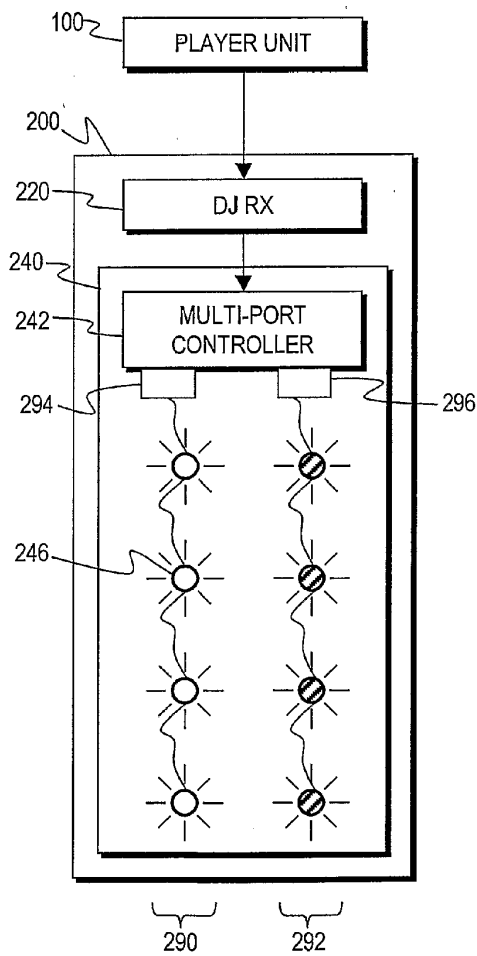
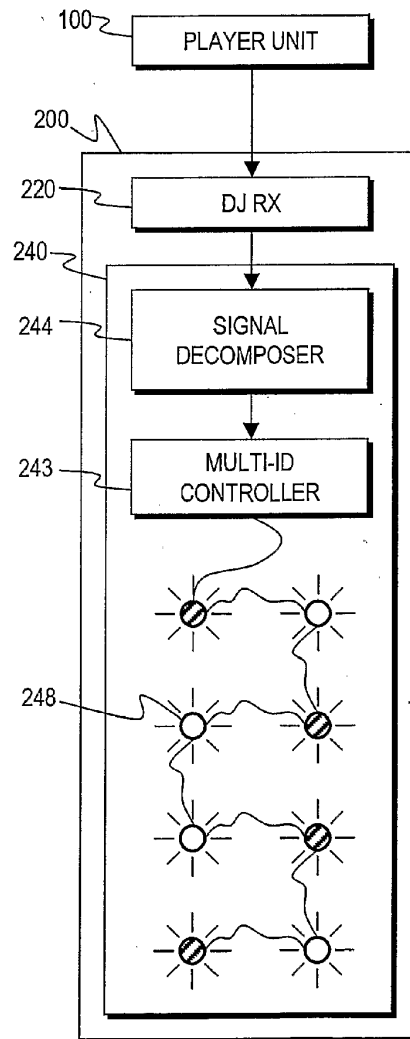
329. The system of claim 320 wherein the transmitter additionally transmits the audio signal to wireless earphones.

10

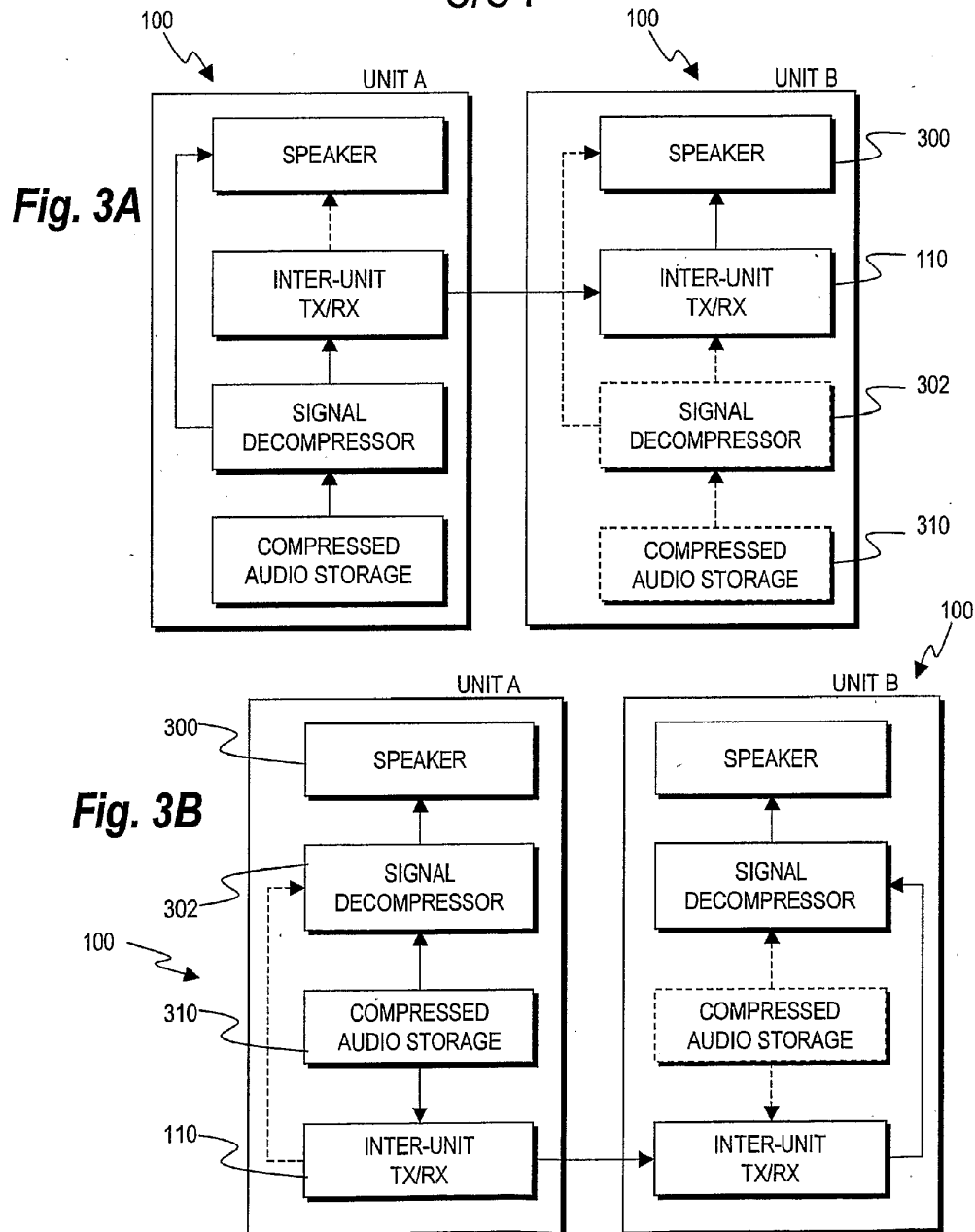
1/34

Fig. 1

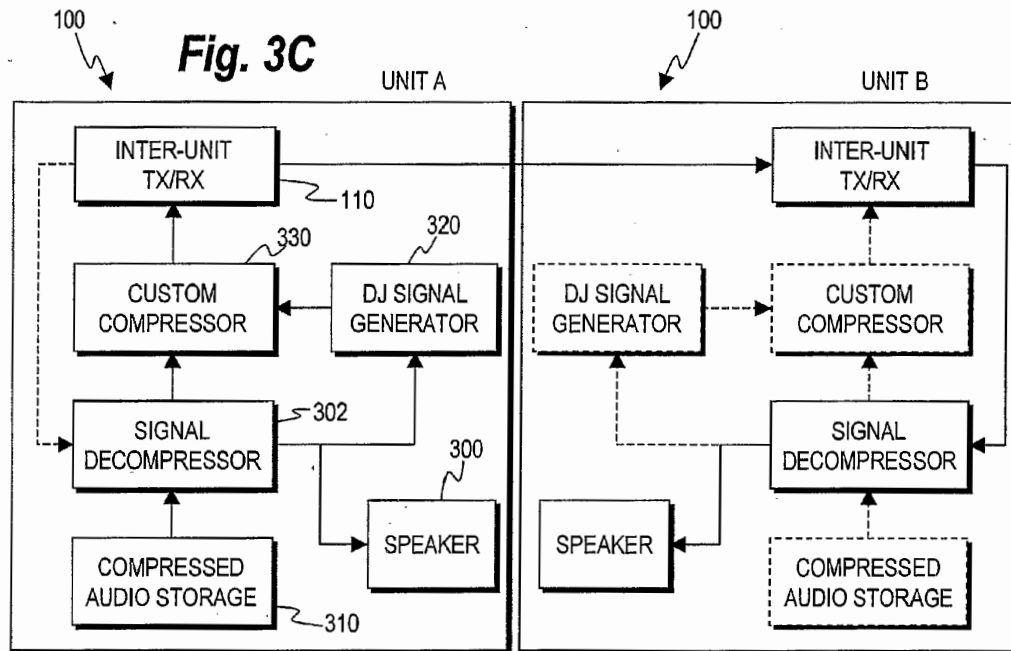
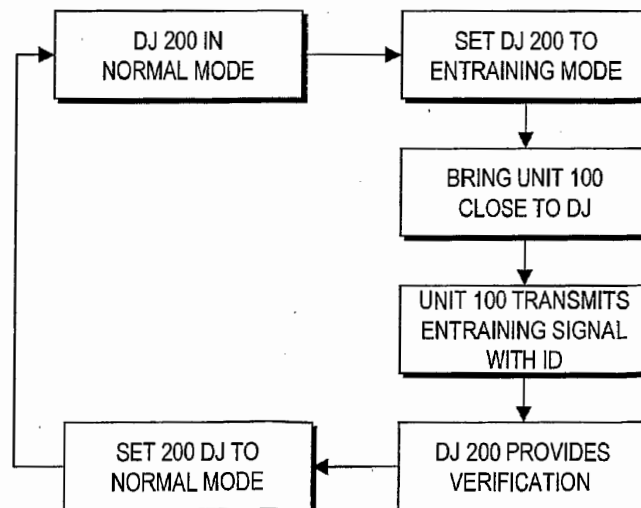
2/34

Fig. 2A**Fig. 2B**

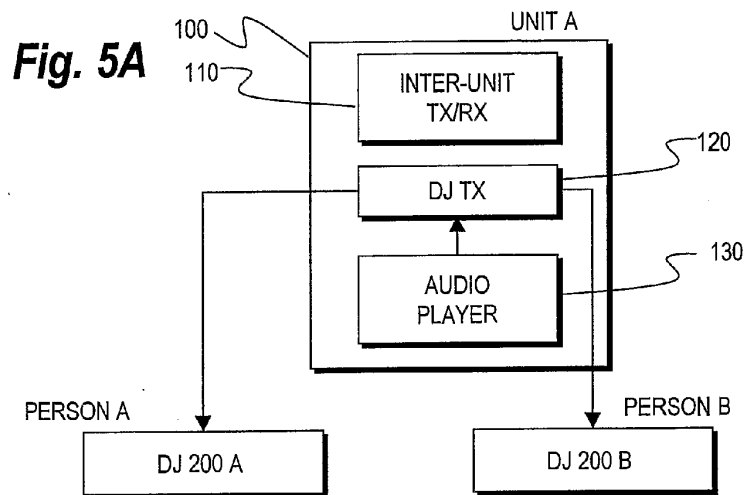
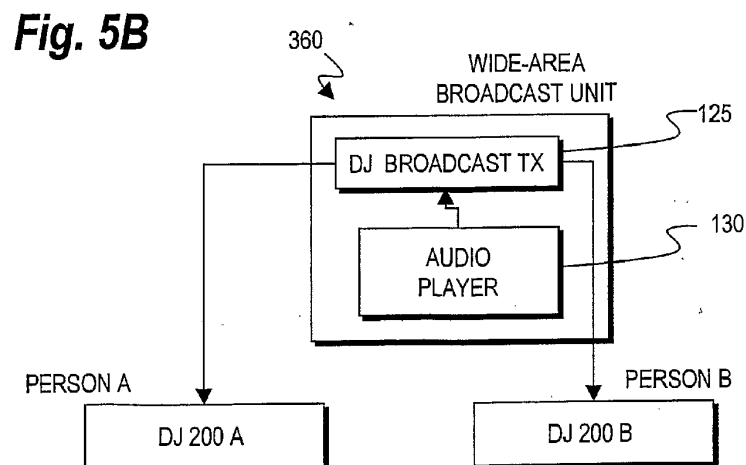
3/34



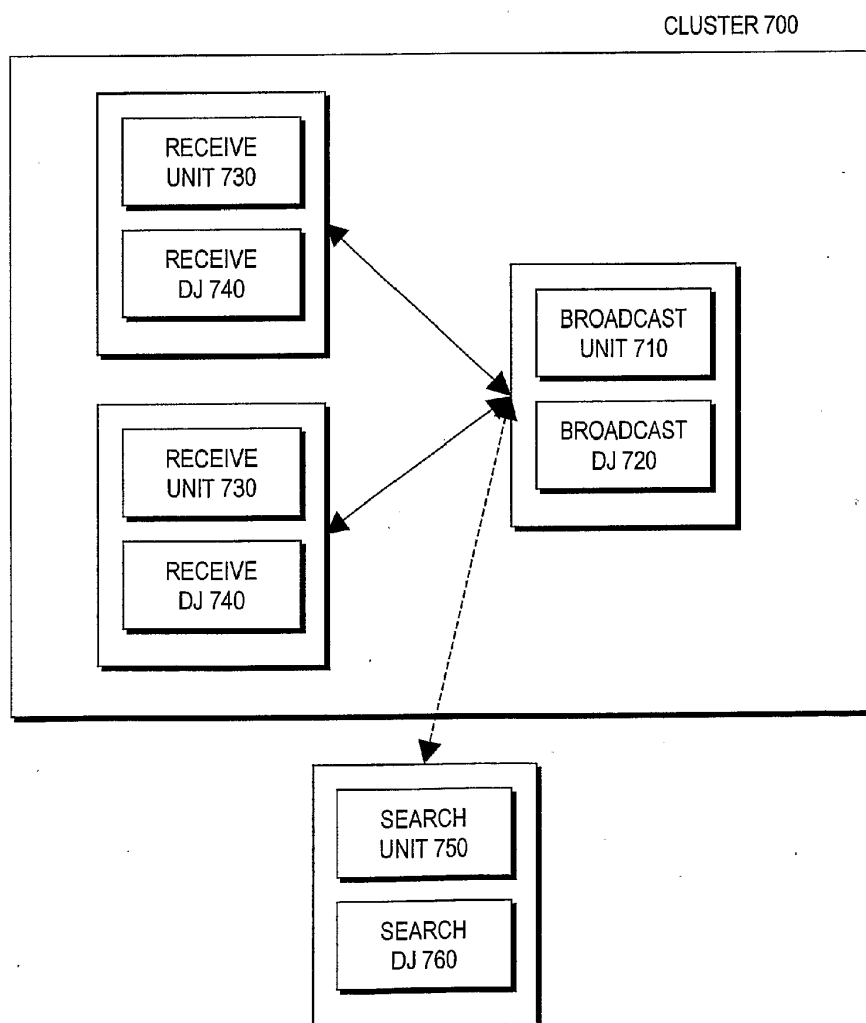
4/34

**Fig. 4**

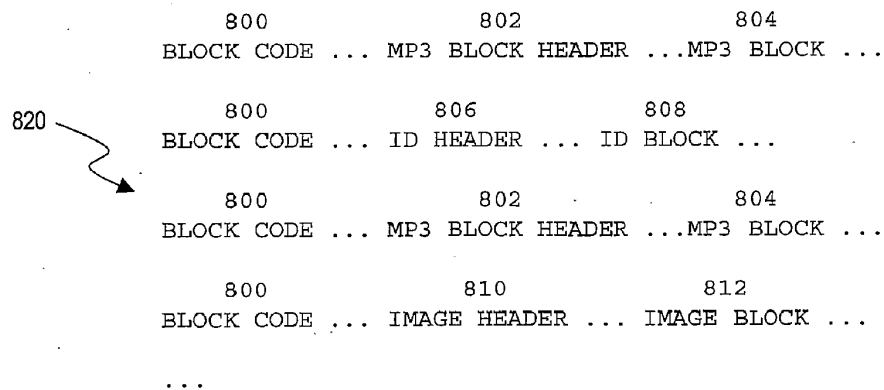
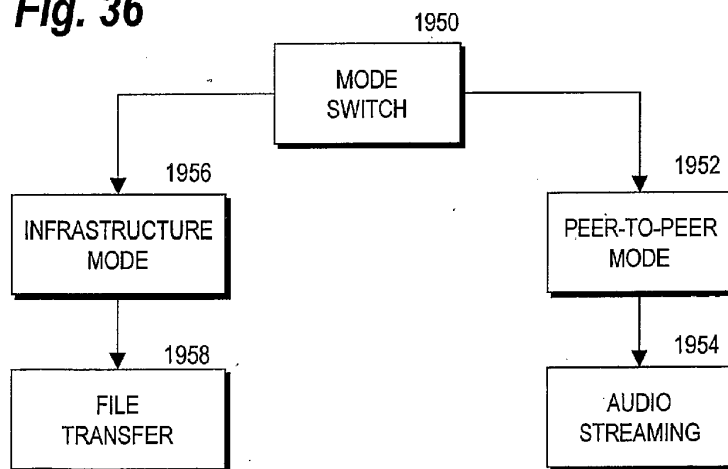
5/34



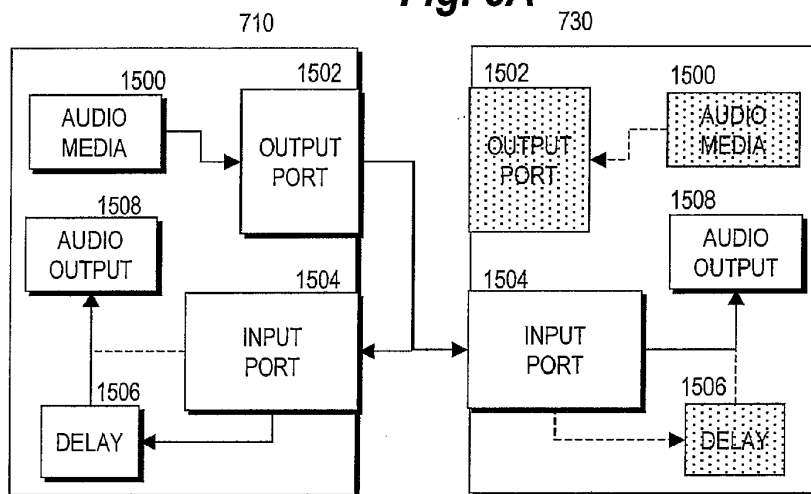
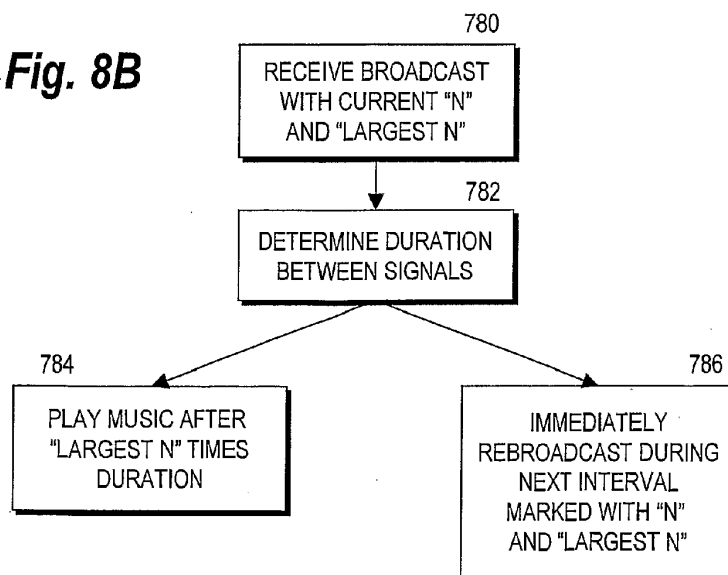
6/34

Fig. 6

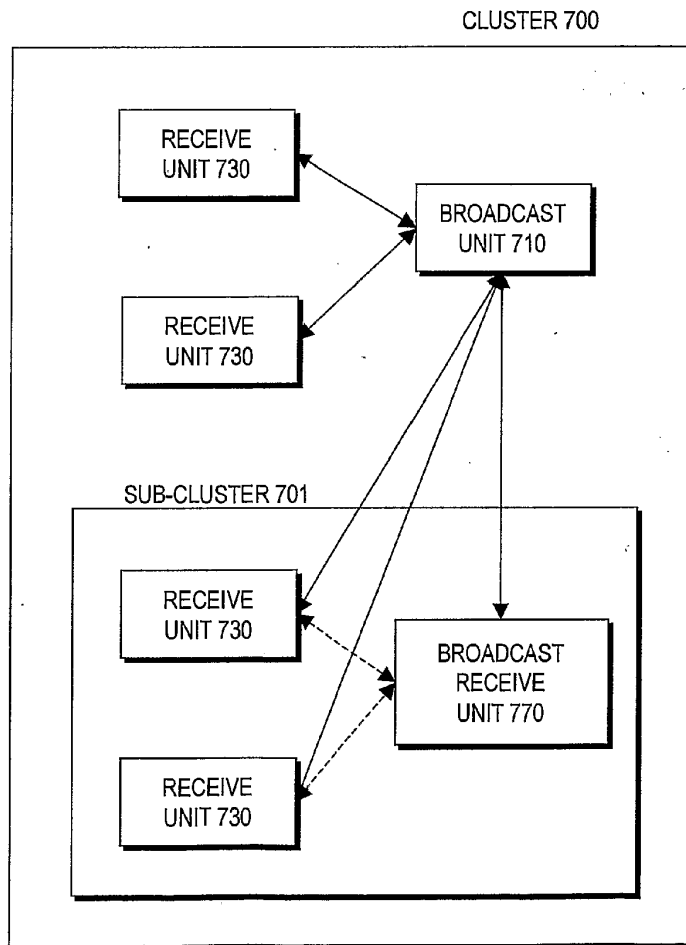
7/34

Fig. 7**Fig. 36**

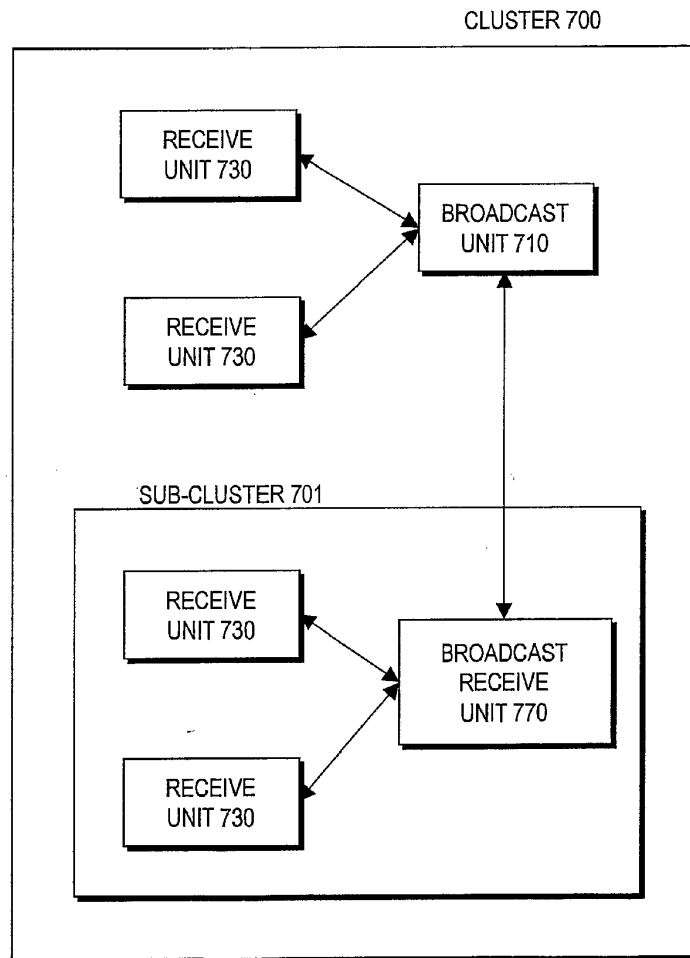
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Fig. 8A**Fig. 8B**

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Fig. 9A

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Fig. 9B

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Fig. 10

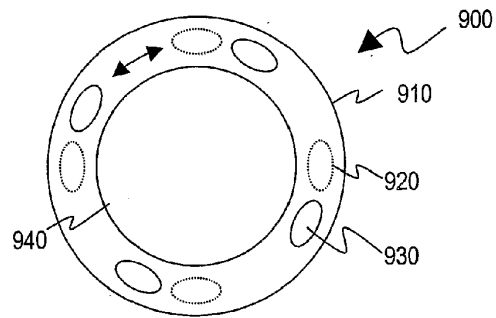


Fig. 11A

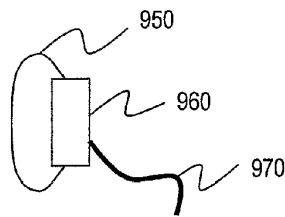
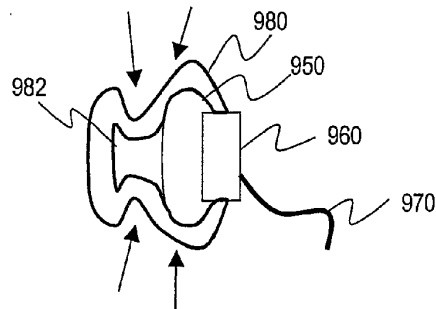
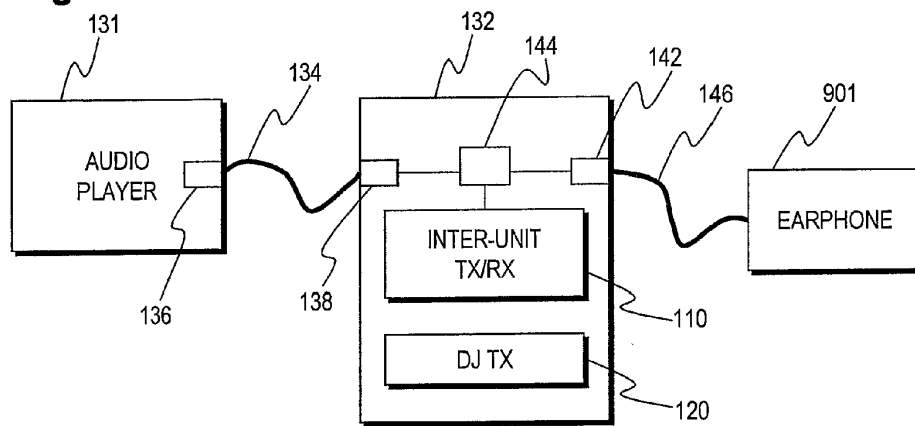
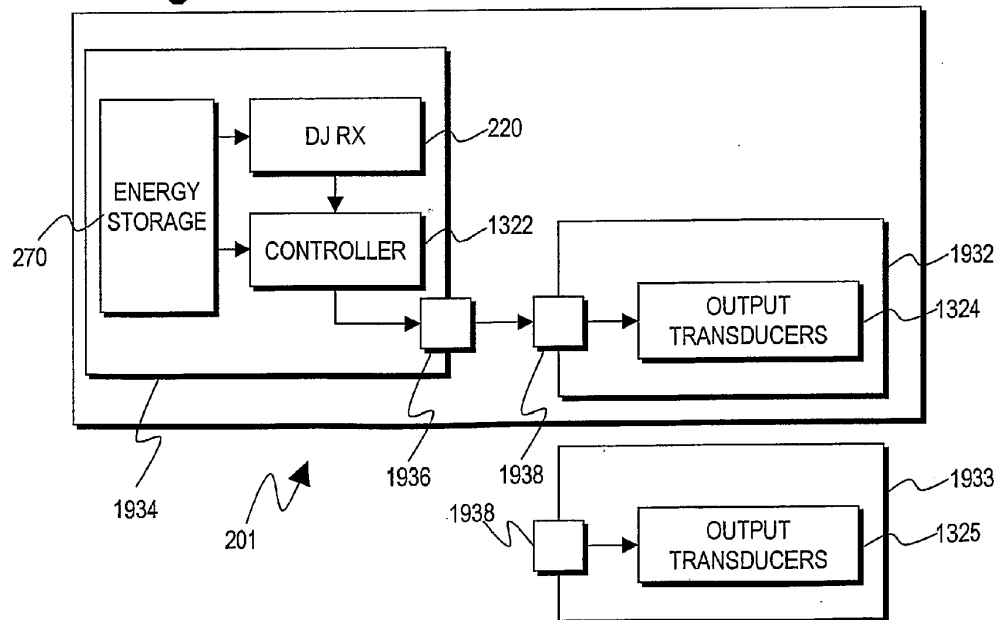


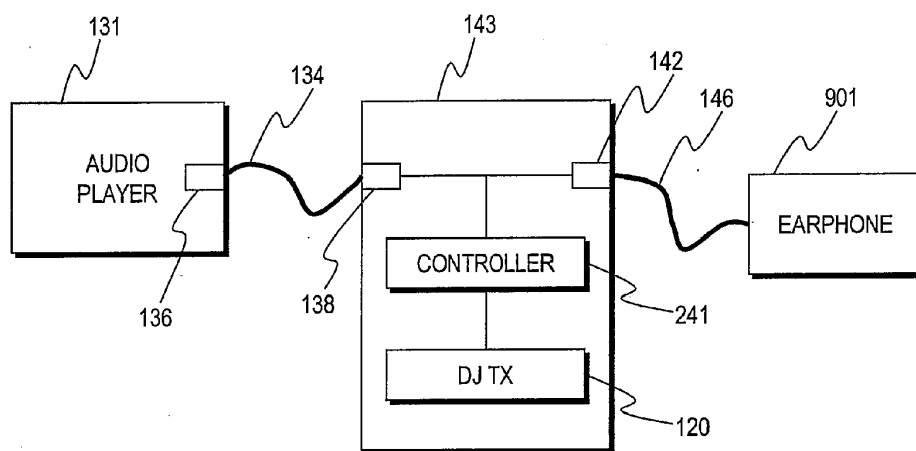
Fig. 11B



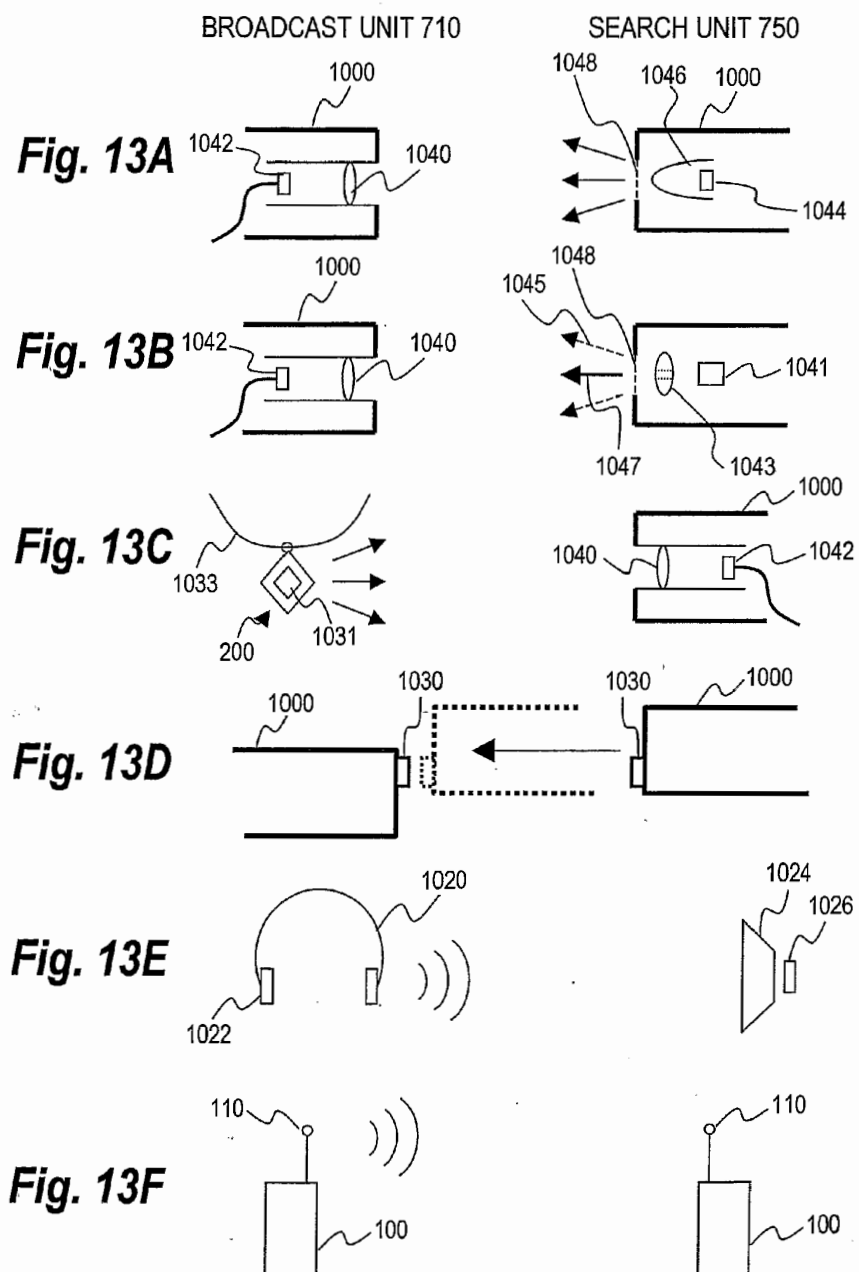
12/34

Fig. 12A**Fig. 12B**

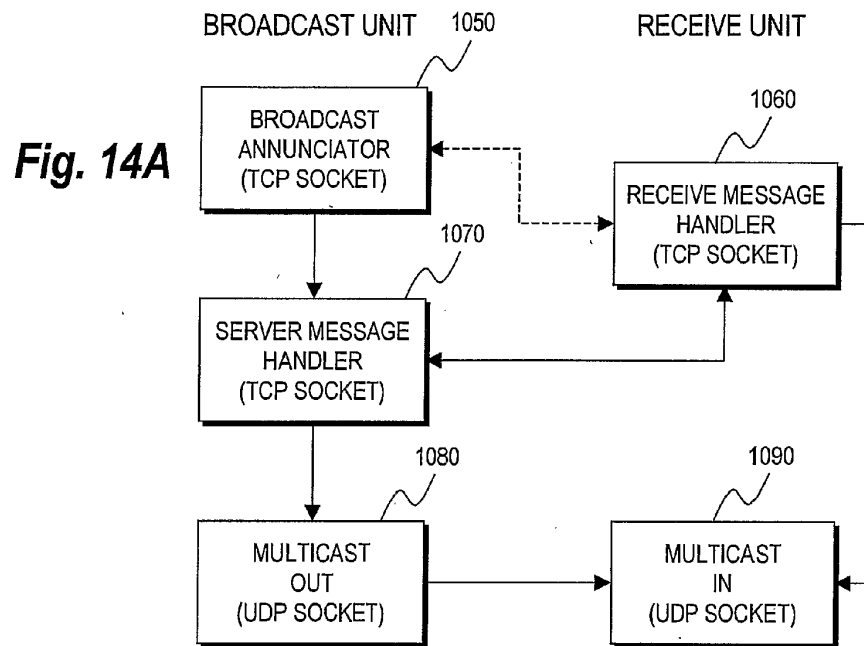
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Fig. 12C

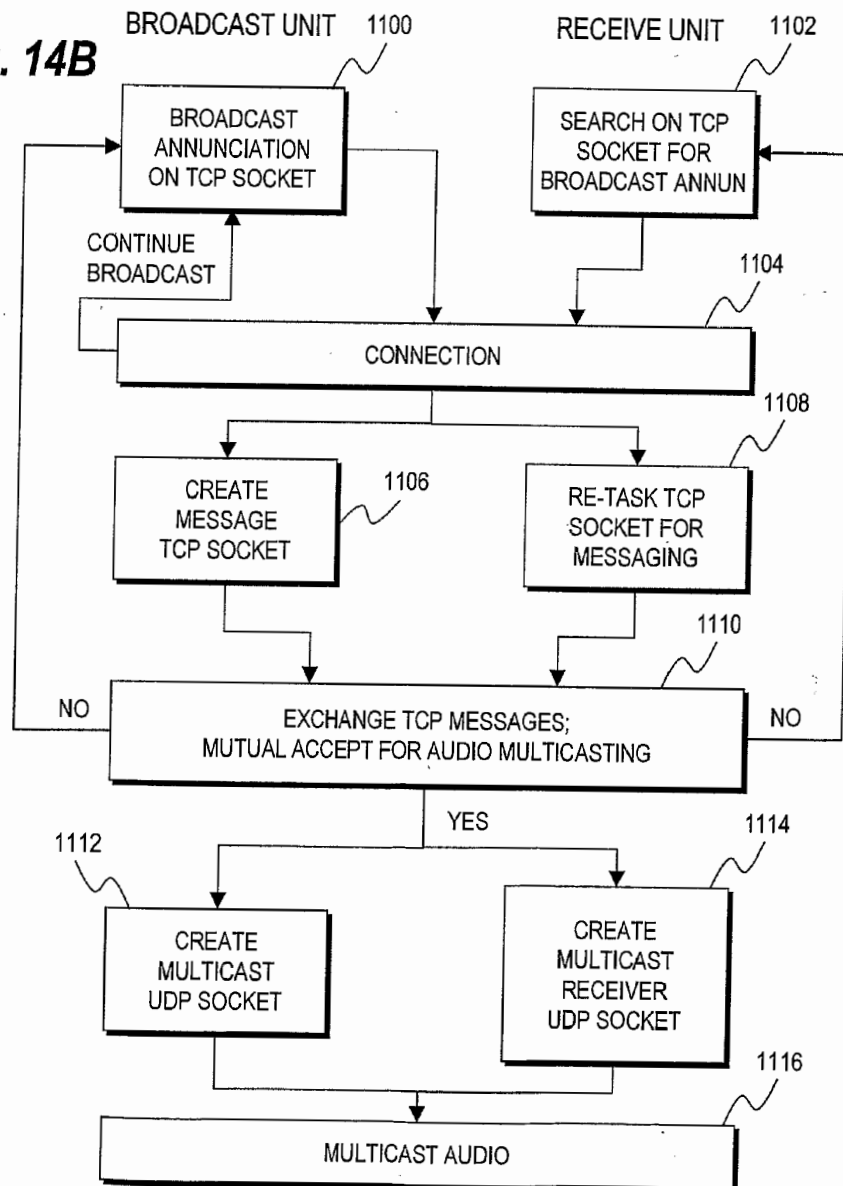
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Fig. 14B

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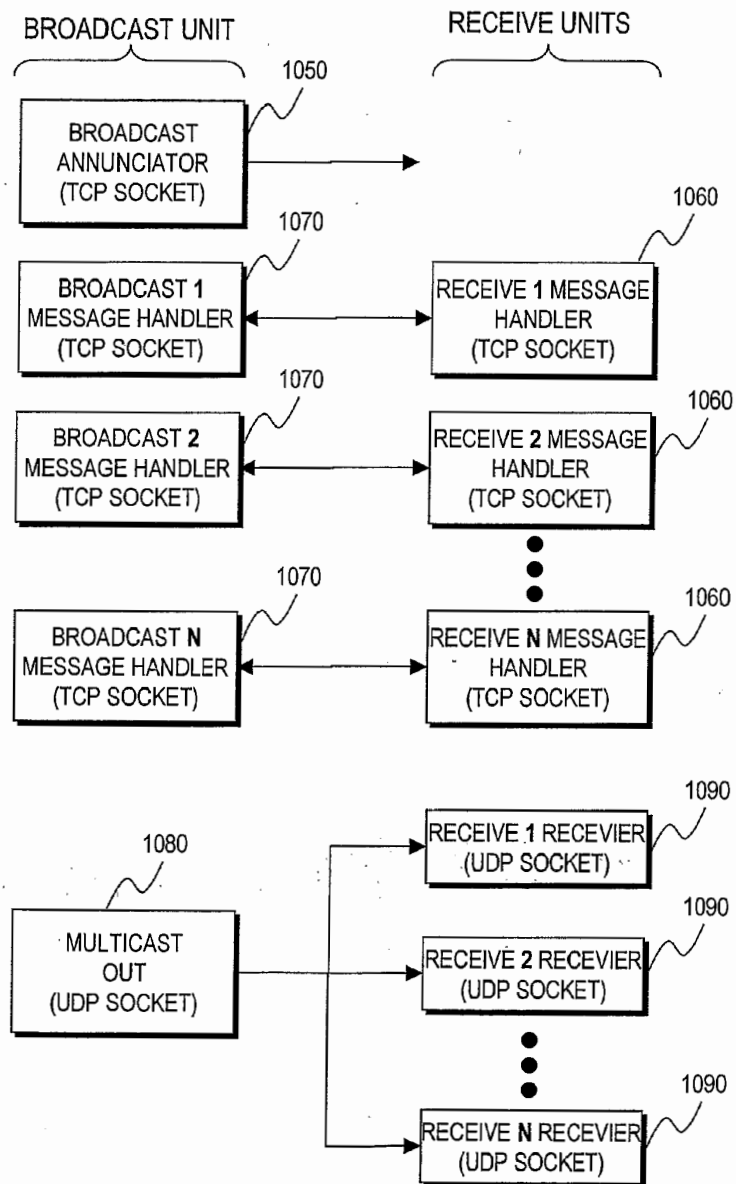
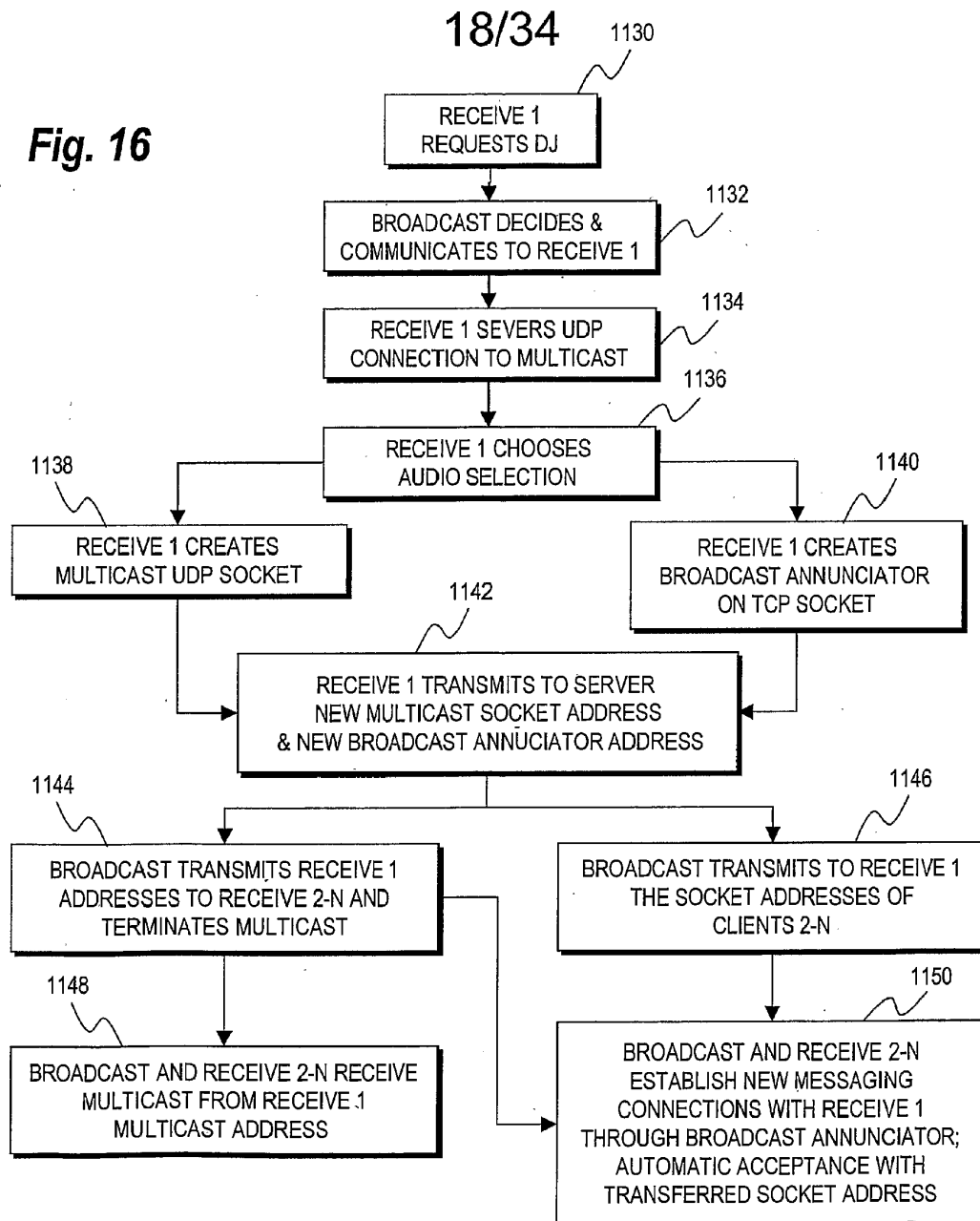
Fig. 15

Fig. 16

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Fig. 17

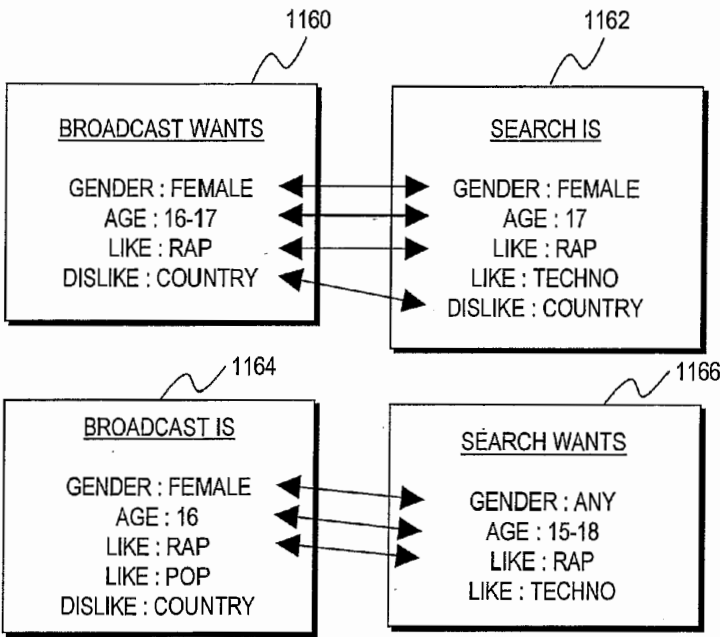


Fig. 18A

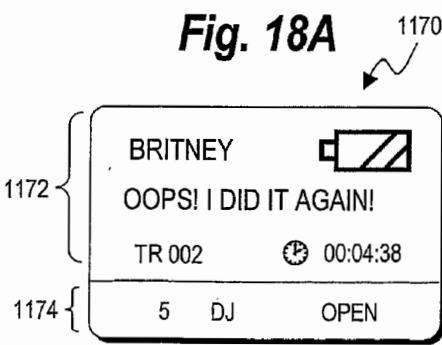
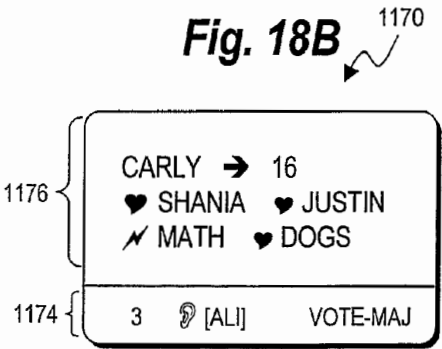


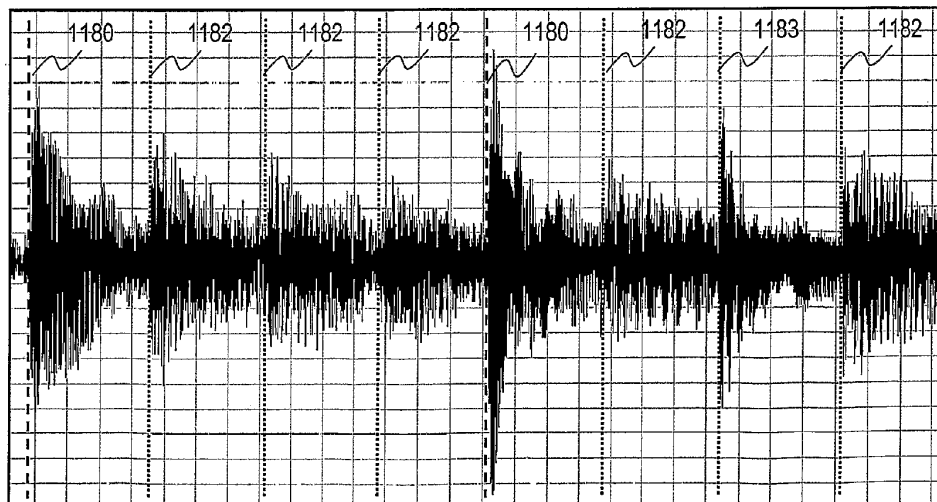
Fig. 18B



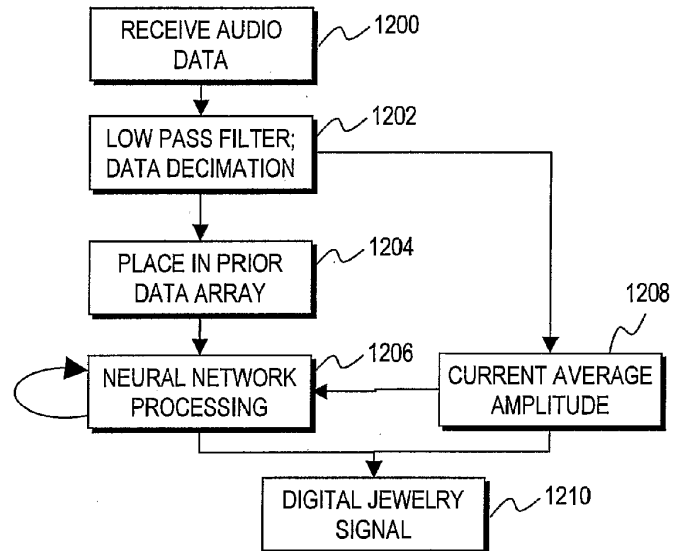
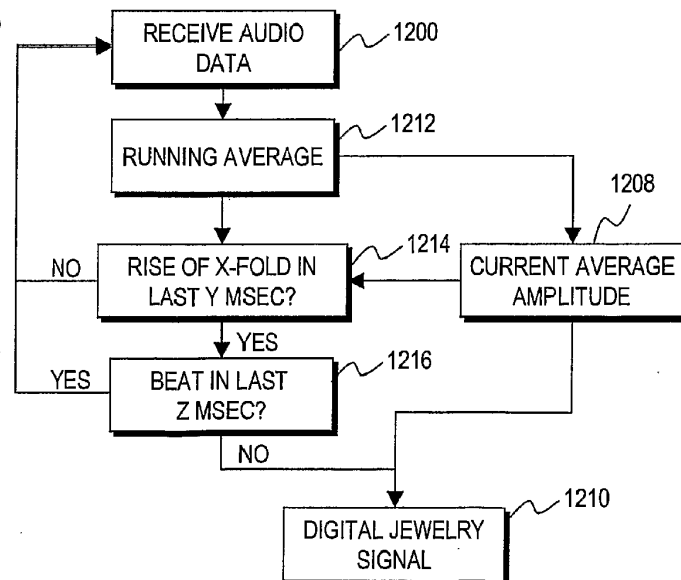
20/34

Fig. 19

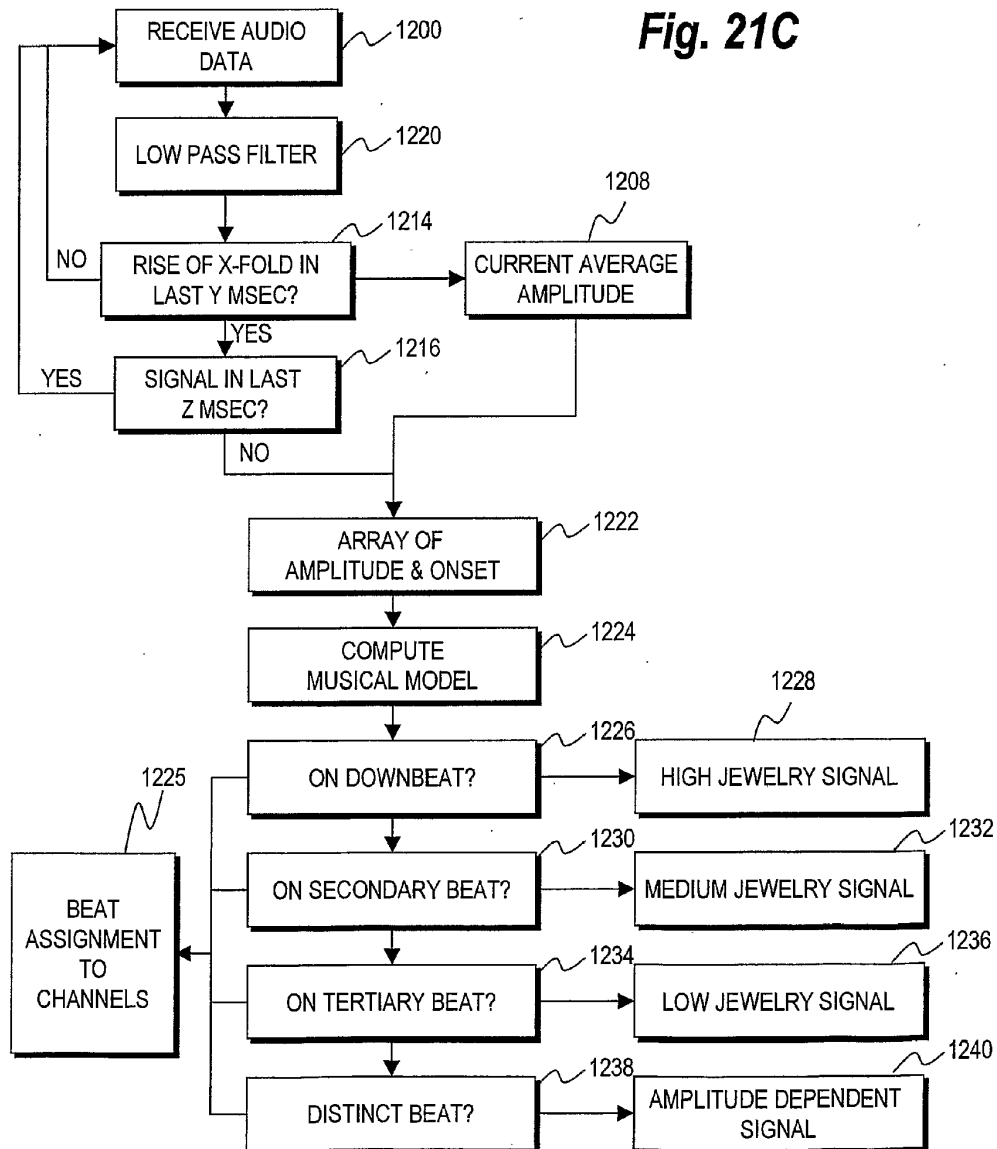
RULE	METHOD
BROADCASTER	ACCEPTED WHEN BROADCASTER INDICATES "YES". REJECTED WHEN BROADCASTER INDICATES "NO"
MAJORITY	ACCEPTED WHEN $(N/2)+1$ INDICATE "YES". REJECTED WHEN $(N/2)$ INDICATE "NO".
UNANIMOUS	ACCEPTED WHEN N MEMBERS INDICATE "YES". REJECTED WHEN 1 MEMBER INDICATES "NO".
TIMED MAJORITY	MACHINE INDICATES ONSET OF VOTING, AND COUNTS DOWN TO VOTING TERMINATION. ACCEPTED IF $(Q/2)+1$ INDICATE "YES" BEFORE TERMINATION; OTHERWISE "NO".
SYNCHRONIZED MAJORITY	MACHINE COUNTS DOWN TO VOTE. ACCEPTED IF $(Q/2)+1$ INDICATE "YES" WITHIN PREDETERMINED TIME OF COUNTDOWN. OTHERWISE "NO".

Fig. 20

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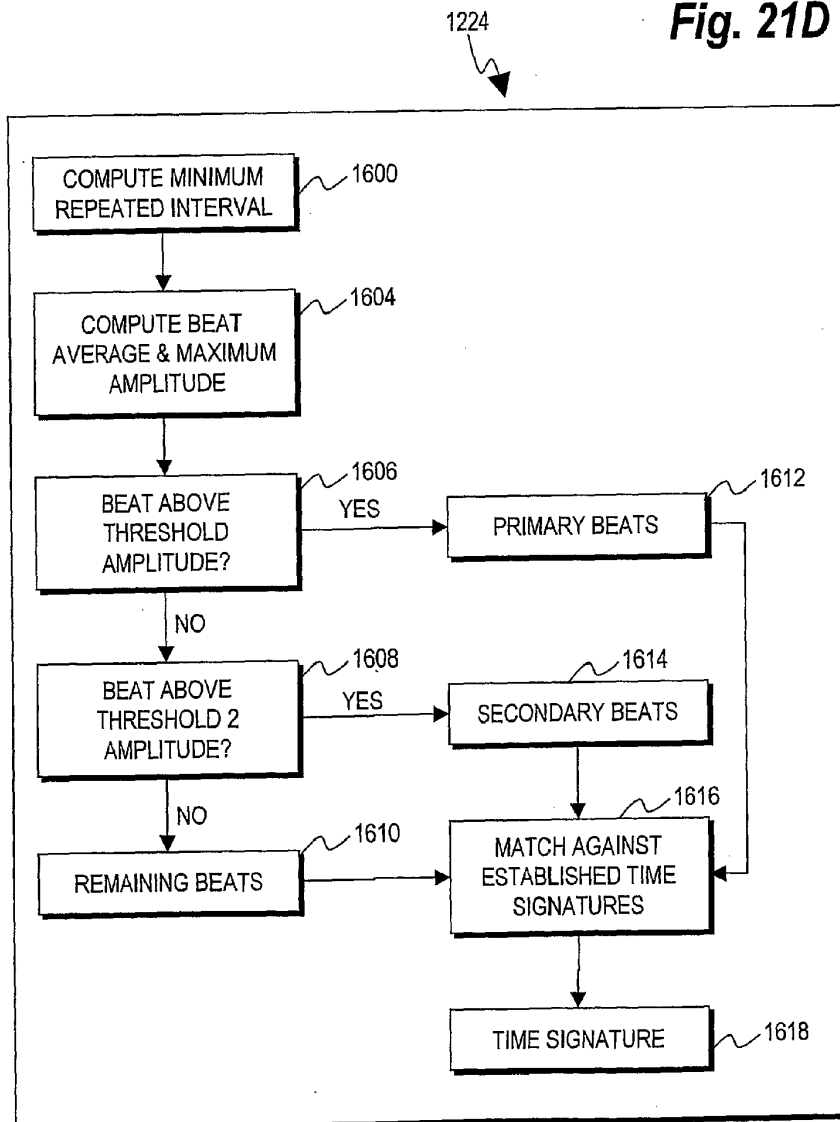
Fig. 21A**Fig. 21B**

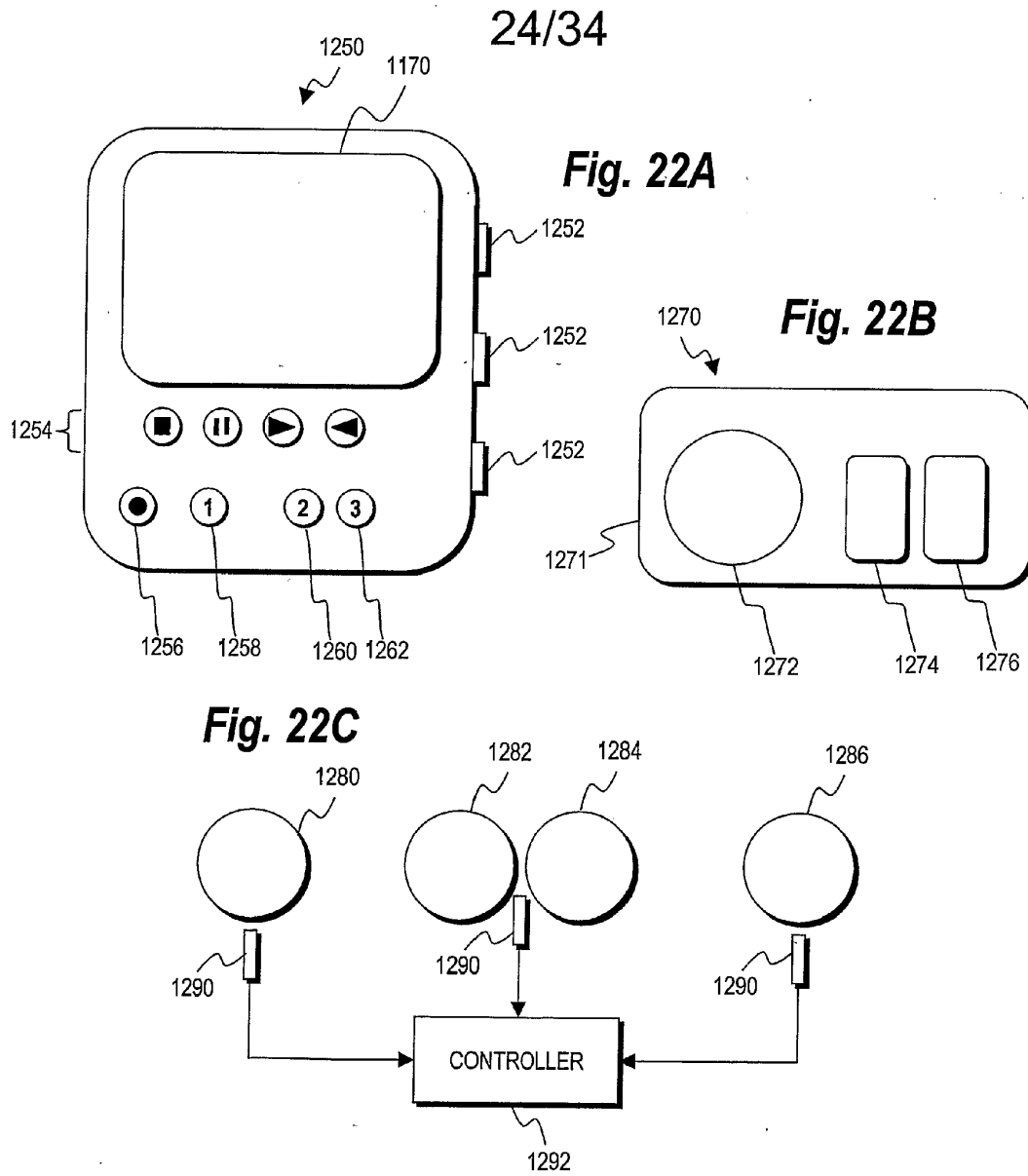
22/33

Fig. 21C

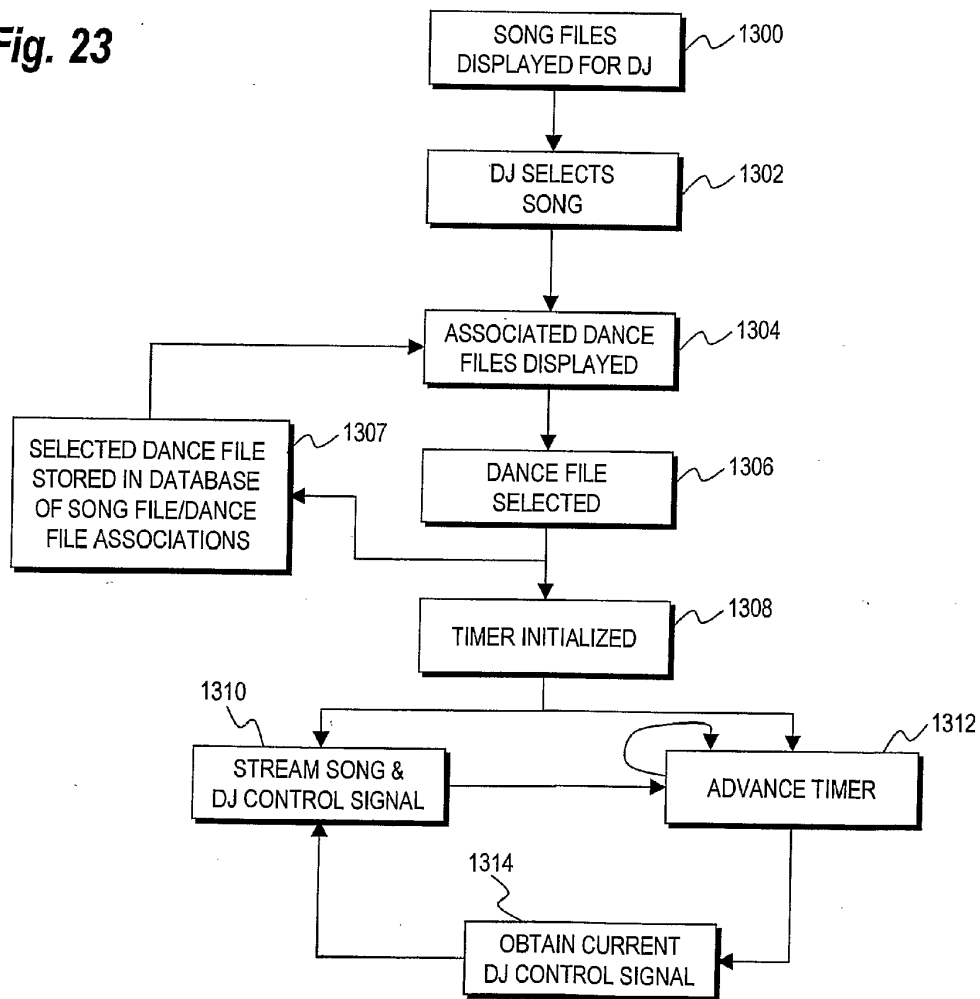
23/34

Fig. 21D

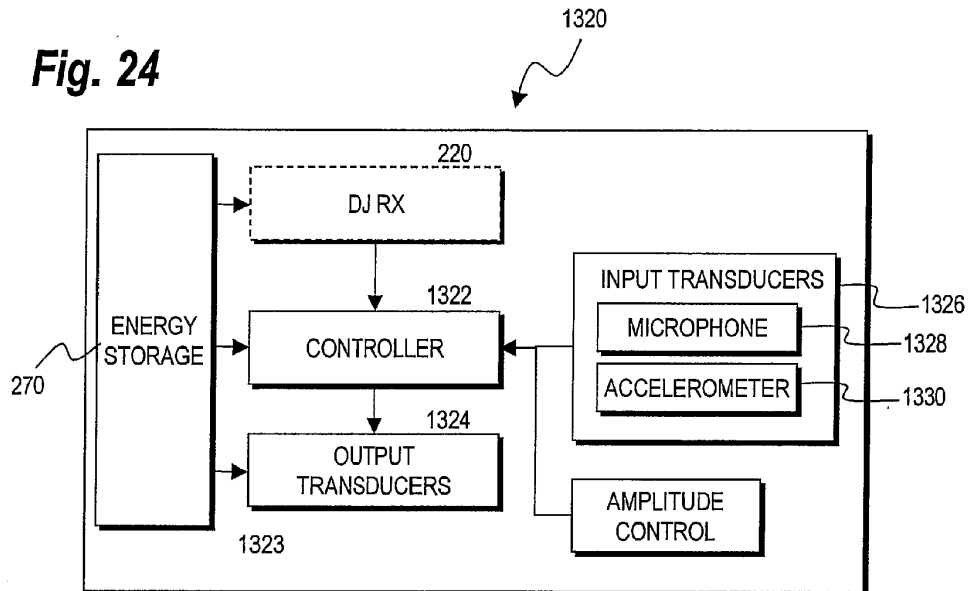




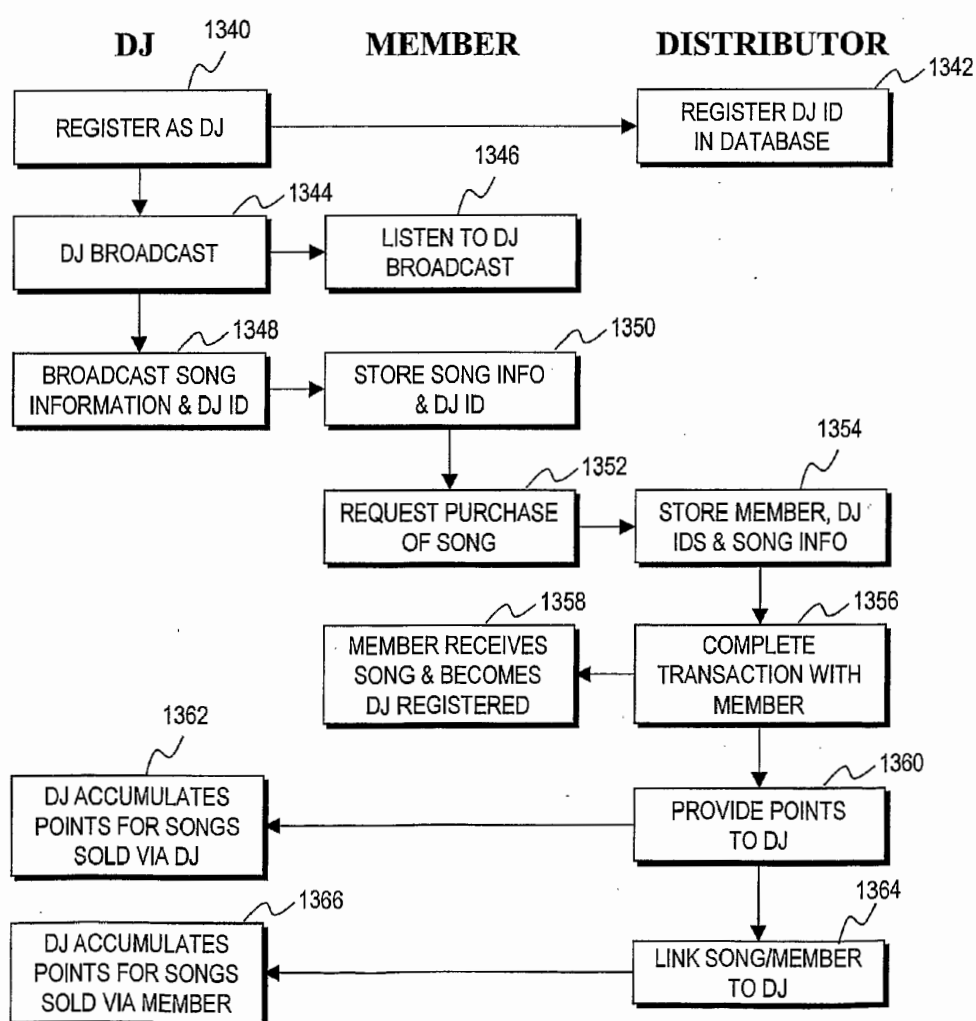
25/34

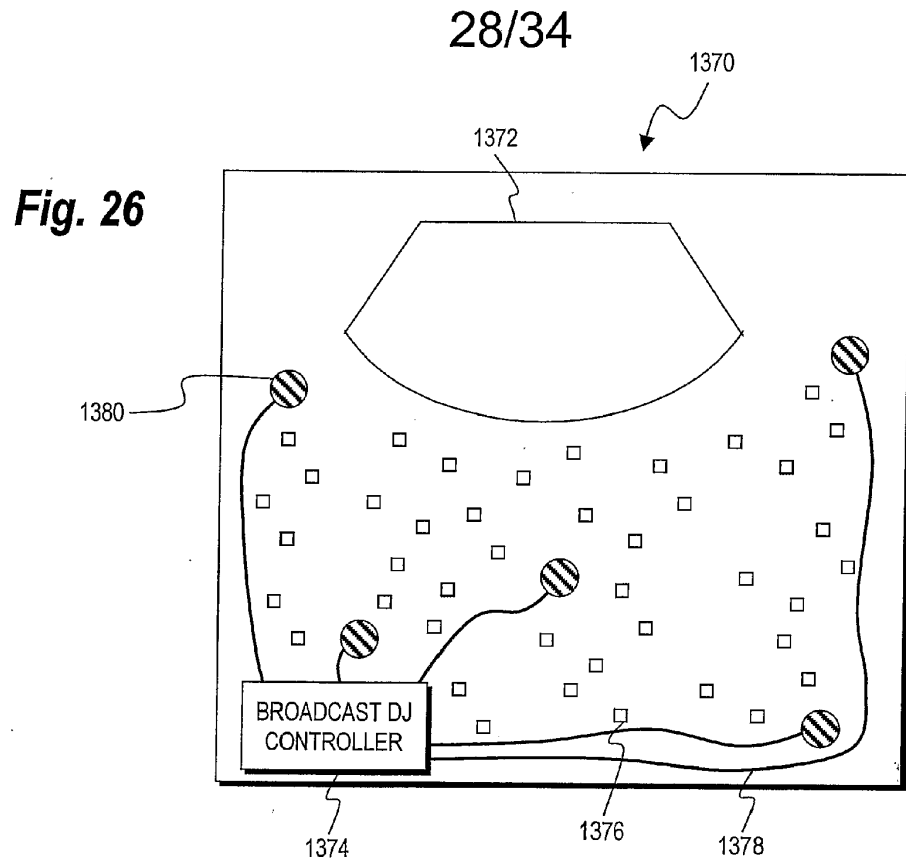
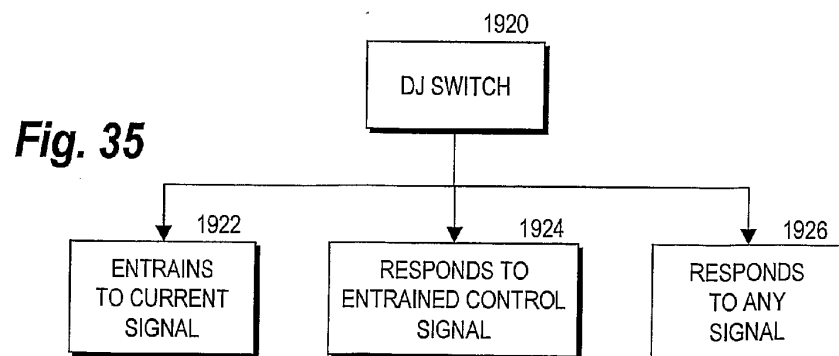
Fig. 23

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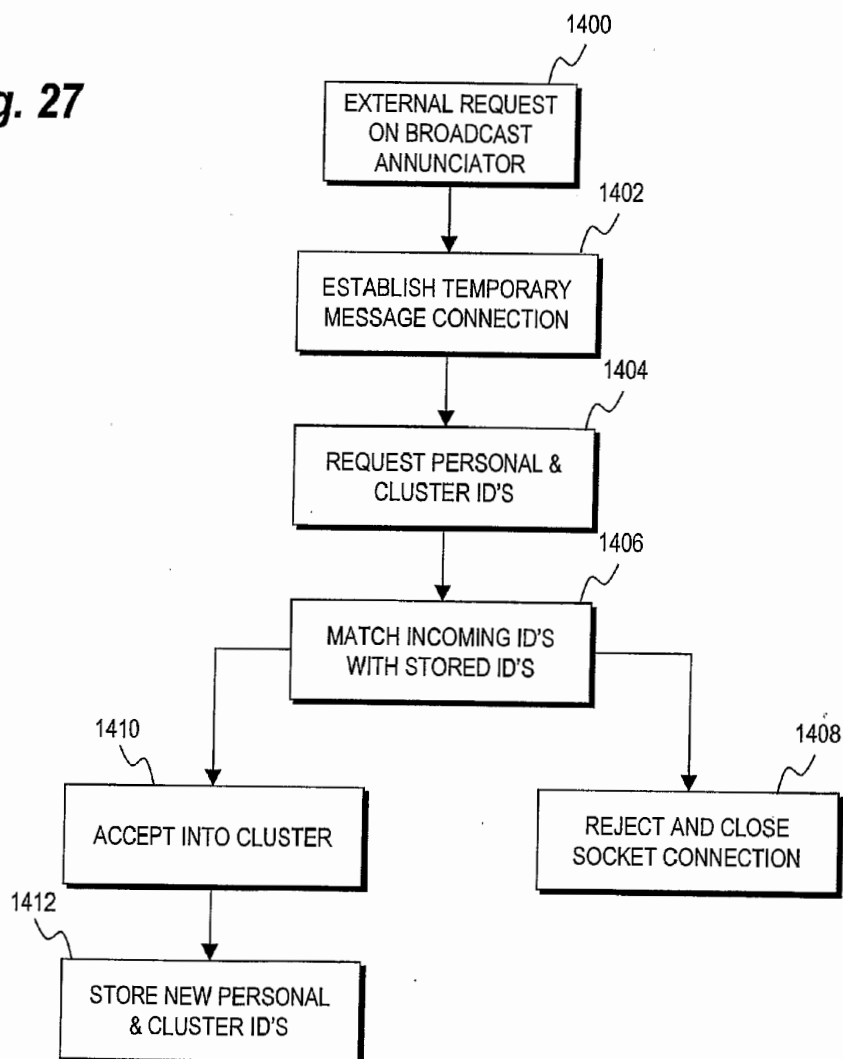
Fig. 24

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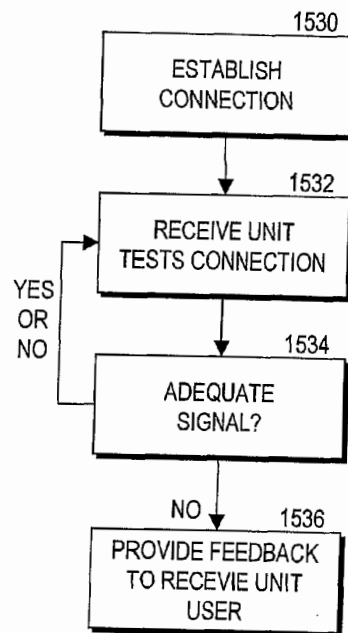
Fig. 25



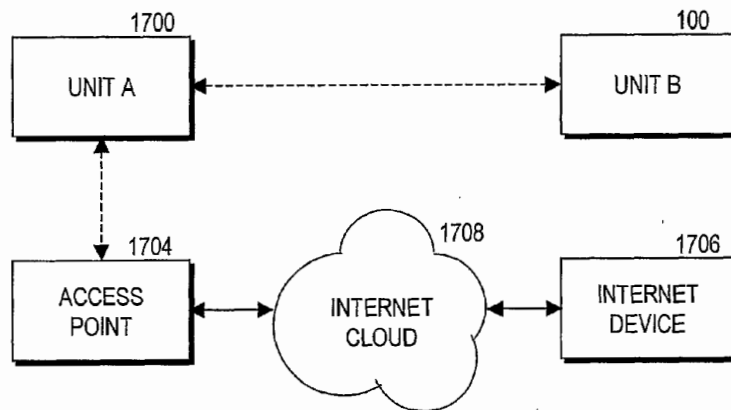
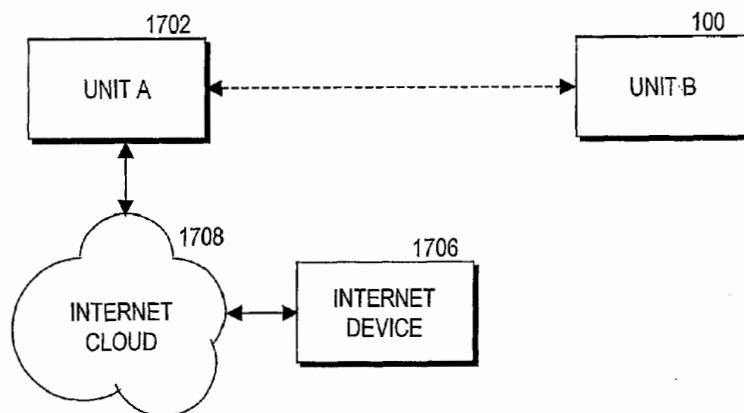
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Fig. 27

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Fig. 28

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Fig. 29A**Fig. 29B**

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Fig. 30

1800		1802				
+\$	12089AD					
-	E1239AC					
+	F105AA3					
+	B1B25C0					
0	ED5491B					

	.
	.
	.
3134FF2	+\$5 -\$7 +21 -8 5
2190AB9	+\$86 -\$2 +517 -62 5
B1B25C0	+\$23 -\$17 +81 -5 12
D19A043	+\$3 -\$0 +37 -0 2
B3278EC	+\$15 -\$3 +54 -4 9
3C4AB3F	+\$52 -\$14 +106 -8 5
06EAB3E	+\$2 -\$0 +70 -12 4
4789A0R	+\$9 -\$9 +10 -0 3
2C43218	+\$41 -\$0 +22 -6 7
9FA4829	+\$11 -\$8 +19 -1 3
	.
	.
	.

Fig. 31**USER**

1810

MACID = B1B25C0
 ALFRED NEWMAN
 "WhatMeWorry"
 AEN@MAD.COM

WISH LIST...

SONG ID = 5234AB433
 DJ = 8913AEC

SONG ID = 23590A9F1
 DJ = 8A81EC2

SONG ID = 532409AB2
 DJ = 8913AEC

SONG ID = 9024890EF
 DJ = 7A1BE34

DISTRIBUTOR

1812

MACID = B1B25C0
 ALFRED NEWMAN
 AN@MAD.COM

SONGS PURCHASED...

SONG ID = 2876BA129
 DJ = 8913AEC

SONG ID = 230871C40
 DJ = 42897DD

SONG ID = A4289B319
 DJ = 8913AEC

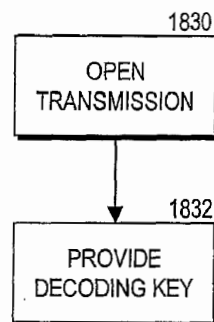
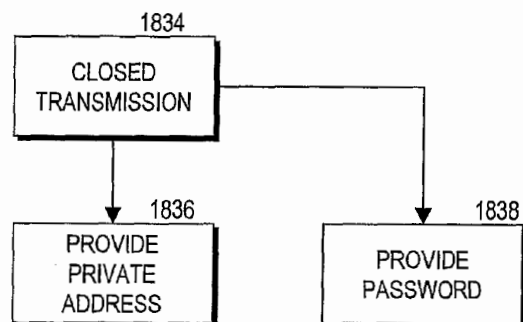
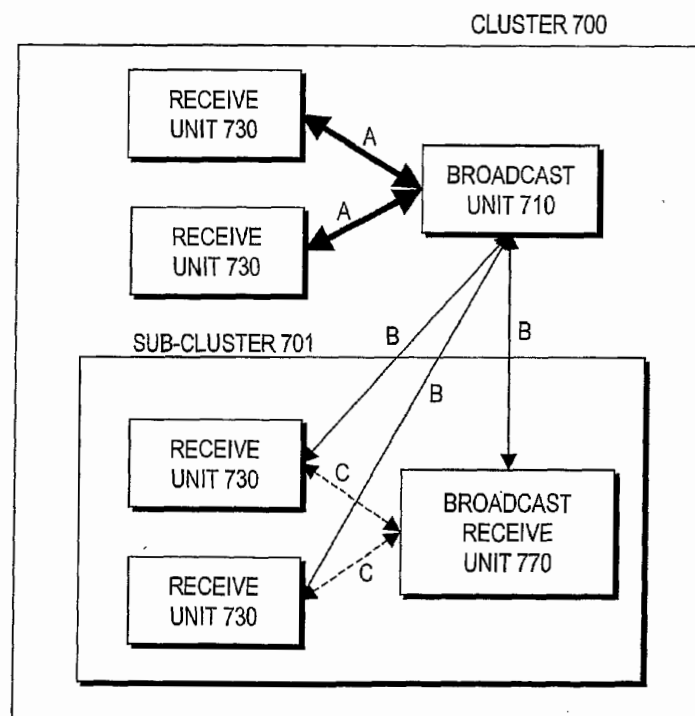
SONG ID = 9827ADD01
 DJ = 8913AEC

.

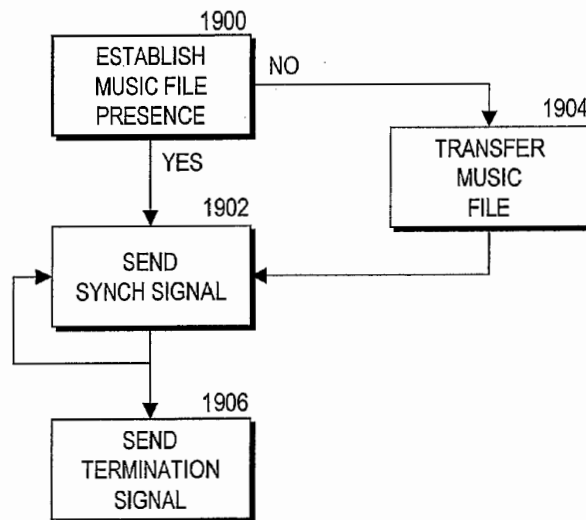
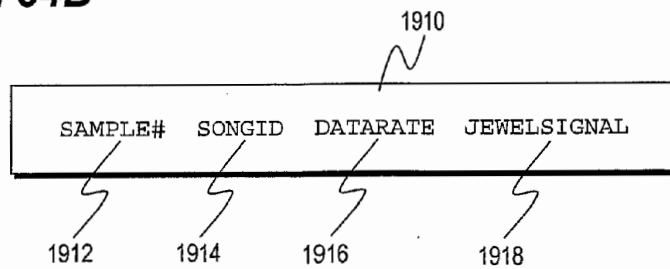
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Fig. 32A**Fig. 32B****Fig. 33**

34/34

Fig. 34A**Fig. 34B**



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Veröffentlichungsnummer:
Publication number:
Numéro de publication:

1 058 985

Internationale Anmeldung veröffentlicht durch die
Weltorganisation für geistiges Eigentum unter der Nummer:

WO 99/35856 (art.158 des EPÜ).

International application published by the World
Intellectual Property Organisation under number:

WO 99/35856 (art.158 of the EPC).

Demande internationale publiée par l'Organisation
Mondiale de la Propriété sous le numéro:

WO 99/35856 (art.158 de la CBE).



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H04Q	A2	(11) International Publication Number: WO 99/35856 (43) International Publication Date: 15 July 1999 (15.07.99)
(21) International Application Number: PCT/US98/26166 (22) International Filing Date: 9 December 1998 (09.12.98) (30) Priority Data: 09/003,252 6 January 1998 (06.01.98) US (71) Applicant: SONY ELECTRONICS, INC. [US/US]; 1 Sony Drive, Park Ridge, NJ 07656 (US). (72) Inventor: LEA, Rodger, J.; 210 & 1/2 16th Street, San Jose, CA 95113 (US). (74) Agents: GALLENSON, Mavis, S. et al.; Ladas & Parry, Suite 2100, 5670 Wilshire Boulevard, Los Angeles, CA 90036-5679 (US).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>Without international search report and to be republished upon receipt of that report.</i>
(54) Title: AN AUDIO VIDEO NETWORK (57) Abstract <p>A method and system for providing seamless interoperability and integration between a plurality of devices in a network using a common protocol, wherein at least one of the devices is a legacy device which communicates with the network using a proprietary protocol. When a legacy device is coupled to the network, one of the plurality of devices on the network queries the legacy device via the proprietary protocol to determine a set of basic capabilities supported by the legacy device. The set of basic capabilities are then mapped from the proprietary protocol to a set of basic commands from the common protocol. A control module is generated for the legacy device, wherein the control module is based upon the set of basic commands. The set of basic capabilities of the legacy device are then accessed via the control module, thereby providing seamless interoperability and integration of the legacy device with the plurality of devices.</p>		

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AN AUDIO VIDEO NETWORKFIELD OF THE INVENTION

The field of the present invention pertains to audio-video systems. More particularly, the present invention
5 pertains to the networking of a number of electronic devices to form an audio video system. In one embodiment the present invention discloses a home audio video network with device control modules for incorporating legacy devices.

10 BACKGROUND OF THE INVENTION

A typical home audiovisual equipment set up includes a number of components. For example, a radio receiver, a CD player, a pair of speakers, a television, a VCR, a tape
15 deck, and alike. Each of these components are connected to each other via a set of wires. One component is usually the central component of the home audiovisual system. This is usually the radio receiver, or the tuner. The tuner has a number of specific inputs for coupling the other components. The tuner has a corresponding number of control buttons or
20 control switches which provide a limited degree of controllability and interoperability for the components. The control buttons and control switches are usually located on the front of the tuner. In many cases, some, or all, of these buttons and switches are duplicated on a hand held
25 remote control unit. A user controls the home audiovisual system by manipulating the buttons and switches on the front

of the tuner, or alternatively, manipulating buttons on the hand held remote control unit.

5 This conventional home audiovisual system paradigm has become quite popular. As consumer electronic devices become more capable and more complex, the demand for the latest and most capable devices has increased. As new devices emerge and become popular, the devices are purchased by consumers and "plugged" into their home audiovisual systems. Generally, the latest and most sophisticated of these devices are
10 quite expensive (e.g., digital audio tape recorders, DVD players, digital camcorders, and alike). As a consumer purchases new devices, most often, the new device is simply plugged into the system alongside the pre-existing, older devices (e.g., cassette tape deck, CD player, and the like). The new device is plugged into an open input on the back of the tuner, or
15 some other device couple to the tuner. The consumer (e.g., the user) controls the new device via the control buttons on the tuner, via the control buttons and control switches on the front of the new device itself, or via an entirely new, separate, respective remote control unit for the new device.

20 As the number of new consumer electronics devices for the home audiovisual system have grown and as the sophistication and capabilities of these devices have increased, a number of problems with the conventional paradigm have emerged. One such problem is incompatibility between devices in the home audiovisual system. Consumer electronic devices from
25 one manufacturer often couple to an audiovisual system in a different manner than similar devices from another manufacturer. For example, a

tuner made by one manufacturer may not properly couple with a television made by another manufacturer.

In addition, where one device is much newer than another device
5 additional incompatibilities may exist. For example, a new device might incorporate hardware (e.g., specific inputs and outputs) which enables more sophisticated remote control functions. This hardware may be unusable with older devices within the system. Or, for example, older
10 tuners may lack suitable inputs for some newer devices (e.g., mini-disc players, VCRs, etc.), or may lack enough inputs for all devices of the system.

Another problem is the lack of functional support for differing devices within an audiovisual system. For example, even though a
15 television may support advanced sound formats (e.g., surround sound, stereo, etc.), if an older less capable tuner does not support such functionality, the benefits of the advanced sound formats can be lost.

Another problem is the proliferation of controls for the new and
20 differing devices within the home audiovisual system. For example, similar devices from different manufacturers can each have different control buttons and control switch formats for accomplishing similar tasks (e.g., setting the clock on a VCR, programming a VCR record a later program, and alike). In addition, each new device coupled to the
25 audiovisual system often leads to another dedicated remote control unit for the user to keep track of and learn to operate.

While the emergence of networking and interface technology (e.g., IEEE 1394 serial communication bus and the wide spread adoption of digital systems) offers prospects for correcting these problems, there is still no coherent, open, extensible architecture which can provide for intelligent, self configuring, easily extensible devices or AV systems. For example, while various solutions involving the use of IEEE 1394 as the basis of an AV system, none provide for the extensibility of the AV system over its life time, as new devices are added whose capabilities and features are unknown. None of these systems guarantee that all devices can be communicated with and controlled and enjoyed by the user.

SUMMARY OF THE INVENTION

Accordingly, what is required is a new architecture for a home audiovisual system which corrects the interoperability and functionality problems of the conventional system. What is required is a new
5 architecture for an open, interoperating, audiovisual system for devices within a home network. What is required is an architecture which allows devices from any manufacturer to function seamlessly with a home audiovisual system. What is required is an architecture which is extensible, and can be readily modified and advanced as market
10 requirements and technology change.

The present invention provides a home audio visual (AV) network which defines an open architecture for inter-operating CE (consumer electronic) devices in a home network. The interoperability aspects of the
15 present invention define an architectural model that allows CE devices from any manufacturer to inter-operate and function seamlessly within the user's home AV system. The system of the present invention includes a combination of a base set of generic device controls with an method to extend a base control protocol as new features and new CE devices are
20 deployed within the home AV network. In so doing, the architecture of the present invention is extensible, and can be readily modified and advanced as market requirements and technology change.

To implement the above features, the present invention includes an
25 architecture that allows the newly coupled device to be queried. Using the results of the query, a software based abstraction of that device is generated

and made available to other elements in the network. The software abstraction is referred to as a device control module. The device control module provides a predefined, standardized, set of interoperability, functionality, and control interfaces for the device. The CE device is
5 coupled to and communicates with the home AV network via a device control module. Each CE device in the home AV system has a corresponding device control module (DCM). The DCM of the present invention also provides an application programming interface (API) to allow other applications to access and manipulate any newly coupled CE
10 device.

Through the DCMs of the present invention, over the life time of the AV system, as new devices are added whose capabilities and features are unknown, or only partially known to other devices, a mechanism is
15 provided which guarantees that all devices can be communicated with and controlled at some basic minimal level, and then where possible, as more information is obtained about the device, a better abstraction of the new device is created.

20 Because it is likely that some devices that will be available in the consumers home were built and sold before the creation of a common home network architecture, it is necessary that the architecture is capable of recognizing using these devices. These devices are referred to as legacy devices and they are generally analog devices controlled through
25 proprietary control protocols.

To allow the architecture of the present invention to provide some level of control for these devices the architecture uses the proprietary communications path to query the device and discover its basic capabilities. The architecture then creates a level 1 DCM for this class of device,
5 however, this level 1 DCM is special in that it is capable of mapping a generic device control command, such as play, to the specific legacy command protocol that the device uses. In some cases no such mapping will be available.

10 Specifically, in one embodiment of the present invention, when a legacy device is coupled to the network, one of the plurality of devices on the network queries the legacy device via the proprietary protocol to determine a set of basic capabilities supported by the legacy device. The set of basic capabilities are then mapped from the proprietary protocol to a set of basic
15 commands from the common protocol. A level 1 DCM is then generated for the legacy device, wherein the DCM is based upon the set of basic commands. The set of basic capabilities of the legacy device are then accessed via the level 1 DCM, thereby providing seamless interoperability and integration of the legacy device with the plurality of devices. Using this
20 mechanism, the base architectural model of generic, level 1 DCMs can be extended to deal with legacy devices that were built before the creation of the architecture of the present invention. In so doing, the present invention provides an extremely flexible mechanism that ensures that not only will new devices become part of the AV system, but that older devices will
25 remain useful also.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated by way of example and not by way of limitation, in the figures of the accompanying drawings and in which like reference numerals refer to similar elements and in which:

5

Figure 1A shows a home AV network in accordance with one embodiment of the present invention.

Figure 1B illustrates a logical bus configuration of the HAVI network
10 of Figure 1A.

Figure 2, shows an exemplary peer to peer, two IAV (intermediate audio video) node network in accordance with one embodiment of the present invention.

15

Figure 3 shows a single FAV (full audio video) cluster HAVI network in accordance with one embodiment of the present invention.

Figure 4 shows an FAV cluster integrated with an IAV peer to peer
20 HAVI network.

Figure 5 shows an exemplary HAVI network having multiple FAVs.

Figure 6 shows a diagram of a set top box in accordance with one
25 embodiment of the present invention.

Figure 7 shows a logical block diagram of one embodiment of the HAVI architecture of the present invention.

Figure 8 shows a layered logic diagram of one HAVI architecture in
5 accordance with the present invention.

Figure 9 shows a diagram of local and remote messaging in the HAVI architecture of one embodiment.

10 Figure 10 shows a diagram of a message being sent via 1394 in the HAVI architecture of one embodiment.

Figure 11 shows a diagram of an application invoking another application in one embodiment of the HAVI architecture.
15

Figure 12A shows a first exemplary UI display (e.g., on a television screen) for a device (e.g., the camcorder).

Figure 12B shows a second exemplary UI display (e.g., on a television
20 screen) for a device(e.g., the camcorder).

Figure 13 shows a flow chart of a process for providing seamless interoperability and integration of a plurality of devices in a HAVI network by using the SDD information stored in each device in accordance with one
25 embodiment of the present invention.

Figure 14 shows a flow chart of a process for providing a basic command functionality and an expanded command functionality between a plurality of devices in a HAVI network in accordance with one embodiment of the present invention.

5

Figure 15 shows a flow chart of a process for ensuring future upgradability and expandability of devices in HAVI network in accordance with one embodiment of the present invention.

10

Figure 16 shows a flow chart of a process for providing seamless interoperability and integration of legacy devices with the HAVI compliant devices in a HAVI network in accordance with one embodiment of the present invention.

15

Figure 17A shows a flow chart of a process for controlling devices within a home audio/video network using an application program from an external service provider accordance with one embodiment of the present invention.

20

Figure 17B shows a diagram of a HAVI network with the service provider in accordance with the process of Figure 17A.

DETAILED DESCRIPTION OF THE INVENTION

Reference will now be made in detail to the embodiments of the invention, examples of which are illustrated in the accompanying drawings. While the invention will be described in conjunction with the preferred embodiments, it will be understood that they are not intended to limit the invention to these embodiments. On the contrary, the invention is intended to cover alternatives, modifications and equivalents, which may be included within the spirit and scope of the invention as defined by the appended claims. Furthermore, in the following detailed description of the present invention, numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be obvious to one of ordinary skill in the art that the present invention may be practiced without these specific details. In other instances, well known methods, procedures, components, and circuits have not been described in detail as not to unnecessarily obscure aspects of the present invention.

The present invention provides a home AV network which defines an open architecture for inter-operating CE devices in a home network. The interoperability aspects of the present invention define an architectural model that allows CE devices from any manufacturer to inter-operate and function seamlessly within the user's home AV system. The system of the present invention includes a combination of a base set of generic device controls with an method to extend a base control protocol as new features and new CE devices are deployed within the home AV network. In so doing, the architecture of the present invention is extensible, and can be

readily modified and advanced as market requirements and technology change. The present invention and its benefits are further described below.

NOTATION AND NOMENCLATURE

5 Some portions of the detailed descriptions which follow are presented in terms of procedures, steps, logic blocks, processing, and other symbolic representations of operations on data bits within a computer memory (see Figure 2). These descriptions and representations are the means used by those skilled in the data processing arts to most effectively convey the
10 substance of their work to others skilled in the art. A procedure, computer executed step, logic block, process, etc., is here, and generally, conceived to be a self-consistent sequence of steps or instructions leading to a desired result. The steps are those requiring physical manipulations of physical quantities. Usually, though not necessarily, these quantities take the form
15 of electrical or magnetic signals capable of being stored, transferred, combined, compared, and otherwise manipulated in a computer system. It has proven convenient at times, principally for reasons of common usage, to refer to these signals as bits, values, elements, symbols, characters, terms, numbers, or the like.

20

 It should be borne in mind, however, that all of these and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to these quantities. Unless specifically stated otherwise as apparent from the following discussions, it is
25 appreciated that throughout the present invention, discussions utilizing terms such as "processing" or "computing" or "translating" or "instantiating" or "determining" or "displaying" or "recognizing" or the

like, refer to the action and processes of a computer system, or similar electronic computing device, that manipulates and transforms data represented as physical (electronic) quantities within the computer system's registers and memories into other data similarly represented as physical quantities within the computer system memories or registers or other such information storage, transmission or display devices.

ARCHITECTURE OVERVIEW

The Architecture of the present invention enables the creation of a Home AV system which provides for seamless support of new devices and problem free interoperability of devices in a home AV network. The most basic components of a system in accordance with the present invention are: a home AV interoperability architecture, a series of home AV interoperability interfaces, and a home AV network. The home AV interoperability architecture is a broad, over arching term encompassing the physical network and the controlling programming interfaces. Interoperability interfaces is a term used to describe the interactions and interfaces of the components of the AV architecture. In addition to providing a common command set, the interoperability interfaces provide a software architecture which allows new devices to be integrated into the network and provide their services in a seamless manner. The home AV network is the term used to describe the physical network and its topology.

It should be noted that the home AV interoperability (HAVI) architecture of the present invention is an open, platform-independent, architecturally-neutral network that allows consumer electronics manufacturers and producers to provide inter-operable appliances. It can

- be implemented on different hardware/software platforms and does not include features that are unique to any one platform. The interoperability interfaces of the HAVI architecture are extensible and can be added to, modified and advanced as market requirements and technology change.
- 5 They provide the infrastructure to control the routing and processing of isochronous and time-sensitive data (e.g., such as audio and video content).

- Specifically, the HAVI architecture provides: an execution environment supporting the visual representation and control of
- 10 appliances; application and system services; and communication mechanisms for extending the environment dynamically through plug and play or otherwise.

- It should be noted that the HAVI architecture supports legacy
- 15 appliances (e.g., appliances that already exist and are available to users). This is important since the transition to more intelligent networked appliances is going to be slow. Most manufacturers will not suddenly begin producing only "intelligent" appliances and most consumers will not quickly begin replacing all of their existing appliances.

20

- In accordance with the present invention, there are two classes of legacy appliances. A first class includes "one-way" or unacknowledged control appliances. A second class includes controllable "two-way" appliances. Examples of one-way appliances are audio/video components
- 25 controlled by infrared commands of a hand held remote. Two-way appliances provide confirmation of command execution, status and error

reporting. Examples of two-way appliances include the recent introduction of well known IEEE 1394 enabled digital cameras.

It should be noted that the home AV network (hereafter HAVI
5 network) of the present invention provides support to accommodate future appliances and protocols through a write-once, run-everywhere common language. In accordance with the present invention, each appliance includes within it self-describing information concerning the user interface and the device control that can be used by an external controller. This
10 information is specified as programs in the common language.

As described below, the underlying structure for such a network consists of set of interconnected clusters of appliances. Typically, there will be several clusters in the home, with one per floor, or per room. Each
15 cluster will work as a set of interconnected devices to provide a set of services to users. Often, one device will act as a controller for a set of other devices. However, the architecture is sufficiently flexible to also allow a home to consist of a single cluster with no master controller.

20 For example, in one embodiment of the present invention, an intelligent television in the family room of a user's home might function as the controller for a number of interconnected appliances. Each of the controlled appliances would have self describing data and possibly some associated control code. When these appliances are first connected, the
25 controller obtains the user interface and the control program for the appliance. An icon representing the appliance may then appear on the television screen, and manipulating the icon may cause elements of the

control program to actuate the represented appliance or appliances in prescribed ways. The exception to this model are legacy devices which will have neither self describing data or control code. For addition descriptions and related art regarding self describing data, the reader is referred to

- 5 Ludtke, et al., A METHOD AND APPARATUS FOR INCLUDING SELF-DESCRIBING INFORMATION WITHIN DEVICES, provisional application number 60/054,327, filed on July 31, 1997, which is incorporated herein by reference.

- 10 It should be noted that the HAVI network of the present invention supports "Plug and Play" consumer appliances are easy to install, and provide a significant portion of their value to the consumer without any action on the user's part, beyond physically connecting the cables. This is in distinction to existing appliances that require configuration to provide
15 some major portion of their functionality. The goal is to offer 'hot' plug and play (not requiring the user to switch off appliances) where the connection method supports it safely and reliably.

- In accordance with the present invention, an appliance configures
20 itself, and integrates into a system-wide "look and feel" user interface, without user intervention. Low-level communication services provide notification when a new appliance is identified on the AV network. While there will often be settings the user may change to suit his or her preferences, the appliance does not require the user to do so in order to offer
25 basic functionality.

It should also be noted that the HAVI network of the present invention is flexible and supports multiple user interfaces, adapting to both the user's needs and the manufacturers need for brand differentiation. In the AV network, protocols scale gracefully from very resource-rich,
5 intelligent PC-like appliances to "dumb", resource starved appliances (e.g., a coffee maker or thermostat). To achieve this, the AV architecture allows low-end appliances to use the resources of more intelligent appliances in well-defined ways. In a similar manner, the AV architecture allows the specification of aggregate appliances where an abstract appliance is
10 created from a logical collection of several lower-level appliances.

And additionally, it should be noted that the HAVI network of the present invention supports existing standards. The HAVI network is complementary to several existing, well known, industry standards and
15 technologies including: CEBus; Home Plug and Play; EHSI; VESA; Home Network, DAVID, CoMMeND, Lonworks, USB, IEEE 1394, etc. Accordingly, one goal of the present invention is to provide an infrastructure into which existing devices can fit.

20 THE SYSTEM MODEL OF THE HAVI ARCHITECTURE

With reference now to Figure 1A, a HAVI network 10a in accordance with one embodiment of the present invention is shown. As described above, the HAVI architecture supports a wide range of devices including intelligent receiver/decoders (IRDs), for example, the set top box 301, digital
25 video tape records (DVTRs), video cassette recorders (VCRs), personal computers (PCs), digital video disk players (DVDs), etc., communicating via a common messaging system. Figure 1A illustrates the physical port-

to-port connecting configuration 10a of an exemplary HAVI network. CE devices ("devices") 12-24 are shown connected together with bus segments 30a-30f. In one embodiment of HAVI, the IEEE 1394 serial communication bus standard is used as a platform to provide the common messaging
5 system.

Figure 1B illustrates a logical bus configuration 10b of the HAVI network of Figure 1A. As shown in Figure 1B, all of the devices 12-24 of the HAVI network can be viewed as logically coupled to a common IEEE 1394
10 serial communication bus 30. Within this bus configuration 10b, peer-to-peer device communication is supported. For example, as shown in Figure 1C, any device (having appropriate capabilities), e.g., device 12, can send or receive communication packets from any other device in the HAVI network. In the example of Figure 1B, the set-top-box (e.g., an IRD) can
15 receive messages from or generate messages to any of the other devices 14-24 of the HAVI network.

Referring still to Figures 1A and 1B, as described above, the interoperability model in HAVI provides for the following: 1) support for
20 existing devices; 2) a default control model; 3) a means to extend the default control model when new devices or functionality is brought to market; and 4) a common means for device representation (e.g., graphics user interfaces). To achieve the above, the HAVI architecture defines three types of nodes in the home network: Full AV nodes (FAV), Intermediate
25 AV nodes (IAV) and Base AV nodes (BAV).

A Full AV node is a device that contains a complete instance of the AV software model (described in detail below). This type of node generally has a richer set of resources and is capable of supporting a complex software environment. The primary distinguishing feature of a FAV is
5 that it is able to take control responsibility for less sophisticated devices and does this by loading a control module, usually from the less sophisticated device, and executing it locally. Examples of such nodes would be Set Top Boxes (e.g., set top box 301), Smart TV's, general purpose home control devices, or even Home PC's.

10

Intermediate AV nodes are generally lower cost devices that have limited resources. They do not provide an execution environment for control modules and so can not act as master controllers within the home network. Because they have limited resources, they can access remote
15 resources in one of two ways: by working with other IAV devices who provide some capability they lack, or by using an FAV node which supports a control module to control them. In this second mode of operation they rely on full AV nodes to provide such facilities as a display device, general purpose compute resources and some overall control framework. This
20 allows Full AV devices to bind a variety of intermediate AV devices together to provide a service or abstraction to the user.

Base nodes are nodes that are neither FAV or IAV nodes. These are two generic types: Legacy base nodes, and other base nodes. Legacy base
25 nodes are devices that were built before the advent of the HAVI architecture. These devices often use proprietary protocols for their control, and quite frequently have a simple, well defined, control only protocol.

Such devices can work in the HAVI network but require that a Full AV node act as a gateway. Communication between a Full or Intermediate AV node and legacy devices requires that the Home AV commands used in the HAVI architecture be translated to and from the legacy command protocol.

- 5 Other base nodes are devices that, for business or resource reasons, choose to implement future proof behavior using uploadable control software and do not carry any of the HAVI architecture or the message communication system. These devices will be controlled by an FAV node with a private command protocol between FAV and BAV node.

10

- With the exception of legacy nodes, each node has, as a minimum, enough functionality to allow it to communicate with other nodes in the system. During the course of interaction, nodes exchange control and data information to enable devices to inter-operate and will do so in a peer to peer
- 15 fashion. This ensures that, at the communication level, no one device is required to act as a master or controller for the system. However, it also allows a logical master or controller to impose a control structure on the basic peer to peer communication model. Services in the HAVI network are provided by one or more nodes communicating amongst themselves to
- 20 deliver a service to user or an application. Where it is necessary for a node to interact with a user, then the node negotiates with other nodes to access and use a display device.

- Additionally, it should be appreciated that a distinction is made
- 25 between Logical and Physical nodes. A good example of this distinction can be found in a normal TV set. Although the TV set is generally one physical box, it contains several functional components, e.g. the tuner, audio output

etc. From the system point of view a physical node is an addressable peer node in the system. If the TV is constructed in such a way that its individual functional components are individually addressable, then it is logically one node and physically several nodes. Conversely, if it is
5 constructed to have one addressable entity, then it is both a single logical node and a single physical node.

The IAV devices and FAV devices communicate by sending messages over the home network using a generic message passing system.
10 When new devices join the home network, they are recognized and added to a global name database (registry). The registry holds information about their characteristics and provides a reference to a handler for that device. Other devices and services are able to query the registry to locate a device and then using the handler, can interact with the device. For additional
15 descriptions and related art regarding the communication and identification processes of the present invention, the reader is referred to Ogino, et al., "METHOD AND SYSTEM FOR PROVIDING A DEVICE IDENTIFICATION MECHANISM WITHIN A CONSUMER AUDIO/VIDEO NETWORK", a US patent application filed on 6, Jan, 1998,
20 which is incorporated herein by reference.

When a device is initially added to the home network, the system queries the device to ascertain its characteristics and capabilities. Once a device's characteristics are known, the architecture provides two methods
25 of controlling it. The first method, level 1 interoperability uses a predefined message set. All IAV and FAV nodes can use this command set to access and control other devices (BAV nodes, because they are deployed before the

architecture was defined, are controlled using legacy protocols). The provides a default level of control. The FAV nodes act as control nodes and create a local representation of the IAV node, known as a device control module (DCM) that provides an API used to send control commands to the
5 device.

Level 2 interoperability within HAVI goes farther and supports future added functionality and new devices. To achieve this, a particular device can carry within its ROM, an override DCM that is uploaded from
10 the IAV device, to the FAV device and replaces the default DCM for the particular device. This override DCM not only contains the basic level 1 command set for the particular device but also includes vendor specific commands to control advanced features of the device. The model allows the device to inform another about its particular functionality. Since the
15 override DCM may be loaded onto any vendor's FAV, the format of the DCM is architecture-neutral.

To allow one device to discover the capabilities of another device and to determine which command set to use with that device, a standard device
20 description structure is provided called the self describing data (SDD) structure. The SDD data structure is extensible. It can be a small number of bytes describing the device type, e.g., TV, or VTR, etc. Alternatively, the SDD data structure can be a more complex structure also defining the override DCM and a graphical representation of the device. The graphical
25 representation within the SDD data structure allows an FAV node to present a pictorial representation of the devices in the home network to users. By defining the graphical representation in a sufficiently generic

manner, a device's SDD graphical data can be used in any vendor's product to display a user interface for that device. This provides an enhanced level of vendor interoperability and also allows a vendor to differentiate a product while maintaining within the general look and feel of the display device.

- 5 This enables a control device (the FAV node) to present a general control user interface for all devices in the home network, irrespective of the differences in type and vendor.

- As described above, Legacy devices are devices that were built before
10 the HAVI architecture or devices that select not to use HAVI. HAVI supports Legacy devices by providing Legacy DCMs to provide protocol conversions for Legacy devices. These Legacy DCMs can contain sufficient knowledge to allow them to support an existing 1 or 2 way control protocol and provide a specific control interface to the devices that conform to HAVI.
15 A legacy DCM acts as a bridge between the Legacy and HAVI devices. This approach allows HAVI also to interact with any future device control protocols such as protocols being used for home energy management or security.

- 20 It should be appreciated that the communications hardware and protocols used by the HAVI architecture are non-specific. The HAVI architecture is readily suited to the incorporation and use of any one of several communications mediums, with the simple requirement that the medium provides a generic communication mechanism that supports the
25 HAVI interfaces. The basic model assumed is one of a logical communications back plane (e.g., IEEE 1394). All AV devices are assumed to be connected to this back plane, and can locate and communicate with all

other AV devices, as shown in Figure 1B. In a physical setting, it is likely that this logical back plane will consist of more than one physical communication medium. It is further assumed that multiple protocols may be in use on different physical media. The Home AV architecture
5 abstracts above all of this and presents a generic model of communicating nodes. It will provide a mechanism above the Transport layer (functionally like a socket) to ensure network transparency. This mechanism can be described as "reliable, ordered datagram service" which will provide all fragmentation and re-assembly.

10

Accordingly, a goal of the present invention is to support each and every physical bus the same, such that an application need not care which physical transport it is using. However, with the familiarity of IEEE 1394 in the electronics industry, features of the present embodiment are illustrated
15 and described in view of functioning with IEEE 1394. Other buses such as CEBus and USB may not require all the same features.

Referring now to Figure 2, an exemplary peer to peer, two IAV node HAVI network 200 in accordance with one embodiment of the present
20 invention is shown. HAVI network 200 includes a first IAV 201 (e.g., a television) coupled to a second IAV 202 (e.g., a receiver). IAV 201 and IAV 202 behave in a peer-peer manner, arbitrating for necessary resources amongst one another. They lack the resources to support the addition of a BAV or LAV device, but can perform meaningful activities within their
25 context. The IAV is not required to provide any standard UI capability. There is no provision in the AV Architecture for "forward compatibility" or discovery of new functions (e.g. IAV 201 only knows the functions that IAV

202 supports based on SDD provided upon connection of IAV2). However, in accordance with the present invention, the features of the SDD can be easily exploited to perform "ad-hoc" feature discovery.

5 Figure 3 shows a single FAV cluster HAVI network 300 in accordance with one embodiment of the present invention. HAVI network 300 includes an FAV 301 (e.g., a set top box) respectively coupled to a first LAV 302 (e.g., a television) a second LAV 303 (e.g., a VCR) and a BAV 304 (e.g., a digital camera). In HAVI network 300,
10 FAV 301 controls Legacy and Base AV devices (e.g., devices 302-304), providing cluster-wide services.

 Figure 4 shows an FAV cluster integrated with an IAV peer to peer HAVI network 400. In accordance with the present invention, the
15 configuration of HAVI network 400 provides support for legacy devices 302 and 303 while enabling independent control to occur within the two IAV devices 401 and 402 when their resources are not in use by the FAV device 301. The IAV devices 401 and 402 behave as peers to the FAV device 301. For efficiency, a resource conflict policy can be implemented for both FAV
20 to FAV or FAV to IAV resource requests. The IAV will be controlled by the FAV by via a DCM running in FAV 301.

 Figure 5 shows an exemplary HAVI network 500 having multiple FAVs. HAVI network 500 includes an additional FAV 501 (e.g., a satellite
25 receiver). This configuration behaves in a similar manner to HAVI network 400 described above. In this configuration, the FAV devices 301 and 501 act as peers.

THE COMPUTER SYSTEM PLATFORM

With reference now to Figure 6, a diagram of a set top box 301 in accordance with one embodiment of the present invention is shown. As described above, any consumer electronics device can be a FAV and thereby provide a computer system platform for HAVI software. For instance, the set-top-box 301 device of the exemplary HAVI network contains special components that provide an operation platform for software components of the HAVI architecture which are described below. Specifically, aspects of the present invention, described below, are discussed in terms of steps executed on a computer system (e.g., processes shown in Figures 13 through 17A). Although a variety of different computer systems can be used with the present invention, an exemplary general purpose computer system is shown in the set-top-box of Figure 6.

15

Set-top-box 301 of Figure 6, in addition to having a video/audio receiver (decoder) unit 606 and MPEG unit 607 also includes an address/data bus 600 for communicating information, one or more central processors 601 coupled with the bus for processing information and instructions, a volatile memory 602 (e.g., random access memory RAM) coupled with the bus 600 for storing information and instructions for the central processor 601 and a non-volatile memory 603 (e.g., read only memory ROM) coupled with the bus 600 for storing static information and instructions for the processor 601. Set-top-box 301 can also optionally include a data storage device 604 ("disk subsystem") such as a magnetic or optical disk and disk drive coupled with the bus 600 for storing information and instructions. Also included in the set-top-box 301 is a bus interface unit

608 for interfacing with the local bus 30 (e.g., an IEEE 1394 serial bus). Set-top-box 301 can operate under a variety of different operating systems (e.g., Windows operating system, DOS operating system, Macintosh O/S), but in the present embodiment the AperiOS operating system is used.

5

THE HAVI SOFTWARE MODEL

In accordance with the present invention, the computational units of the HAVI architecture (e.g., DCMs) are modeled as objects. Each object is a self contained entity, accessible through a well defined interface and
10 executing within a well defined software execution environment. The software execution environment (e.g., set top box 301 from Figure 6) provides a set of well defined services (locally or remotely) that are also modeled as objects and can be accessed, using the communications infrastructure, via their well defined interfaces.

15

Each object is uniquely named. No distinction is made between objects used to build system services and those used for application services. All objects make themselves known via the registry. Objects in the system can query the registry to find a particular service or device and can use the
20 result of that query to send messages to that service or device. The identifier assigned to an object is created when the object registers. This identity, if required, is guaranteed to be persistent during the lifetime of the object and will remain persistent even in the face of a complete reboot of the home network.

25

In accordance with the present invention, the objects communicate using a message passing model. An object that wishes to use the service of

another object, does so by using a general purpose message passing mechanism that delivers the service request to the target object. The target object is specified using the unique object identifier discussed above. While in the present embodiment the message passing mechanism functions

5 with IEEE 1394, it should be noted that there is no distinction between sending a message across a 1394 bus, or over a Control A1 link. In the same manner, there is no distinction between objects on the same node and one on a remote node. The actual implementation of the message passing infrastructure will depend on the system and networking environment and

10 will differ from node to node and between vendors. However, the actual format of the messages must be common so that interoperability is assured.

It should be appreciated that the general intent of the object model and messaging system is to provide a completely generic software model

15 that is sufficiently flexible to allow multiple implementations with a variety of software systems and languages. Details of the binding between messages and the code that handles them are left to the system implementor.

20 SOFTWARE ARCHITECTURE OVERVIEW

The HAVI software architecture defines the way that the software model is used to support the HAVI architecture. In particular it defines the way that devices are abstracted and managed within the AV architecture. It defines the ways that interoperability is assured, and it

25 defines the ways that future devices and services can be integrated into the architecture.

Full AV nodes as software managers: In accordance with the present invention, Full AV nodes (FAVs) act as managers for Intermediate (IAVs) and Base (BAVs) nodes and provide a platform for the services that support the HAVI architecture. To achieve this they provide an execution
5 environment which allow objects to control and communicate with services and devices. To ensure that devices are accessible within the Home AV network, the FAV nodes support a software abstraction of the services that a device offers to others. As described above, this abstraction is referred to as a device control module (DCM). The DCM is modeled as an object within
10 the software architecture but is refereed to hereinafter simply as the DCM to distinguish it. The interface that the DCM exposes to the rest of the system provides the means to access and control that device. In the general case, a FAV will manage a set of DCMs, one for each IAV node and base node in the home network or portion of the IAV network that it manages.
15 Thus, it should be appreciated that from an interoperability perspective, the primary role of the FAV node is to manage DCMs of the present invention and act as an execution environment for DCMs.

Full AV node as controller and display device: In accordance with
20 the present invention, in most cases, FAVs will have an associated display device which is used for display of AV content and of user interface (UI) material. However, the HAVI software architecture does not mandate this and FAV nodes may be "headless". In this case they will cooperate-operate with other nodes to display content and UI information (see below).
25 However, FAV devices will be responsible for supporting the high level UI APIs that provide the look and feel of the entire home network. The lower level graphic manipulation APIs will generally be located close to the

graphics display device itself and are manipulated by the FAV high level APIs.

5 Peer to peer architecture between full AV nodes: In a Home AV network in accordance with the present invention, there may be more than one FAV. In this case, each FAV cooperates with other FAVs to ensure that services are provided to the user. This allows FAV nodes to cooperate to share resources. For example, an FAV node that does not have direct access to a display device, may use a remote FAV node to display DCM user
10 interfaces. Alternatively, a FAV node may require the services of a data translation module that exists on a remote node to allow it to set up a data route between two AV devices.

LEVEL 1 AND LEVEL 2 INTEROPERABILITY GENERALLY

15 In accordance with the present invention, one of the major goals of the HAVI architecture of the present invention is to support interoperability between devices. This includes existing devices and future devices. To achieve that interoperability, the HAVI architecture of the present invention supports a general model that allows two levels of
20 interoperability. These levels are referred to as Level 1 and Level 2.

Level 1 interoperability: Level 1 interoperability of the present invention addresses the general need to allow existing devices to communicate. To achieve this, level 1 interoperability of the present
25 invention defines and uses a generic set of control messages (commands) that enable one device to talk to another device and a set of event messages that it should reasonably expect from the device. To support this approach

a basic set of processes are required. These processes include device discovery, communication, and a generic message set.

The device discovery process of the present invention provides for the
5 fact that each device in the Home AV network needs a well defined method that allows it to advertise to others its characteristics. The approach we have adopted is to specify a data structure, required on all FAV and LAV devices, that contains information about the device and which can be accessed by all other devices. This data structure is referred to as a Self
10 Describing Data structure (SDD). The SDD contains, as a minimum, enough information to allow another device to discover its basic capabilities and so infer the basic set of command messages that can be sent to that device and events it should reasonably expect to receive from that device.

15 The communication process of the present invention provides for the fact that once a device has determined the capabilities of another device, it then needs to be able to access those capabilities. To achieve that requires a general communication facility that allows one device to send a message containing a command request to another device. The general message
20 service processes of the present invention were discussed above.

Generic message set refers to the process required to support level 1 interoperability. This includes a well-defined set of messages that must be supported by all devices of a particular class. This ensures that a device
25 can work with other devices, irrespective of the manufacturer, because all devices agree to a common set of generic commands. As discussed above,

within the HAVI software architecture of the present invention, these commands are presented as a DCM to the rest of the system.

These three basic processes of the present invention support at least a
5 minimal level of interoperability. Since, in most cases, any device can query the capabilities of another via the SDD, any device can determine the command set supported by another device. And since each device has access to a generic messaging system, then any device can interact with any other device.

10

However, it should be appreciated that level 1 compatibility in accordance with the present invention only ensures that devices can inter-operate at a minimal or degraded level of functionality. The generic message set for each device class is a minimal and common set of
15 commands. The SDD facility offers a means to provide some degree of customization of a device by providing information about its UI and some aspects of its interaction model. Other IAV devices can use this information to present an interface to the device. Alternatively, any FAV device can use this information to customize the generic DCM it has
20 created for the device. However, it should be noted that a more extensible mechanism is also needed to allow a device to communicate to other devices any additional functionality it possesses. Level 2 interoperability of the present invention provides this mechanism. Level 1 and Level 2 interoperability are discussed in greater detail below.

25

LEVEL 1 AND LEVEL 2 DCMs

As described above, the DCM of the present invention functions by providing access, control and interaction with a device. DCMs are typically instantiated (e.g., executed) on the resources of FAVs in the Home AV architecture. The DCM of the present invention provides an interface to a device and manages a UI that the device wishes to present to users.

In accordance with the present invention, with the level 1 interoperability, the DCMs created for devices are generic. They support a minimal command set that allows generic control of the device. To support device specific features requires that the DCM provide access to such device specific features and is capable of presenting device specific features to users via the UI.

To achieve this, Level two interoperability is used. In accordance with the present invention, the Home AV architecture allows a device to provide an "override" DCM for the generic DCM that would normally be created for that device. The override DCM (e.g., level 2 DCM) is capable of replacing the default DCM (e.g., level 1 DCM) on the FAV. It should be appreciated that the level 2 DCM could be retrieved from a variety of sources. One such source is the SDD of the device itself. In this case, the level DCM is fetched, received, or otherwise acquired from the SDD of the device and instantiated in an FAV node when the device is installed into the system. Because the Home AV architecture is vendor neutral, it is necessary that the level 2 DCM work on a variety of FAV nodes, each with potentially different hardware architectures. To achieve this, the format of both the level 1 and level 2 DCMs of the present invention are architecture

neutral such that a wide variety of software execution environments of the FAV nodes are able to instantiate and run the level 1 and level 2 DCMs.

It should be appreciated that, in accordance with the present invention, once created and running within a FAV node, the DCMs of the present invention communicate with the IAV and BAV nodes in the same manner as described above using the basic messaging mechanism.

As described above, there are many permutations of FAV, IAV and BAV nodes possible within a given HAVI network. These permutations generally fall into two types: HAVI network configurations that support an FAV device, and those that do not. This distinction essentially defines whether a HAVI network will be using a peer to peer configuration (e.g., as shown in Figure 2, where no FAV is present) or will be imposing some form of control hierarchy (e.g., the FAV cluster as shown in Figure 3).

In accordance with one embodiment of the present invention, in the cases where no FAV is present, only level 1 interoperability is available and the devices are forced to use SDD information to discover other IAV capabilities, present those capabilities, and control the device. In the cases where FAVs are present, DCMs are instantiated and uses. If these are level 1 (e.g., generic) DCMs, the devices are operating at level 1 interoperability. If there is at least one level 2 DCM present, then some of the devices are operating at level 2 interoperability.

In accordance with the present invention, it should be noted that a mixed mode of operation is possible in which clusters of devices are inter-

operating under control of an FAV node, while other devices are inter-operating in a peer to peer fashion. In this manner, the flexibility of the present invention allows vendors the freedom to design and build devices at all points on the cost/capability spectrum with the certainty that these
5 devices will inter-operate seamlessly with other devices in the HAVI network.

Referring now to Figure 7, a logical block diagram 700 of one embodiment of the HAVI architecture is shown. Figure 7 shows an overall
10 HAVI architecture in accordance with the present invention. The components shown in diagram 700 are as follows:

Device manager 761: Device manager 761 is responsible for creating and managing the DCMs that represent devices managed by an FAV
15 device.

Device Modules 720: These are the DCMs for individual devices. As described above, each DCM functions as a control point for a device and provides a UI component and a control component. The DCMs (e.g., device modules 720) provide an API to allow other applications to access and
20 manipulate the devices.

Service Modules 730: These modules can be viewed as software devices. They are DCMs for any software component (as opposed to a hardware device) that provides a general service to other devices or components in the home network.

25 Comms Media Manager 740: This component is responsible for managing the underlying physical communications process. It provides

an API that allows code modules to interact with the features of the communications media (e.g., IEEE 1394).

Registry 706: This is a service database. All DCMs for physical devices and software services will register themselves in the registry 706
5 and all modules (e.g., device modules 720) can query the registry to get a handle for another device or module.

Communications manager 750: This component is a low level abstraction of the communications media.

Messaging 702: This component provides a basic message passing
10 facility to allow both devices (hardware) and device modules 720 and service modules 730 to communicate with each other.

Event Manage 703: This module provides a generic event service. This is a one-to-many communication service allowing notification in the HAVI network.

15 Initialization manager 701: This component is used as part of the device bootstrap process.

Data routing 762: The data routing component 702 is responsible for helping services set up routes between devices and devices modules. It takes into consideration the 'cost' of transferring data via a particular
20 route, the requirements on data format translation etc. This component is not needed for the basic architecture.

AV Actions/Macros 763: this component is a manager for higher level AV actions which are groups of individual low level commands, i.e. it provides a macro service. This component is not needed for the basic
25 architecture.

High level UI library 704: This component provides a set of high level UI components that are used by device modules 720 to build UIs for their

corresponding devices. This component is not needed for the basic architecture.

Application (and User) interface 705: This component provides the linkage between a common consumer electronics platform (CCEP) APIs of
5 the HAVI compliant devices and applications which are local or possibly remote. This component is not needed for the basic architecture.

It should be appreciated that the above components as diagrammed
in Figure 7 are abstractions of functionality. They are designed to make
10 clear what functionality is included in the architecture for HAVI compliant devices. In order to avoid unnecessarily obscuring the present invention, the relationship between components 701-763 and the message flows between them are not shown.

15 DCM CONFIGURATION AND FUNCTION

Overview

In one embodiment of the present invention, in HAVI network configurations where a FAV node is available, a DCM exists for each
20 physical device in the HAVI network known about by that FAV node. The DCM provides an interface to the device and presents it as an object in the architecture. Other DCMs, system services or application services can query the local registry to find out the devices available and to get an identifier to allow them to interact with the devices via its DCM.

25

Device control modules are also responsible for interacting with the software architecture to present the device user interface (UI) to the user.

Input from users is then passed to the DCM which uses the input to control the actual device.

As discussed above, DCMs support the level 1 and the level 2 interoperability. A level 1 DCM is a generic DCM, usually supplied with the FAV node, and capable of managing a basic, pre-defined set of features of a device class using a pre-defined message set. During initialization, the DCM will work with the Device manager (below) to discover the actual characteristics of the device to be managed, and will configure itself to control that device. Thus a generic VCR controller could be instantiated to control a standard VCR using either 1394 AV/C messages, or via Control A1.

In the case of level 2 interoperability, the DCM instantiated for that device will be an override DCM that has been loaded from an external source, e.g. the device itself. These override DCMs are written in the common language format for DCMs. The functioning of an override DCM doesn't differ from generic ones but the API offered is likely to be more comprehensive.

20

Once instantiated, DCMs will provide not only control interfaces for the device, but also access to SDD data associated with a device. They will act as event managers for a device, receiving device specific events and posting those to the event system (see below). They will also act as UI manager for the device, interacting with the UI management system to provide a user interface via some display device. Lastly, the DCM will

25

operate as a resource manager for devices, arbitrating requests made for device access and service.

General DCM terminology

5 In the terminology of the present invention as used in the following descriptions, each DCM presents a model of a device in the home network. The basic terminology used is as follows:

- 1) Device: This term refers the entire device.
- 10 2) Subdevice: This term refers to one of possibly many components that make up a device. Some technologies do not have the ability to distinguish subdevices.
- 3) Internal Connection: This term refers to the logical or physical connection between internal subdevices.
- 15 4) External Connection: This term refers to the connection between a physical connector on the outside of a device and a destination device outside the device. The same as unit Serial Bus and external input and output plugs for AV/C.
- 5) Protocol: This term refers to the control protocol spoken by the
20 sub-device or device (e.g., AV/C, Control A1, etc.). It should be note that a device may contain subdevices which speak different protocols.
- 6) Interface: This term refers to the physical bus connection interface (1394, USB, etc.).
- 7) Device Class: This term is one way to describe the basic
25 functionality of a given collection of devices. For example, the class of DVCR devices can record data to a tape medium. Likewise, there may be many devices that can take audio input, perform some kind of special

effects, and output the modified audio stream. These would all come under the class of audio processor or something like that. The usefulness of this concept will become more apparent later in the document.

8) Device Model: This term refers to the collection of subdevices and
5 connections that make up either a standard or custom device definition. Individual subdevices that are accessible within physically separate devices can be combined to form logical or virtual devices using the device model.

9) Standard Device: This term refers to standard model definitions (e.g. a DVCR device is composed of at least a tuner subdevice and a VCR
10 (transport) subdevice, with plugs between them).

10) Special Device: This term refers to a vendor-specified device model, composed of either standard subdevices or a combination of standard and vendor-specific subdevices. For example, a dual deck DVCR may have two VCR subunits, which are standard items, but in a non-
15 standard configuration.

11) Aggregate devices: This term refers to logical entities which can be combined from a variety of components. Physical devices and subdevices are individually accessible pieces of hardware. When devices have accessible subdevices, this model is extended to support aggregate devices.
20 Examples of aggregate devices include subdevices from separate physical devices or within a single device, and software modules such as software codecs which provide services or capabilities similar to devices and subdevices. These modules can all reside in the same node on the AV network, or can be distributed among many nodes..

25

Device classification

Classifying devices based on the kind of actions they perform, or the kind of medium they deal with, is a way of allowing us to create a generalized control API that will work for devices that are created in the future. The intent is to allow a high percentage of basic functionality to
5 always be accessible regardless of the type of device or the manufacturer of the device.

Any manufacturer-specific or device-specific functionality that is controllable as well but falls outside of the generalized control API will only
10 be accessible via the SDD information and other techniques for extending a DCM.

In the most general terms, the classification of devices or subdevices can be described by their main functionality. The AV/C control protocol of
15 the 1394 standard uses a convenient method of classifying devices which we have adopted below. Following is the first set of factors used for classifying a device or subdevice:

- 1) Whether a particular device has a transport mechanism.
- 20 2) Whether the usefulness of this subdevice defined mostly by the fact that a signal ends up here (regardless of the fact that it may be propagated without changes).
- 3) Whether a particular subdevice a signal source (e.g., does it have a signal output).
- 25 4) Whether a particular device accepts input, performs some sort of processing, and then outputs modified data.

5) Whether there is no signal input or output of any kind (e.g., is the device a utility of some kind, such as a mechanism for positioning a satellite antenna).

5 In accordance with the present invention, at a second level of classification, we can study devices that contain a transport mechanism. In this case, a general question would be "does this device deal with removable media?". If it does, then a basic set of controls is applied, such as Play(), Stop() and even Search(). Devices with media can be queried for
10 their ability to record, to determine the organization of information on the medium (is it track-based? continuous such as a tape? how is it measured - SMPTE time codes, time offset from a certain position, etc.).

In the present embodiment, a signal processing service can be
15 described by the kind of signal(s) it can accept, and the kind it can produce as a result. This requires the establishment of common definitions for describing signal types and methods for accessing the services, so that any client can know how to describe what kind of service it is looking for, and how to access that service.

20

Any device which accepts one kind of data and has the ability to transmit that data on a different type of connection (for example, it takes digital video as input and has standard analog video RCA jacks which can send that data back out) can act as a data converter class. The DCM for
25 these devices will register itself as a data converter in the system registry, so that clients can find them and use them as necessary.

Device access and control

In accordance with the present invention, once a basic device classification has been made, then the generic DCM instantiated for that device will provide an API that causes control messages to be sent to that
5 device. The base set of control messages that can be sent or received (in the case of events) to a particular class of device are standardized and detailed in the appendix (not available in this version of the document). In the present embodiment, these messages represent a basic API presented by the DCM.

10

Device management

In accordance with the present invention, the DCM API also provides a set of higher level services that allow more sophisticated management of the device. Examples of this include device reservation and
15 event management. In the case of device reservation it is likely that a request for a device may be refused due to existing requests on the device, alternatively, the device request may be for a future reservation for a time based macro. In these cases the DCM provide an interface to allow an application or service to queue requests with the DCM, i.e. reserve a device,
20 or to receive notification when a device becomes available.

Connection management

The DCMs of the present invention also provide a high level API to allow other objects to query the state of connections between devices and to
25 manipulate those connections. This API is primarily used by the Route manager but is available to any object in the system. Connection management allows connections to be established, both internally between

subdevice units, and externally between devices. Connection status can be queried and connection capabilities (signal formats) can also be queried.

SDD management

- 5 The DCMs of the present invention also provides a generalized interface to SDD management. This allows the SDD data in the device to queried and used. The API is divided into two parts, part 1 provides APIs for getting well know information from the SDD data including the DeviceImage, its name and the URL (if available) of a location for an
- 10 override DCM or other icons to be used in representing the device's UI. Part 2 of the SDD API is designed to provide more detailed access to functional aspects of the device.

Device representation and user interface (UI)

- 15 In accordance with the present invention, the DCM is also responsible for the UI aspects of the device. In the case of level 1 interoperability, a generic UI is used to interface with users. This may be augmented by basic SDD data that allows such aspects as UI icons to be specified and accessed by the generic DCM. In order to avoid unnecessarily
- 20 obscuring the present invention, the details of how the DCM interacts with the UI management system to present a device specific UI is not discussed in detail. In the present embodiment, however, the basic model is that internal management code within the DCM works with the UI management system to present a UI for the device. User input is then
- 25 forwarded by the UI management system, to the DCM which then converts it into device specific commands. These commands are sent, using the basic messaging system, to the device. If replies are received then these are

passed via the DCM up to the UI. In addition, any status changes of the device, e.g. on/off are also passed, via the event system to the DCM which uses them to update the UI.

5 Service Modules

Service modules (e.g., service modules 730) are conceptually similar to device control modules. They provide an interface to a service which is usually provided by software only. In the present embodiment, service modules are of two types, system services and application services. A
10 system service is a well know service that is provided as part of the HAVI software architecture. Examples of these types of services are data format translators, protocol converters or graphics services. These services have well known APIs which are defined as part of the HAVI architecture. Application services are objects that have been created for and by other
15 service objects. These objects provide a well defined API, however that API is not public. In the present embodiment, any application or other object that wishes to use an application object needs to know its API and calling semantics. Although not required, generally, system services will exist for the lifetime of the system. Application services will exist for the lifetime of
20 an application and may be quite short lived.

System services

In accordance with the present invention, many of the services provided by the AV architecture are provided as service modules, who
25 register their services in the system registry and can be accessed using messaging. Examples of such services are the UI service modules that

provide a mechanism to allow devices to present a UI to the user, data format services that convert AV data between different formats.

THE DCM MANAGER

5

Overview

In accordance with the present invention, the DCM Manager is responsible for all aspects of handling the collection of DCMs resident on a FAV node. This includes the tasks of discovering, instantiating and
10 disposing of all possible device control module candidates that are available to a given system. Device resource management is generally carried out by individual DCMs, however, where multiple devices or services are interacting and where some of the DCMs are located on different FAV nodes, higher level management will be needed. Therefore, the DCM
15 Manager communicates with other DCM Managers on remote nodes to arbitrate for network-wide device and subdevice resource allocation and management. Its responsibilities are discussed below.

Discovery and enumeration of physical devices

20 In accordance with the present invention, the DCM Manager works with the underlying OS services to obtain a raw list of available devices. Note that depending on the underlying bus technology, these DCMs may be dynamic. In the present embodiment, for example, as physical devices come and go on a 1394 bus the DCMs will come and go with them. In the
25 same manner, the service and aggregate device DCMs are also dynamic, being created and destroyed in response to events in the FAV node.

This task requires interaction both with elements of the AV architecture and also with elements of the FAV host OS, node hardware and communications hardware. Due to this, the exact process required for device discovery will depend on the system environment. However, the
5 general approach, of querying a device and any SDD data it contains to discover its characteristics, as discussed in the DCM section, is common. In the present embodiment, this requires the DCM manager to follow a set of rules in a given sequence each time the system is initialized, or any time the system may change (such as when the bus is reset).

10

Creation of Generic DCMs

In accordance with the present invention, for each node, the DCM Manager does enough work to determine that it should create a DCM. This work is carried out for all media-related devices which will be managed by
15 the FAV node. In the present embodiment, Devices under a different management technology, e.g. USB based devices, may be presented within the architecture as DCMs on nodes that support USB communication, or as special DCMs that act as proxies for a remote management system. It should be noted, however, that some USB-based devices such as hard disks
20 may in fact be made to appear simply as random-access media recording or playback devices; in these cases, they are treated like any other "real" media device. In the present embodiment, for each media-related entity, the DCM Manager will create a generic or level 1 DCM. Each DCM will later have the responsibility to make itself more device-specific if possible. This is
25 described below.

Integration of level 2 DCMs

In cases where an over-ride (e.g., level 2) DCM is available and accessible, the DCM manager is responsible for attempting to fetch that DCM and installing it into the FAV node. In the present embodiment,, the details of how the over-ride DCM and the generic DCM interact is
5 dependent on the DCM developer. For example, in some cases it will completely replace the default DCM, in others it will work with the default DCM to augment its capabilities.

In accordance with the present invention, manufacturer-supplied
10 level 2 DCMs may come from a variety of sources. Devices may carry them within their ROM or some other storage mechanism such as the header of a disc or tape. They may be downloaded from a web or ftp site if such capabilities are accessible to the FAV node, or they could be supplied in the typical computer industry manner, via an installation from a disk or other
15 storage medium. Allowing this manufacturer-supplied over-ride DCM capability requires a model for creating and installing DCMs. In the present embodiment, when installed, the level two DCM will provide the same base interface to the client as a level 1 DCM, while either providing additional interfaces or just underlying functionality modifications.

20

DCM Disposal

In accordance with the present invention, the DCM Manager will be responsible for disposing of DCMs at the appropriate times, and notifying clients that DCMs have been removed. In the present embodiment, the
25 rules for when DCM disposal occur, and the distribution of responsibility for clean up, between the DCM and the DCM Manager, are tailorable to for the specific requirements of a particular HAVI network.

Coordinate Amongst Multiple DCMs

Some complex services among multiple DCMs, for example, command queuing of complex operations, etc., require the DCM Manager
5 to coordinate with multiple DCMs to carry out these operations. This will be influenced by the "command model" that is provided for clients. For example, if we define an upper level API that allows clients to specify actions that are based on HH:MM:SS:FF time codes, then we need to translate between this time model and whatever the hardware or
10 underlying support modules deal with. It should be noted that complex time-based operations that are affected by mechanical delays, etc., need to be accounted for. This type of coordination requires some notion of real time behavior in the network and is dependent on the physical and software infrastructure providing some level of guarantee.

15

Referring now to Figure 8, a layered logic diagram 800 of one HAVI architecture in accordance with the present invention is shown. The components shown in diagram 800 are similar to those shown in diagram 700, however, diagram 800 is organized such that high level processes are
20 on top (e.g., applications 801) with respect to lower level processes on the bottom (e.g., 1394 module 830). Diagram 800 also depicts other services 810, transportation adaptation modules 815, and other modules 840.

As described above, the overall HAVI architecture can be shown as
25 communications components and service components. Applications 801, at the highest level in the architecture use the services and the communication components (e.g., DCMs 720, service modules 730, etc.). In

turn, a number of the service components (e.g., service modules 730, DCMs 720, etc.) will use the underlying communications components (e.g., messaging 702, transportation adaptation modules 815, etc.). For example, in the case of one of applications 801 requesting, via the registry 706, the
5 handle for a DVTR (digital video tape recorder) device, and then sending a play command to the device. As described above, components in the HAVI architecture communicate using the underlying messaging system, i.e. the modules use message passing.

10 Figure 9 shows a diagram 900 of local and remote messaging in the HAVI architecture of one embodiment. The messaging component 702 is shown handling both local messaging and remote messaging. Hence the messaging component 702 is depicted at the base of diagram 900. Local messages are shown as arrows 902a, 903a, 904a, to various applications 901-
15 904. A remote message is shown as arrow 901b. For the sake of clarity, in diagram 900 and in the following discussions, local communication via the messaging system is not depicted, rather, local messaging (e.g., arrows 901a-904a) are shown as if based on direct function calls between components.

20

Figure 10 shows a diagram 1000 of a message being sent via 1394 in the HAVI architecture of one embodiment. In diagram 1000, message 1 (e.g., arrow 820a) is a request from one of applications 801 to the registry 706 (via the query API) for the handle of a DVTR device. The registry 706
25 returns a handle for the DVTR DCM in message 2 (e.g., arrow 820b). This handle is the message address used for the messaging system.

In accordance with the present invention the application then uses the handle to invoke the DCM for the DVTR with message 3 (e.g., 820c). The DCM converts the application invocation of the play call to an internal command which is sent to the messaging component, message 4 (e.g.,
5 arrow 820d). This internal command is part of the well defined command set at level 1, i.e. it is a HAVI command. The messaging component 702 then internally uses the handle information to determine which bus this device resides on. When it discovers that it is on the IEEE 1394 bus, it uses the IEEE 1394 transport adaptation module (TAM) 830 to convert the
10 message to a 1394 packet, message 5 (e.g., arrow 820e), which is placed in the data portion of a FCP packet. The TAM then calls the 1394 device driver, message 6 (e.g., arrow 820f) to send the message over 1394.

At the receiving side (not shown), the message will be delivered to the
15 1394 device driver, and then passed up through a 1394 TAM to the Messaging component. The messaging component will receive a HAVI message packet which it will then deliver to the receiving code directly via a message queue or callback function. In the present embodiment, if the receiving device is an IAV device, it will only have the communications
20 component of the CCEP architecture and the registry. Any other functionality it has will be device specific.

It should be noted that the previous example in Figure 10 illustrates a distinction in the HAVI architecture between the messaging system and
25 the command set used to control devices. In accordance with the present invention, the messaging system is a generic messaging mechanism that provides a message packet with a data section whose contents are

completely opaque to the messaging system. For example, the messaging system can carry private application to application commands, AVC-CTS commands, CAL commands or any other command. The DCM is the entity responsible for communicating with remote devices, it uses the messaging system to carry commands specific to that device. For a level 1 HAVI compliant device, the command set carried by the messaging system is defined as part of the CCEP architecture. Messages carried by the messaging system between DCMs and devices they control contain these well defined commands. For level 2 devices the extended command set is undefined, these may be pure AV/C-CTS, CAL or any other commands.

Referring now to Figure 11, a diagram 1100 of an application invoking another application in one embodiment of the HAVI architecture is shown. Diagram 100 shows an application 801a running on a device 1101 passing a message 1105 to an application 801b running on a separate device 1102 via messaging systems 702a and 702b. As described above, any application running within the HAVI network can access any other application if it has a message handle for that application. To acquire a message handle, the same process is used as for a remote IAV device (e.g., described in Figure 10 above). Once a message handle is available, the source application 801a can send a message 1105 to the target application 801b. As described above, the format of these messages is entirely dependent on the application and is of no concern to the CCEP architecture. It simply provides a communication mechanism to send a receive messages between the applications.

It should be appreciated that in the above example, it is assumed that the applications 801a and 801b reside on different AV devices 1101 and 1102. However, as discussed previously, it is quite possible that these applications 801a and 801b will reside on the same AV device and so the messaging system will perform a purely local communication call rather than a call that uses 1394 to transport the message.

Invoking a software service

A software service is a special case of the generic application case above. In accordance with the present invention, a software service is simply an application that is part of the system infrastructure. In this case, when a module wishes to invoke a system service, e.g. the UI component, it uses the messaging component to do this. If the UI component is local then the call is contained entirely within one AV device. However, if the UI component is remote, then the call will be routed over the 1394 network to the remote AV device, where the message system will dispatch the call to the UI system service.

Adding a new device to a HAVI network

In adding new devices to a HAVI network, there are 3 general situations: handling a legacy device using a legacy protocol carried over a non 1394 network; handling a base device using a non HAVI protocol over a 1394 network; and handling a new IAV device that is HAVI compliant.

In the case of adding a legacy device, in the present embodiment, a legacy device can only be directly controlled by an FAV node. As described above, for each legacy device, a legacy DCM must be created. Consider an

FAV that has a 1394 port and an Ethernet port. The CMM module will have been configured to manage both 1394 and Ethernet. When the legacy device becomes known to the FAV, it will first become known at the CMM module. Note that the mechanism used to achieve this is not within the scope of the CCEP architecture. It is communications media specific. Once the CMM recognizes a new device, it will go through whatever media specific mechanism it uses to determine the type of the device. Again this is not part of the CCEP architecture. Eventually it will ask the DM to instantiate a legacy DCM for this device. It is assumed that the FAV node has been pre-
10 configured with this DCM.

In the present embodiment, once the DCM is created, it registers itself in the same way as any standard DCM. However, one crucial difference between this DCM and other DCMs is that the communication
15 model and the command set used to control the legacy device is completely unknown to the CCEP architecture. For example, it is possible that the device is an IP device that implements a printer service. In this case the DCM will provide a set of commands such as Print, Status etc. When an application calls the DCM API with a print request, the print command
20 will be sent out by the DCM, via an IP stack, to the printer device. The actual details of how this happens are implementation specific.

In accordance with the present invention, one possibility is that the legacy DCM has a full implementation of the IP stack within the DCM and
25 knows how to bind to the Ethernet device driver. Another possibility is that the FAV device provides an IP stack and a higher level API such as sockets. These are FAV implementation details and not part of the CCEP

architecture. However, it should be noted that the legacy DCM is acting as a "proxy" DCM. Once it has been registered in the registry, it is visible to all other modules in the home network. They can all invoke its API and it performs the necessary conversion to the private command language of the

5 Ethernet IP printer.

In the case of adding a base AV device, in the present embodiment, when the CMM is informed about the new device, it recognizes that this is not a CCEP node, but it also discovers that a DCM is available for this

10 device. In this case, the CMM is responsible for implementing a mechanism that allows it to upload the DCM and to ask the DM to create this DCM. However, once the DCM is instantiated then it uses a purely private communication mechanism to access and control the device. As described above, in the present embodiment, a base AV device is one that

15 uses 1394 and implements the over-ride DCM but does not implement any of the CCEP architecture and will not implement level 1 HAVI commands. An example of this device could be one that contains an over-ride DCM but does not support the CCEP communications infrastructure.

20 In the case of adding an IAV device, it should be appreciated that in the previous examples, the application queried the registry to get a message handle for the device it wished to communicate with. Note that for a FAV device, the handle returned is always used to access the DCM. It is not possible to send messages directly to the device. To understand how a

25 device which is added to the network becomes available via the registry then the following example is used.

For example, assume a new device (e.g., a camcorder) is plugged into the HAVI network (e.g., 1394 based). This causes a bus reset. The bus reset is handled by the Communications media manager (CMM) on the IRD. The CMM is responsible for querying the SDD data of the Camcorder device to discover its capabilities. Assuming the device is a level 1 device, i.e. it does not have an uploadable DCM, then the CMM informs that Device Manager, that a new device has been installed. The Device Manager creates a new DCM for this type of device and registers the DCM with the registry. The DCM, when it initializes is free to query the device directly to find out more information about itself and to specialize itself if needed, e.g. it can access UI information if it exists in the device. Once the DCM is registered in the registry, then any other module can query the registry to get a handle for the device and communicate with the DCM to access and control the device and present the UI to the user.

15

For example, Figure 12A and 12 B show an exemplary UI display (e.g., on a television screen) for such a device(e.g., the camcorder). Figure 12A shows a text menu display, where the user is presented with the various controls that can be modified using the control names and control values. For buttons, the user can select them (which equates to pushing a button). Figure 12B shows a "next level" UI display for the camcorder. Here, the user selected the main panel from the menu in Figure 12A, and the display presents controls based on their grouping information. In the present embodiment, group names are used on a tabbed interface to allow the user to navigate between groups within the selected panel.

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Referring now to Figure 13, a flow chart of a process 1300 in accordance with one embodiment of the present invention is shown. Process 1300 shows the steps of a method for providing seamless interoperability and integration of a plurality of devices in a HAVI network by using the SDD information stored in each device. Process 1300 begins in step 1301, where a new device is coupled to a HAVI network. In step 1302, the device is queried to obtain a description (e.g., SDD) of level 1 functions supported by the device. In step, 1303, a level 1 DCM, which implements the level 1 functions, is generated for the device based upon the SDD. In step 1304, the device manager determines whether the new device contains software for a level 2 DCM.

Referring still to Figure 13, in step 1305, if the new device contains software for implementing level 2 functions, the software is retrieved from the device and in step 1306, a level 2 DCM which implements the level 2 functions is generated using the software. In steps 1307 and 1308, the device is continually accessed via the level 2 DCM. In steps 1309 and 1310, if the new device does not include software for a level 2 DCM, the new device is continually accessed via the level 1 DCM. In this manner, the combination of the level 1 DCM and the level 2 DCM allow the present invention to provide seamless interoperability and integration of the new device with the plurality of devices in the network.

Figure 14 shows a flow chart of a process 1400 in accordance with one embodiment of the present invention. Process 1400 shows the steps of a method for providing a basic command functionality and an expanded command functionality between a plurality of devices in a HAVI network.

In step 1401, a device is coupled to a HAVI network which includes a FAV device. In step 1402, a generic level 1 DCM for the device is generated by the FAV device. As described above, the generic level 1 DCM is a basic abstraction of the capabilities of the device. The generic level 1 DCM
5 enables the device to respond to a basic set of commands from the FAV device. In steps 1403 and 1404, the FAV device uses the generic DCM to query the device to determine whether the device includes descriptive information (e.g., SDD). As described above, the descriptive information describes the capabilities of the device. In step 1405, if the device includes
10 descriptive information, the FAV device generates a parameterized DCM for the device by modifying the generic DCM based upon the descriptive information. In steps 1406 and 1407, the device is continually controlled using the parameterized level 1 DCM. In steps 1408 and 1409, if the device does not include descriptive information, the FAV device is continually
15 controlled via the generic level 1 DCM.

Referring now to Figure 15, a flow chart of a process 1500 in accordance with one embodiment of the present invention is shown. Process 1500 shows the steps of a method for ensuring future upgradability
20 and expandability of devices in HAVI network. In step 1501, a default level 1 DCM for a device coupled to the network is generated. As described above, the default level 1 DCM is configured to ensure at least a minimum degree of interoperability between the device and the other devices on the HAVI network. In step 1502, the device is accessed by other devices via the default
25 level 1 DCM. As described above, the default DCM enables the first device to respond to a default set of commands from other devices on the HAVI network. In step 1503, an updated level 1 DCM for the devices is either

received or not received. In step 1504, updated level 2 DCM for the device is either received or not received. As described above, the updates enable the device's capabilities and functionality to evolve (e.g., as new, more efficient software becomes available).

5

In steps 1509 and 1508, where an updated level 1 DCM is received, the updated level 1 DCM is incorporated (e.g., this could involve merely modifying the current level 1 DCM) and the device is continually accessed via this DCM until a later update is available. In step 1505, where an
10 updated level 2 DCM is received, the DCM manager on the host FAV device unlinks the current DCM, and in steps 1506 and 1507, the updated level 2 DCM is linked and the registry is updated to allow other devices within the HAVI network to access the updated level 2 DCM. This DCM is continually used for accessing the device until a later updated level 2 DCM is received.
15 In step 1510, if neither an updated level 1 or an updated level 2 DCM is received, process 1500 continues operation with the current DCM (e.g., the last installed DCM).

Figure 16 shows a flow chart of a process 1600 in accordance with one
20 embodiment of the present invention. Process 1600 shows the steps of a method for providing seamless interoperability and integration of legacy devices with the HAVI compliant devices in a HAVI network. Process 1600 begins in step 1601, where a legacy device is coupled to the HAVI network. In step 1602, the legacy device is queried via the proprietary protocol to
25 determine a set of basic capabilities of the legacy device. As described above, HAVI compliant devices use a common HAVI defined protocol. The legacy device typically communicates with external devices (if at all) using

a proprietary protocol. In step 1603, process 1600 maps a set of basic commands from the common protocol to the set of basic capabilities of the legacy device. In step 1604, a level 1 DCM for the legacy device is generated. As described above, the DCM is based upon the set of basic commands. In
5 steps 1605 and 1606, the legacy device is continually accessed via the level 1 DCM such that the other HAVI devices are able to access the set of basic capabilities of the legacy device.

Figure 17A shows a flow chart of a process 1700 in accordance with
10 one embodiment of the present invention. Process 1700 shows the steps of a method of controlling devices within a home audio/video network using an application program from an external service provider. In step 1702, an application program is originated by a service provider (e.g., via cable television, internet web site, etc.). In step 1703, the service provider
15 communicates the application program from the service provider to an intelligent receiver/decoder device of the HAVI network over a logical channel. The application is subsequently instantiated within a computer readable memory unit of the intelligent receiver/decoder.

20 Referring still to Figure 17A, in step 1704, the application program queries the HAVI registry of the device (e.g., FAV device) to locate DCMs on the network and selects a respective DCM from the registry. In step 1705, the down loaded application determines a communications point information from the selected DCM. In step 1706, the application controls a
25 respective device of the HAVI network by communicating with the respective device using the communication point information. In step 1707,

if the application needs to control another device, steps 1704 through 1706 are repeated. If the application does not need to control another device, processes 1700 ends in step 1708.

- 5 Figure 17B shows a diagram of a HAVI network 1750 with the service provider 1720 in accordance with process 1700 of Figure 17A. As described above, the application program is downloaded from the service provider 1720 to the HAVI network 1750. The application is instantiated on the processor 601 and memory 602 of the intelligent device (e.g., set top box 301).
- 10 HAVI network 1750 also includes four HAVI devices, device 0 through device 3 (e.g., television, DVTR, etc.).

DCM MANAGEMENT API

- 15 An example DCM management API in accordance with one embodiment of the present invention is shown below. In the present embodiment, the common DCM commands include areas such as connection management, information and status queries for the device and its plugs etc. Regardless of the type of device represented by the DCM, such message sets need to be supported.

20

The following is a list of DCM management messages that, in the present embodiment, all DCM's need to support for the HAVI architecture:

- 25 ChannelUsage(plug); // returns the 1394 isoch. channel used by the specified unit plug
- PlugUsage(channel); // returns the plug associated with the specified channel


```

    GetDevicePlugCount(count); // returns the number of unit plugs on the
    device

    EstablishInternalConnection(sourcePlug, destPlug);
5   EstablishExternalConnection(sourcePlug, destPlug)

    StartDataFlow(plug);
10  StopDataFlow(plug);

    GetSourceConnection(in dest, out source); // given a destination plug,
    return the source to which it is connected (return the source plug of the
    transmitting device which shares the same isoch. channel)
15  GetDestinationConnection(in source, out );

    GetAllConnection();

20  NotifyOnConnectionChange();

    GetDynamicConnectionCapability(); // report whether the target device
    supports dynamic connection changes or not (e.g., a non-I394 device)

25  LockConnection(plug);

    UnlockConnection(plug);

    GetConnectionStatus(plug); // status = busy, data transmission format,
30  channel, bandwidth usage, etc.

    BreakInternalConnection(plug);

    BreakExternalConnection(plug);
35  GetInputSignalFormat(plug);

    setInputSignalFormat(plug);

40  NotifyInputSignalFormat(plug); // send a notification if the signal format is
    changed.

    GetSupportedInputSignalFormats(plug); // repeat the above for output
    signals
45  GetFunctionInfo(); // return information about the functional modules
    within the device (e.g., the AV/C subunits)

    GetDeviceType();

```

```

    GetVendorName();
    GetVendorLogo();
5   SetDevicePowerState(powerstate);
    GetDevicePowerState(powerstate);
10  GetSupportedPowerStates(list);
    NotiyPowerState(powerstate);
    ReserveDevice();
15  GetDeviceReservationStatus();
    NotifyDeviceReservationStatus();
20  VendorDependentCommand(command parameters); // pass thru a
    vendor-specific command in the native protocol;
    Function Control Module (FCM) Messages;

```

25 The function-specific messages correspond to the typical native commands such as PLAY, STOP, REWIND for the VCR functionality within a device. Because we need to address these messages to a well defined location within a device, we use the FCM (Function Control Module) to represent the target of these messages. Like DCM's, there are

30 some messages that have to deal with administration and management of FCM's. These messages are supported by all FCM's, independent of their particular domain. The messages are as follows:

```

35  GetFunctionType(); // VCR, tuner, disc, etc.
    GetFunctionInfo(); // more detailed information about the function, such as
    the particular kind of disc player (DVD, CD, etc.)
40  GetNumberOfPlugs(inputPlugs outputPlugs); // returns the number of
    source and destination plugs for the functional module

```

- GetFunctionStatus(); // current status of the functional module, including the status of source and destination plugs (input and output)
- 5 GetPowerState(powerState); // functional modules may have individually controllable power states
- SetPowerState(powerState);
- 10 GetSupportedPowerStates(list);
- GetSupportedDataFormats(list); // returns the data formats supported by this functional module
- 15 NativeCommand(params); // send the functional module a command in its native command protocol

The functional domain messages are based on the type of function (VCR, tuner, etc.). These are the typical PLAY, STOP, REWIND commands that

20 one would expect.

Level I interoperability includes both device-to-device and human-to-device interaction. The functional message sets such as PLAY, STOP and REWIND are used for device-to-device interaction. One example of this

25 would be a video editing software package that wants to control any type of VCR; the program is designed with a very specific set of user interface controls which apply to all VCR's. When the user interacts with the application, the application in turn sends domain-specific commands such as PLAY and STOP to the target device.

30

In the HAVI architecture, the application will send these messages to the DCM, and the DCM will translate them into the native language of the target BAV device. If the target device happens to support the HAVI

messaging architecture, then these commands don't need to be translated at all; they are simply sent as HAVI message to the HAVI target.

Camcorder devices are essentially VCR like. Their additional
 5 functionality is part of the camcorder effects, transitions, etc. They are as follows:

```

    stop()
    play()
  10  rewind()
    forward()
    record()
    volume(setvalue)
    changeStatus(newMode) // newMode of: VTR, CAMERA, STANDBY
  15  cameraControl(controlType) // controlTYPE defines control Type and
    subType structures eg zoom, zoomValue, or Effect, transition5 etc.
  
```

MiniDiscs are of the category random access storage, they support a
 base set of commands to control PLAY, FORWARD, etc and a set of
 20 command specific to random access media. The commands are as follows:

```

    stop()
    play()
    rewind()
  25  forward()
    record()
    volume(setValue)
    changeStatus(newMode) // newMode of: STANDBY
    seek(track)
  30  seekstart()
    seekEnd()
    getDiskInfo()
    mdControl(controlType) // controlTYPE defines control Type and subType
    structures eg intro mode, random play.
  35
  
```

Hard Disks are of the category random access storage, they support a base set of commands to control PLAY, FORWARD, etc and a set of command specific to random access media. The commands are as follows:

```

5  stop()
   play()
   rewind()
   forward()
   record(type) // type structure passes info to allow intelligent devices to
10  optimise storage policy changestatus(newMode) // newMode of: STANDBY
   seek(track)
   seek(block)
   seekStart()
   seekEnd()
15  HDDControl(controlType) // controlTYPE defines control Type and subType
   structures eg layout commands for block-structures

```

With respect to user interfaces, it should be appreciated that a generic and simple UI may be a textual based one, as shown in Figure 12A.

20 A more sophisticated one, based on DCM specialization, may be as shown on figure 12B. Where graphical information, carried in SDD is used by the generic DCM to specialize itself.

Hence, the present invention provides a home audio visual (AV)

25 network which defines an open architecture for inter-operating CE (consumer electronic) devices in a home network. The interoperability aspects of the present invention define an architectural model that allows CE devices from any manufacturer to inter-operate and function seamlessly within the user's home AV system. The system of the present

30 invention includes a combination of a base set of generic device controls with an method to extend a base control protocol as new features and new CE devices are deployed within the home AV network. In so doing, the

architecture of the present invention is extensible, and can be readily modified and advanced as market requirements and technology change.

The foregoing descriptions of specific embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teaching. The embodiments were chosen and described in order to best explain the principles of the invention and its practical application, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the Claims appended hereto and their equivalents.

15

CLAIMS

What is claimed is:

- 5 1. A method for providing interoperability and communication between a plurality of devices in a network using a common protocol, the method comprising the steps of:
- a) coupling a legacy device to the network as one of the plurality of devices wherein the legacy device
- 10 communicates with the network using a proprietary protocol;
- b) querying the legacy device using the proprietary protocol to determine a set of basic capabilities of the legacy device;
- c) mapping a set of basic commands from the common
- 15 protocol to the set of basic capabilities of the legacy device;
- d) generating a control module for the legacy device, wherein the control module is based upon the set of basic commands; and
- 20 e) accessing the set of basic capabilities of the legacy device to provide interoperability and communication between the legacy device and the plurality of devices by accessing the legacy device via the control module.
- 25 2. The method of Claim 1 wherein steps b) through d) are performed by a device manager executing on an

intelligent device of the plurality of devices in the network.

3. The method of Claim 1 wherein the control module
5 provides a standardized control interface for the legacy device.

4. The method of Claim 3 wherein the standardized control interface includes software code which provides a
10 predefined set of interoperability interfaces for the legacy device which enable communication between the legacy device and the plurality of devices in the network.

5. A method for a home audio visual network including
15 a plurality of devices coupled to a bus, wherein one device is a host device having a processor coupled to a computer readable memory, the memory containing computer readable instructions which when executed implement a method for providing interoperability and communication between the
20 devices, the method comprising the steps of:

- a) querying a legacy device, of the plurality of devices, via a proprietary protocol of the legacy device to determine a set of basic capabilities supported by the legacy device;
- 25 b) mapping a set of basic commands from a common protocol to the set of basic capabilities of the legacy device;

c) generating a control module for the legacy device, wherein the control module is based upon the set of basic commands; and

d) providing interoperability and communication
5 between the legacy device with the plurality of devices by the plurality of devices accessing the set of basic capabilities of the legacy device using the control module.

6. The method of Claim 5 wherein steps a) through c)
10 of the method are performed by a device manager executing on the host device.

7. The method of Claim 1 or 5 wherein the control module executes on one of the plurality of devices in the
15 network.

8. The method of Claim 1 or 5 wherein the legacy device is an analog device.

20 9. The method of claim 5 wherein steps a) through c) are performed by a device manager executing on the host device.

25 10. The method of Claim 1, 6 or 9 wherein the legacy device is accessed by the plurality of devices via the control module, wherein the plurality of devices communicate

with the control module using the common protocol and the legacy device communicates with the control module using the proprietary protocol.

5 11. The method of Claim 1, 5 or 9 wherein step b) includes the step of communicating with the legacy device using the proprietary protocol to determine the set of basic capabilities.

10 12. The home audio visual network of Claim 1, 5 or 9 wherein the bus of the network is an IEEE 1394 bus and the control module is configured to function with or to IEEE 1394.

15 13. The method of Claim 9 wherein the control module provides a standardized control interface for the legacy device and wherein the control interface includes software which provides a predefined set of interoperability interfaces for the legacy device which enable communication
20 between the legacy device and the plurality of devices in the network.

 14. The method of Claim 5 or 9 wherein the control module provides a standardized control interface for the
25 legacy device and wherein the control interface includes software which provides a predefined set of functionality interfaces for the legacy device which enable communication

between the legacy device and the plurality of devices in the network.

15. A method for an apparatus method for providing
5 interoperability and communication between a plurality of devices in a network using a common protocol, the method comprising the steps of:

a) means for coupling a legacy device to the network as one of the plurality of devices wherein the legacy device
10 communicates with the network using a proprietary protocol;

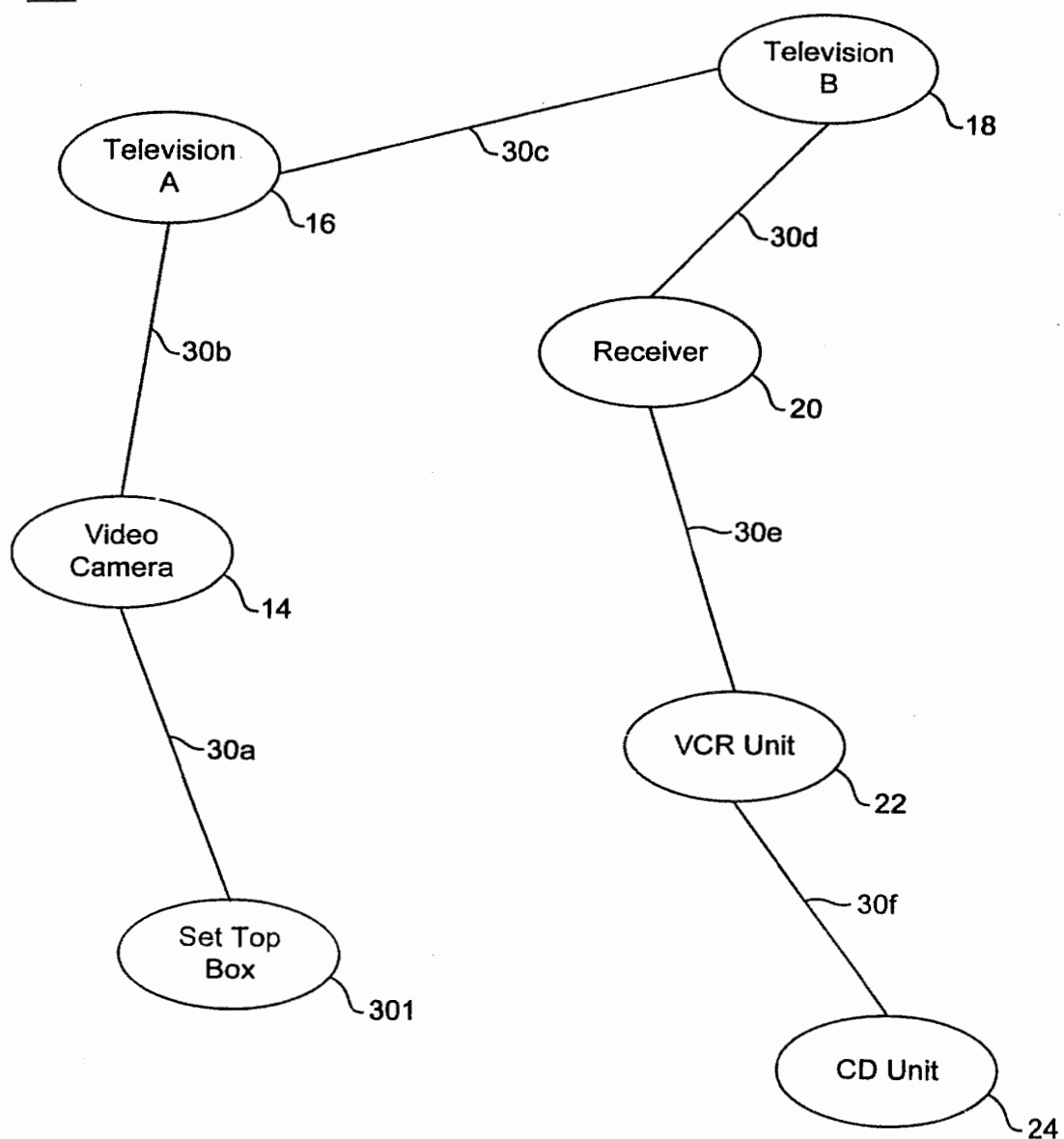
b) means for querying the legacy device using the proprietary protocol to determine a set of basic capabilities of the legacy device;

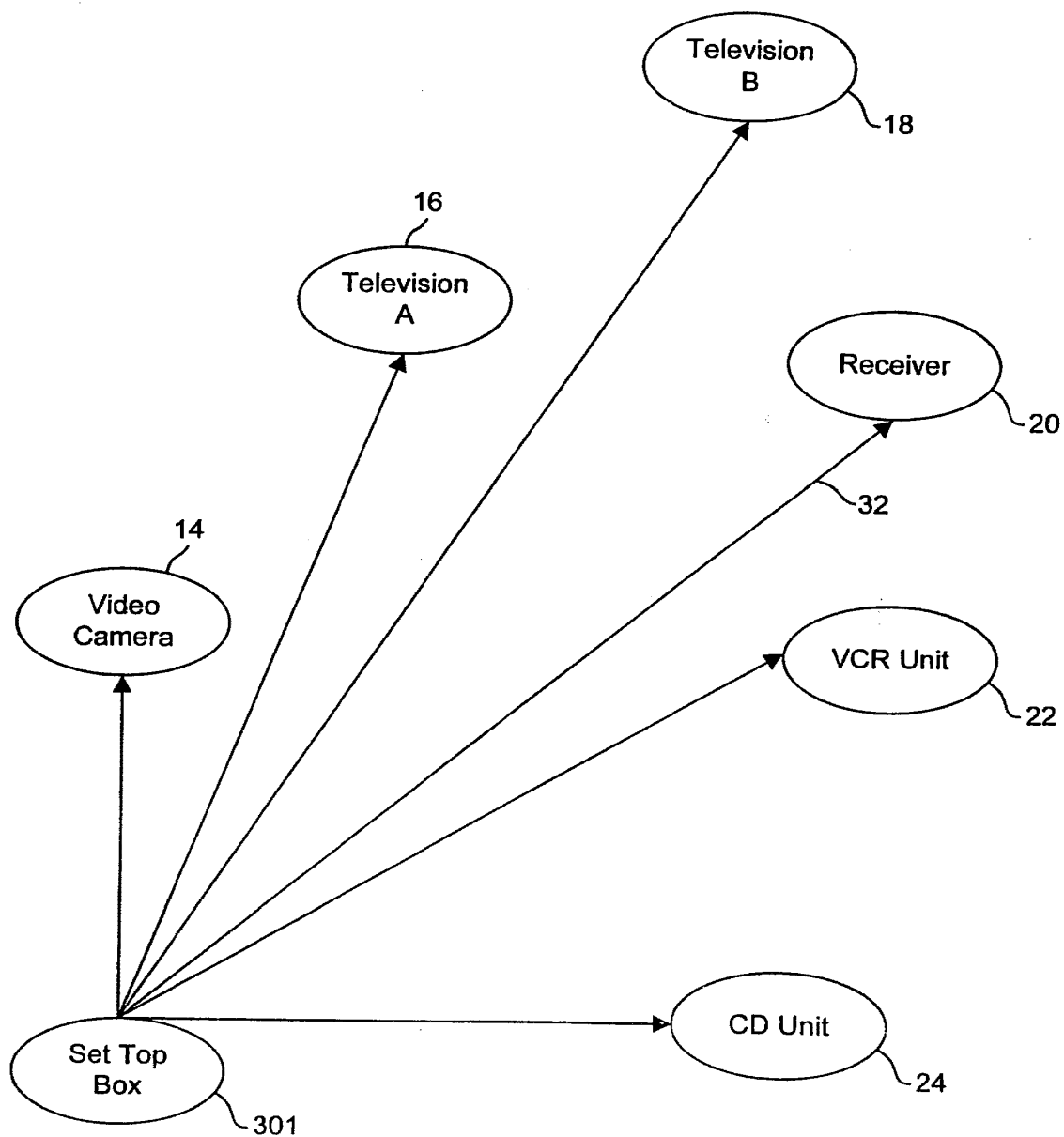
c) means for mapping a set of basic commands from the
15 common protocol to the set of basic capabilities of the legacy device;

d) means for generating a control module for the legacy device, wherein the control module is based upon the set of basic commands; and

20 e) means for accessing the set of basic capabilities of the legacy device to provide interoperability and communication between the legacy device and the plurality of devices by accessing the legacy device via the control module.

25

10a**FIG. 1A****SUBSTITUTE SHEET (rule 26)**

10b**FIG. 1B****SUBSTITUTE SHEET (rule 26)**

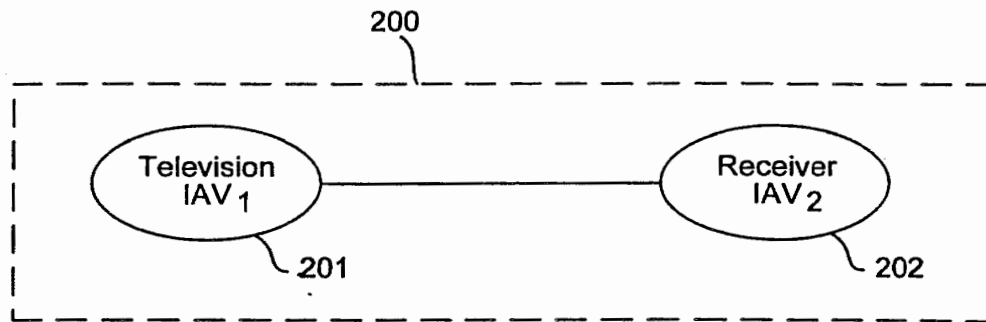


FIG. 2

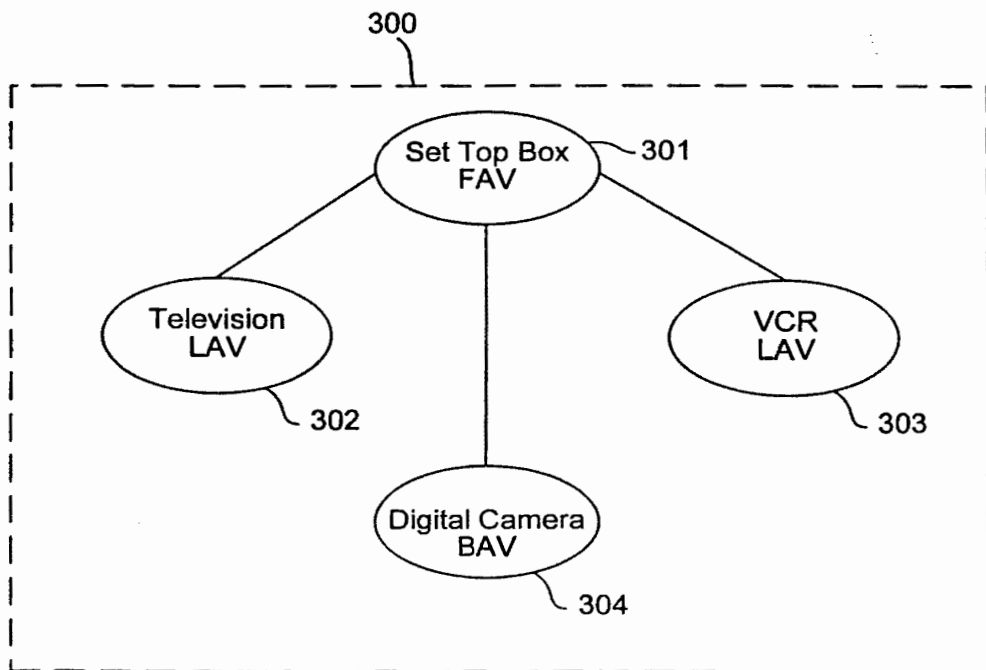


FIG. 3

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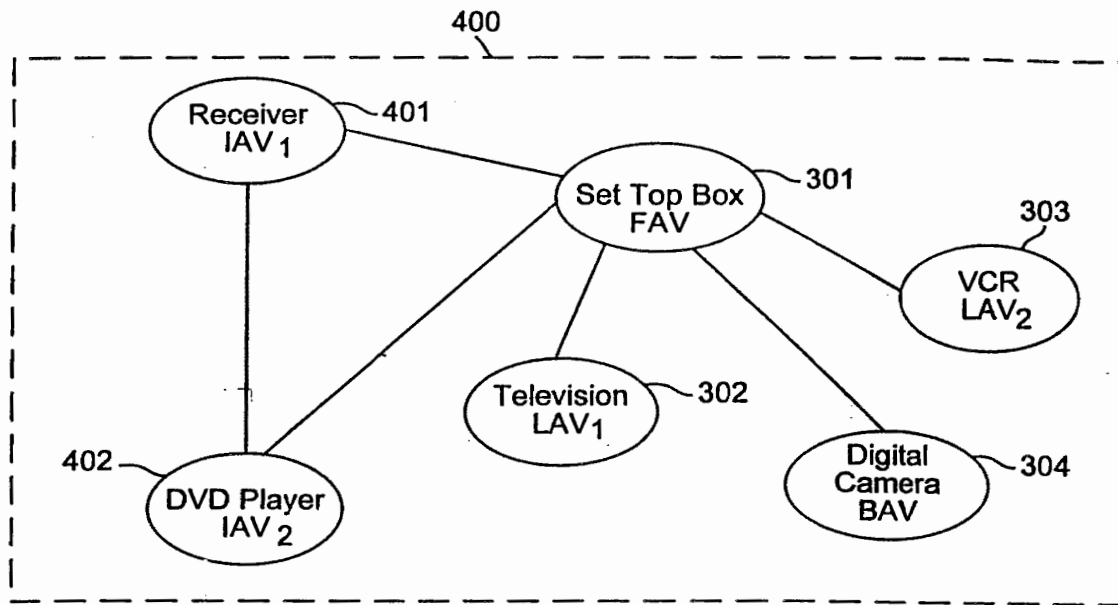


FIG. 4

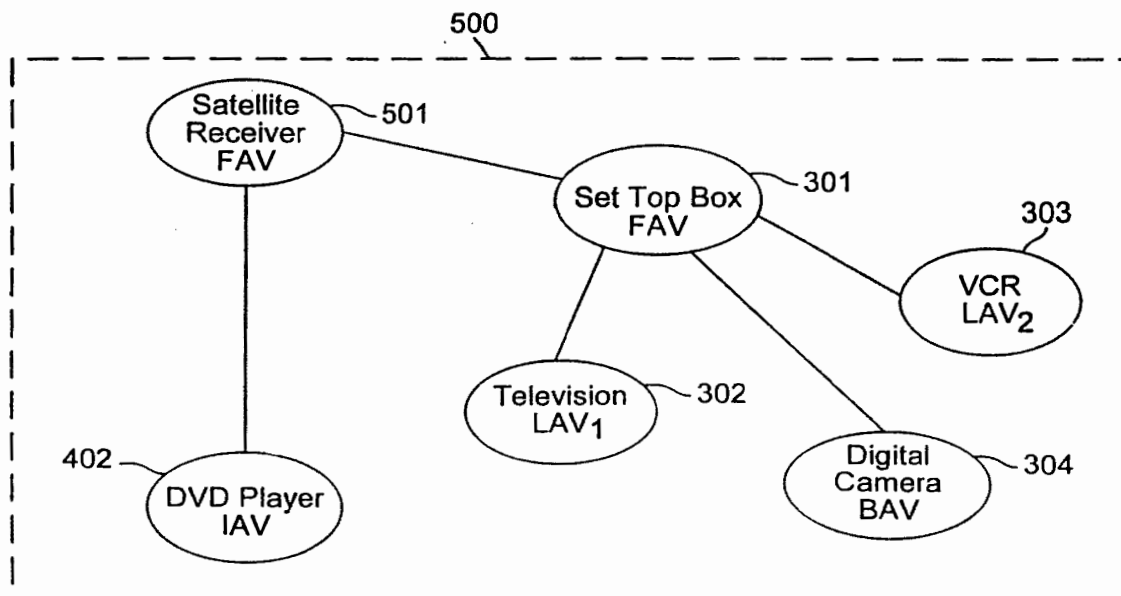


FIG. 5

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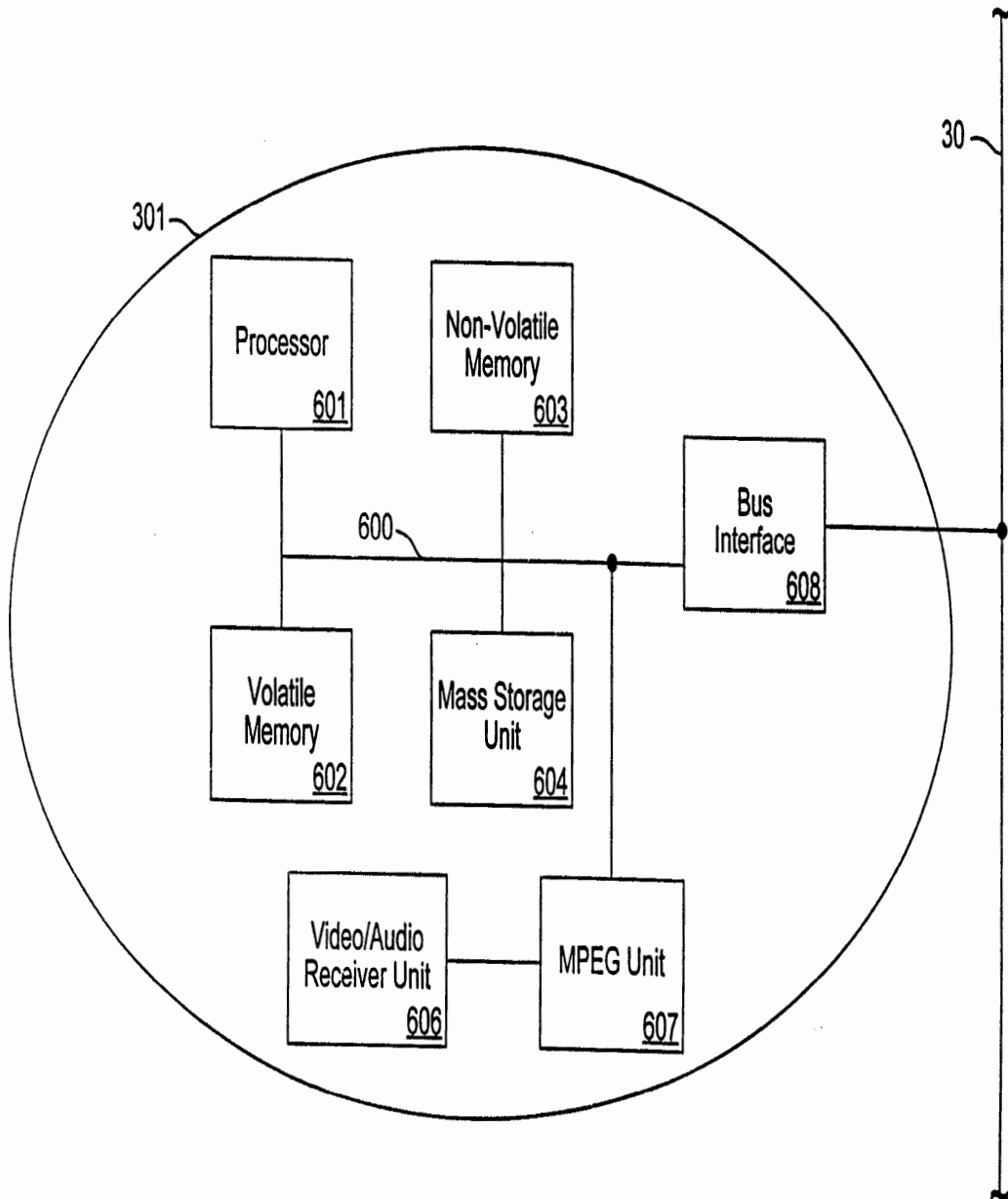


FIG. 6

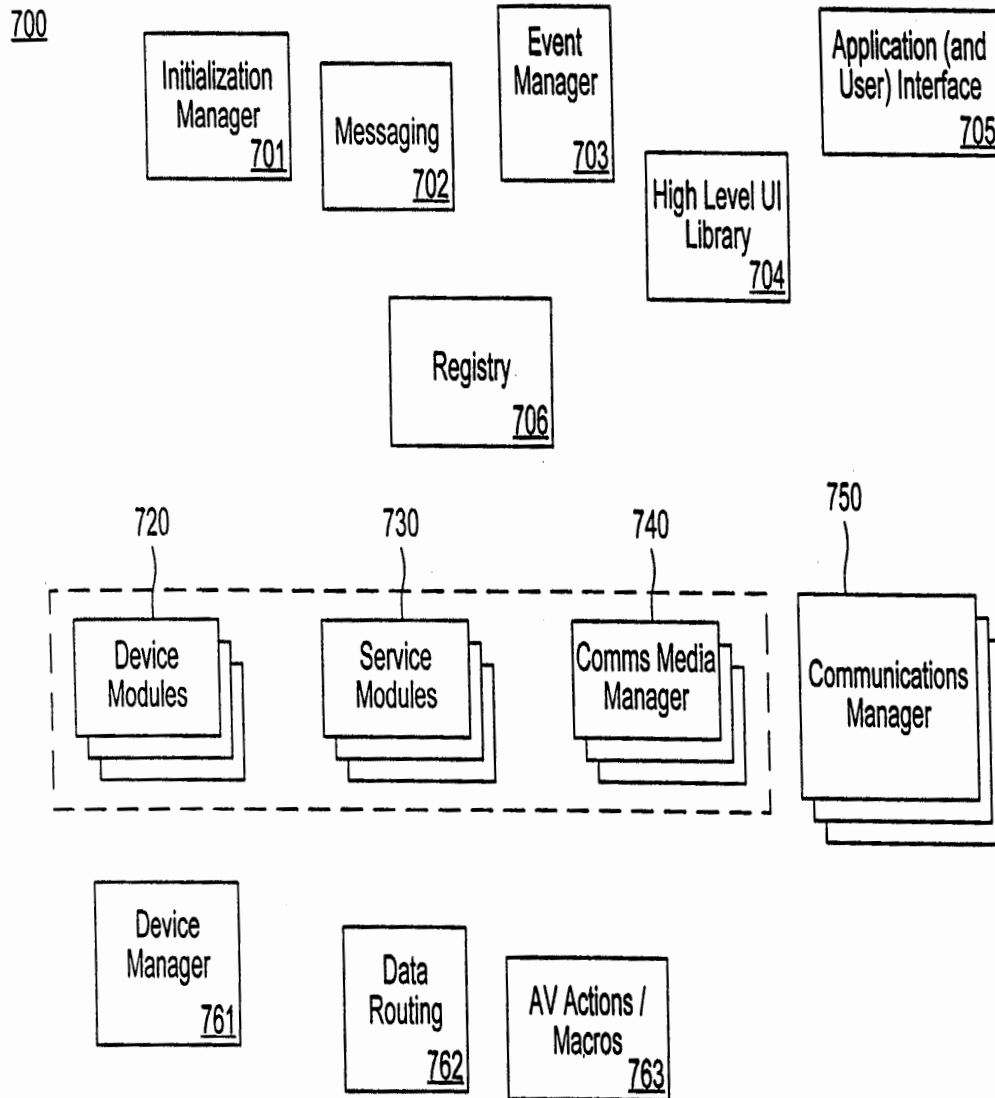


FIG. 7

800

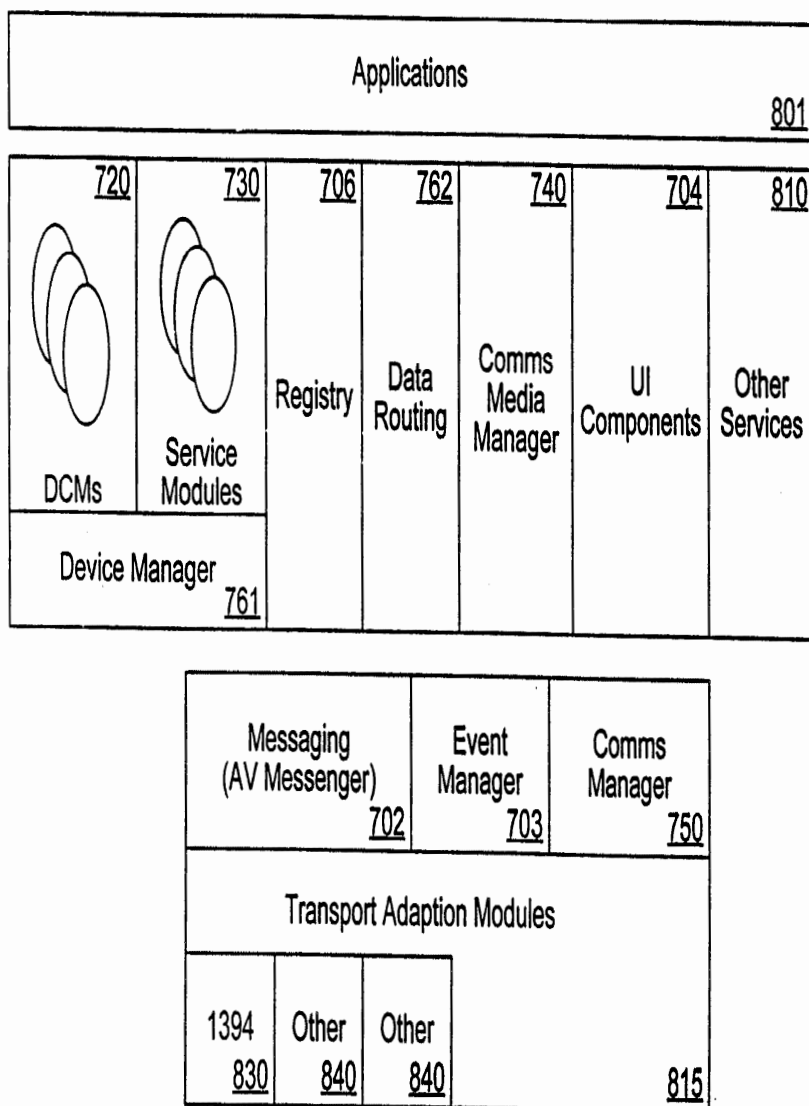


FIG. 8

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900

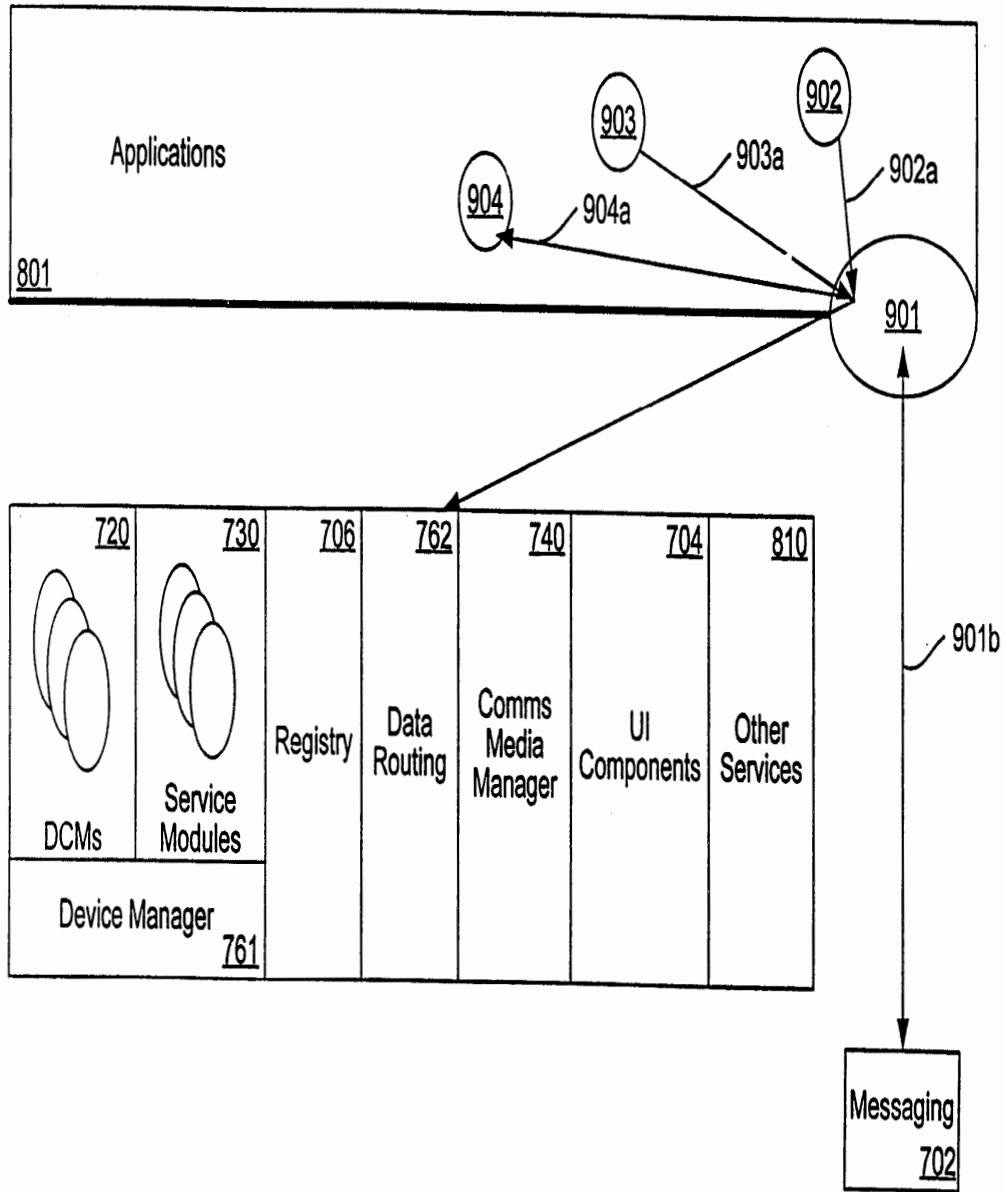


FIG. 9

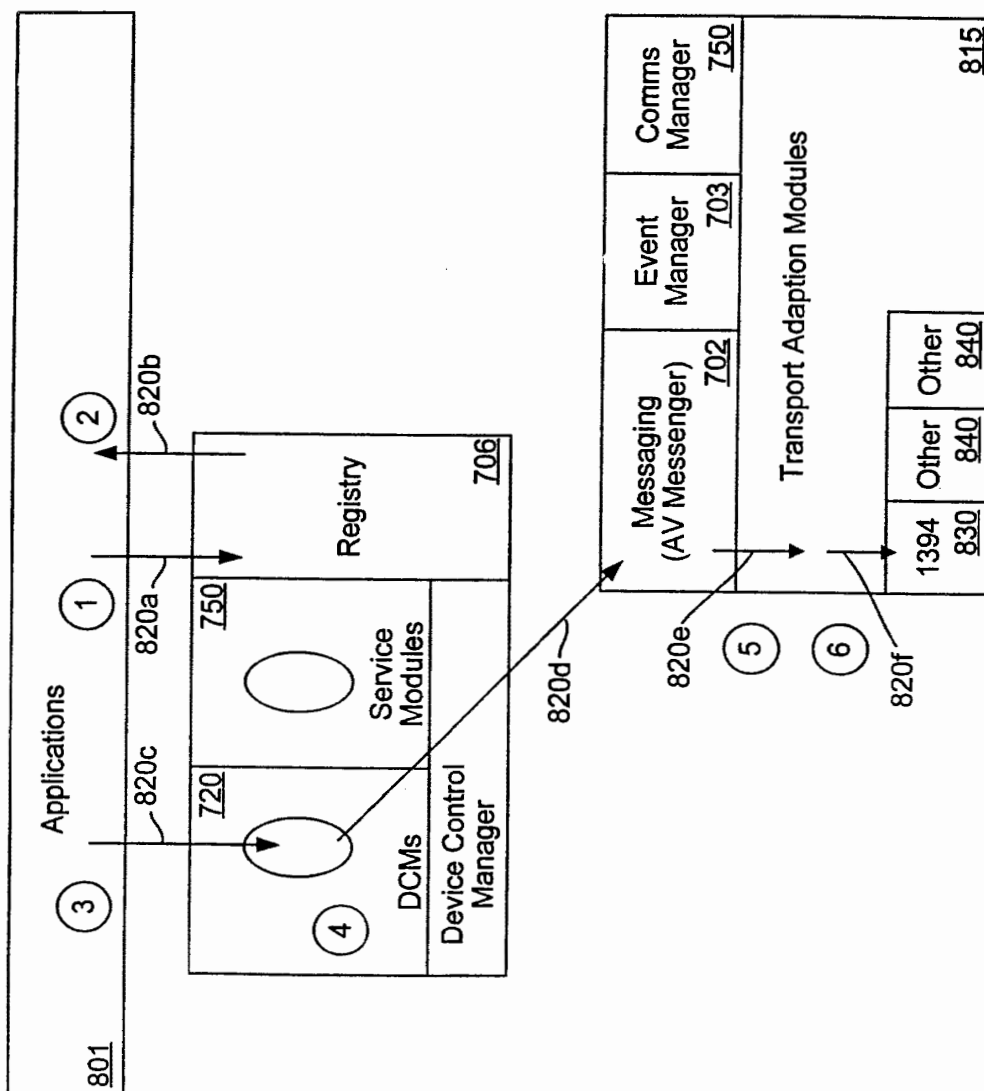


FIG. 10

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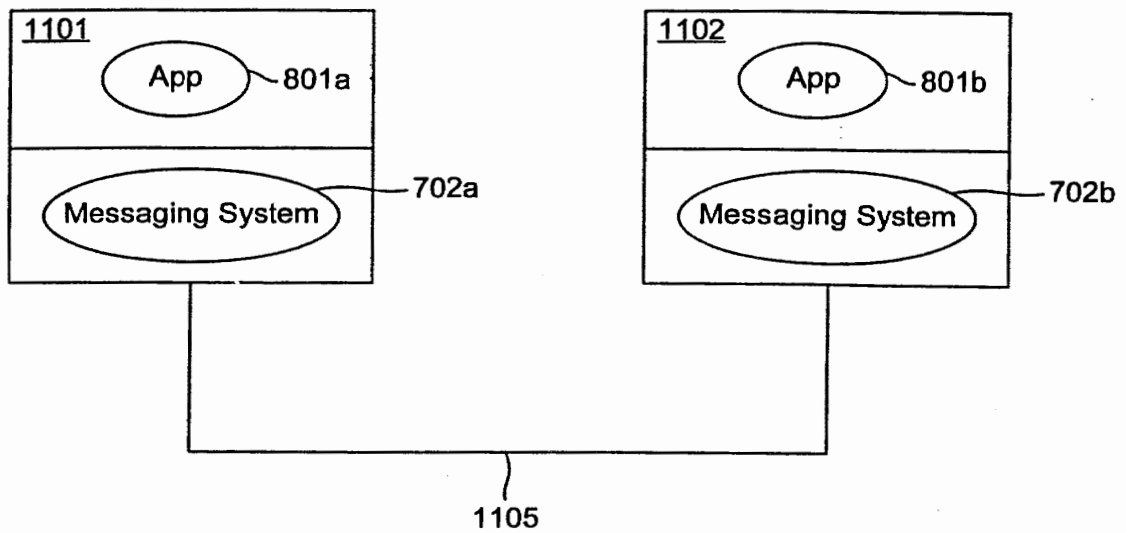
1101

FIG. 11

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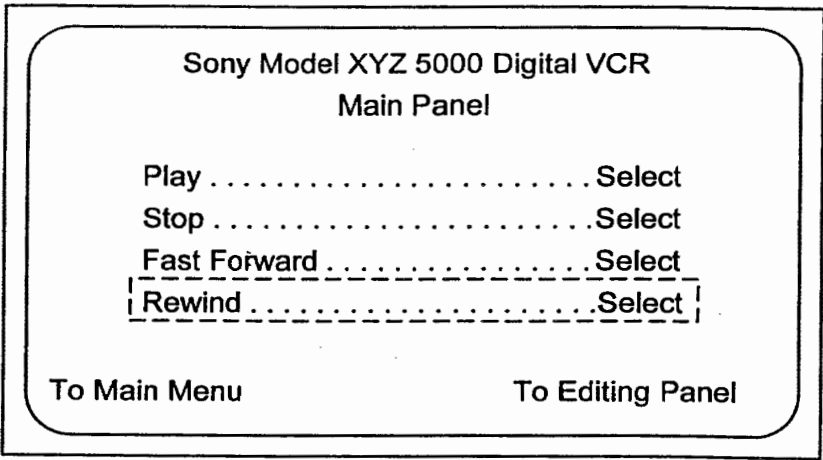


FIG. 12A

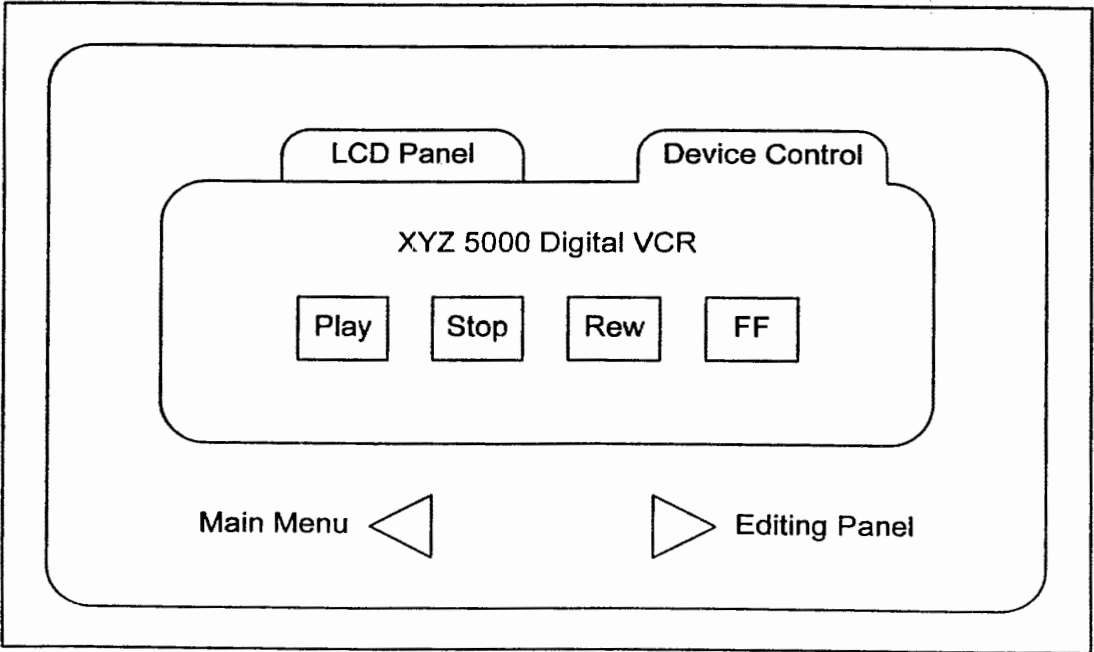
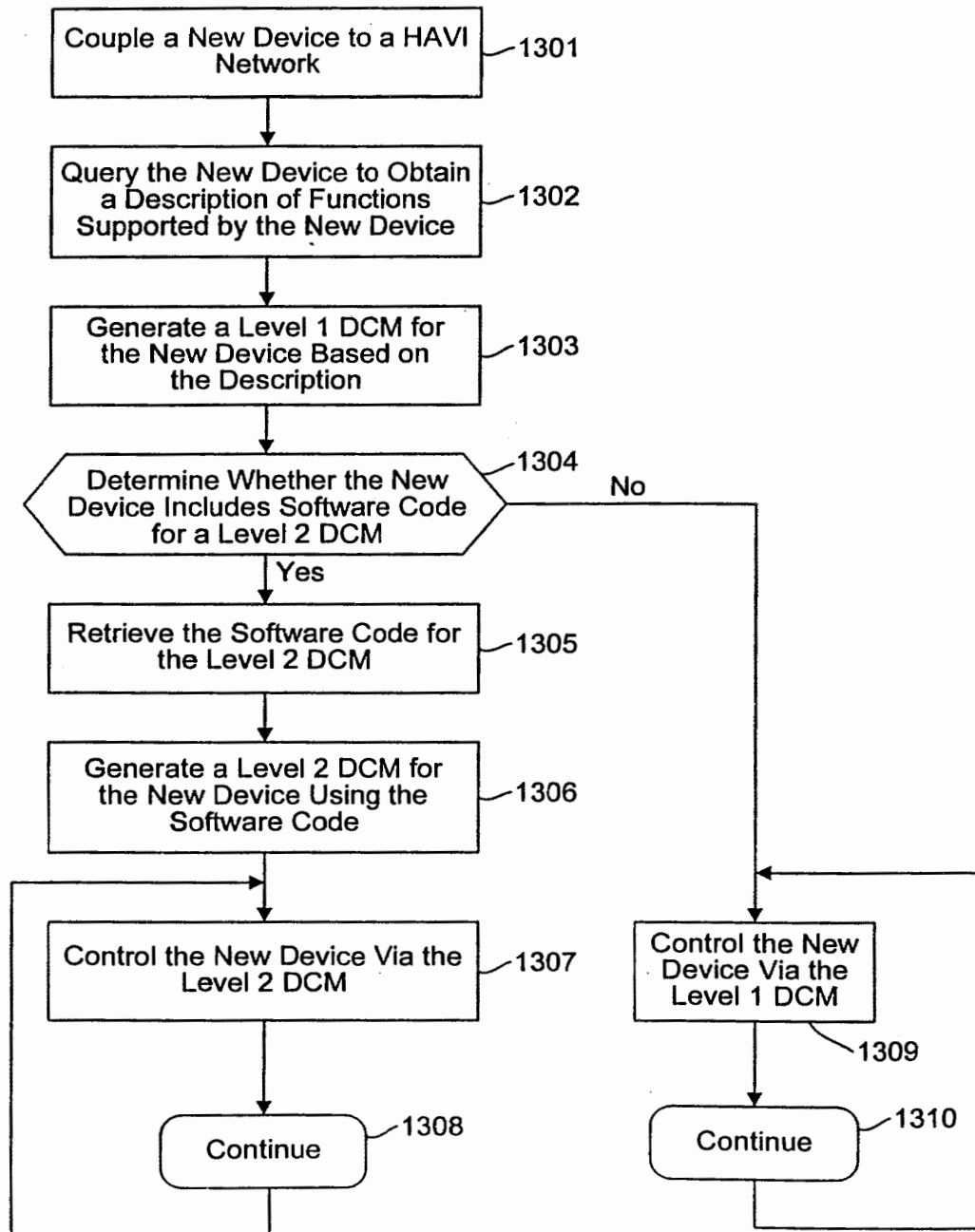


FIG. 12B

SUBSTITUTE SHEET (rule 26)

1300**FIG. 13****SUBSTITUTE SHEET (rule 26)**

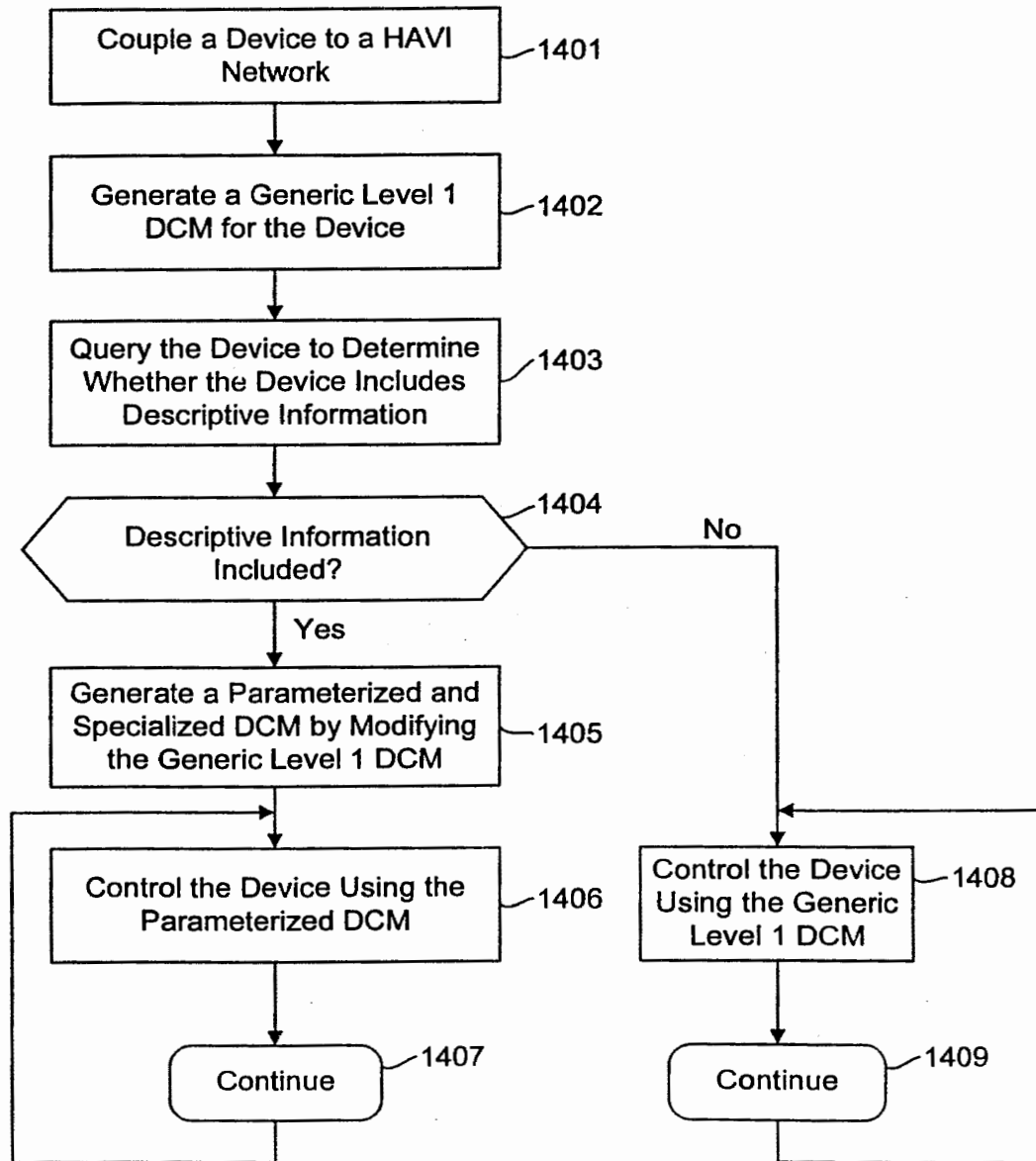
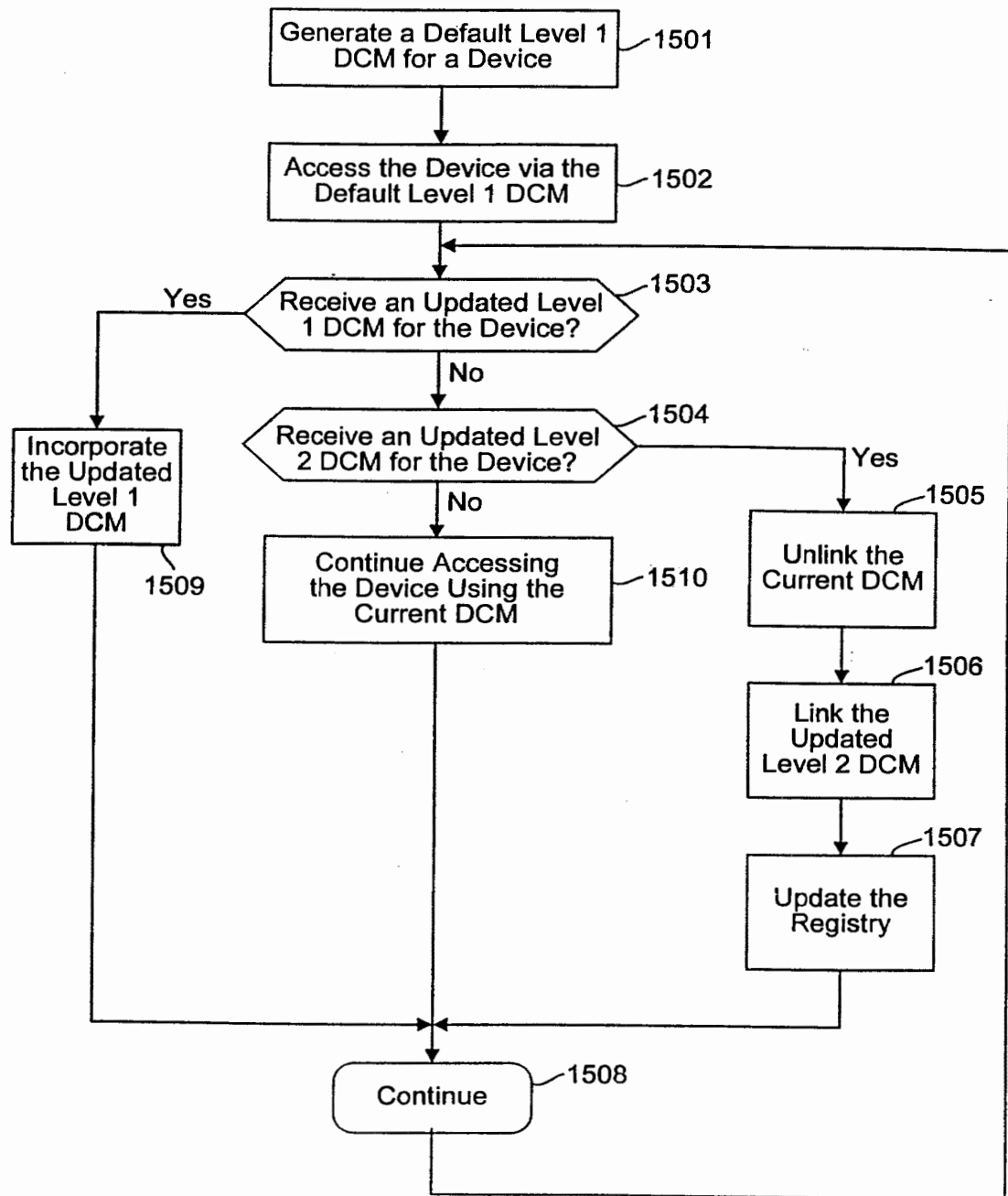
1400

FIG. 14

SUBSTITUTE SHEET (rule 26)

1500**FIG. 15****SUBSTITUTE SHEET (rule 26)**

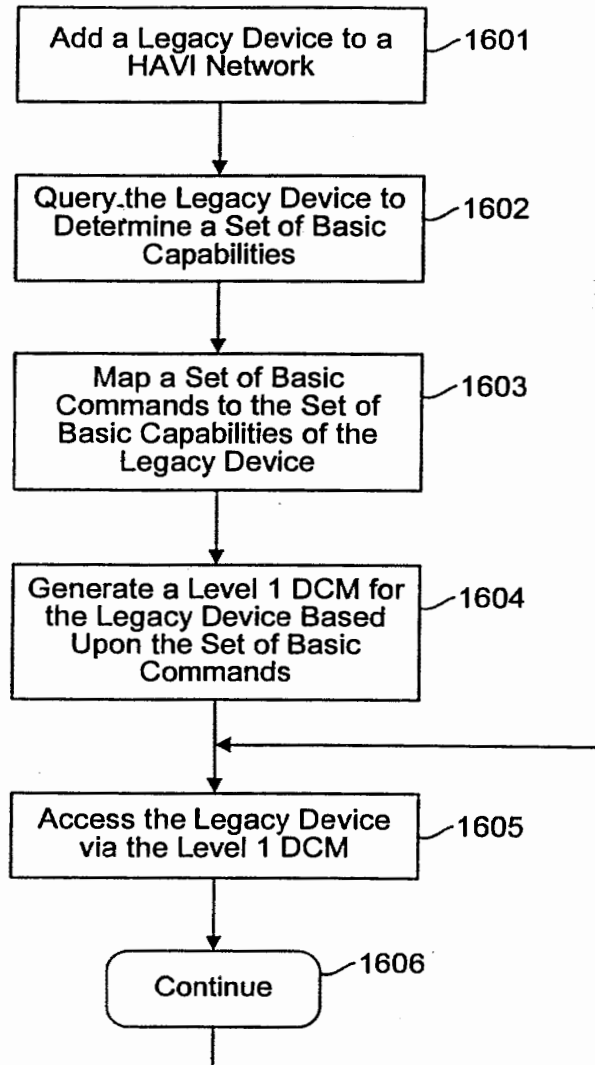
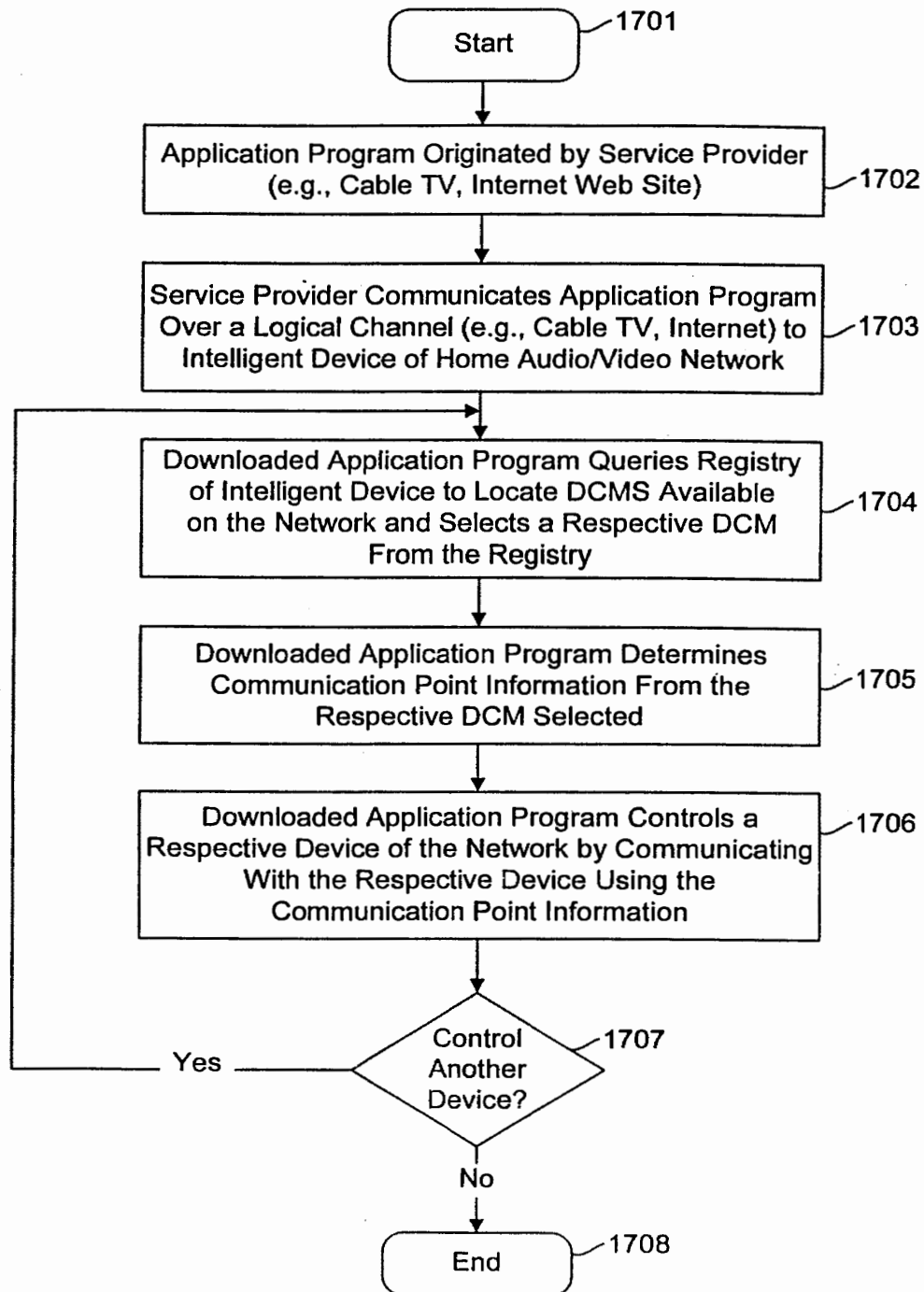


FIG. 16

SUBSTITUTE SHEET (rule 26)

1700**FIG. 17A****SUBSTITUTE SHEET (rule 26)**

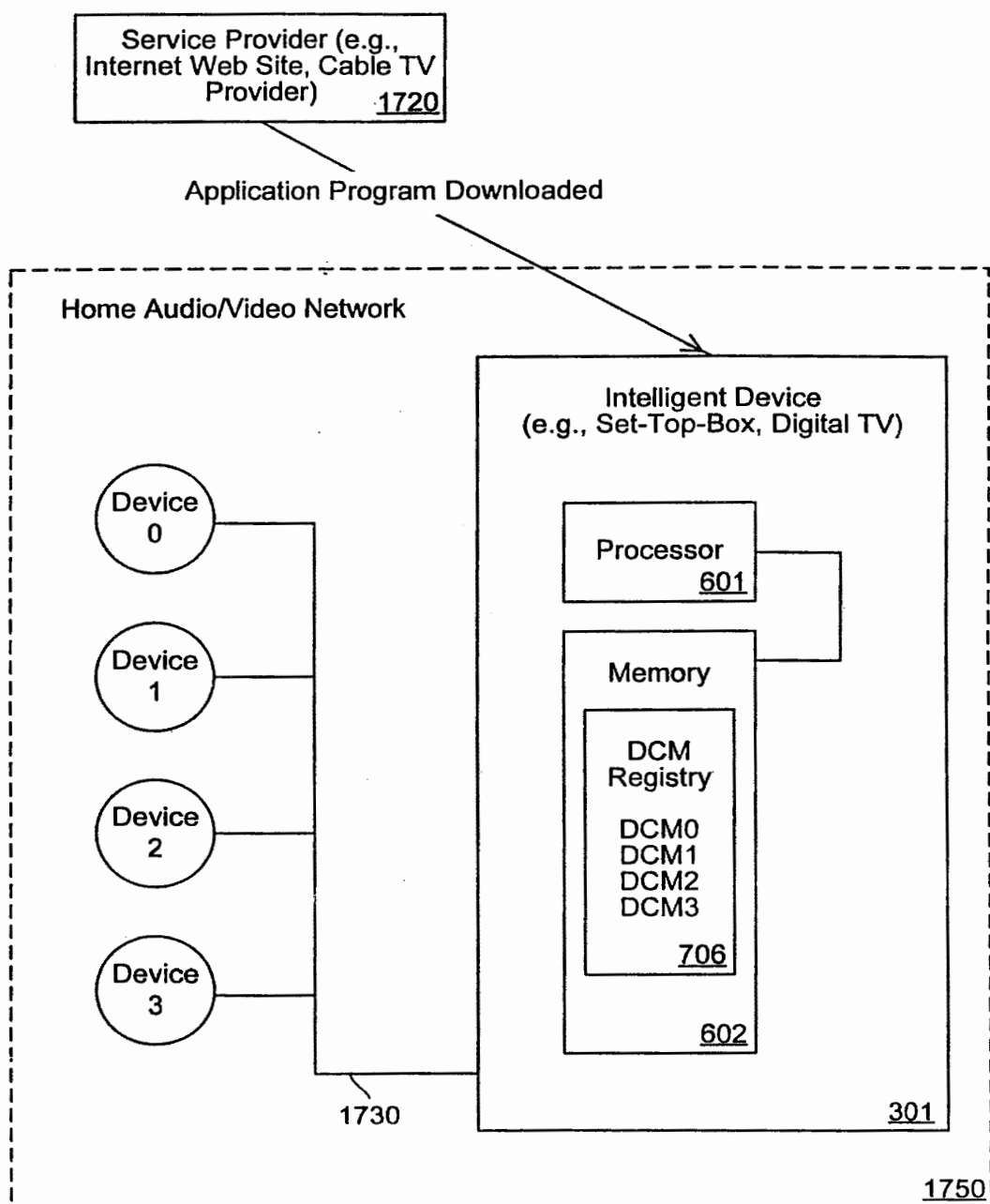


FIG. 17B

SUBSTITUTE SHEET (rule 26)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Veröffentlichungsnummer:

(11) Publication number:

(11) Numéro de publication:

EP 1 295 420 A0

Internationale Anmeldung veröffentlicht durch die
Weltorganisation für geistiges Eigentum unter der Nummer:

WO 02/001775 (art. 158 des EPÜ).

International application published by the World
Intellectual Property Organisation under number:

WO 02/001775 (art. 158 of the EPC).

Demande internationale publiée par l'Organisation
Mondiale de la Propriété sous le numéro:

WO 02/001775 (art. 158 de la CBE).

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
3 January 2002 (03.01.2002)

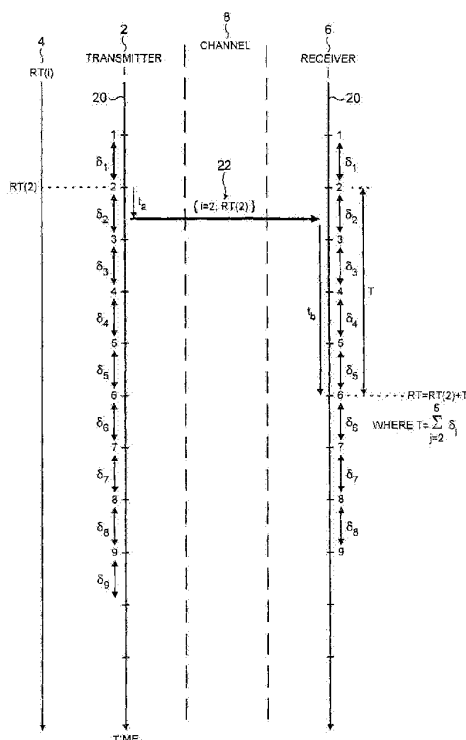
PCT

(10) International Publication Number
WO 02/01775 A1

- (51) International Patent Classification⁷: **H04J 3/06**
- (21) International Application Number: PCT/EP01/06675
- (22) International Filing Date: 13 June 2001 (13.06.2001)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
0015721.4 27 June 2000 (27.06.2000) GB
- (71) Applicant: **NOKIA MOBILE PHONES LIMITED**
[FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI).
- (72) Inventors: **MULLER, Thomas**; Laerstrasse 50, 44803 Bochum (DE). **JOERESSEN, Olaf**; Geibelstrasse 30, 40235 Düsseldorf (DE). **SCHNITZLER, Jürgen**; Hugo-Schultz-Strasse 39, 44789 Bochum (DE).
- (54) **SCHETELIG, Markus**; Imbuschstrasse 54, 45731 Wal-
trop (DE).
- (74) Agents: **HIGGIN, Paul** et al.; Nokia House, Summit Av-
enue, Farnborough, Hampshire GU14 ONG (GB).
- (81) Designated States (*national*): AE, AG, AI, AM, AT, AT
(utility model), AU, AZ, BA, BB, BG, BR, BY, BZ, CA,
CH, CN, CR, CU, CZ, CZ (utility model), DE, DE (utility
model), DK, DK (utility model), DM, DZ, EE, EE (utility
model), ES, FI, FI (utility model), GB, GD, GE, GH, GM,
HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK,
LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX,
MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK
(utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN,
YU, ZA, ZW.
- (84) Designated States (*regional*): ARIPO patent (GI, GM,
KE, LS, MW, MZ, SD, SI, SZ, TZ, UG, ZW), Eurasian
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European

[Continued on next page]

(54) Title: MASTER/SLAVE SYNCHRONISATION METHOD IN A BLUETOOTH SYSTEM



(57) Abstract: A transceiver for operating in a network wherein the transceiver is arranged to synchronise to a time reference common to the network having distinguishable instances comprising: means for reading or writing a real time clock at an identified instance of the common time reference; means for transmitting an identification of the real time clock value of a first instance and an identification of the first instance; and additionally comprising means for receiving a transmitted identification of a real time clock value and an identification of a first instance.

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patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

— with international search report

MASTER/SLAVE SYNCHRONISATION METHOD IN A BLUETOOTH SYSTEM

The present invention relates to the synchronisation of Real Time clocks of
5 separate devices. It has particular application for devices communicating
according to the Bluetooth Standard.

In an increasingly multimedia world, it is important to be able to control the
timing of multimedia output so that each of the outputs have the correct timing
10 relative to other events and outputs. If the correct timing is achieved each
output will be in real time and will be correctly synchronised with the other
outputs.

If the outputs are distributed in space, however, it may be difficult to establish
15 and maintain synchronicity between the real time clocks associated with each
output. This problem is particularly acute when the latencies between the
different outputs are unknown or variable.

This problem applies equally to multimedia inputs and maintaining the
20 synchronism between them.

An exemplary scenario in which the problem comes to the fore is in a
surround sound video application in which multiple audio outputs are
synchronised to the video output. During recording and playback the different
25 media streams (audio and video) need to be adjusted with respect to a certain
time reference.

It would be desirable to address the above mentioned problem of
synchronisation.

30

According to one aspect of the present invention there is provided a
transmitter for transmitting in a network comprising the transmitter and at

least one receiver wherein the transmitter is arranged to synchronise to a common time reference having distinguishable instances, comprising: means for reading a real time clock at an identified instance of the common time reference; and means for transmitting an identification of the real time clock value for a first instance and an identification of the first instance.

The first instance may be in the past or may be in the future at the moment of transmission. The transmitter may calculate the real time clock value at the first instance by adding the time difference between the first instance and the identified instance to the real time clock value at the identified instance to obtain the real time clock value for the first instance. However, the first instance and the identified instance may be one and the same, in which case such calculation is unnecessary.

According to another aspect of the invention there is provided a receiver for receiving in a network comprising at least the receiver and a transmitter wherein the receiver is arranged to synchronise to a common time reference having distinguishable instances comprising: means for receiving a transmitted identification of a real time clock value and an identification of a first instance; and means for determining a real time clock value, current at a second instance from the received identification of a real time clock value and the received identification of a first instance.

The real time clock value is the received value, if necessary, corrected in accordance with the time difference between the first and second instances.

The first instance may be in the past at the moment of reception. The real time clock value determination may be by calculation in which the time difference between the second and first instances is added to the received value of the real time clock.

3

The first instance may be in the future at the moment of reception. The means for determining may determine that the current real time clock value is the received value when the second instance of the common time reference occurs, the second and first instances being one and the same.

5

The transmitter may be a part of a transceiver and the receiver may be a part of a transceiver.

The transmitter and receiver may together form a transceiver.

- 10 According to other aspects of the invention there are provided transceivers as claimed in claims 36, 37, 38 and 39.

According to a further aspect of the present invention there is provided methods as claimed in claims 41 and 42.

15

According to a still further aspect of the present invention there is provided a network as claimed in claim 43--.

- 20 The problem addressed may be exacerbated when the inputs or outputs are not physically connected but communicate wirelessly. The limitations on available bandwidth may cause problems in real time communication.

- According to a preferred embodiment of the present invention the wireless communication is provided in accordance with the Bluetooth Standard, adapted to incorporate the present invention. In this preferred embodiment existing aspects of the existing Bluetooth system are ingeniously re-used. In particular the Link Level Synchronisation which is used for the timing of Fast Frequency Hopping is used as the common time reference of the present invention. This advantageously provides Real Time synchronism between devices in the range of a few microseconds. Furthermore, Link Level Messages may be used to communicate the necessary identifications of the real time value and the first instance.
- 25
- 30

In embodiments of the invention, the synchronous instances of the common time reference are such that when there is an instance in one device there is an identifiably corresponding instance in an other device. Preferably the instances are separated by a fixed time period or an integral number of fixed
5 time periods.

For a better understanding of the present invention and to understand how the same may be brought into effect reference will now be made by way of example only to the following drawings in which:

10

Figure 1 is a schematic illustration of a transmitter and a receiver each of which performs aspects of the present invention;

Figure 2 is a schematic illustration of the common time reference, the communication between transmitter and receiver and the calculations
15 performed at the receiver according to a first embodiment of the invention;

Figure 3 is a schematic illustration of the common time reference, the calculation performed in the transmitter and the communication between the transmitter and receiver according to a second embodiment of the invention;
20

Figure 4 illustrates a Bluetooth communications network;

Figure 5 illustrates the time frame of the communications network;
25

Figure 6 illustrates a radio packet;

Figure 7 illustrates a transceiver unit suitable for use as a master or slave;

30 Figure 8 illustrates the correspondence between common time reference and the Bluetooth clock .

5

Referring to Figure 1, there is illustrated a transmitter device 2 having access 3 to a Real Time (RT) Clock 4, and a receiver device 6. The transmitter 2 communicates with the receiver via a communication channel 8, which may for example be a radio channel. The receiver may have access 7 to a RT
5 Clock 10.

The transmitter is able to provide information to the receiver via channel 8 that allows the receiver 6 at some future time to have a RT value which is synchronous with the value of the RT Clock 4. The receiver may update RT
10 clock 10 accordingly.

The transmitter 2 and receiver 6 share a common time reference. The time reference is typically a clock which produces a plurality of beats or instances, such as a rising (or falling) voltage, each of which is separated by a time
15 interval. The common time reference 20 is illustrated in Figures 2 and 3. The RT clock 4 and common time reference 20 of the transmitter are illustrated to the left of the figures, the common time reference 20 of the receiver is illustrated to the right of the Figures and the channel 8 is illustrated in the middle of the Figures. The arrow of time extends down the page. The
20 common time reference 20 in the transmitter illustratively uses an index i $\{i=1, 2, 3, \dots\}$ to represent the successive instances of the common time reference. The common time reference 20 in the receiver illustratively uses an index j $\{j=1, 2, 3, \dots\}$ to represent the successive instances of the common time reference. It should be noticed that the instances i of the transmitter and the
25 instances j of the receiver are synchronous because when an instance i occurs in the transmitter an instance j simultaneously occurs in the receiver.

The interval between instance i and instance $i+1$, δ_i , and the interval between instance j and instance $j+1$, δ_j , are the same when instance i and j
30 are synchronous for all i and j . The intervals may be the same duration irrespective of i and j or the interval δ_i may differ from the interval δ_{i+1} .

Not only are there synchronous instances in the transmitter and receiver, but a particular instance i in the transmitter will be synchronous with a particular instance j in the receiver. Therefore an instance in the transmitter can be identified by a value for i of x and a corresponding synchronous instance j in the transmitter can be identified as the instance when $j=x$. The instances of the common time reference which occur in the transmitter are therefore distinguishable, in this example by the index i . The instances of the common time reference which occur in the receiver are therefore distinguishable, in this example by the index j .

10

The operation of the transmitter and receiver according to a first embodiment will now be explained with reference to Figure 2. At an instance $i=2$, the transmitter 2 reads the current settings $RT(2)$ of the RT clock 4. At a later time (latency of t_a) the transmitter sends a message 22 to the receiver. The message indicates the instant $i=2$ when the RT clock was read and indicates the read value $RT(2)$ of the RT clock. The receiver 6 receives the message 22 and identifies the value $RT(2)$ and the value $i=2$. The receiver, synchronous with an instance $j=6$ of the common time frame, determines the current Real Time Clock value RT . There is a latency of t_b between the receipt of the message 22 and the determination of the current Real Time Clock value RT . The receiver calculates the time difference T between the instance at which $RT(2)$ was read ($i=j=2$) and the current instance ($j=6$) and adds it to the received value of the Real Time clock ($RT(2)$). To calculate T , the receiver identifies the prior instance of the common time reference in the receiver which corresponds to the identified instance $i=2$ of the common time frame of the transmitter. The receiver sums the known interceding interval(s) to calculate T .

The operation of the transmitter and receiver according to a second embodiment will now be explained with reference to Figure 3. At an instant $i=2$, the transmitter 2 reads the current settings $RT(2)$ of the RT clock 4. The transceiver determines what the Real Time value RT' will be at a future

7

instance j' of the common time frame. The transmitter calculates the time difference T between the instance at which $RT(2)$ was read ($i=2$) and the future instance j' and adds it to the value of the Real Time clock ($RT(2)$). To calculate T , the transmitter sums the known interval(s) between $i=2$ and $i=j'$. At
 5 a later time (latency of t_a) the transmitter sends a message 24 to the receiver. The message indicates the instant j' and the value RT' . The receiver 6 receives the message 22 and identifies the value RT' and the value j' . At an instance j of the common time reference of the receiver corresponding to the instance j' , the current Real Time Clock value RT is RT' .

10

The latencies t_a and t_b are generally unknown and variable.

Generalising, let k , l , and m be instances of the common reference 20. At the transmitter, a real time value $RT(k)$ is read at instant k and a message is sent
 15 which identifies an instant l and a real time value $RT(l)$ at that instant, where instant l is synchronous with or after instant k . At the receiver, at an instant m , the current real time value $RT(m)$ is set to $RT(l) + T_{lm}$ where T_{lm} is the interval between instant m and l .

20 The system as described is particularly useful for distributed devices or application which require synchronicity in real time such as multimedia applications. The transmitter 2 may be part of a multimedia input such as a camera or speaker or local distribution point such as a satellite receiver. The receiver 6 may be part of a multimedia output device such as a speaker or
 25 screen.

The transmitter may send audio, video or data to the receiver, together with a Real Time stamp. The transmitter produces an output at the correct time using its own correct Real Time clock and the time stamp. The above
 30 mentioned procedure creates and maintains synchronicity between the Real

Time clock associated with the transmitter 2 and the Real Time clock associated with the receiver 6.

Embodiments of the invention find particular application in transmitters,
5 receivers and transceivers operating in accordance with the Bluetooth specification as described below. The current specification is 1.0B, the contents of which are hereby included by reference.

Figure 4 illustrates a network 102 of radio transceiver units, including a master
10 unit 104 and slave units 106, 108 and 110, communicating by transmitting and receiving radio packets. The master unit is the transceiver unit which initiates the connection of a slave to the network. There is only one master in a network. The network operates in a time division duplex fashion. A single packet is transmitted in the network at a time and the transceiver units are
15 synchronised to a common time frame determined by the master unit 104. This time frame consists of a series of time slots of equal length. Normally, each radio packet transmitted in the network has its start aligned with the start of a slot and adjacent slots are assigned for respectively transmission and reception by the master unit. When the master unit is performing point-to-
20 point communication a transmitted radio packet is addressed to a particular transceiver which replies to the master unit by transmitting a radio packet addressed to the master unit in the next available time slot. When the master unit is performing point to multi-point communication a transmitted radio packet is addressed to all transceiver units. Any time misalignment between
25 the master and a slave is corrected by adjusting the timing of the slave.

The transceivers transmit and receive in a microwave frequency band, typically 2.4 GHz.

30 The network reduces interference by changing the frequency at which each radio packet is transmitted. A number of separate frequency channels are

assigned each with a bandwidth of 1MHz, and the frequency hops at a rate of 1600hops/s. The frequency hopping of the transceivers communicating in or joining the network is synchronised and controlled by the master unit. The sequence of hopping frequencies is unique for the network and is determined
5 by a unique identification of the master unit. Each transceiver unit has a unique identification, the Unit ID, henceforth referred to as the Slave ID for the slave units and the Master ID for a master unit.

The network is a radio frequency network suitable for transmitting voice
10 information or data information between transceivers. The transmissions made are of low power, for example 0 to 20dBm, and the transceiver units can effectively communicate over the range of a few centimetres to a few tens or hundred of metres. The master unit has the burden of identifying the other transceiver units within its transmission range and the burden of paging a
15 transceiver unit to set up a communication link between the master unit and that slave unit. Each of the slave units has a low power mode in which it neither transmits nor receives and other modes in which it receives and then responds to radio packets addressed to it by the master unit. A slave unit may remain in the low power mode except when transmitting or receiving.

20

Referring to Figure 5, a frame 120 is illustrated. This frame 120 is the common time frame used by the network 102 and controlled by the master unit 104. The frame illustratively has slots 122 to 129. The slots designated by even numbers are normally reserved. Only the master unit can normally begin
25 transmitting a radio packet aligned with the start of the even numbered slots. The slots designated by odd numbers are normally reserved. Only radio packets transmitted by a slave, that is radio packets addressed for reception by the master unit can normally have their start aligned with the start of the odd numbered slots. Each slot is allocated a different one of a sequence of
30 hopping frequencies. A slot has a constant time period and is typically 625 microseconds.

10

Referring to Figure 6, a typical radio packet 130 is illustrated. The radio packet has a start 132 and contains three distinct portions: a first portion contains an Access Code 134, a second portion contains a Header 136 and a third portion contains a Payload 138.

5

The Access Code is a series of symbols used in the network to identify the start of a radio packet. It has a fixed length. In a normal communication mode, the master and slave units use the Master ID as the Access Code. As there is only one master unit in a network, the Master ID identifies the network.

10

The header 136 may or may not be present. If present, it has a fixed length. The header contains control words. The local address (L_ADDR) is a word uniquely identifying a slave within a network. The local address is assigned to a slave unit by the master unit when the master unit joins the slave to the network. The all zero L_ADDR is reserved for broadcast purposes. The packet identification word (PK_ID) specifies the features of the radio packet 130. PK_ID specifies whether a payload is present and its size and whether the payload contains data or transceiver control information.

15

20 The payload 38 carries either transceiver control information or voice/data information. The payload is of variable length and may be absent.

Referring to Figure 7, a schematic illustration of a transceiver unit is shown. Only as many functional blocks and interconnections are shown in this diagram as are necessary to explain in the following how a transceiver unit and the communication network operates. The transceiver unit 140 contains a number of functional elements including: an antenna 146, receiver 150, synchroniser 152, header decoder 154, controller 160, memory 156 having memory portion 158 storing the transceiver unit's Unit ID, packetiser 142, clock 168, frequency hop controller 148 and transmitter 144. Although these elements are shown as separate elements they may in fact be integrated together and may be carried out in software or in hardware.

25

30

Data to be transmitted in the payload of a packet by the transceiver unit 140 is supplied as data signal 141 to the packetiser 142. Control information to be transmitted in the payload of a packet is supplied in a payload control signal 189 provided by the controller 160 to the packetiser 142. The packetiser 142
5 also receives an access code control signal 169 and a header control signal 171 from controller 160 which respectively control the Access Code 134 and the Header 136 attached to the payload to form the packet. The packetiser 142 places the data or control information into a packet 130 which is supplied as signal 143 to the transmitter 144. The transmitter 144 modulates a carrier
10 wave in dependence upon the signal 143 to produce the transmitted signal 145 supplied to the antenna 146 for transmission. The frequency of the carrier wave is controlled to be one of a sequence of hop frequencies by a transmission frequency control signal 147 supplied by the frequency hop controller 148 to the transmitter 144.

15 The antenna 146 receives a radio signal 151 and supplies it to the receiver 150 which demodulates the radio signal 151 under the control of a reception frequency control signal 149 supplied by the frequency hopping controller 148 to produce a digital signal 153. The digital signal 153 is supplied to the
20 synchroniser 152 which synchronises the transceiver unit 40 to the time frame of the network. The synchroniser is supplied with an access code signal 181 specifying the Access Code of the packet which the transceiver unit is expecting to receive. The synchroniser accepts those received radio packets with Access Codes which correspond to the expected Access Codes and
25 rejects those received radio packets with Access Codes that do not correspond to the expected Access Code. A sliding correlation is used to identify the presence and the start of the expected Access Code in a radio packet. If the radio packet is accepted then the radio packet is supplied to the header decoder 154 as signal 155 and a confirmation signal 179 is returned
30 to the controller 160 indicating that the packet has been accepted by the synchroniser 152. The confirmation signal 179 is used by the controller in a slave unit to resynchronise the slave clock to the master clock. The controller

compares the time at which a radio packet was received with the time at which the radio packet was expected to be received and shifts its timing to offset the difference. Such an offset may be achieved by varying the value of M_OFFSET stored in memory 156 by the value of the difference. The header decoder 154 decodes the header in the received packet and supplies it to the controller 160 as header signal 175. The header decoder 54, when enabled by a payload acceptance signal 177 supplied by the controller 160, produces a data output signal 157 containing the remainder of the radio packet, the payload 138. The controller responds to a zero value of L_ADDR in the header signal 175 to enable the header decoder. The data output signal 157 may contain transceiver control information. In this instance the data output signal 157 is supplied to controller 160 in response to the payload acceptance signal 177 provided by the controller 160.

The frequency-hopping controller 148 cycles through a sequence of frequencies. The transmission frequency control signal 147 and the reception frequency control signal 149 normally alternately control the transmitter 144 and the receiver 150. When the transceiver 140 is acting as a master, the receiver 150 is normally capable of receiving at frequencies determined by the odd values of the sequence and the transmitter is normally capable of transmitting at frequencies determined by the even values of the sequence. When the transceiver is acting as a slave unit the reverse is true. The frequency-hopping controller 148 receives the access code control signal 169 (also supplied to the packetiser 142) and an offset signal 167 from the controller 160 and a clock signal 159, which represents the time held in clock 168, from the clock 168. The offset signal 167 defines the value of an offset from the time held in the clock 168. This value may be null. The frequency-hopping controller combines the clock signal 159 and the offset signal 167 to emulate the time held in a clock offset by the value of the offset signal 167 from the clock 168. The sequence of frequencies through which the hopping controller 148 cycles is dependent upon the access code control signal 169. The position within the cycle is dependent upon the emulated time. When the

access code control signal 169 provides the value MASTER ID a master unit frequency-hopping sequence is defined. When the access code control signal 169 provides the value SLAVE ID a slave unit frequency-hopping sequence is defined.

5

The memory 156 has a portion 158 which permanently stores the Unit ID of the transceiver unit 140. The remaining portion of the memory 156 can be written to by the controller 160. If the transceiver unit 140 is functioning as a slave unit, the memory 156 will additionally store the Master ID, a value
 10 M_OFFSET representing the difference between the slave unit's clock and the master unit's clock and the slave's address in the network, L_ADDR. If the transceiver unit 140 is functioning as a master unit, the memory 156 will additionally store for each slave unit participating in the network: the Slave ID; a value S_OFFSET representing the difference between the master unit's
 15 clock and that particular slave unit's clock and L_ADDR uniquely identifying the particular slave unit in the network.

It should be noted that the access code signal 181, the access code control signal 169 and the offset signal 167 in the communication mode remain the
 20 same for adjacent duplex time slots, and that the access code signal 81 and the access code control signal 169 will have the same values.

It will therefore be appreciated that when a master unit and Slave unit are in normal communication, the Slave unit emulates the Master unit's clock by
 25 combining the stored current value of M_OFFSET with the value of its own clock. The Master clock and emulated Master clock may both be referred to as the Bluetooth clock. The Bluetooth clock provides a synchronous time reference which is common to the Slave unit and Master Unit. The Bluetooth clock has no relation to the time of day and can be initialised at any value. It is
 30 used to provide the timing reference for the Bluetooth transceiver. The Bluetooth clock may be implemented as a free-running 28-bit counter that wraps around at $2^{28} - 1$ at a regular rate of 3.2kHz. The Bluetooth clock in

normal communication is synchronous with the Master clock and is used to keep the Fast Frequency Hopping of the transceivers in the network in step.

Thus far, the transceiver described is known (see WO 00/18149, published
5 29th March 00).

The controller 160 has access 192 to a Real Time Clock 190. The Real Time Clock may be part of a separate application, in which case access 192 represents an interface between the application and the transceiver circuitry
10 140.

The common time reference 20 previously described with reference to Figures 2 and 3 is based upon the Bluetooth clock. The Bluetooth clock which is an existing accurate synchronised clock already used for FFH is reused as the
15 common time reference 20. The Bluetooth clock is a synchronised clock which is shared amongst the devices participating a piconet. In the master unit the Bluetooth clock is the unit's clock, whereas for each Slave unit, the Bluetooth clock is the unit's clock offset by a particular amount.

20 The synchronisation between the Bluetooth clocks is maintained by the synchroniser 152 to a bit level accuracy (1 microsecond). The synchroniser accepts those received radio packets with Access Codes which correspond to the expected Access Codes and rejects those received radio packets with Access Codes that do not correspond to the expected Access Code. A sliding
25 correlation is used to identify the presence and the start of the expected Access Code in a radio packet. and resynchronise or maintain synchronisation of the slave clock to the master clock. This maintains the common Bluetooth clock.

30 An instance in the Bluetooth clock reference, can be defined by the frame or slot number n and a trigger instant within a frame or slot. The frame number is specified by 26 bits and the slot number is specified by 27 bits. The trigger

instant allows the precise timing of the instance to be identified and the frame/slot number allows the more general timing of the instance to be identified, that is, it allows one trigger instant to be differentiated from other trigger instants. The trigger instant, can be pre-set as some fixed point within a slot/frame, in which case the frame/slot number n is sufficient to identify the instance and differentiate it from other instances. The preferred point for the trigger instant within the slot/frame is at the very beginning as illustrated in Figure 8. The trigger instant may alternatively be one of many points within the slot/frame, in which case the frame/slot number is insufficient to identify and differentiate the instance. A trigger flag is also necessary to identify which of the many points within the slot/frame is to be used as a trigger. Consequently, if the trigger instant is pre-set, the index i or j' in the messages 22 and 24 respectively can be the appropriate slot/frame number. However, if the trigger instant is not pre-set, the index i or j' in the messages 22 and 24 respectively can be the combination of appropriate slot/frame number and trigger flag.

The messages 22 and 24 may be transmitted as a new form of Link Manager messages. Conventional Link Manager Messages are described in the Bluetooth specification and they are a particular form of transceiver control messages described above in relation to Figure 7. According to the first embodiment described above, the payload of the Link Manager Message would contain $\{ i, RT(i) \}$, that is an indication of a past Real Time value and an indication of the past instance at which it was valid. According to the second embodiment described above, the payload of the Link Manager Message would contain $\{ j', RT(j') \}$, that is an indication of a future Real Time value and an indication of the future instance at which it will be valid.

The Real Time value transmitted in message 22 or 24 may have many different formats. If the format is predetermined or fixed no indication of the format type is needed. However, if the format may vary, a format flag may also need to be included within the message to identify the format of the Real

Time value sent. One possible format for the Real Time value is the Network Time Protocol format referenced in the RTP/RTCP specification (RFC 1889).

5 The controller 160 is arranged to read and/or write to the RT clock 190 and it is provided with the clock signal 159 and the offset value which are added to make the Bluetooth clock.

10 The intervals of the Bluetooth clock are predetermined and fixed. The interval between the beginning of adjacent slots is $625\ \mu\text{s}$ and the interval between the beginning of adjacent frames is 1.25ms. An instance for the Bluetooth clock is preferably at the beginning of each frame.

When operating as a transmitter in accordance with the first embodiment, the controller 160 at an instance i in the Bluetooth clock reads the Real Time
15 clock 190 and then controls the packetiser 42 to produce the message 22. The message 22 will have as its Access Code 134 the Master ID, a header 136 indicates that the packet contains transceiver control information and may identify the message as a particular type of Link Manager Message and the payload contains an indication of a past Real Time value and an indication of
20 the past instance at which it was valid.

When operating as a transmitter in accordance with the second embodiment, the controller 160 at an instance i in the Bluetooth clock reads the Real Time clock 190. It then calculates the interval T between instance i and j' and
25 controls the packetiser 42 to produce the message 22. The message 22 will have as its Access Code 134 the Master ID, a header 136 indicates that the packet contains transceiver control information and may identify the message as a particular type of Link Manager Message and the payload contains an indication of a future Real Time value and an indication of the future instance
30 at which it will be valid.

- When operating as a receiver in accordance with the first embodiment, the header decoder 154 provides the payload of the message 22 to the controller. The controller obtains the indication of the past instance i and the indication of past Real Time value $RT(i)$. The controller then calculates the interval T
- 5 between the past instance i and a future instance j , and determines the expected Real Time value RT at instance j . At the instance j the expected Real Time value becomes the current Real Time value RT and may be written to RT clock 190.
- 10 When operating as a receiver in accordance with the second embodiment, the header decoder 154 provides the payload of the message 22 to the controller. The controller obtains the indication of the future instance j' and the indication of the future Real Time value RT' . At the instance j' the received Real Time value RT' becomes the current Real Time value RT and may be written to RT
- 15 clock 190.

The invention when implemented in Bluetooth devices reuses the existing Link Level Synchronisation used for FFH. The transmission and reception of messages occur at instances of the Bluetooth clock. The receiver 2 illustrated

20 in Figure 1 may be a Bluetooth Master or Slave which remains active in low power mode. The Real Time clocks 4 and 10 are separate from the Bluetooth chip which has an interface for reading/writing a Real Time clock. The controller 160 is controllable through a command to initiate Real Time synchronisation with another device. The controller may access a Real Time

25 clock synchronously with an instance of the Bluetooth Clock and then asynchronously communicate with other devices to cause them to synchronise to that Real Time clock. Alternatively, the controller of a receiver 6 may send a request message requesting that its local Real Time clock is resynchronised, in which case the controller of transmitter 2 may access a

30 Real Time clock synchronously with an instance of the Bluetooth Clock and then communicate with the receiver 6 to cause it to synchronise to that Real

Time clock. In either case, such communication is preferably in the next available time slot for transmission.

- Although the transmission and reception of messages 22 and 24 have been dealt with separately, it should be appreciated that a transceiver may be able to read a RT clock value and send the messages to provide a Real Time clock value and/or receive the messages to acquire a current Real Time clock value.
- 10 Although first and second embodiments have been presented separately, it is envisioned that a receiver, transmitter or transceiver may operate in accordance with one or both of the embodiments and may be controlled to selectively operate in accordance with a particular embodiment.
- 15 Although the invention has been primarily described with reference to a point to point communication system as shown in Figure 1 it also find application in a point to multi-point communication system where the messages 22, 24 are broadcast

Claims

1. A **transmitter** for transmitting in a network comprising the transmitter and at least one receiver wherein the transmitter is arranged to synchronise to a common time reference having distinguishable instances, comprising:
5 means for reading a real time clock at an identified instance of the common time reference; and
means for transmitting an identification of the real time clock value for a first instance and an identification of the first instance.
- 10 2. A transmitter as claimed in any preceding claim further comprising means for calculating the real time clock value at the first instance by adding the time difference between the first instance and the identified instance to the real time clock value at the identified instance to obtain the real time clock value
15 for the first instance.
3. A transmitter as claimed in claim 1 or 2 wherein the first instance is in the past at the moment of transmission.
- 20 4. A transmitter as claimed in claim 1 or 2 wherein the first instance is in the future at the moment of transmission.
5. A transmitter as claimed in claim 1, 2 or 3 wherein the identified instance and the first instance are one and the same.
- 25 6. A transmitter as claimed in any preceding claim further comprising a synchronisation controller for maintaining the common time reference.
7. A transmitter as claimed in any preceding claim, arranged to communicate
30 in accordance with the Bluetooth Standard, wherein Link Level synchronisation provides the common time reference.

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8. A transmitter as claimed in any preceding claim, arranged to communicate in accordance with the Bluetooth Standard, wherein the identification of the real time clock value and the identification of the first instance are transmitted as a Link Manager Message.

5

9. A transmitter as claimed in any preceding claim, arranged to communicate in accordance with the Bluetooth Standard, wherein the instances of the common time reference are synchronous with the frequency hopping of the network.

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10. A transmitter as claimed in any preceding claim wherein the first instance is identified by using a frame/slot number.

11. A transmitter as claimed in claim 10 wherein the occurrence of the instance within the identified slot/frame is predetermined.

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12. A transmitter as claimed in claim 11 wherein occurrence of the instance within the identified slot/frame is determined by the transmission of a message.

20

13. A transmitter as claimed in any preceding claim further comprising an interface for connection to a Real Time Clock or Real Time application.

14. A transmitter as claimed in any preceding claim arranged for asynchronous transmission of the identification of the real clock value and of the identification of the first instance.

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15. A transmitter substantially as hereinbefore described and/or as shown in the accompanying Figures.

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16. A media device such as a speaker, microphone, screen, camera or computer comprising a transmitter as claimed in any preceding claim.

17. A **receiver** for receiving in a network comprising at least the receiver and a transmitter wherein the receiver is arranged to synchronise to a common time reference having distinguishable instances comprising:
means for receiving a transmitted identification of a real time clock value and
5 an identification of a first instance;
and means for determining a real time clock value, current at a second instance from the received identification of a real time clock value and the received identification of a first instance.
- 10 18. A receiver as claimed in claim 17, wherein the real time clock value is the received value, if necessary, corrected in accordance with the time difference between the first and second instances.
- 15 19. A receiver as claimed in claim 17 or 18, wherein the first instance is in the past at the moment of reception.
- 20 20. A receiver as claimed in claim 17, 18 or 19, wherein the real time clock value determination is by calculation in which the time difference between the second and first instances is added to the received value of the real time clock.
21. A receiver as claimed in claim 17 or 18, wherein the first instance is in the future at the moment of reception.
- 25 22. A receiver as claimed in claim 17, 18 or 21, wherein the means for determining determines that the current real time clock value is the received value when the second instance of the common time reference occurs, the second and first instances being one and the same.
- 30 23. A receiver as claimed in any one of claims 17 to 22, further comprising a synchronisation controller for maintaining the common time reference.

24. A receiver as claimed in claim 23 wherein the synchronisation controller comprises correlation means for identifying access codes preceding the payload of data packets.
- 5 25. A receiver as claimed in claim 24 wherein the synchronisation to the common time reference is updated as each packet is received .
26. A receiver as claimed in any one of claims 23 to 25, wherein the synchronisation controller provides bit- level synchronisation of the common
10 time reference.
27. A receiver as claimed in any one of claims 17 to 26, arranged to communicate in accordance with the Bluetooth Standard, wherein Link Level synchronisation provides the common time reference.
15
28. A receiver as claimed in any one of claims 17 to 22, arranged to communicate in accordance with the Bluetooth Standard, wherein the identification of the real time clock value and the identification of the first instance are transmitted as a Link Manager Message.
20
29. A receiver as claimed in any one of claims 17 to 28, arranged to communicate in accordance with the Bluetooth Standard, wherein the first instance is identified by using a frame/slot number.
- 25 30. A receiver as claimed in claim 29 wherein the occurrence of the instance within the identified slot/frame is predetermined.
31. A receiver as claimed in claim 29 wherein occurrence of the instance within the identified slot/frame is determined by the reception of a message.
30
32. A receiver as claimed in any one of claims 17 to 31, further comprising an interface for connection to a Real Time Clock or Real Time application.

33. A receiver as claimed in any one of claims 17 to 32 arranged for asynchronous transmission of the identification of the real clock value and of the identification of the first instance.

5 34. A receiver substantially as hereinbefore described and/or as shown in the accompanying Figures.

35. A media device such as a speaker, microphone, screen, camera or computer comprising a receiver as claimed in any one of claims 17 to 34.

10

36. A **transceiver** for operating in a network wherein the transceiver is arranged to synchronise to a time reference common to the network having distinguishable instances comprising:

means for reading a real time clock at an identified local instance of the common time reference; and

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means for transmitting an identification of the local real time clock value of a first instance and an identification of the local first instance; and additionally comprising

means for receiving a transmitted identification of a distal real time clock value and an identification of a distal first instance;

20

and means for determining, a distal real time clock value current at a local second instance of the common time reference.

37. A **transceiver** for operating in a network wherein the transceiver is arranged to synchronise to a time reference common to the network having distinguishable instances comprising:

25

means for reading a real time clock at an identified local instance of the common time reference; and

means for transmitting an identification of the local real time clock value of a first instance and an identification of the local first instance; and additionally comprising

30

24

means for receiving a transmitted identification of a distal real time clock value and an identification of a distal first instance;

and means for determining, a distal real time clock value current at a local second instance by adding the time difference between the received distal first instance and the second local instance to the received distal real time clock value.

38. A **transceiver** for operating in a network wherein the transceiver is arranged to synchronise to a time reference common to the network having distinguishable instances comprising:

means for reading a local real time clock at an identified local instance of the common time reference; and

means for calculating the local real time clock value at a first local instance by adding the time difference between the first local instance and the identified local instance to the local real time clock value at the identified instance to obtain the local real time clock value for the first instance and

means for transmitting an identification of the local real time clock value of a first instance and an identification of the local first instance; and additionally comprising

means for receiving a transmitted identification of a distal real time clock value and an identification of a distal instance;

and means for determining that the current distal real time clock value is the received distal real time clock value when the distal instance of the common time reference occurs locally.

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39. A **transceiver** for operating in a network wherein the transceiver is arranged to synchronise to a time reference common to the network having distinguishable instances comprising:

means for reading or writing a real time clock at an identified instance of the common time reference;

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means for transmitting an identification of the real time clock value of a first instance and an identification of the first instance; and additionally comprising means for receiving a transmitted identification of a real time clock value and an identification of a first instance.

5

40. A transceiver substantially as hereinbefore described and/or as shown in the Figures.

41. A **method** of providing real time clock information from a transmitter device to a receiver device

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comprising :

synchronising the transmitter device to a time reference having distinguishable instances shared in common with the transmitter and receiver obtaining a real time clock value at an identified instance of the common time

15

reference and

transmitting an identification of the real time clock value for a first instance and an identification of the first instance.

42. A **method** of receiving real time clock information transmitted from a transmitter device to a receiver device

20

comprising :

synchronising the receiver device to a time reference having distinguishable instances shared in common with the transmitter and receiver;

receiving a transmitted identification of a real time clock value and an identification of a first instance of the common reference; and

25

determining a real time clock value current at a second instance of the common time reference, corresponding to the received real time clock value corrected in accordance with the time difference between the first and second instances, if any.

30

43. A **network** comprising a transmitter device and at least one receiver device wherein the transmitter and receiver are synchronised to a common time reference having distinguishable instances such that when an instance is measurable at one device there is simultaneously an identifiably
5 corresponding instance measurable at the other device, the transmitter comprising:
means for reading a real time clock at an identified instance of the common time reference; and
means for transmitting an identification of the real time clock value for a first
10 instance and an identification of the first instance,
and the receiver comprising:
means for receiving the transmitted identification of the real time clock value at the first instance and the identification of the first instance;
and means for determining, at a second instance, a current real time clock
15 value .

44. A network substantially as hereinbefore described and/or as shown in the accompanying Figures.

1 / 6

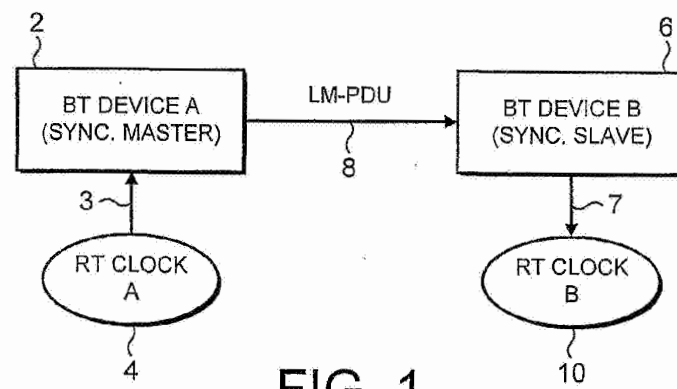
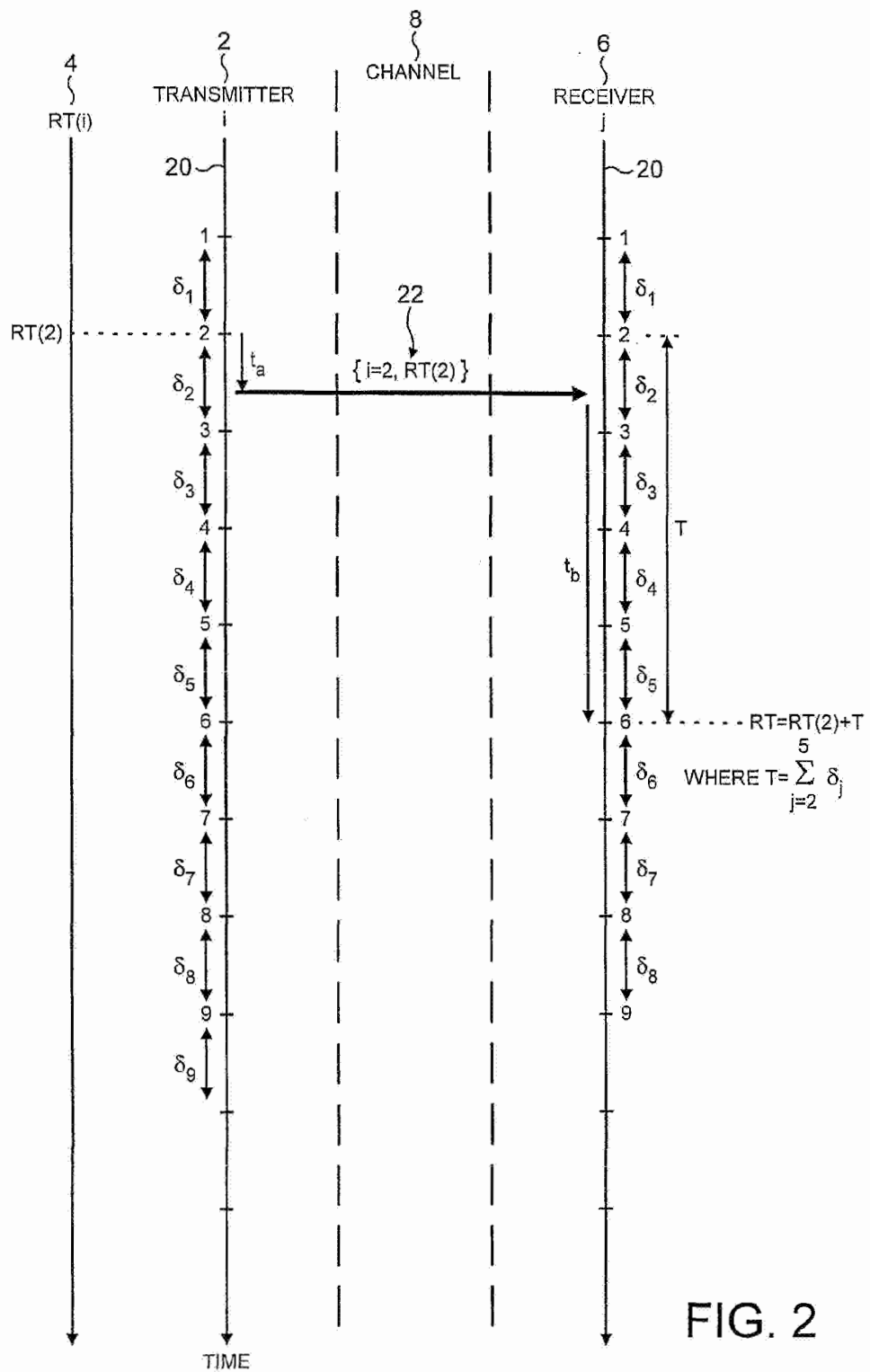


FIG. 1

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3 / 6

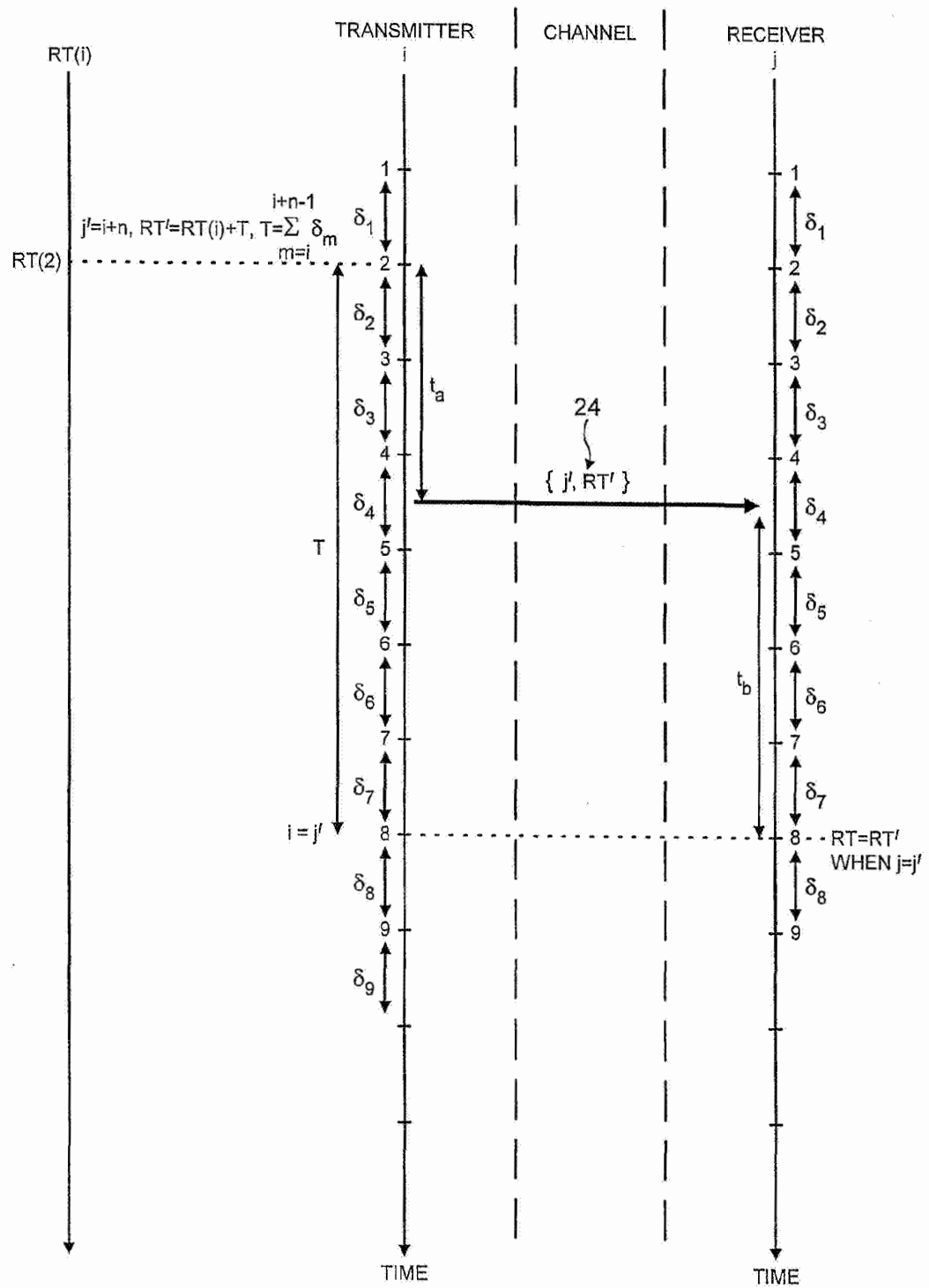


FIG. 3

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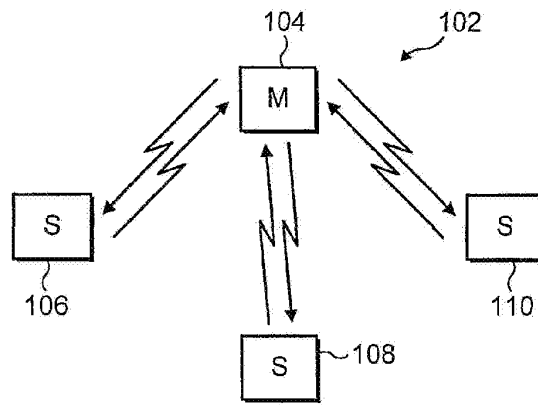


FIG. 4

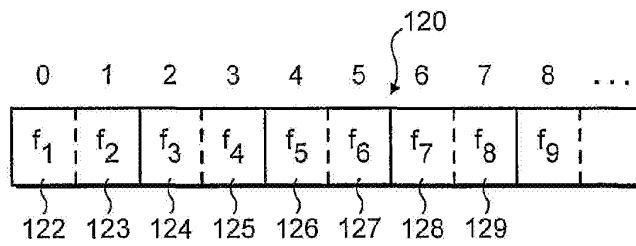


FIG. 5

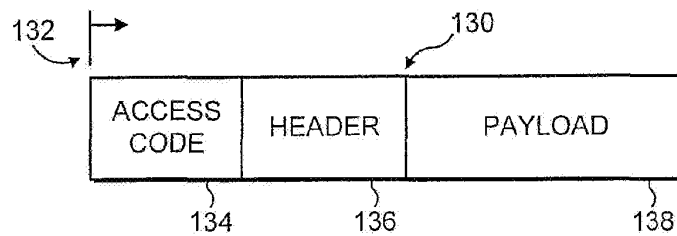


FIG. 6

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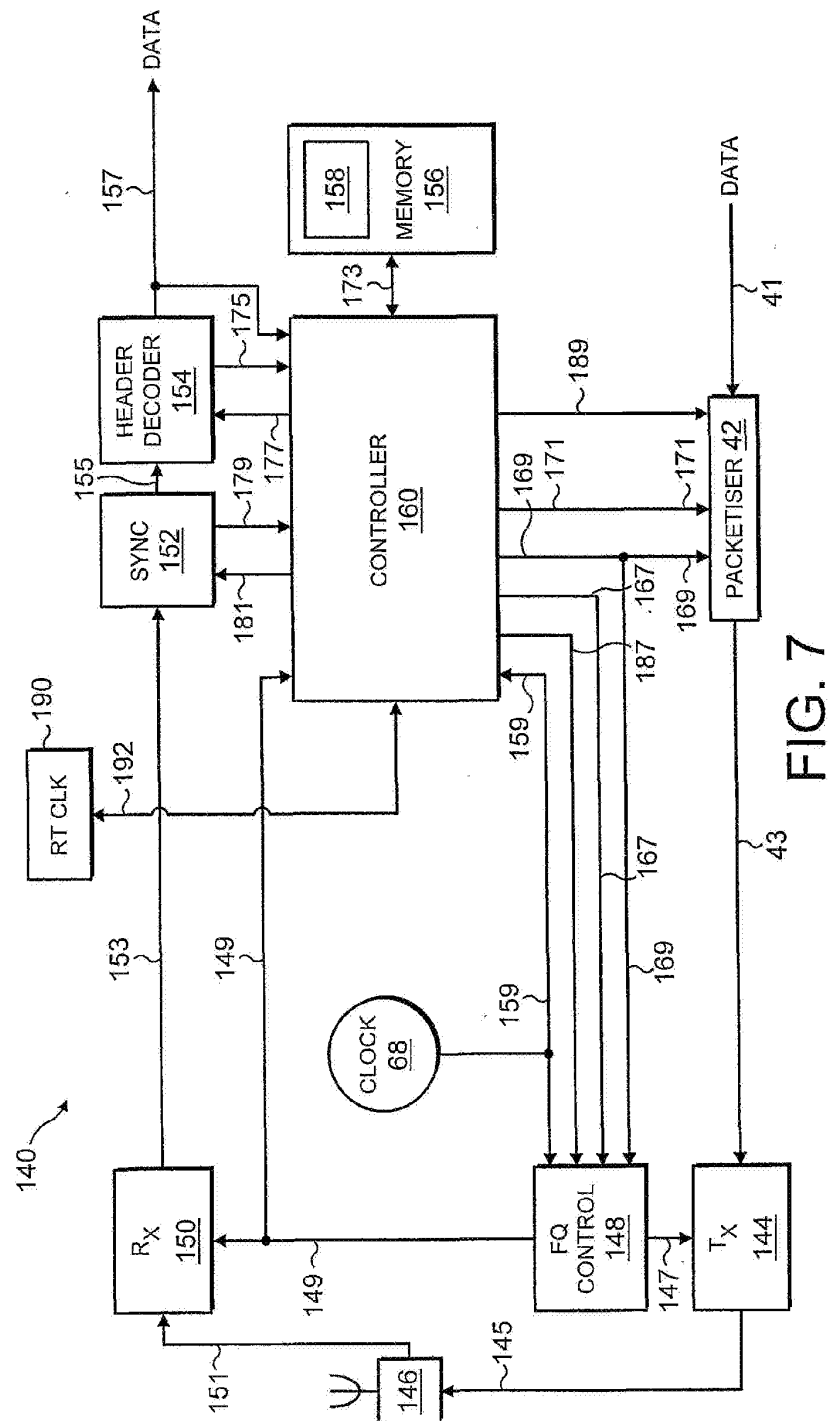


FIG. 7

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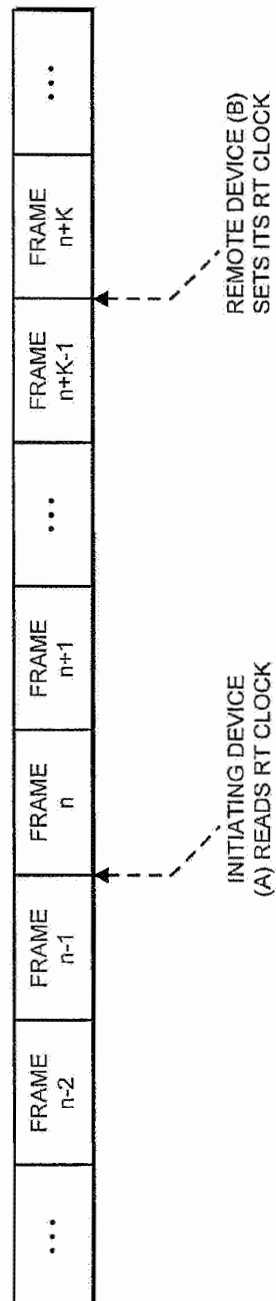


FIG. 8

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 01/06675

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04J3/06

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 7 H04J G06F H04B

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	WO 00 38361 A (ERICSSON TELEFON AB L M) 29 June 2000 (2000-06-29) page 5, line 16 -page 9, line 2 figures 2, 4A	1, 17, 36-39, 41-43
A	US 4 530 091 A (CROCKETT GARY B) 16 July 1985 (1985-07-16) column 9, line 34 -column 10, line 57	1, 17, 36-39, 41-43

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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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.

A document member of the same patent family

Date of the actual completion of the international search

12 October 2001

Date of mailing of the international search report

18/10/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

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INTERNATIONAL SEARCH REPORT

Information on patent family members

In tional Application No
PCT/EP 01/06675

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0038361	A	29-06-2000	AU 3093700 A EP 1142176 A2 WO 0038361 A2	12-07-2000 10-10-2001 29-06-2000
US 4530091	A	16-07-1985	CA 1211850 A1 DE 3377817 D1 EP 0148179 A1 WO 8500441 A1	23-09-1986 29-09-1988 17-07-1985 31-01-1985

Form PCT/ISA/210 (patent family annex) (July 1992)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
17 July 2003 (17.07.2003)

PCT

(10) International Publication Number
WO 03/058965 A1

(51) International Patent Classification⁷: **H04N 7/14**, 7/15

(21) International Application Number: PCT/US02/22757

(22) International Filing Date: 18 July 2002 (18.07.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/034,355 27 December 2001 (27.12.2001) US

(71) Applicant: **DIGEO, INC.** [US/US]; 8815 122nd Avenue
NE, Kirkland, WA 98033 (US).

(72) Inventor: **BILLMAIER, James**; 22322 NE 157th Street,
Woodinville, WA 98072 (US).

(74) Agent: **CHRISTENSEN, Kory**; Steel Rives LLP, 201 S.
Main Street, Suite 1100, Salt Lake City, UT 84111 (US).

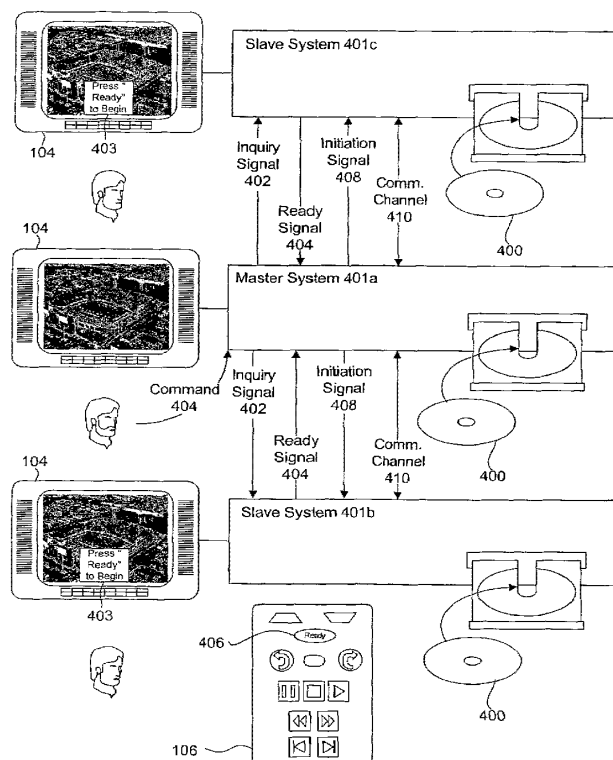
(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report

[Continued on next page]

(54) Title: CONFERENCING WITH SYNCHRONOUS PRESENTATION OF MEDIA PROGRAMS



(57) Abstract: A plurality of entertainment systems linked by network may synchronously present a media program, such as an audio or video program, while providing two-way audio and/or video conferencing. Each entertainment system may independently receive or access a copy of the media program. The synchronous presentation may be initiated in response to a master system (401a) receiving a predetermined number of ready signals (404) from one or more slave systems (401c, 401b). The master system may further control synchronous presentation of the media program (e.g., pause or fast forward within the media program) by transmitting control signals to each participating slave system.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

**METHOD AND SYSTEM FOR SYNCHRONOUSLY PRESENTING
5 MEDIA PROGRAMS ON MULTIPLE ENTERTAINMENT SYSTEMS**

BACKGROUND

FIELD OF THE INVENTION

The present invention relates generally to entertainment systems. More
10 specifically, the present invention relates to a method and system for
synchronously presenting media programs on multiple entertainment systems.

DESCRIPTION OF RELATED BACKGROUND ART

The viewing of television programs or other forms of media, whether live or
pre-recorded, is typically enhanced by watching such programs in the company
15 of others. Certain programs are more frequently viewed by groups of people.
For instance, sporting events, movies, season premieres, political debates, and
other significant programs are typically viewed with family and friends.

However, being physically present in the same room is often inconvenient
due to geographical distances, conflicting schedules, and the like. In such
20 instances, viewers may watch a program individually and then meet at a later
time to discuss the program. Alternatively, viewers may teleconference during an
ongoing program for a more interactive discourse. Unfortunately, conventional
teleconferencing presents a number of disadvantages.

For example, extended teleconferencing while watching a television
25 program may deprive other household members of the use of a telephone.
Moreover, a separate telephone receiver is typically required for each party,
making teleconferencing between groups of people difficult or expensive.

Thus, it would be an advancement in the art to provide a convenient
technique for conversing during presentation of a television broadcast or other
30 media program with one or more other viewers at remote physical locations. It
would be a further advancement in the art to provide a cost-effective system for
audio and video conferencing which provides minimal disruption of the program
being viewed.

Conventionally, in order to watch a live broadcast, viewers had little choice but to gather at a time appointed by the broadcaster. Today, however, personal video recorders (PVRs), such as TiVo®, may start recording a program when it is broadcast, but allow viewers to watch the program at any convenient time.

5 Likewise, many programs are now available on physical media, such as digital versatile disks (DVDs), which allow people to watch programs at their convenience.

Unfortunately, no system exists for synchronizing the presentation of media programs on multiple PVRs, DVD players, or the like, at remote locations.

10 Even if users start watching a media program at an agreed upon time, presentation may commence at different times because the users' clocks may be unsynchronized. Moreover, even if presentation begins at the same time, there is no conventional mechanism for synchronized pausing, restarting, or otherwise navigating the media program.

15 As a consequence, it would be an advancement in the art to provide a system and method for synchronously presenting media programs on different entertainment systems at remote locations. It would be a further advancement in the art to provide a system and method for establishing audio and/or video communication between users viewing a synchronously presented media

20 program. It would also be an advancement in the art to provide a system and method for synchronously pausing, restarting, or otherwise navigating the media program.

BRIEF DESCRIPTION OF THE DRAWINGS

25 Non-limiting and non-exhaustive embodiments of the invention are described with reference to the figures, in which:

FIG. 1 is a block diagram of a communication system;

FIG. 2 is an illustration of an interactive television (ITV) system;

FIG. 3 is a block diagram of physical components of a set top box (STB);

30 FIG. 4 is a dataflow diagram illustrating synchronous presentation of a media program;

FIG. 5 is a timeline of communication between a master and a plurality of slave entertainment systems in an embodiment of this invention;

FIG. 6 is a dataflow diagram illustrating transmission of various control signals from a master to a plurality of slave entertainment systems;

FIG. 7 is a logical block diagram illustrating a system for synchronously playing a media program; and

5 FIG. 8 is a flowchart of a method of synchronously presenting a media program.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 The present invention solves the foregoing problems and disadvantages by providing a system and method for synchronously presenting a media program on a plurality of entertainment systems. As used herein, "media program" may include any type of audio and/or video program, non-exhaustive embodiments of which include television programs, movies, concerts, streaming video programs, streaming audio programs, and the like.

15 The media program may be provided in advance to each of the entertainment systems on physical media, e.g., DVD, CD, etc. Alternatively, the media program may be automatically or manually recorded in advance by each of the entertainment systems. For example, the entertainment systems may be embodied as personal video recorders (PVRs), which record the media program
20 at an appointed time. In still another embodiment, the media program may be downloaded by each of the entertainment systems in real time from a server, such as a video-on-demand (VoD) server.

 In one implementation, one of the entertainment systems is designated as a "master" system, while each of the other systems is designated as a "slave"
25 system. The designation may be made by one of the users of the entertainment systems. For example, one user may designate his or her system as a master system.

 In one embodiment, the master system receives a "ready" signal from one or more of the slave systems. The ready signal indicates that the user of the
30 slave system is ready to begin watching the media program. For example, each user of a slave system may press an appropriate button on a remote control unit to indicate that the user is ready to begin the presentation.

When a predetermined number of ready signals have been received, the master entertainment system transmits an initiation signal to each slave system that is ready to present the media program. Alternatively, when a predetermined number of ready signals are received by an established time or from particular
5 slave systems, an initiation signal may be transmitted to participating slave systems.

The initiation signal initiates synchronous presentation of the media program on the slave systems to which it is transmitted. In one embodiment, the master entertainment system also presents the media program in unison with the
10 slave systems.

Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one
15 embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment.

Furthermore, the described features, structures, or characteristics may be combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided, such as examples of
20 programming, software modules, user selections, network transactions, database queries, database structures, etc., to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention can be practiced without one or more of the specific details, or with other methods, components, materials, etc. In other instances,
25 well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

Referring now to FIG. 1, there is shown a communication system 100 according to an embodiment of the invention. In one implementation, the system 100 includes a broadband communication network 101, such as a cable
30 television network or direct satellite broadcast (DBS) network, although other networks are possible.

The system 100 may include a plurality of set top boxes (STBs) 102 located, for instance, at customer homes or offices. Generally, an STB 102 is a

consumer electronics device that serves as a gateway between a customer's television 104 and the network 101. An STB 102 may be embodied more generally as a personal computer, an advanced television 104 with STB-like functionality, or another type of customer premises equipment (CPE). Thus, the
5 term "STB" should not be limited to cable or satellite equipment.

The following specification describes video communication between one or more STBs 102. However, those skilled in the art will recognize that other types of video communication devices may be used, such as dedicated videophones, personal computers, PDAs, etc.

10 An STB 102 receives encoded television signals and other information from the network 101 and decodes the same for display on the television 104 or other display device, such as a computer monitor. As its name implies, an STB 102 is typically located on top of, or in close proximity to, the television 104.

Each STB 102 may be distinguished from other network components by a
15 unique identifier, number, code, or address, such as an Internet Protocol (IP) address (e.g., IPv6), a Media Access Control (MAC) address, or the like. Thus, video signals and other information may be transmitted from the network 101 to a specific STB 102 by addressing the same with the correct address, after which the network 101 routes the transmission to its destination using conventional
20 techniques.

A remote control 106 is provided, in one configuration, for convenient remote operation of the STB 102 and the television 104. The remote control 106 may use infrared (IR), radio frequency (RF), or other wireless technologies to transmit control signals to the STB 102 and the television 104. Other remote
25 control devices are also contemplated, such as wired or wireless mice (not shown).

Additionally, a keyboard 108 (either wireless or wired) is provided, in one embodiment, to allow a user to rapidly enter text information into the STB 102. Such text information may be used for e-mail, instant messaging (e.g. text-based
30 chat), or the like. In various embodiments, the keyboard 108 may use IR, RF, or other wireless technologies to transmit keystroke data to the STB 102.

Each STB 102 may be coupled to the network 101 via a broadcast center 110. In the context of a cable television network, a broadcast center 110 is often

referred to as a "head-end", which is generally a centrally-located facility within a community where television programming is received from a local cable TV satellite downlink or other source and packaged together for transmission to customer homes. In one configuration, a head-end also functions as a Central
5 Office (CO) in the telecommunication industry, routing video signals and other data to and from the various STBs 102 serviced thereby.

A broadcast center 110 may also be embodied as a satellite broadcast center within a direct broadcast satellite (DBS) system. A DBS system may utilize a small 18-inch satellite dish, which is an antenna for receiving a satellite
10 broadcast signal. Each STB 102 may include a digital integrated receiver/decoder (IRD), which separates each channel, and decompresses and translates the digital signal from the satellite dish to be displayed by the television 104.

Programming for a DBS system may be distributed, for example, by
15 multiple high-power satellites in geosynchronous orbit, each with multiple transponders. Compression (e.g., MPEG) may be used to increase the amount of programming that can be transmitted in the available bandwidth.

The broadcast centers 110 may be used to gather programming content, ensure its digital quality, and uplink the signal to the satellites. Programming may
20 be received by the broadcast centers 110 from content providers (CNN®, ESPN®, HBO®, TBS®, etc.) via satellite, fiber optic cable and/or special digital tape. Satellite-delivered programming is typically immediately digitized, encrypted and uplinked to the orbiting satellites. The satellites retransmit the signal back down to every earth-station, e.g., every compatible DBS system receiver dish at
25 customers' homes and businesses.

Some broadcast programs may be recorded on digital videotape in the broadcast center 110 to be broadcast later. Before any recorded programs are viewed by customers, technicians may use post-production equipment to view and analyze each tape to ensure audio and video quality. Tapes may then be
30 loaded into a robotic tape handling systems, and playback may be triggered by a computerized signal sent from a broadcast automation system. Back-up videotape playback equipment may ensure uninterrupted transmission at all times.

Regardless of the nature of the network 101, the broadcast centers 110 may be coupled directly to one another or through the network 101. In alternative embodiments, broadcast centers 110 may be connected via a separate network, one particular example of which is the Internet 112. The Internet 112 is a
5 "network of networks" and is well known to those skilled in the art. Communication over the Internet 112 is accomplished using standard protocols, such as TCP/IP (Transmission Control Protocol/Internet Protocol) and the like.

A broadcast center 110 may receive television programming for distribution to the STBs 102 from one or more television programming sources
10 114 coupled to the network 101. Preferably, television programs are distributed in an encoded format, such as MPEG (Moving Picture Experts Group).

MPEG is a form of predictive coding. In predictive coding, how and how much a next image changes from a previous one is calculated, and codes are transmitted indicating the difference between images, rather than the image itself.
15 In MPEG, the images or frames in a sequence are typically classified into three types: I frames, P frames, and B frames. An I frame (or intrapicture) is an image that is coded without reference to any other images. A P frame (or predicted picture) is an image that is coded relative to one other image. A B frame (or bi-directional picture) is an image that is derived from two other images, one before
20 and one after.

Various MPEG standards are known, such as MPEG-2, MPEG-4, MPEG-7, and the like. Thus, the term "MPEG," as used herein, contemplates all MPEG standards. Moreover, other video encoding/compression standards exist other than MPEG, such as JPEG, JPEG-LS, H.261, and H.263. Accordingly, the
25 invention should not be construed as being limited only to MPEG.

Broadcast centers 110 may be used to enable audio and video communications between STBs 102. Transmission between broadcast centers 110 may occur (i) via a direct peer-to-peer connection between broadcast centers 110, (ii) upstream from a first broadcast center 110 to the network 101 and then
30 downstream to a second broadcast center 110, or (iii) via the Internet 112. For instance, a first STB 102 may send a video transmission upstream to a first broadcast center 110, then to a second broadcast center 110, and finally downstream to a second STB 102.

Of course, the communication system 100 illustrated in FIG. 1 is merely exemplary, and other types of devices and networks may be used within the scope of the invention.

Referring now to FIG. 2, there is shown an interactive television (ITV) system 200 according to an embodiment of the invention. As depicted, the system 200 may include an STB 102, a television 104 (or other display device), a remote control 106, and, in certain configurations, a keyboard 108.

The remote control 106 is provided for convenient remote operation of the STB 102 and the television 104. In one configuration, the remote control 106 includes a wireless transmitter 202 for transmitting control signals (and possibly audio/video data) to a wireless receiver 203 within the STB 102 and/or the television 104. In certain embodiments, the remote control 106 includes a wireless receiver 204 for receiving signals from a wireless transmitter 205 within the STB 102. Operational details regarding the wireless transmitters 202, 205 and wireless receivers 203, 204 are generally well known to those of skill in the art.

The remote control 106 preferably includes a number of buttons or other similar controls. For instance, the remote control 106 may include a power button 206, an up arrow button 208, a down arrow button 210, a left arrow button 212, a right arrow button 214, a "Select" button 216, an "OK" button 218, channel adjustment buttons 220, volume adjustment buttons 222, alphanumeric buttons 224, a "Help" button 226, and the like.

In one embodiment, the remote control 106 includes a microphone 242 for capturing audio signals. The captured audio signals may be transmitted to the STB 102 via the wireless transmitter 202. In addition, the remote control 106 may include a speaker 244 for generating audible output from audio signals received from the STB 102 via the wireless receiver 204. In alternative embodiments, as shown in FIG. 3, the microphone 242 and/or speaker 244 may be integrated with the STB 102.

In certain embodiments, the remote control 106 further includes a video camera 246, such as a CCD (charge-coupled device) digital video camera, for capturing video signals. In one implementation, the video camera 246 is in electrical communication with the wireless transmitter 202 for sending the

captured video signals to the STB 102. Like the microphone 242 and speaker 244, the video camera 246 may be integrated with the STB 102, or attached to the STB 102, as in the depicted embodiment.

5 The various components of the remote control 106 may be positioned in different locations for functionality and ergonomics. For example, as shown in FIG. 2, the speaker 244 may be positioned near the "top" of the remote control 106 (when viewed from the perspective of FIG. 2) and the microphone 242 may be positioned at the "bottom" of the remote control 106. Thus, in one embodiment, a user may conveniently position the speaker 244 near the user's
10 ear and the microphone 242 near the user's mouth in order to operate the remote control 106 in the manner of a telephone. Of course, the remote control 106 may be embodied as a standard remote control, without audio/video capture capability.

The optional keyboard 108 facilitates rapid composition of text messages.
15 The keyboard 108 includes a plurality of standard alphanumeric keys 236. In one configuration, the keyboard 108 includes a wireless transmitter (not shown), similar or identical to the wireless transmitter 202 of the remote control 106. The wireless transmitter transmits keystroke data from the keyboard 108 to the STB 102. Additionally, the keyboard 108 may include one or more of the buttons
20 illustrated on the remote control 106.

Alternatively, or in addition, a hands-free headset 248 may be coupled to the remote control 106 or the keyboard 108. The headset 248 may be coupled using a standard headset jack 250. The headset 248 may include a microphone 242 and/or speaker 244. Such a headset 248 may be used to reduce audio
25 interference from the television 104 in order to improve audio quality and to provide the convenience of hands-free operation.

Referring now to FIG. 3, there is shown a block diagram of physical components of an STB 102 according to an embodiment of the invention. As noted above, the STB 102 includes a wireless receiver 203 for receiving control
30 signals sent by the wireless transmitter 202 in the remote control 106 and a wireless transmitter 205 for transmitting signals (such as audio/video signals) to the wireless receiver 204 in the remote control 106.

The STB 102 also includes, in one implementation, a network interface 302 for communicating with the network 101 via the broadcast center 110. The interface 302 may include conventional circuitry for receiving, demodulating, and demultiplexing MPEG packets. The interface 302 may also include conventional
5 modem circuitry for sending or receiving data. For example, the interface 302 may conform to the DOCSIS (Data Over Cable Service Interface Specification) or DAVIC (Digital Audio-Visual Council) cable modem standards.

In one configuration, one or more frequency bands (for example, from 5 to 30 MHz) may be reserved for upstream transmission. Digital modulation (for
10 example, quadrature amplitude modulation or vestigial sideband modulation) may be used to send digital signals in the upstream transmission. Of course, upstream transmission may be accomplished differently for different networks 101. Alternative ways to accomplish upstream transmission include using a back channel transmission, which is typically sent via an analog telephone line, ISDN,
15 DSL, or other techniques.

The STB 102 also preferably includes a codec (encoder/decoder) 304, which serves to encode audio/video signals into a network-compatible data stream for transmission over the network 101. The codec 304 also serves to decode a network-compatible data stream received from the network 101. The
20 codec 304 may be implemented in hardware and/or software. Moreover, the codec 304 may use various standard algorithms, such as MPEG and/or Voice over IP (VoIP), for encoding and decoding.

The STB 102 further includes a memory device 306, such as a random access memory (RAM), for storing temporary data. Similarly, a read-only
25 memory (ROM) may be provided for storing more permanent data, such as fixed code and configuration information.

In one embodiment, an audio/video (A/V) controller 308 is provided for converting digital audio/video signals into analog signals for playback/display on the television 104. The A/V controller 308 may be implemented using one or
30 more physical devices, such as separate graphics and sound controllers. The A/V controller 308 may include graphics hardware for performing bit-block transfers (bit-blits) and other graphical operations for displaying a graphical user interface (GUI) on the television 104.

In some implementations, the STB 102 may include a storage device 310, such as a hard disk drive or the like. The storage device 310 may be configured to store encoded incoming and outgoing video signals as well as television broadcasts and retrieve the same at a later time for display. The storage device
5 310 may be configured, in one embodiment, as a personal video recorder (PVR), enabling scheduled recording of television programs, pausing (buffering) live video, etc. The storage device 310 may also be used in various embodiments to store viewer preferences, parental lock settings, electronic program guide (EPG) data, passwords, e-mail messages, video messages, video greetings, and the
10 like. In one implementation, the storage device 310 also stores an operating system (OS) for the STB 102, such as Windows CE® or Linux®.

In one embodiment, a removable media storage device 310 may be provided, such as a digital versatile disk (DVD) drive, a CD-ROM drive, or the like. The STB 102 may further include standard circuitry and/or software for
15 presenting media programs read from removable media.

As noted above, the STB 102 may include, in certain embodiments, a microphone 242 and a speaker 244 for capturing and reproducing audio signals, respectively. The STB 102 may also include or be coupled to a video camera
20 246 for capturing video signals. These components may be included in lieu of or in addition to similar components in the remote control 106, keyboard 108, and/or television 104.

A CPU 312 controls the operation of the STB 102, including the other components thereof, which are coupled to the CPU 312 in one embodiment via a bus 314. The CPU 312 may be embodied as a microprocessor, a
25 microcontroller, a digital signal processor (DSP) or other device known in the art. For instance, the CPU 312 may be embodied as an Intel® x86 processor. As noted above, the CPU 312 may perform logical and arithmetic operations based on program code stored within the memory 306 or the storage device 310.

Of course, FIG. 3 illustrates only one possible configuration of an STB
30 102. Those skilled in the art will recognize that various other architectures and components may be provided within the scope of the invention. In addition, various standard components are not illustrated in order to avoid obscuring aspects of the invention.

Referring now to FIG. 4, a group of users at remote locations may desire to have a media program 400 synchronously presented on their respective entertainment systems 401 (e.g., interactive television systems 200, personal computers, mobile computing devices, etc.). As noted, a media program 400
5 may include any type of audio or video program, such as a concert, television show, movie, etc.

For instance, a group of friends may desire to synchronously view a football game previously recorded by each system 401. Further, the group members may desire to communicate with each other while watching the game
10 using teleconferencing hardware/software supplied with their systems 401.

The systems 401 may be in electrical communication via a network 101 (not shown), which may be used for audio/video communication, as well as for transmitting control signals between the systems 401 to synchronize presentation of the media program 400. Of course, a wide variety of networks 101, including
15 wireless technologies, may be used within the scope of the invention.

In one embodiment, each system 401 is provided with (or provided with access to) the media program 400 to be synchronously presented. The media program 400 may be provided in advance of presentation to the systems 401 in various ways. For example, as illustrated in FIG. 4, the media program 400 may
20 be provided on a removable storage medium, such as a digital versatile disk (DVD) or compact disc (CD). Alternatively, the media program 400 may be automatically pre-recorded by each system 401 from a broadcast medium, such as a cable television network or a direct satellite broadcast (DBS) network, or even off-the-air (OTA). Various systems are known for scheduled recording of
25 media programs 400, one example of which is a personal video recorder (PVR), such as Tivo®. Accordingly, the systems 401 may include PVR functionality.

In other embodiments, the media program 400 may be downloaded during presentation thereof from a server, such as a video-on-demand (VoD) server. The media program 400 need not be provided to each system 401 using the
30 same technique, and various other techniques may be employed not specifically mentioned here.

In the depicted embodiment, one of the systems 401 is designated as a "master" system (referred to herein as 401a), while each remaining system 401 is

designated as a "slave" system (referred to herein as 401b, 401c, etc.) In the depicted embodiment, only two slave systems, e.g., system 401b-c, are illustrated. Of course, any number of slave systems 401b-c may be provided within the scope of the invention.

5 The designation of a master system 401a may be made in any suitable manner. For example, in one embodiment, the designation is made by one of the users by issuing an appropriate command 404. The command may be entered using a remote control device 106 or keyboard 108 using standard techniques. In other embodiments, the master/slave designations may be pre-defined.

10 Once the master/slave designations are made, the master system 401a transmits a readiness inquiry signal 402 to each of the slave systems 401b-c. The inquiry signal 402 may be embodied in any suitable form depending on the hardware and software being used.

 In one embodiment, the inquiry signal 402 may include an indication of the
15 media program 400 to be presented (e.g., the Dallas v. Denver game), the name of the user of the master system 401a, the names of users of the slave systems 401b-c, a proposed starting time, a user-defined message, etc. In response to the inquiry signal 402, the slave system 401b-c prompts its user to indicate whether he or she is ready to begin the presentation (or whether he or she will be
20 ready at a proposed starting time). For instance, a prompt 403 may be displayed on a television 104 associated with the slave system 401b-c. The prompt 403 may ask the user to press a designated button, activate an on-screen control, or the like.

 In one embodiment, the master system 401a waits until a predetermined
25 number of ready signal(s) 404 are received at the master system 401a via the network 101. Like the readiness inquiry signal 402, the ready signal 404 may be embodied in any suitable form depending on the hardware and software in use. The ready signal 404 indicates that a user of the associated slave system 401b-c is ready for the synchronous presentation of the media program 400 to begin. A
30 ready signal 404 may be sent to the master system 401a in response to a user of a slave system 401b-c pressing a "ready" button or control 406 or the like.

 As stated above, in one configuration, the master system 401a may wait until a predetermined number of ready signals 404 have been received, or a

predetermined number of signals 404 have been received within or by an established time period. The predetermined number may be equal to the total number of slave systems 401b-c or be a subset thereof. Alternatively, the master system 401a may await receipt of a predetermined number of ready signals 404
5 from particular slave systems 401b-c. The predetermined number may be specified in response to a suitable user command.

Once the predetermined number of ready signals 404 has been received, the master system 401a transmits an initiation signal 408 to each slave system 401b-c from which a ready signal 404 has been received. In one embodiment,
10 the initiation signal 408 causes each slave system 401b-c to immediately begin to present the media program 400. For example, the initiation signal 408 may be a command to play a DVD on each slave system 401b-c. In alternative embodiments, the initiation signal 408 may cause each slave system 401b-c to begin presenting the media program 400 at a specified time (i.e. the master
15 system 401a may transmit a start time to each slave system 401b-c). For instance, a short time interval may be provided to compensate for network latency.

The initiation signals 408 transmitted to different slave systems 401b are not necessarily identical and may be transmitted at different times in view of
20 certain factors so that presentation is as close to synchronous as possible. It should be recognized that the term "synchronous," as used herein, does not require perfect or absolute synchronization. For example, presentation of the media program 400 may be "off" by a fraction of a second for certain systems 401, but still be considered to be effectively "synchronized" from the users'
25 perspectives.

In one embodiment, the master system 401a also begins to synchronously present the media program 400. For instance, the master system 401a may begin to present the media program 400 after transmitting the initiation signal 408. Alternatively, the master system 401a may wait until a predetermined time.

30 In one configuration, a communication channel 410 may be established between the master system 401a and the slave system 401b-c to enable users thereof to communicate during presentation of the media program 400 via a network 101. The communication channel 410 may enable various types of

communication, such as audio or video communication. Other types of communication are contemplated, such as instant messaging (e.g., text chat). These and other communication techniques and devices are known to those skilled in the art, and may use the various hardware and software components
5 illustrated in FIGs. 2 and 3.

In an alternative embodiment, the inquiry signal 402 may be transmitted from a server (e.g., a broadcast center 110) coupled to both the master and slave systems 401a-c through a network 101. Also, the ready signal 404 may be received at the server so that, for example, the master system 401a may be
10 turned off until the time for synchronous presentation arrives. The inquiry signal 402 may be transmitted, for instance, in response to a signal sent from the master system 401a to the server. Thereafter, synchronous presentation of the media program 400 may follow as a result of transmitting an initiation signal 408 from the server to both the slave and master systems 401a-c. In addition, in such
15 an embodiment, the server may also transmit the media program 400 to the master and slave systems 401a-c.

With reference to FIG. 5, a timeline 500 of a sequence of signals 402, 404, 408 for synchronous presentation of the media program 400 is illustrated. The timeline 500 views a sequence of events from the perspective of a master system
20 401a. In the depicted embodiment, synchronous presentation begins when the master system 401a receives a predetermined number of ready signals 404 (e.g., three signals in the depicted embodiment).

As shown, a number of inquiry signals 402 are transmitted from a master system 401a to various slave systems 401b-c slightly after 7:00 PM. Thereafter,
25 three ready signals 404a-c are received at the master system 401a at different times. When the third ready signal 404c is received, an initiation signal 408 is transmitted to each slave system 401b-c from which a ready signal 404a-c has been received. As explained above, the initiation signal 408 initiates synchronous presentation of the media program 400 on the slave systems 401b-
30 c. In one embodiment, synchronous presentation may also begin on the master system 401a.

As stated above, the predetermined number of ready signals 404 may be equal to the total number of slave systems 401b-c or a subset thereof.

Alternatively, the master system 401a may await receipt of ready signals 404 from a predetermined number of particular slave systems 401b-c.

Alternatively, when a predetermined number of ready signals 404a-c are received before an established time (e.g., 8:00 pm), an initiation signal 408 will be
5 transmitted at the established time. The established time could also include, for instance, a fixed period of time (e.g., five minutes) from transmission of an inquiry signal or signals 402. Naturally, the foregoing examples are illustrative, not limiting, of methods for determining when to transmit an initiation signal 408.

Referring now to FIG. 6, during synchronous presentation of the media
10 program 400, a master system 401a may control various aspects of the presentation of a media program 400. For example, in response to an appropriate command, synchronous presentation of the media program 400 may be synchronously paused or restarted. To do so, the master system 401a may transmit a restart or pause signal 602, 604 to each slave system 401b-e.

15 In one configuration, pausing or restarting may be initiated in response to activation of a restart or pause button or control 606, 608, for example, on a remote control 106. Naturally, controls 606, 608 may be otherwise configured (e.g., embodied as on-screen controls).

In one configuration, the controls 606, 608 may be activated by a user of
20 the master system 401a. Alternatively, the control 606, 608 may be activated by user of a slave system 401b-e and a corresponding request (e.g., to request a pause or restart) may be transmitted from the slave system 401b-e to the master system 401a. In one embodiment, the master system 401a, after receiving the requests, automatically transmits a restart or pause signal 602, 604 to each slave
25 system 401b-e. In another embodiment, approval of a user of the master system 401a is required prior to transmission of the control signal 602, 604 to the slave systems 401b-e.

In one embodiment, synchronous presentation of the media program 400 may also include synchronously navigating within the media program. Navigation
30 includes, for example, fast forwarding, rewinding, skipping forward or skipping backward within the media program. Skipping forward and skipping backward may include jumping to a next chapter or section marker within a DVD being presented.

In one embodiment, synchronous navigation may occur in response to activation of a rewind control (e.g., button or on-screen control) 610, fast forward control 612, skip-backward control 614, or skip-forward control 616 on a remote control 106 for the master system 401a. Following activation of the control 610, 5 612, 614, 616 corresponding navigation signals 618 may be transmitted to each slave system 401b-e. In one embodiment, the navigation signals 618 will result in synchronous navigation within the media program 400 among the slave systems 401b-e. As explained in connection with restarting and pausing, a user of a slave system 401b-c may in one embodiment, also control or request 10 synchronous navigation within the media program 400. Each of the signals discussed above 602, 604, 618 may be embodied in any suitable format according to the hardware and software in use.

With reference to FIG. 7, there is shown a logical block diagram of a system 700 for synchronously playing a media program 400 on multiple 15 entertainment systems 401a-c. The depicted logical components may be implemented using one or more of the physical components shown in FIG. 3. Additionally, or in the alternative, various logical components may be implemented as software modules stored in the memory 306 and/or storage device 310 and executed by the CPU 312. Those skilled in the art will recognize 20 that various illustrated components may be combined together or integrated with standard components in various configurations without departing from the scope or spirit of the invention.

As explained before, one entertainment system 401 may be designated as a master system 401a, and at least one other system may be designated as a 25 slave system 401b-c using any of the techniques described above.

In one embodiment, both the slave and master systems 401a-c may include a media interface component 702, 704 for receiving or accessing a copy of the media program 400. The media interface component 702, 704 may include, for example, a network interface 302 and suitable software for 30 downloading media programs 400 from a network 101, such as the Internet 112. The media interface component 702, 704 may also include a DVD drive for reading a DVD including the media program 400. As explained previously, the media program 400 may be received or accessed in a variety of different ways.

In one implementation, upon receipt of an appropriate command from a user of the master system 401a, a signal transmission component 706 may transmit an inquiry signal 402 to each slave system 401b-c. Thereafter, a signal reception component 708 in each slave system 401b-c may receive the inquiry signal 402.

In one implementation, in response to receipt of an inquiry signal 402, the display component 710 displays a prompt 403, as discussed in connection with FIG. 4. A display component 710 may include, for instance, an A/V controller 308 coupled to a television 104 and/or suitable software for displaying images on the television 104.

Thereafter, a slave system or systems 401b-c may each transmit a ready signal 404 to the master system 401a. As explained before, in one implementation, when a user activates a ready button 406 at a slave system 401b-c in response to the prompt 403, a ready signal 404 is transmitted from the associated slave system 401b-c to the master system 401a.

Thereafter, a signal reception component 712 within the master system 401a may receive each transmitted ready signal 404. A signal reception component 712 may include a network interface 302 and suitable software for receiving data. In response to receipt of a predetermined number 714 of ready signals 404, as discussed above, the presentation component 716, 718 may synchronously present the media program 400 on each slave system 401b-c from which a ready signal 404 has been received and, in one embodiment, on the master system 401a.

More particularly, in one implementation, in response to receipt of a predetermined number 714 of ready signals 404, a signal transmission component 706 may transmit an initiation signal 408 to each participating slave system 401b-c. Thereafter, in response to receipt of the initiation signal 408 at a signal reception component 708 of each slave system 401b-c, the media program 400 is synchronously presented at each participating slave system 401b-c. Naturally, synchronous presentation may be delayed slightly from the time the initiation signal 408 is received to compensate for network latency and other factors. As stated before, the initiation signal 408 may, for example, be configured to initiate playback of a DVD on an associated slave system 401b-c.

In one embodiment, in response to a determination that the predetermined number 714 of ready signal(s) 404 have been received, the display component 720 synchronously presents the media program 400 on the master system 401a.

Furthermore, in one implementation, during synchronous presentation of
5 the media program 400, a communication component 722, 724 within the master system 401a and each slave system 401b-c may establish a communication channel 410 for audio, video, or text-based communication between each of the systems 401 via a network 101. The same network 101 over which control signals are transmitted may be used to transmit communication signals so that,
10 for example, telephone lines within a household or business remain open for other uses during synchronous viewing of the media program 400.

The communication components 722, 724 may be configured in various ways. For example, the communication component 722, 724 may use Voice over IP (VoIP) technology in the ITU-T H.323 communication protocol for audio
15 communication between users of the systems 401. Alternatively, the communication component 722, 724 could include Logitech's® QuickCam® Express Web cam and Microsoft's® NetMeeting® software for video communication between the users. Various similar devices and software may be integrated with or used by an entertainment system 401, as will be understood by
20 those skilled in the art.

As explained previously, synchronous presentation may also involve pausing, restarting, or navigating within the media program. In one embodiment, the presentation component 716, 718 may synchronously pause, restart, and navigate within the media program 400. For example, in one configuration, in
25 response to receipt of a user command to pause, restart, or navigate, the signal transmission component 706 may transmit pause, restart, or navigation signals 602, 604, 618 to each slave system 401b-c. In response to receipt of the signals 602, 604, 618 at each slave system 401b-c, the media program 400 may be presented in accordance with the received signals 602, 604, 618. Naturally,
30 pausing, restarting, or navigating may also synchronously occur on the master system 401a.

As explained previously, user commands for restarting, pausing, or navigating, may be generated in response to activation of corresponding controls

at either a master or slave system 401a-c, as discussed in connection with FIG. 6.

With reference to FIG. 8, a flowchart of a method 800 of synchronously presenting a media program 400 is illustrated. In one configuration, one of a plurality of entertainment systems 401 is designated 802 as a master system 401a, and at least one other system 401 may be designated 804 as a slave system 401b-c using any of the techniques described previously.

Thereafter, a readiness inquiry signal 402 may be transmitted 806 from the master system 401a to each slave system 401b-c. In response, a user of each slave system 401b-c is prompted 808 to activate a readiness control, such as a ready button 406 on a remote control device 106.

Thereafter, activation of a readiness control is detected 810 by at least one of the slave systems 401b-c. In response, a ready signal 404 is transmitted 812 from at least one of the slave systems 401b-c to the master system 401a.

Each transmitted ready signal 404 is received 814 at the master system 401a until a predetermined number 714 of ready signals 404 have been received 816 at the master system 401a. In response to receipt of the predetermined number 714 of ready signals 404, an initiation signal 408 is transmitted 818 to each slave system 401b-c from which a ready signal 404 has been received.

In response thereto, each slave system 401b-c that received an initiation signal synchronously presents 820 the media program 400. In one configuration, the media program 400 is also synchronously presented 822 at the master system 401a.

Based on the foregoing, the present invention offers a number of advantages not available in conventional approaches. A media program 400 may be synchronously presented at any number of remote entertainment systems 401. Moreover, synchronously pausing, restarting, fast forwarding, rewinding, and skipping within the media program 400 are also available. Simultaneous video or audio communication or textual chat between users of each participating system further enhances the viewing experience.

While specific embodiments and applications of the present invention have been illustrated and described, it is to be understood that the invention is not limited to the precise configuration and components disclosed herein. Various

modifications, changes, and variations apparent to those skilled in the art may be made in the arrangement, operation, and details of the methods and systems of the present invention disclosed herein without departing from the spirit and scope of the invention.

5 What is claimed is:

CLAIMS

1. A method for synchronously presenting a media program on a plurality of entertainment systems linked by network, a first entertainment system being designated as a master system and at least one other entertainment system being designated as a slave system, the method comprising:
- 5 receiving at a master entertainment system a ready signal sent by at least one slave entertainment system, the ready signal indicating that a user of the at least one slave system is ready to begin synchronous presentation of a media program;
- 10 in response to receiving a predetermined number of ready signals at the master system, transmitting an initiation signal to the at least one slave system, the initiation signal being configured to initiate synchronous presentation of the media program on the at least one slave system.
2. The method of claim 1, further comprising:
- 15 synchronously presenting the media program on the master system.
3. The method of claim 1, further comprising:
- establishing two-way audio communication between a user of the master system and a user of the at least one slave system.
4. The method of claim 1, further comprising:
- 20 establishing two-way video communication between a user of the master system and a user of the at least one slave system.
5. The method of claim 1, wherein the predetermined number is equal to a total number of the slave systems.
6. The method of claim 1, wherein the predetermined number is at
- 25 least a predetermined subset of the slave systems.
7. The method of claim 1, wherein the initiation signal is transmitted in response to a predetermined number of ready signals being received from particular slave systems.
8. The method of claim 1, wherein the initiation signal is transmitted in
- 30 response to a predetermined number of ready signals being received within an established time period.
9. The method of claim 1, further comprising:
- receiving the media program at each entertainment system.

10. The method of claim 9, wherein receiving comprises:
accessing a removable storage medium including the media program.
11. The method of claim 10, wherein the removable storage medium
comprises a digital versatile disk (DVD).
- 5 12. The method of claim 9, wherein receiving comprises:
receiving the media program via a network.
13. The method of claim 9, wherein receiving comprises:
digitally recording the media program from a broadcast medium.
14. The method of claim 1, further comprising:
10 transmitting a readiness inquiry signal to the at least one slave system, the
readiness inquiry signal being configured to cause each slave system to prompt a
user thereof to indicate readiness to view the media program.
- 15 15. The method of claim 1, wherein each ready signal is received from
the at least one slave system in response to a user thereof activating a readiness
control.
16. The method of claim 1, further comprising:
transmitting to the at least one slave system a pause signal that
synchronously pauses presentation of the media program.
17. The method of claim 16, wherein the pause signal is transmitted in
20 response to a user of one of the entertainment systems activating a pause
control.
18. The method of claim 1, further comprising:
transmitting to the at least one slave system a restart signal that
synchronously restarts presentation of the media program.
- 25 19. The method of claim 18, wherein the restart signal is transmitted in
response to a user of one of the entertainment systems activating a restart
control.
20. The method of claim 1, further comprising:
transmitting to the at least one slave system a navigation signal that
30 causes each slave system to synchronously navigate within the media program.
21. The method of claim 20, wherein the navigation signal is
transmitted in response to a user of one of the entertainment systems activating a
navigation control.

22. The method of claim 21, wherein the navigation control is selected from a group consisting of a fast-forward control, a rewind control, a skip-forward control, and a skip-backward control.

23. The method of claim 1, wherein at least one of the entertainment
5 systems comprises an interactive television (ITV) system.

24. A method for synchronously presenting a media program on a plurality of entertainment systems linked by network, the method comprising:
designating a first entertainment system as a master system;
designating at least one other entertainment system as a slave system;
10 receiving a copy of the media program at the master system and at each slave system;
receiving at the master system a ready signal sent by at least one slave system; and
synchronously presenting the media program on the master system and
15 the at least one slave system in response to receiving a predetermined number of ready signals at the master system.

25. A system for synchronously presenting a media program on a plurality of entertainment systems linked by network, a first entertainment system being designated as a master system and at least one other entertainment
20 system being designated as a slave system, the system comprising:
a signal reception component that receives at a master entertainment system a ready signal sent by at least one slave entertainment system, the ready signal indicating that a user of the at least one slave system is ready to begin synchronous presentation of a media program;
25 a signal transmission component that transmits, in response to receiving a predetermined number of ready signals at the master system, an initiation signal to the at least one slave system, the initiation signal being configured to initiate synchronous presentation of the media program on the at least one slave system.

26. The system of claim 25, further comprising:
30 a display component that synchronously presents the media program on the master system.

27. The system of claim 25, further comprising:

a communication component that establishes two-way audio communication between the master system and the at least one slave system.

28. The system of claim 25, further comprising:

a communication component that establishes two-way video
5 communication between the master system and the at least one slave system.

29. The system of claim 25, wherein the predetermined number is equal to a total number of slave systems.

30. The system of claim 25, wherein the predetermined number is at least a predetermined subset of the slave systems.

10 31. The system of claim 25, wherein the signal transmission component transmits the initiation signal in response to a predetermined number of ready signals being received from particular slave systems.

32. The system of claim 25, wherein the signal transmission component transmits the initiation signal in response to a predetermined number of ready
15 signals being received within an established time period.

33. The system of claim 25, further comprising:

a media interface component that receives the media program at each entertainment system.

34. The system of claim 33, wherein the media interface component
20 accesses a removable storage medium including the media program.

35. The system of claim 34, wherein the removable storage medium comprises a digital versatile disk (DVD).

36. The system of claim 33, wherein the media interface component receives the media program via a network.

25 37. The system of claim 33, wherein the media interface component digitally records the media program from a broadcast medium.

38. The system of claim 25, wherein the signal transmission component transmits a readiness inquiry signal to the at least one slave system, the readiness inquiry signal being configured to cause each slave system to prompt a
30 user thereof to indicate readiness to view the media program.

39. The system of claim 25, wherein the signal reception component receives each ready signal from the at least one slave system in response to a user thereof activating a readiness control.

40. The system of claim 25, wherein the signal transmission component transmits to the at least one slave system a pause signal that synchronously pauses presentation of the media program.

41. The system of claim 40, wherein the signal transmission component
5 transmits the pause signal in response to a user of one of the entertainment systems activating a pause control.

42. The system of claim 25, wherein the signal transmission component transmits to the at least one slave system a restart signal that synchronously restarts presentation of the media program.

10 43. The system of claim to 42, wherein the signal transmission component transmits the restart signal in response to a user of one of the entertainment systems activating a pause control.

44. The system of claim 25, wherein the signal transmission component transmits to the at least one slave system a navigation signal that causes each
15 slave system to synchronously navigate within the media program

45. The system of claim 44, wherein the signal transmission component transmits the navigation signal in response to a user of one of the entertainment systems activating a navigation control.

46. The system of claim 45, wherein the navigation control is selected
20 from a group consisting of a fast-forward control, a rewind control, a skip-forward control, and a skip-backward control.

47. The system of claim 25, wherein at least one of the entertainment systems comprises an interactive television (ITV) system.

48. A system for synchronously presenting a media program on a
25 plurality of entertainment systems linked by network, a first entertainment system being designated as a master system and at least one other entertainment system being designated as a slave system, the system comprising:

a media interface component in a master entertainment system that receives a copy of a media program;

30 a media interface component in each slave entertainment system that receives a copy of the media program;

a signal reception component of the master system that receives a ready signal sent by at least one slave system; and

a presentation component that synchronously presents the media program on the master system and the at least one slave system in response to receiving a predetermined number of ready signals at the master system.

49. A system for synchronously presenting a media program on a plurality of entertainment systems linked by network, a first entertainment system being designated as a master system and at least one other entertainment system being designated as a slave system, the system comprising:
- means for receiving at a master entertainment system a ready signal sent by at least one slave entertainment system, the ready signal indicating that a user of the at least one slave system is ready to begin synchronous presentation of a media program;
 - means for transmitting an initiation signal to the at least one slave system, the initiation signal being configured to initiate synchronous presentation of the media program on the at least one slave system in response to receiving a predetermined number of ready signals at the master system.

1/8

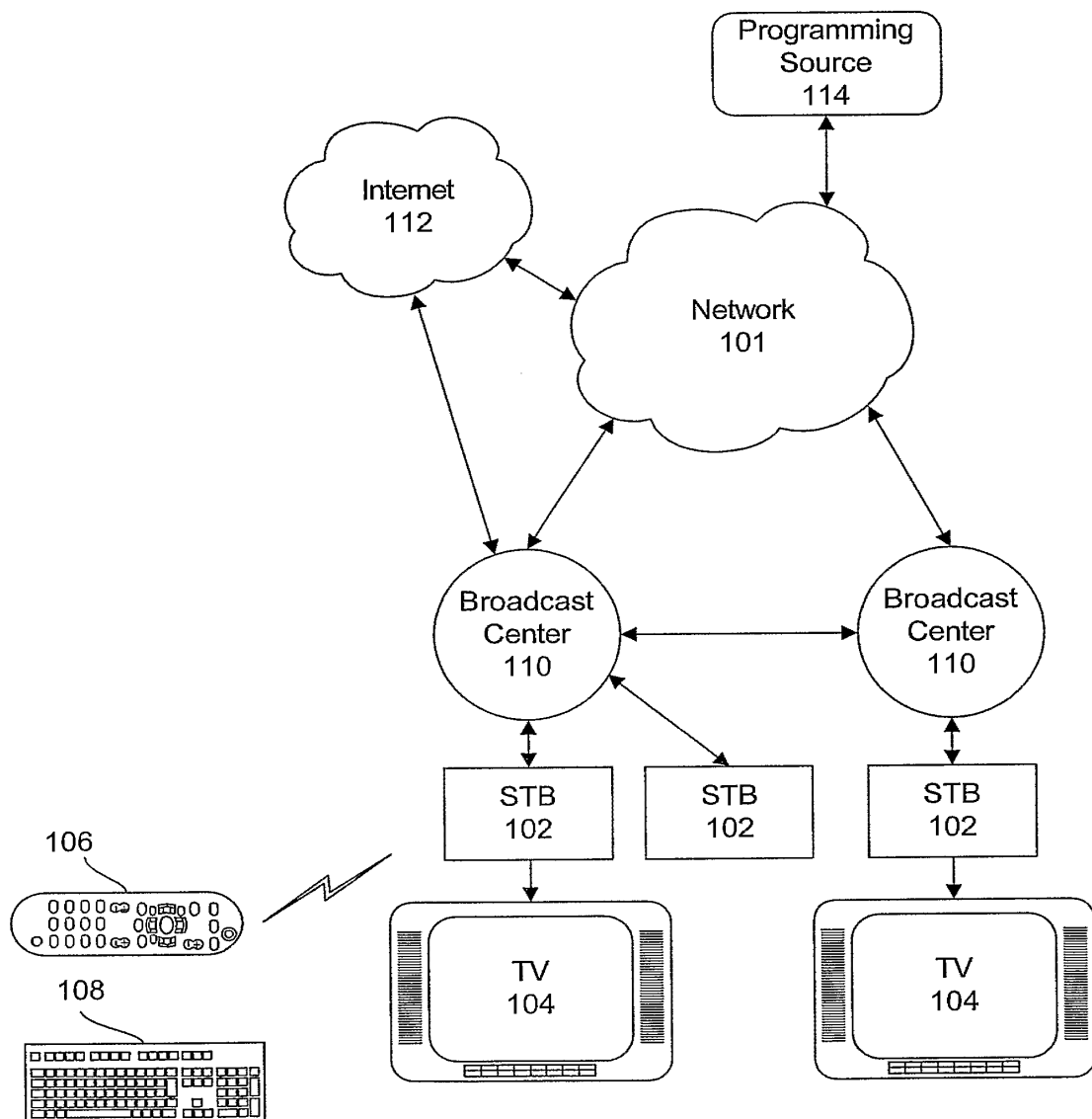
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FIG. 1

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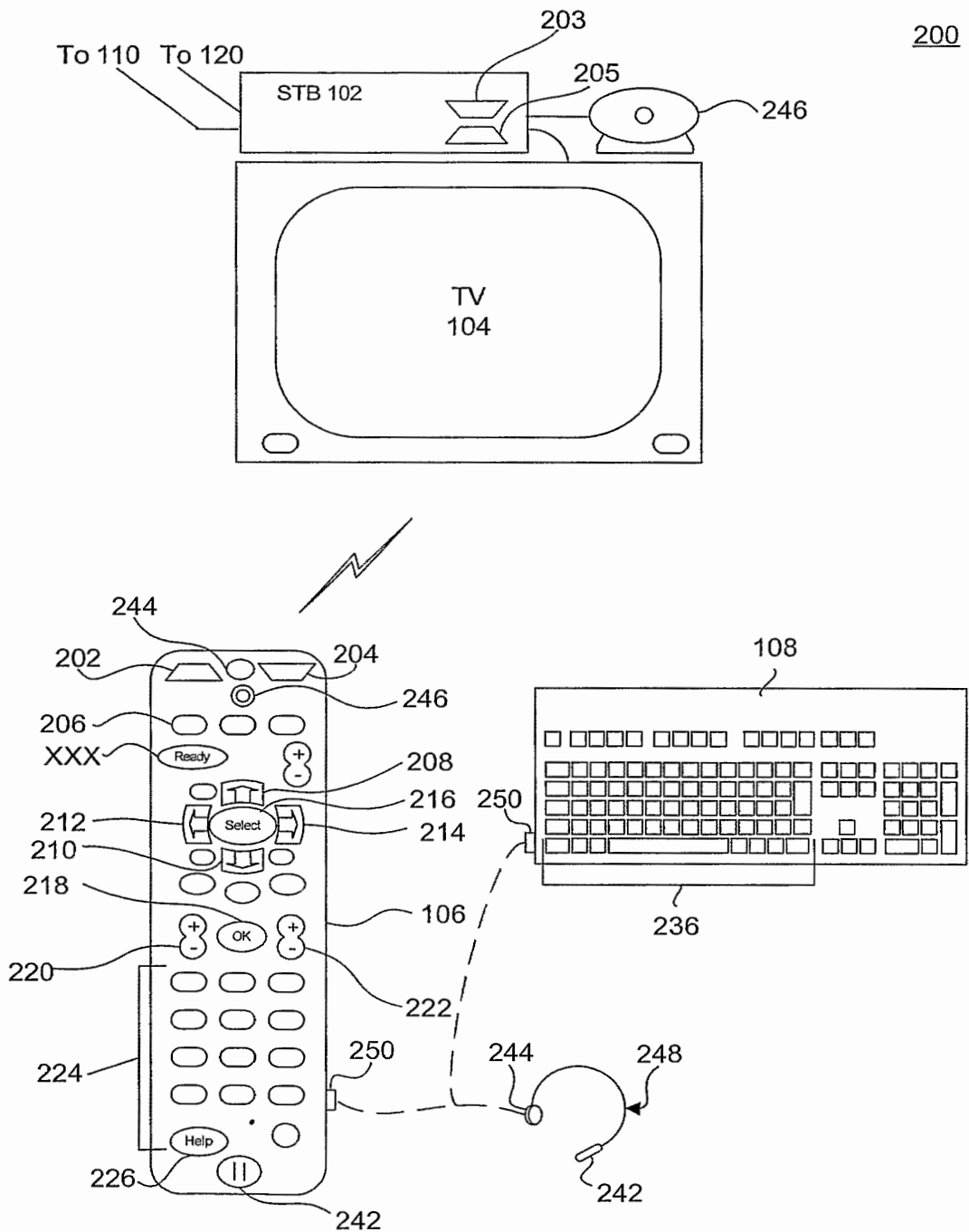


FIG. 2

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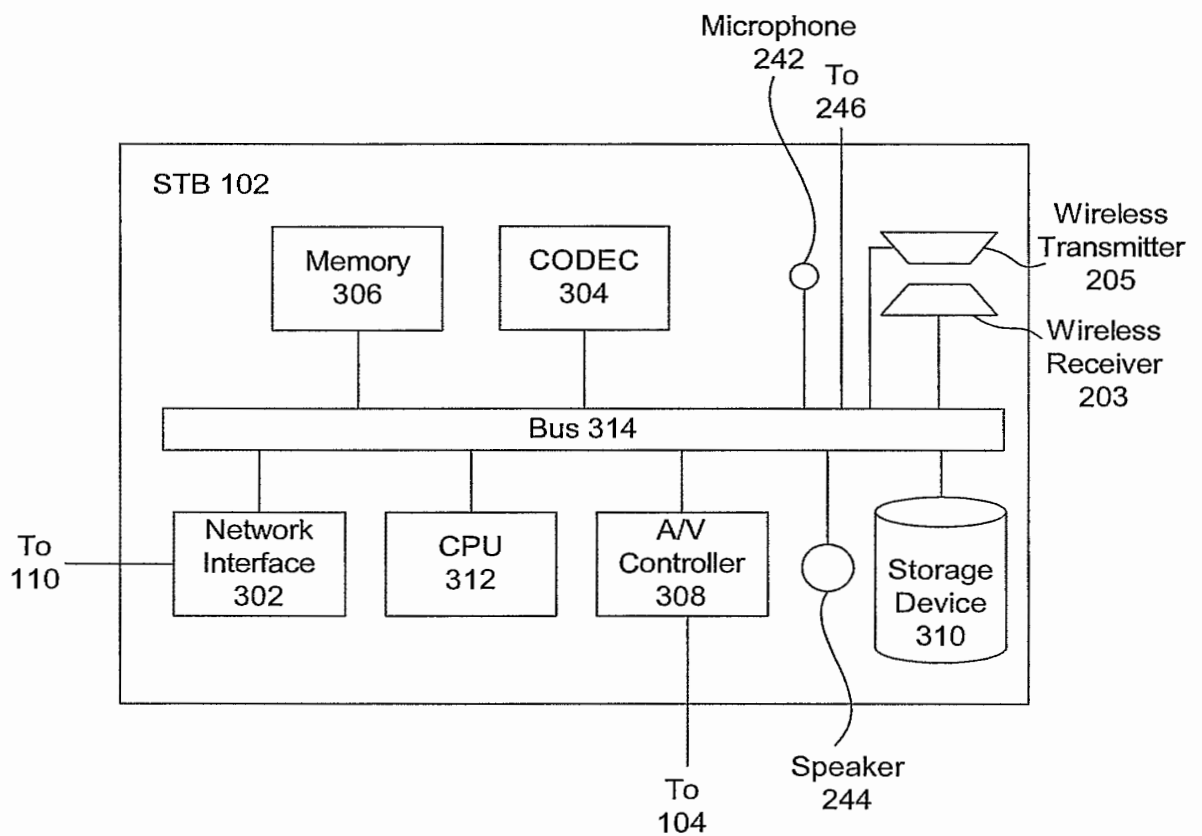


FIG. 3

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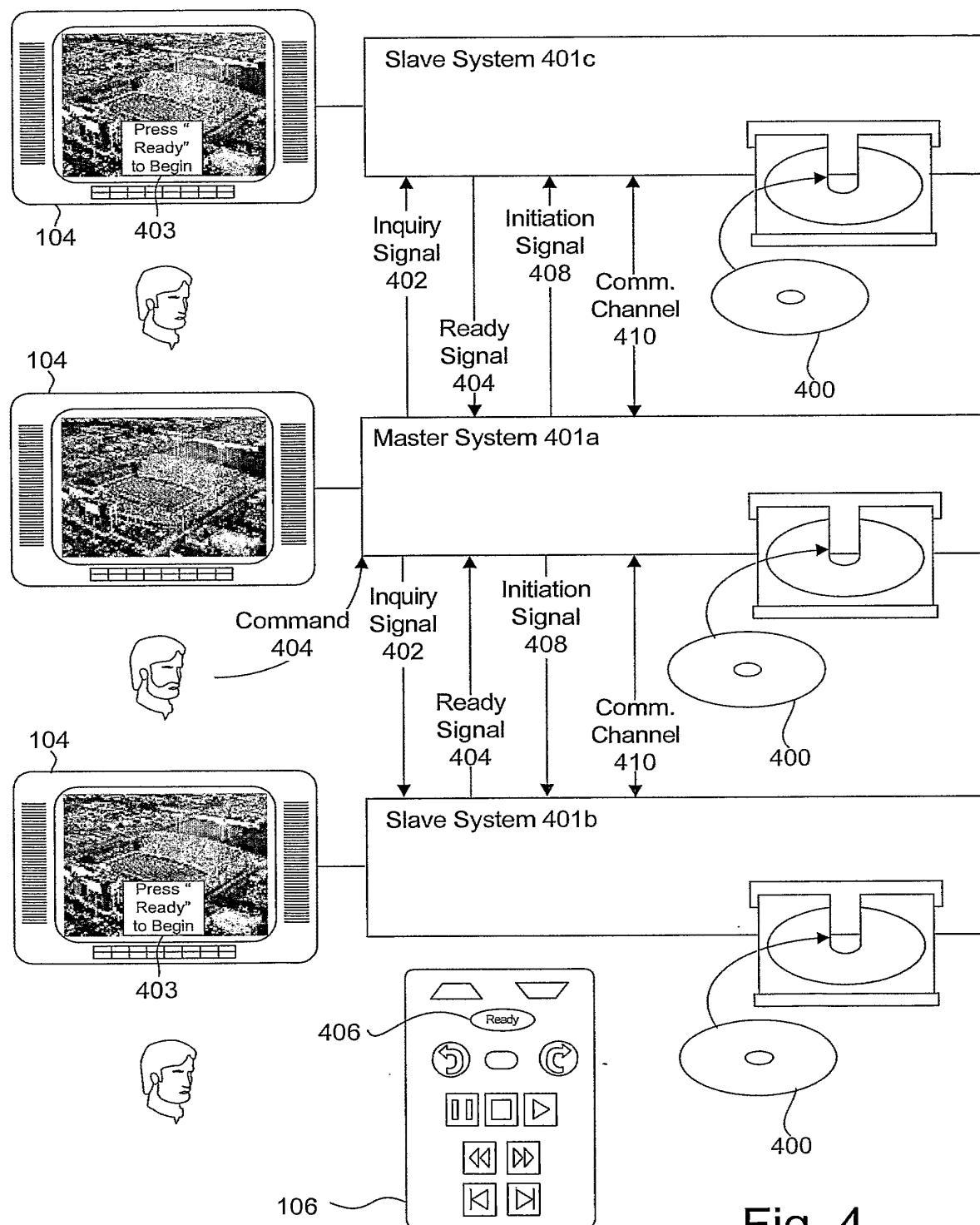


Fig. 4

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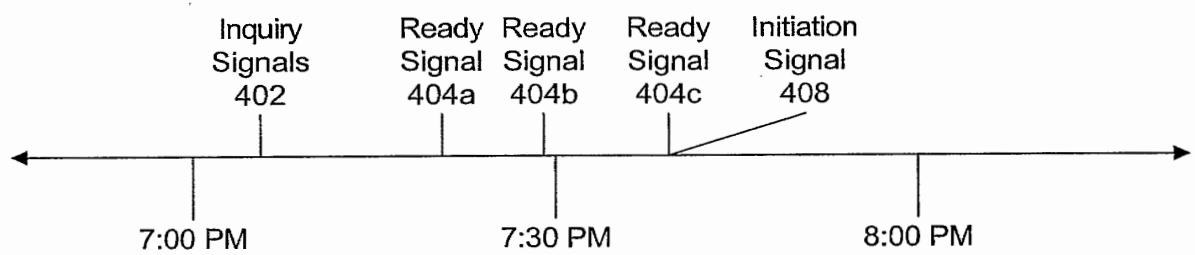
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Fig. 5

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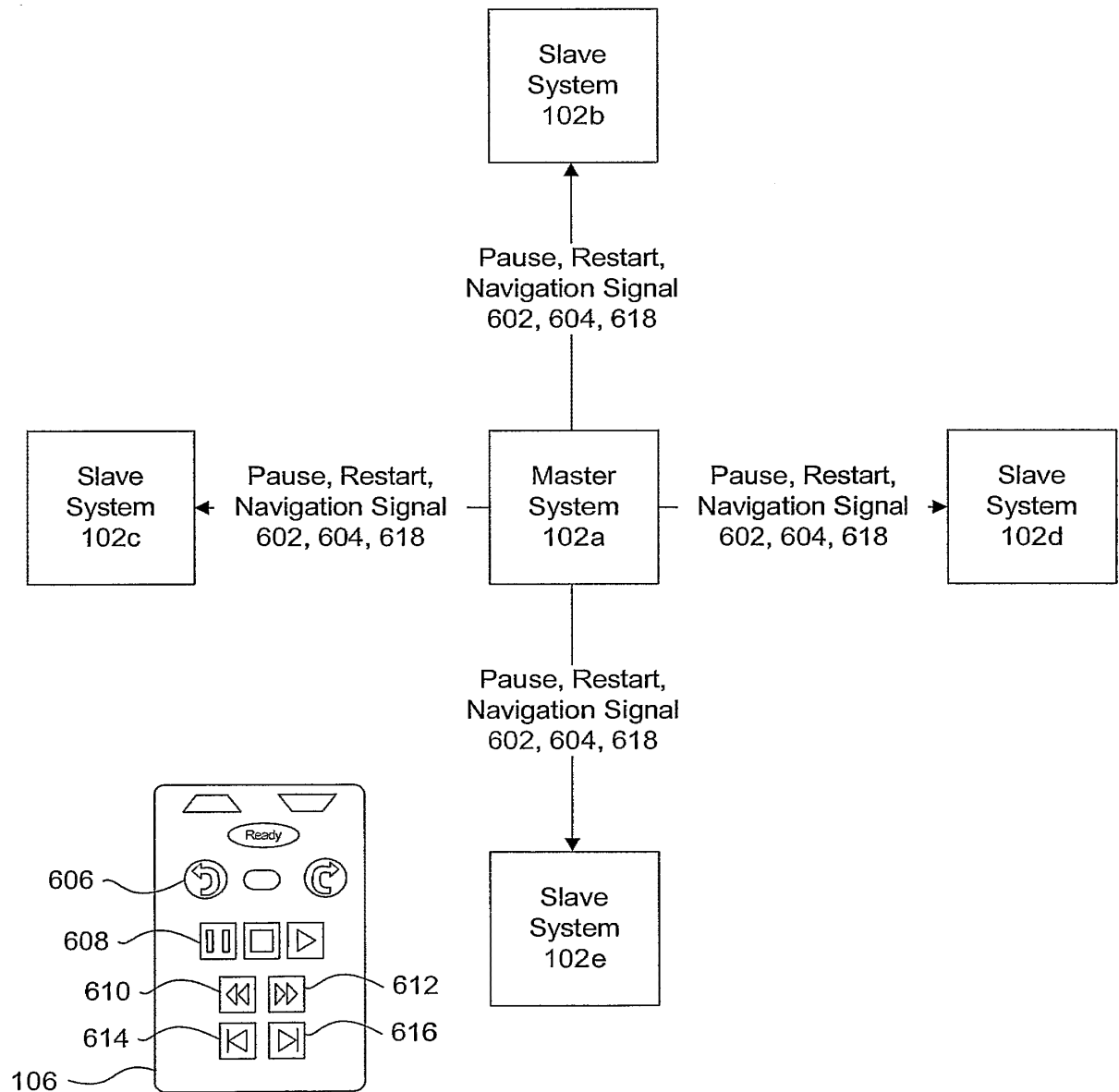
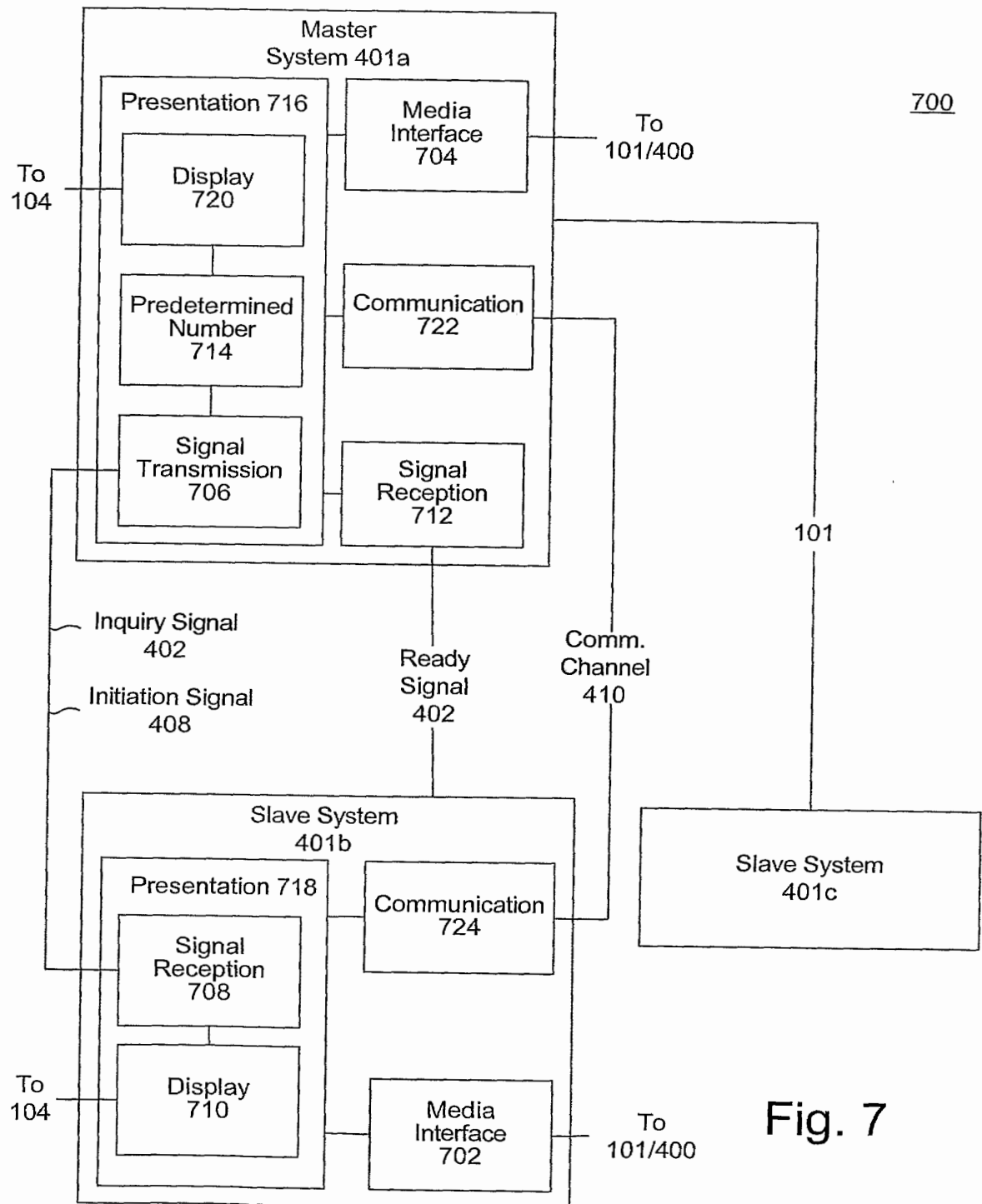


Fig. 6

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8/8

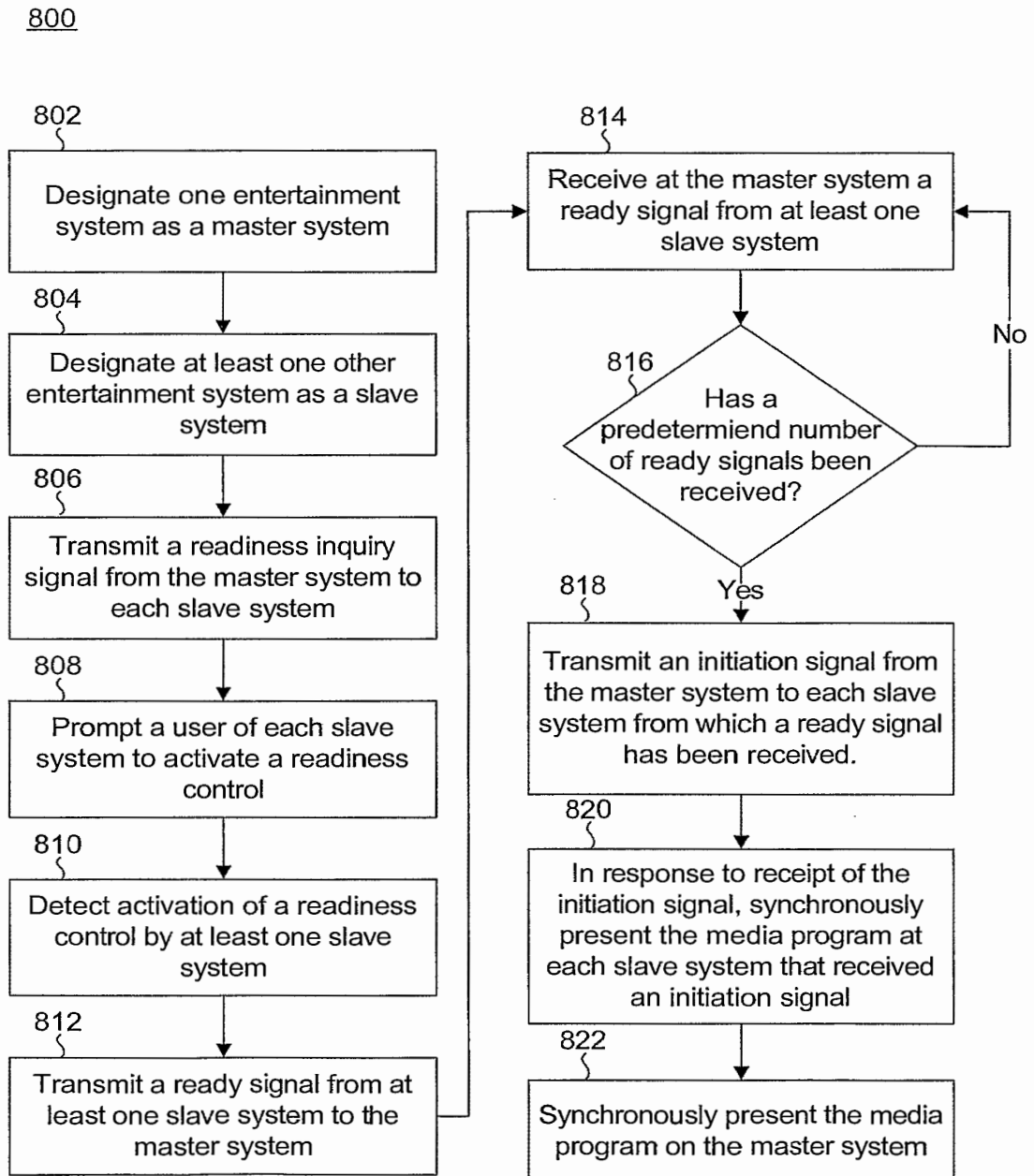


Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/22757

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H04N 7/14, 7/15

US CL : 725/105

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)

U.S. : 725/105-106,118,119, 133, 134; 348/14.01, 14.08, 14.12, 500; 386/83; H04N 7/14, 7/15

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,785,472 A (SHAPIRO) 15 November 1988	1-3,5-10,16,24-27,29-34,40,48,49
---	figure 1, column 5, line 48 - column 6, line 64	
Y	column 10, line 16 - column 11, line 24.	4,11-13,23,28,35-37,47
Y	US 6,288,753 B1 (DENICOLA et al.) 11 September 2001	4,11-13,23,28,35-37,47
A	whole document	
A	US 6,081,513 A (ROY) 27 June 2000	1-49
	whole document	

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

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"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

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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

03 September 2002 (03.09.2002)

Date of mailing of the international search report

23 DEC 2002

Name and mailing address of the ISA/US

Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703)305-3230

Authorized officer

Christopher Grant
Christopher Grant

Telephone No. (703) 305-4700

Form PCT/ISA/210 (second sheet) (July 1998)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Docket No. 13-0402)**

In re the Application of:	)	
	)	
Sonos, Inc.	)	
	)	Group Art Unit 2442
Serial No.: 13/864,249	)	
	)	
Filed: April 17, 2013	)	
	)	Examiner: Oleg Survillo
Confirmation No. 9806	)	
	)	
For: Concurrent Transmission and Playback	)	
Of Audio Information	)	

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

TRANSMITTAL WITH INFORMATION DISCLOSURE STATEMENT

Pursuant to 37 CFR § 1.34, the undersigned hereby confirms that the attached Information Disclosure Statement (IDS) is being filed in accordance with the undersigned's authority to act in a representative capacity on behalf of Applicant, Sonos, Inc., in connection with the preparation and filing of IDSs for the above-referenced matter.

Respectfully submitted,

Dated: May 5, 2020

By: /Brandon J. Kennedy/
Brandon J. Kennedy
Reg. No. 67,894
Lee Sullivan Shea & Smith LLP
656 W. Randolph St., Floor 5W
Chicago, Illinois 60661
(312) 754-9315
kennedy@ls3ip.com



United States Patent and Trademark Office

Office of the Chief Financial Officer

Document Code:WFEE

User :72568

Sale Accounting Date:03/31/2020

Sale Item Reference Number
13864249

Effective Date
03/27/2020

Document Number	Fee Code	Fee Code Description	Amount Paid	Payment Method
I20203UF24248790	1202	CLAIMS IN EXCESS OF 20	\$600.00	Deposit Account

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 13/864,249		Filing Date 04/17/2013		☐ To be Mailed	
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO									
APPLICATION AS FILED - PART I									
		(Column 1)		(Column 2)					
FOR		NUMBER FILED		NUMBER EXTRA		RATE (\$)		FEE (\$)	
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A		N/A		N/A			
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A		N/A		N/A			
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A		N/A		N/A			
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 =		*		x \$80 =			
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =		*		x \$420 =			
☐ 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).							
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL			
APPLICATION AS AMENDED - PART II									
AMENDMENT		(Column 1)		(Column 2)		(Column 3)			
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)	
		03/27/2020		Total (37 CFR 1.16(i))		* 33		Minus ** 27 = 6	
		Total (37 CFR 1.16(i))		* 33		Minus ** 27 = 6		x \$100 = 600	
		Independent (37 CFR 1.16(h))		* 3		Minus *** 3 = 0		x \$460 = 0	
		☐ Application Size Fee (37 CFR 1.16(s))							
		☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
						TOTAL ADD'L FEE		600	
AMENDMENT		(Column 1)		(Column 2)		(Column 3)			
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)	
		Total (37 CFR 1.16(i))		* 33		Minus ** 27 = 6		x \$100 = 600	
		Total (37 CFR 1.16(i))		* 33		Minus ** 27 = 6		x \$100 = 600	
		Independent (37 CFR 1.16(h))		* 3		Minus *** 3 = 0		x \$460 = 0	
		☐ Application Size Fee (37 CFR 1.16(s))							
		☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
						TOTAL ADD'L FEE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						LIE			
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						/JEFFERY L OLSEN/			
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".									
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.									

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

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No. 13-0402
(MBHB 15-518-CON)

In the Application of:	)	
Nicholas A. J. Millington	)	Examiner: SURVILLO, Oleg
	)	
Application No.: 13/864,249	)	Group Art Unit: 2442
	)	
Filed: April 17, 2013	)	Confirmation No. 9806
	)	
Title: Concurrent Transmission and	)	
Playback of Audio Information	)	
	)	
	)	

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

**RESPONSE TO NON-FINAL OFFICE ACTION
MAILED SEPTEMBER 27, 2019**

Please consider the following **AMENDMENTS** and **REMARKS** in response to the Non-Final Office Action mailed on September 27, 2019, in the above-captioned application.

AMENDMENTS TO THE CLAIMS begin on page 2.

REMARKS begin on page 16.

Please charge any underpayment of fees or credit any overpayment of fees in connection with the prosecution of the above-captioned application to Deposit Account 13-2490.

CLAIMS

1-46. (Canceled)

47. (Currently Amended) A first zone player comprising:

a network interface that is configured to communicatively couple the first zone player to at least one data network;

at least one processor;

a tangible, non-transitory computer-readable medium; and

program instructions stored on the tangible, non-transitory computer-readable medium that are executable by the at least one processor such that the first zone player is configured to perform functions comprising:

receiving, via the network interface, a request to engage in synchronous playback of audio content as part of a synchrony group that includes at least a second zone player that is communicatively coupled to the first zone player via the at least one data network;

after receiving the request to engage in synchronous playback of audio content as part of the synchrony group:

detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group; and

beginning to operate in the synchrony group in accordance with the indication;

wherein, while operating in the control-master mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, first control information for the synchrony group from a network device that is communicatively coupled to the first zone player; and

based on the first control information, cause, via the network interface, at least one playback action to be applied in the synchrony group;

wherein, while operating in the control-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, second control information from another zone player; and

perform one or more playback actions in accordance with the second control information;

wherein, while operating in the audio-master mode for the synchrony group, the first zone player is configured to:

obtain audio information that is representative of the audio content;

generate playback timing information associated with the obtained audio information that is indicative of ~~one or more~~ at least one future time[[s]] that is relative to a reference clock time and denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information; and

transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player; and

wherein, while operating in the audio-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, audio information and playback timing information associated with the received audio information from another zone player; and

engage in synchronous playback of the received audio information with at least the second zone player based on the received playback timing information associated with the received audio information.

48. (Previously Presented) The first zone player of claim 47, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-master mode for the synchrony group and (b) the audio-master mode for the synchrony group.

49. (Previously Presented) The first zone player of claim 47, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-slave mode for the synchrony group and (b) the audio-master mode for the synchrony group.

50. (Previously Presented) The first zone player of claim 47, wherein beginning to operate in the synchrony group in accordance with the indication comprises either (a) transitioning from operating in the audio-master mode to operating in the audio-slave mode or (b) transitioning from operating in the audio-slave mode to operating in the audio-master mode.

51. (Previously Presented) The first zone player of claim 47, wherein the first control information identifies particular audio content to be played back by the synchrony group that is available at an audio source outside of the at least one data network, and wherein causing the at least one playback action to be applied in the synchrony group comprises causing a zone player operating in the audio-master mode to obtain audio information that is representative of the particular audio content.

52. (Currently Amended) The first zone player of claim 47, wherein the ~~one or more~~ at least one future time[[s]] relative to the reference clock time ~~at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information~~ comprise at least one first future time that is determined based on a local clock of a zone player other than the first zone player.

53. (Currently Amended) The first zone player of claim 47, wherein the ~~one or more~~ at least one future time[[s]] relative to the reference clock time ~~at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information~~ comprise at least one first future time that is determined based on a local clock of the first zone player.

54. (Previously Presented) The first zone player of claim 47, wherein the second control information comprises information indicative of a volume adjustment, and wherein performing one or more playback actions in accordance with the second control information comprises adjusting a playback volume of the first zone player.

55. (Currently Amended) The first zone player of claim 47, wherein the playback timing information that is received while operating in the audio-slave mode comprises at least one future time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the received audio information, and wherein being configured while operating in the audio-slave mode to engage in synchronous playback of the received audio information with at least the second zone player comprises being configured to:

update the at least one future time to account for a differential between a local clock time of the first zone player and a local clock time of another zone player; and

when the local clock time of the first zone player reaches the updated at least one future time, engage in synchronous playback of the corresponding portion of the received audio information with at least the second zone player.

56. (Currently Amended) A method performed by a first zone player, the method comprising:

receiving, via a network interface at the first zone player, a request to engage in synchronous playback of audio content as part of a synchrony group that includes at least a second zone player that is communicatively coupled to the first zone player via at least one data network;

after receiving the request to enter into the synchrony group:

detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group; and

beginning to operate in the synchrony group in accordance with the indication;

wherein, while operating in the control-master mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, first control information for the synchrony group from a network device that is communicatively coupled to the first zone player; and

based on the first control information, cause, via the network interface, at least one playback action to be applied in the synchrony group;

wherein, while operating in the control-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, second control information from another zone player; and

perform one or more playback actions in accordance with the second control information;

wherein, while operating in the audio-master mode for the synchrony group, the first zone player is configured to:

obtain audio information that is representative of the audio content;

generate playback timing information associated with the obtained audio information that is indicative of ~~one or more~~ at least one future time[[s]] relative to a reference clock time that denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information; and

transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player; and

wherein, while operating in the audio-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, audio information and playback timing information associated with the received audio information from another zone player; and engage in synchronous playback of the received audio information with at least the second zone player based on the received playback timing information associated with the received audio information.

57. (Previously Presented) The method of claim 56, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-master mode for the synchrony group and (b) the audio-master mode for the synchrony group.

58. (Previously Presented) The method of claim 56, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-slave mode for the synchrony group and (b) the audio-master mode for the synchrony group.

59. (Previously Presented) The method of claim 56, wherein beginning to operate in the synchrony group in accordance with the indication comprises either (a) transitioning from

operating in the audio-master mode to operating in the audio-slave mode or (b) transitioning from operating in the audio-slave mode to operating in the audio-master mode.

60. (Previously Presented) The method of claim 56, wherein the first control information identifies particular audio content to be played back by the synchrony group that is available at an audio source outside of the at least one data network, and wherein causing the at least one playback action to be applied in the synchrony group comprises causing a zone player operating in the audio-master mode to obtain audio information that is representative of the particular audio content.

61. (Currently Amended) The method of claim 56, wherein the ~~one or more~~ at least one future time[[s]] relative to the reference clock time ~~at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information~~ comprise at least one first future time that is determined based on a local clock of a zone player other than the first zone player.

62. (Currently Amended) The method of claim 56, wherein the ~~one or more~~ at least one future time[[s]] relative to the reference clock time ~~at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information~~ comprise at least one first future time that is determined based on a local clock of the first zone player.

63. (Previously Presented) The method of claim 56, wherein the second control information comprises information indicative of a volume adjustment, and wherein performing one or more playback actions in accordance with the second control information comprises adjusting a playback volume of the first zone player.

64. (Currently Amended) The method of claim 56, wherein the playback timing information that is received while operating in the audio-slave mode comprises at least one future time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the received audio information, and wherein operating in the audio-slave mode to engage in synchronous playback of the received audio information with at least the second zone player comprises:

updating the at least one future time to account for a differential between a local clock time of the first zone player and a local clock time of another zone player; and

when the local clock time of the first zone player reaches the updated at least one future time, engaging in synchronous playback of the corresponding portion of the received audio information with at least the second zone player.

65. (Currently Amended) Tangible, non-transitory computer-readable media having instructions stored therein, wherein the instructions, when executed, cause a first zone player to perform functions comprising:

receiving, via a network interface at the first zone player, a request to engage in synchronous playback of audio content as part of a synchrony group that includes at least a second zone player that is communicatively coupled to the first zone player via at least one data network;

after receiving the request to enter into the synchrony group:

detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group; and

beginning to operate in the synchrony group in accordance with the indication;

wherein, while operating in the control-master mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, first control information for the synchrony group from a network device that is communicatively coupled to the first zone player; and

based on the first control information, cause, via the network interface, at least one playback action to be applied in the synchrony group;

wherein, while operating in the control-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, second control information from another zone player; and

perform one or more playback actions in accordance with the second control information;

wherein, while operating in the audio-master mode for the synchrony group, the first zone player is configured to:

obtain audio information that is representative of the audio content;

generate playback timing information associated with the obtained audio information that is indicative of one or more future times relative to a reference clock time, wherein an individual future time denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information; and

transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player; and
wherein, while operating in the audio-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, audio information and playback timing information associated with the received audio information from another zone player; and
engage in synchronous playback of the received audio information with at least the second zone player based on the received playback timing information associated with the received audio information.

66. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-master mode for the synchrony group and (b) the audio-master mode for the synchrony group.

67. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-slave mode for the synchrony group and (b) the audio-master mode for the synchrony group.

68. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein beginning to operate in the synchrony group in accordance with the indication comprises either (a) transitioning from operating in the audio-master mode to operating in the audio-slave mode or (b) transitioning from operating in the audio-slave mode to operating in the audio-master mode.

69. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein the first control information identifies particular audio content to be played back by the synchrony group that is available at an audio source outside of the at least one data network, and wherein causing the at least one playback action to be applied in the synchrony group comprises causing a zone player operating in the audio-master mode to obtain audio information that is representative of the particular audio content.

70. (Currently Amended) The tangible, non-transitory computer-readable media of claim 65, wherein the ~~one or more~~ at least one future time[[s]] relative to the reference clock time at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information comprise at least one first future time that is determined based on a local clock of a zone player other than the first zone player.

71. (Currently Amended) The tangible, non-transitory computer-readable media of claim 65, wherein the ~~one or more~~ at least one future time[[s]] relative to the reference clock time at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information comprise at least one first future time that is determined based on a local clock of the first zone player.

72. (Previously Presented) The tangible, non-transitory computer-readable media of claim 65, wherein the second control information comprises information indicative of a volume adjustment, and wherein performing one or more playback actions in accordance with the second control information comprises adjusting a playback volume of the first zone player.

73. (Currently Amended) The tangible, non-transitory computer-readable media of claim 65, wherein the playback timing information that is received while operating in the audio-slave mode comprises at least one future time at which at least the first and second zone players are to engage in synchronous playback a corresponding portion of the received audio information, and wherein operating in the audio-slave mode to engage in synchronous playback of the received audio information with at least the second zone player comprises:

updating the at least one future time to account for a differential between a local clock time of the first zone player and a local clock time of another zone player; and

when the local clock time of the first zone player reaches the updated at least one future time, engaging in synchronous playback of the corresponding portion the received audio information with at least the second zone player.

74. (New) The first zone player of claim 48, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

75. (New) The first zone player of claim 49, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing

further comprises a future time relative to the reference clock that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

76. (New) The method of claim 57, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

77. (New) The method of claim 58, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

78. (New) The tangible, non-transitory computer-readable media of claim 66, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the reference clock that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

79. (New) The tangible, non-transitory computer-readable media of claim 67, wherein the obtained audio information comprises a beginning of the obtained audio information, and wherein the playback timing further comprises a future time relative to the

reference clock that denotes a time at which at least the first and second zone players are to initiate synchronous playback at the beginning of the obtained audio information.

REMARKS

I. Status of the Claims

Claims 47-79 are now pending; claims 47, 56, and 65 are independent.

Without conceding the merits of the rejections, and solely to advance prosecution, Applicant has (i) added new claims 74-79 and (ii) amended claims 47, 52-53, 55-56, 61-62, 64-65, 70-71, and 73 to further clarify the claim language and to generally put the claims in better condition for allowance. Applicant reserves the right to pursue the subject matter of the originally-filed and/or previously-pending claims in one or more continuation applications.

The subject matter of the amendments can be found generally throughout Applicant's originally-filed specification, including but not limited to ¶¶ 9, 37-41, and 66-71 of U.S. Pub. 2013/0238108. No new matter has been added.

II. Summary of the Non-Final Office Action

In the Office Action, the Office rejected claims 47-73 under 35 U.S.C. § 103 based on U.S. Pub. 2002/0124097 (Isely) and U.S. Pub. 2007/0142944 (Goldberg).

III. Response to the § 103 Rejections based on Isely and Goldberg

The claims are patentable over Isely and Goldberg for at least the reason that Isely and Goldberg, individually or in combination, fail to teach or suggest all the elements recited in the claims. For example, with reference to independent claim 47, Isely and Goldberg fail to teach or suggest at least "generat[ing] playback timing information associated with the obtained audio information that is indicative of at least one future time that is relative to a reference clock time and denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information" and

“transmit[ting], via the network interface, the obtained audio information and the generated playback timing information to the second zone player,” in combination with the other elements recited in the claims.

A. Isely fails to teach or suggest all the claim elements

The Office Action acknowledges, and Applicant agrees that “Isely fails to expressly teach that in the audio-master mode, the first zone player is configured generate playback timing information associated with the obtained audio information that is indicative of one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information; and transmit, via the network interface, the obtained audio information and the generated playback timing information to second zone player.” Office Action, pp. 4-5. Therefore, Isely cannot possibly teach or suggest the more specific features of “generat[ing] playback timing information associated with the obtained audio information that is indicative of at least one future time that is relative to a reference clock time and denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information” and “transmit[ting], via the network interface, the obtained audio information and the generated playback timing information to the second zone player,” in combination with the other elements recited in the claims.

B. Goldberg fails to teach or suggest all the claim elements

The addition of Goldberg fails to overcome the deficiencies of Isely because Goldberg also fails to teach or suggest “generat[ing] playback timing information associated with the obtained audio information that is indicative of at least one future time that is relative to a reference clock time and denotes a time at which at least the first and second zone players are to

engage in synchronous playback of a corresponding portion of the obtained audio information” and “transmit[ting], via the network interface, the obtained audio information and the generated playback timing information to the second zone player,” in combination with the other elements recited in the claims.

The Office Action contends Goldberg discloses “generat[ing] playback timing information associated with the obtained audio information that is indicative of one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information [synchronization signals].” Office Action, p. 6 (citing Goldberg, ¶¶ 201-206). Goldberg describes “transmission of synchronization signals” in connection with synchronizing playback among multiple units. Goldberg, ¶ 201. But Goldberg’s synchronization signals do not amount to “timing information associated with the obtained audio information that is indicative of at least one future time that is relative to a reference clock time and denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information.”

Goldberg states “the synchronization signals can comprise many different forms,” but Goldberg provides only three examples. Goldberg, ¶ 202. None of Goldberg’s examples describe any synchronization signal(s) that is “indicative of at least one future time that is relative to a reference clock time and denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information,” as recited in the claims.

For the first example, Goldberg explains “the synchronization signal can be the time stamp from the beginning of the music file to the current position of the music file being played on the broadcast unit,” i.e., a time stamp denoting the elapsed time from the beginning of the

track. Goldberg, ¶ 202. However, a time stamp relating to an elapsed time from the start of a track on its own is neither a “future time that is relative to a reference clock time,” nor does it “denote[] a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information.”

For the second example, Goldberg explains the synchronization signal can alternatively be “the sample number that is currently being played on the broadcast unit 100.” Goldberg, ¶ 202. But a “sample number” on its own is not a “future time that is relative to a reference clock time,” nor does such a sample number “denote[] a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information.”

Goldberg’s third example is shown in Figure 34B, which Goldberg describes as “a schematic layout of a synchronization signal record 1910.” Goldberg, ¶ 204. Goldberg’s synchronization signal record 1910 includes four fields: (1) SAMPLE#, (2) SONGID, (3) DATARATE, and (4) JEWEL SIGNAL. Goldberg, Fig. 34B. The SONGID and JEWEL SIGNAL are not used for synchronizing playback. Goldberg, ¶ 205. Neither the SAMPLE# nor the DATARATE, individually or in combination, amount to a “future time” as recited in the claims. Goldberg explains the “position field 1912 (SAMPLE#) ... contains an indicator of position in a music file—in this case the sample number within the file.” Goldberg, ¶ 205. As explained earlier, a sample number, on its own, does not amount to a “future time” as recited in the claims. Goldberg further explains “the sample rate field 1916 (SAMPLERATE)...is primarily relevant if the position field 1912 is given in samples, which allows a conversion into time.” Goldberg, ¶ 205. But because the SAMPLE# is “the sample number within the file,” any playback time calculated from the SAMPLE# and SAMPLERATE values is a playback time

measured from the start of the track, Goldberg, ¶ 5, rather than a “future time[] relative to a reference clock time.”

Thus, like Isely, Goldberg also fails to teach or suggest “generat[ing] playback timing information associated with the obtained audio information that is indicative of at least one future time that is relative to a reference clock time and denotes a time at which at least the first and second zone players are to engage in synchronous playback of a corresponding portion of the obtained audio information.” And because Goldberg fails to teach or suggest generating the recited playback timing, Goldberg cannot possibly teach or suggest “transmit[ing], via the network interface, the obtained audio information and the generated playback timing information to the second zone player,” in combination with the other elements recited in the claims.

C. The claims are patentable over Isely and Goldberg

Accordingly, independent claim 47 is patentable over Isely and Goldberg for at least the reason the combination of Isely and Goldberg fails to teach or suggest all the elements recited in the claims. And because independent claims 56 and 65 recite elements similar to those recited in independent claim 47, independent claims 56 and 65 are likewise patentable over Isely and Goldberg for similar reasons. Finally, and without conceding the merits of the other assertions set forth in the Office Action, the pending dependent claims are patentable over Isely and Goldberg for at least the reason that they depend from patentable independent claims.

V. Conclusion

The pending claims are patentable over the cited references. If further dialog would advance prosecution, Applicant invites the Office to telephone the undersigned at 312-913-0001.

Respectfully submitted,
McDonnell Boehnen Hulbert & Berghoff LLP

Date: March 27, 2020

By: /Jeffrey P. Armstrong/
Jeffrey P. Armstrong
Reg. No. 54,967

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Jeffrey Armstrong		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 3 months with \$0 paid	1253	1	1400	1400
Miscellaneous:				
Total in USD (\$)				1400

Electronic Acknowledgement Receipt	
EFS ID:	38992260
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Jeffrey Armstrong
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	27-MAR-2020
Filing Date:	17-APR-2013
Time Stamp:	15:05:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1400
RAM confirmation Number	E20203QF06017130
Deposit Account	132490
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37 CFR 1.19 (Document supply fees)					
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37 CFR 1.21 (Miscellaneous fees and charges)					
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Extension of Time	13-0402_EOT.pdf	118502	no	1
			53c2b15d0e04de51d89110f867cd05aa52ec220c		
Warnings:					
Information:					
2		13-0402_Response.pdf	113924	yes	22
			4f8ad85015fc731b700d295b1775b7a637c6062a		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Amendment/Req. Reconsideration-After Non-Final Reject		1	1	
	Claims		2	16	
	Applicant Arguments/Remarks Made in an Amendment		17	22	
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	31000	no	2
			3ffab884eb88cd1e934104810adc422809cd7e13		
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)		Docket Number (Optional) 13-0402																																		
Application Number 13/864,249	Filed April 17, 2013																																			
For Concurrent Transmission and Playback of Audio Information																																				
Art Unit 2442	Examiner Survillo																																			
<p>This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.</p> <p>The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):</p> <table style="width: 100%; border-collapse: collapse;"><thead><tr><th></th><th style="text-align: center;"><u>Fee</u></th><th style="text-align: center;"><u>Small Entity Fee</u></th><th style="text-align: center;"><u>Micro Entity Fee</u></th><th></th></tr></thead><tbody><tr><td>☐ One month (37 CFR 1.17(a)(1))</td><td style="text-align: center;">\$200</td><td style="text-align: center;">\$100</td><td style="text-align: center;">\$50</td><td>\$ _____</td></tr><tr><td>☐ Two months (37 CFR 1.17(a)(2))</td><td style="text-align: center;">\$600</td><td style="text-align: center;">\$300</td><td style="text-align: center;">\$150</td><td>\$ _____</td></tr><tr><td>☒ Three months (37 CFR 1.17(a)(3))</td><td style="text-align: center;">\$1,400</td><td style="text-align: center;">\$700</td><td style="text-align: center;">\$350</td><td>\$ 1,400.00</td></tr><tr><td>☐ Four months (37 CFR 1.17(a)(4))</td><td style="text-align: center;">\$2,200</td><td style="text-align: center;">\$1,100</td><td style="text-align: center;">\$550</td><td>\$ _____</td></tr><tr><td>☐ Five months (37 CFR 1.17(a)(5))</td><td style="text-align: center;">\$3,000</td><td style="text-align: center;">\$1,500</td><td style="text-align: center;">\$750</td><td>\$ _____</td></tr></tbody></table> <p>☐ Applicant asserts small entity status. See 37 CFR 1.27.</p> <p>☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.</p> <p>☐ A check in the amount of the fee is enclosed.</p> <p>☐ Payment by credit card. Form PTO-2038 is attached.</p> <p>☒ The Director has already been authorized to charge fees in this application to a Deposit Account.</p> <p>☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number <u>13-2490</u>.</p> <p>☒ Payment made via EFS-Web.</p> <p>WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.</p> <p>I am the</p> <p>☐ applicant/inventor.</p> <p>☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).</p> <p>☒ attorney or agent of record. Registration number <u>54,967</u>.</p> <p>☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.</p> <table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 50%; padding: 5px;">/Jeffrey P. Armstrong/ _____ Signature</td><td style="width: 50%; padding: 5px;">March 27, 2020 _____ Date</td></tr><tr><td style="padding: 5px;">Jeffrey P. Armstrong _____ Typed or printed name</td><td style="padding: 5px;">312-913-0001 _____ Telephone Number</td></tr></table> <p>NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.</p> <p>☒ * Total of <u>1</u> forms are submitted.</p>				<u>Fee</u>	<u>Small Entity Fee</u>	<u>Micro Entity Fee</u>		☐ One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ _____	☐ Two months (37 CFR 1.17(a)(2))	\$600	\$300	\$150	\$ _____	☒ Three months (37 CFR 1.17(a)(3))	\$1,400	\$700	\$350	\$ 1,400.00	☐ Four months (37 CFR 1.17(a)(4))	\$2,200	\$1,100	\$550	\$ _____	☐ Five months (37 CFR 1.17(a)(5))	\$3,000	\$1,500	\$750	\$ _____	/Jeffrey P. Armstrong/ _____ Signature	March 27, 2020 _____ Date	Jeffrey P. Armstrong _____ Typed or printed name	312-913-0001 _____ Telephone Number
	<u>Fee</u>	<u>Small Entity Fee</u>	<u>Micro Entity Fee</u>																																	
☐ One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ _____																																
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/Jeffrey P. Armstrong/ _____ Signature	March 27, 2020 _____ Date																																			
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	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	2	6119239		2000-09-12	FUJII; Kazuo	
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	4	6389057		2002-05-14	HAARTSEN; Jacobus C.	
	5	6703940		2004-03-09	ALLEN; William A. et al.	
	6	6775246		2004-08-10	KURIBAYASHI; Hirotaka et al.	
	7	7089333		2006-08-08	MARINESCU; Marian et al.	
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	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

	9	7313384		2007-12-25	MEENAN; Patrick et al.	
	10	8601394		2013-12-03	SHEEHAN; Conor et al.	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
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	Art Unit	2442	
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	Attorney Docket Number	13-0402	

7	Sonos, Inc. v. Lenbrook Industries Limited et al., Defendants' Answer to Plaintiff's Complaint - Exhibit A, filed October 14, 2019, 3 pages.
8	Sonos, Inc. v. Lenbrook Industries Limited et al., Defendants' Answer to Plaintiff's Complaint - Exhibit C, filed October 14, 2019, 16 pages.
9	Sonos, Inc. v. Lenbrook Industries Limited et al., Defendants' Answer to Plaintiff's Complaint - Exhibit D, filed October 14, 2019, 36 pages.
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	Filing Date	2013-04-17
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	Art Unit	2442
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	Attorney Docket Number	13-0402

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Signature	/Brandon J. Kennedy/	Date (YYYY-MM-DD)	2019-11-25
Name/Print	Brandon J. Kennedy	Registration Number	67894
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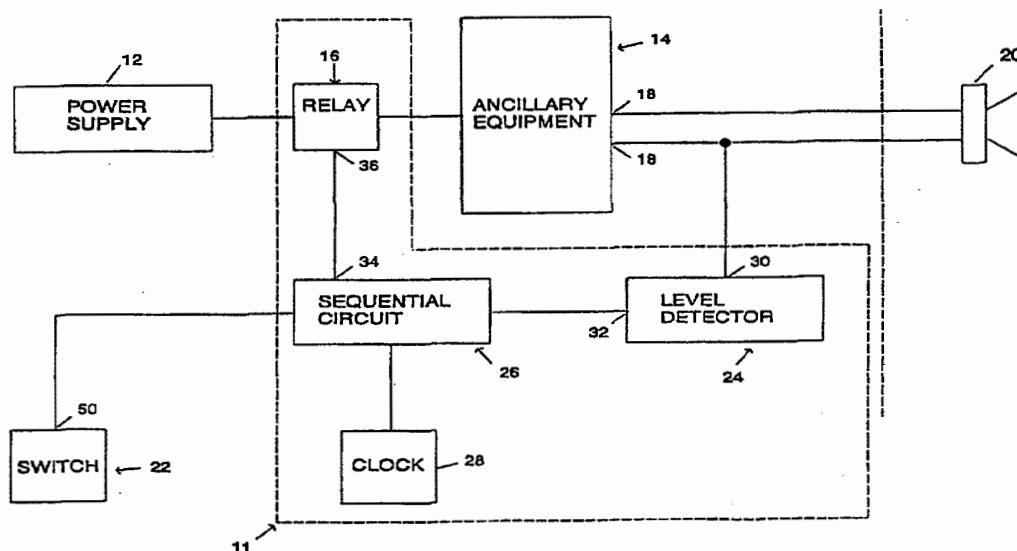
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(51) International Patent Classification ⁶ : H01S		A2	(11) International Publication Number: WO 97/09756
			(43) International Publication Date: 13 March 1997 (13.03.97)
(21) International Application Number: PCT/US96/13713 (22) International Filing Date: 26 August 1996 (26.08.96) (30) Priority Data: 521,681 31 August 1995 (31.08.95) US (71)(72) Applicants and Inventors: BUCALO, Brian, D. [US/US]; Apartment LPH 9, 1010 South Ocean Boulevard, Pompano Beach, FL 33062 (US). BUCALO, Louis, R. [US/US]; 3418 Dividadero Street, San Francisco, CA 94123 (US). (74) Agents: POISSANT, Brian, M. et al.; Pennie & Edmonds, 1155 Avenue of the Americas, New York, NY 10036 (US).		(81) Designated States: AL, AM, AU, AZ, BB, BG, BR, BY, CA, CN, CU, CZ, EE, FI, GE, HU, IL, IS, JP, KG, KP, KR, KZ, LK, LR, LS, LT, LV, MD, MG, MK, MN, MX, NO, NZ, PL, RO, RU, SG, SI, SK, TJ, TM, TR, TT, UA, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>Without international search report and to be republished upon receipt of that report.</i>	

(54) Title: METHOD AND APPARATUS FOR AUTOMATIC SHUT OFF OF ELECTRONIC EQUIPMENT



(57) Abstract

An audio output signal generated by audio, audio/visual, or electronic musical instrument equipment is monitored. If the level of the output signal falls below a predetermined threshold for a predetermined period of time, then power to the equipment is automatically shut off, resulting in a state that is the same as or similar to that which occurs when the normal user power switch is turned off. The equipment may also be turned on and turned off with the normal user power switch.

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**Method and Apparatus for Automatic
Shut Off of Electronic Equipment**

FIELD OF THE INVENTION

5 The present invention relates generally to automatic shut off devices, and more particularly to methods and apparatus for automatically shutting off electronic devices having an audio signal output.

10 BACKGROUND

Many electronic devices having an audio signal output (such as audio tape decks, CD players, electronic keyboards, amplifiers, pre-amplifiers, video tape players, video disk players, etc.) will remain in a powered on state indefinitely, even if no audio signal output is being generated. Thus, users of such audio, audio/visual, or electronic musical instrument devices may not be aware that the device is or remains powered on after they have finished using it. For example, the user of a CD player may listen to one or more CDs, and then forget to turn off the CD player after a CD has stopped playing. Since no sound is generated after a CD has stopped playing, the user may leave the CD player and its associated amplifier powered on for hours, days, or even weeks, wasting energy, causing excessive equipment wear, and posing a potential fire hazard.

Similar drawbacks and hazards are presented to users of amplified musical instruments, such as electronic keyboards. Again, these instruments and devices cease to provide an audible sound output after the user stops playing or otherwise interacting with the instrument. Therefore, the user may forget to turn off the instrument or amplifier after she has finished playing, and the device will stay powered on indefinitely. Clearly, any device which can remain powered on indefinitely, but which generates no audio output signal when not in use, presents similar problems.

Prior art devices have been described which turn off electronic equipment after sensing the presence of a

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specific signal. For example, U.S. Patent 5,170,159 to Kawabata et al., discloses an apparatus which has an auto-sleep mode. In this mode, a C.P.U. monitors for the presence of specific electronic signals which indicate that the end of the source audio material (such as a cassette tape or CD) has been reached. When such a signal is detected, the equipment is turned off. As noted in the Kawabata patent, these signals may be in the form of the output of a photo interrupter (which generates an output when the playback of a cassette tape is complete), or an end code, such as is detected by a CD player when a CD has finished playing.

During normal daytime use of audio or audio/visual equipment (such as stereo equipment) the user might wish to play many successive tapes or CDs. In this situation, the user may not want the equipment to shut off at the end of each tape or CD. Therefore, devices such as those disclosed in the Kawabata patent are primarily useful for bedtime application, or when the user wants the unit to specifically shut off once the audio material (e.g., tape or CD) has been played. Such prior art devices also cannot be modified for use in devices such as electronic keyboards or musical instrument amplifiers.

Other prior art techniques for shutting off electronic equipment incorporate sleep timers which shut off the equipment after a pre-selected period of time. Such sleep timers, which are commonly used in television sets, require human intervention for their operation. For example, the Kawabata patent discloses a device in which a sleep key must be depressed for the auto-sleep mode to be entered. That is, a conscious decision and intervention by the user of the electronic equipment must be made to insure that the equipment will shut itself off automatically at a later time. If this human intervention does not take place, the device may remain powered on indefinitely.

In addition, and perhaps most importantly, prior art sleep timer devices cannot practically be used to prevent the user from inadvertently leaving equipment on after normal

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daily use. During such normal daily use, the user would not want the device to automatically shut off after a predetermined period of time, since it is not always clear how long the equipment will be in use.

5 Accordingly, there remains a need in the art for a device which can automatically, and without human intervention, shut off audio, audio/visual, or electronic musical instrument equipment generating an audio output signal, after the equipment has ceased to generate an audio
10 output signal for a period of time, indicating that a user is no longer using the equipment.

SUMMARY

The present invention meets these needs by
15 providing a device which automatically shuts off audio, audio/visual, or electronic musical instrument equipment generating an audio signal output after a period of non-use, without prior intervention on the part of the operator of the equipment.

20 In such a device, the audio output level is preferably continuously monitored. If the audio output level falls below a predetermined threshold for some predetermined (and possibly user programmable) length of time, power to at least a portion of the electronic equipment is cut off.
25 Power to the equipment may in this way be turned off, resulting in a state identical or similar to that which occurs when the normal user controlled power switch is turned off. The user can restore power by pressing a single power switch, most ideally the normal user controlled power switch.

30

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic showing audio, audio/visual, or electronic musical instrument equipment including a preferred digital embodiment of an automatic shut
35 off device.

Figure 2 is a schematic showing audio, audio/visual, or electronic musical instrument equipment

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including a preferred alternative digital embodiment of an automatic shut off device.

Figure 3 is a schematic showing audio, audio/visual, or electronic musical instrument equipment including a preferred analog embodiment of an automatic shut off device.

DETAILED DESCRIPTION

The structure and function of the preferred embodiments can best be understood by reference to the drawings. The reader will note that the same reference numerals appear in multiple figures. Where this is the case, the numerals refer to the same or corresponding structure in those figures.

Referring now to **Figure 1**, a schematic of audio, audio/visual, or electronic musical instrument equipment including automatic shut off device 11 is shown. As will be made clear by the discussion below, equipment 10 is preferably not electronic equipment that receives a continuously broadcast signal, such as a television or radio receiver. Automatic shut off device 11 preferably works with audio, audio/visual, or electronic musical instrument equipment in which an audio output signal ceases when either a) a prerecorded program (such as on a tape or CD) finishes; or b) the user ceases interaction with the equipment.

Equipment 10 includes a conventional power supply 12, and ancillary equipment 14. Ancillary equipment 14 includes the electronics and mechanisms (such as amplifiers, motors, optics, etc.) necessary to generate an analog or digital audio signal either from a prerecorded medium (such as a tape or CD), or from the input of a user (such as would occur with the use of a musical instrument). Ancillary equipment 14 may also include other power consuming devices (such as displays, lights, LEDs, etc.) that are normally in use when the power switch 22 of equipment 10 is turned on. Thus, the power status or state of ancillary equipment 14 (i.e., whether or not ancillary equipment 14 is on or off) is normally controlled by the user operated power switch 22

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associated with equipment 10. Equipment 10 may also include power consuming devices (such as clocks, memories, etc.) that are always in use when equipment 10 is plugged in, regardless of whether or not the power switch is on.

5 Power supply 12 supplies electrical power to ancillary equipment 14 via power coupling device, or relay 16. Relay 16 may be replaced with a semiconductor switch such as a transistor, or by any other switching device controllable by an input signal. Depending upon the desired
10 configuration, a portion of power supply 12 may be included within ancillary equipment 14.

Ancillary equipment 14 includes one or more outputs 18 upon which one or more audio output signals appear. Audio output 18 may be coupled directly to an external speaker 20,
15 or to some other piece of audio equipment such as an amplifier or mixer (not shown). The operation of relay 16 (and thus whether or not ancillary equipment 14 will receive power) is controlled by switch 22, level detector 24, sequential circuit 26, and clock 28. Power may be supplied
20 to elements 22 through 28 in a conventional manner, such as directly from power supply 12, or from some other source of electrical energy, such as a battery or capacitor (not shown).

Level detector 24 has an input 30 which is
25 connected to one or more audio outputs 18 of ancillary equipment 14. Level detector 24 preferably has two output states which are representative of the level of the audio signal detected at input 30. For example, if the detected audio signal has a level above a predetermined threshold, a
30 logic 1 may be generated at output 32. If the detected audio signal has a level below a predetermined threshold, a logic 0 may be generated at output 32. The chosen threshold level should be appropriate for the type of equipment that automatic shut off device 11 is to be used with. For
35 example, with certain types of audio equipment, there may be a certain amount of noise which is generated at the outputs,

regardless of whether or not the audio equipment is "in use" in the conventional sense.

If ancillary equipment 14 can reproduce sound from a prerecorded program (such as from a tape or CD), ancillary equipment 14 may include certain components (such as motors, lasers, etc., not shown) that receive or draw power (or more power) when an audio signal is being generated at output 18. Thus, such a component would generally be in a "powered on" state when an audio signal is generated at output 18, and would generally be in a "powered off" state when no audio signal is generated at output 18. For example, a CD player may include a motor which causes a CD to rotate when the player generates an audio signal output. CD players are typically configured such that this motor turns off after a CD has finished playing.

In equipment 10 including components which are generally powered on only when an audio signal output is being generated, level detector 24 could be coupled to a power or control input of such a component (instead of output 18), and level detector 24 could be configured such that its two output states reflect whether or not the component it is coupled to is in a powered on or powered off state.

Sequential circuit 26 preferably receives as inputs electrical or other signals received from level detector 24, clock 28, and switch 22. Clock 28 may also be incorporated in sequential circuit 26. Depending upon the signals received from switch 22 and level detector 24, sequential circuit 26 generates at its output 34 a voltage which is received by input 36 of relay 16. If sequential circuit 26 is in a state which indicates that power should be supplied to ancillary equipment 14, the signal generated at output 34 is of the type that would allow relay 16 to pass power from power supply 12 to ancillary equipment 14. Otherwise, the voltage or signal generated at output 34 is of the type that would prevent relay 16 from passing power from power supply 12 to ancillary equipment 14. Again, it should be understood that ancillary equipment 14 can include power consuming

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devices that are normally turned on (including audio generating electronics and any associated displays, keyboards, etc.) when the power to equipment 10 is turned on.

The operational requirements of sequential circuit 26 are as follows: at any time, the user of equipment 10 should be able to either turn on or turn off equipment 10 by pressing switch 22, which is preferably a momentary contact switch in this embodiment. If sequential circuit 26 receives an input from level detector 24 indicating that the audio signal output level of ancillary equipment 14 is below a predetermined threshold, then a timing operation is begun. This timing operation will continue until either: (a) an audio signal having a level above a predetermined threshold is detected; (b) an input is received from switch 22 indicating that power should be turned off immediately; or (c) a predetermined or programmable time-out period has elapsed. Under circumstances (b) and (c), sequential circuit 26 generates an output which will cause relay 16 to shut off power to ancillary equipment 14.

As will be apparent to those skilled in the art, sequential circuit 26, which may include both logical and memory elements, may be configured in any of a number of different ways to provide the proper output necessary to control relay 16. Sequential circuit 26 may be implemented with a registered programmable array logic (PAL) device, or with any other elements which can be combined to form an appropriate sequential circuit. Again, clock 28 may be external to sequential circuit 26, or may form a part of sequential circuit 26.

Referring now to **Figure 2**, an alternative embodiment of automatic shut off device 11 is shown. In **Figure 2**, the functions of sequential circuit 26 and clock 28 are performed specifically by the combination of OR gate 40, timer 42, AND gate 44, and memory element or flip flop 46. Memory element 46 is preferably a positive- or negative- edge triggered DQ flip flop which can be reset or cleared if desired.

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Timer 42 may be preprogrammed to measure a certain length of time. The length of time measured may also be programmable by the user of equipment 10. When reset input 48 of timer 42 receives the appropriate signal (i.e., either a logic 0 or a logic 1 signal) timer 42 is reset to zero. In the embodiment shown in Figure 2, timer 42 is reset when reset input 48 receives a logic 1 signal. Reset input 48 receives the output of OR gate 40. OR gate 40 receives as its inputs the output 32 of level detector 24, and the output 50 of switch 22. Switch 22 is preferably a momentary contact switch which generates at its output 50 a single positive going pulse when switch 22 is depressed or otherwise activated. Thus, timer 42 is reset either when switch 22 is depressed, or when level detector 24 generates a logic 1 at its output 32, indicating that the audio signal present at output 18 is above a predetermined threshold.

In a preferred embodiment, timer 42 generates at its output 52 a logic 1 when timer 42 has not yet timed out; and timer 42 generates at its output 52 a logic 0 when it has timed out, i.e., when the predetermined time has elapsed. Output 52 of timer 42 is used as an input by AND gate 44.

Memory element 46 is preferably configured as a divide-by-two counter with the inverted Q output ($\bar{Q}$) fed back into the D input. The Q output is used as an input by AND gate 44. Upon initial power up of equipment 10 (i.e., when power supply 12 first plugged in), memory element 46 may be reset so that it generates a logic 0 at its Q output. Thus, on initial power up, AND gate 44 receives from the Q output of memory element 46 a logic 0. Regardless of what logic signal timer 42 generates at its output 52, AND gate 44 generates at its output 34A a logic 0 which is received by input 36 of relay 16. Thus, as described above, relay 16 prevents power from flowing between power supply 12 and ancillary equipment 14.

At this time, if the user of equipment 10 presses or otherwise activates switch 22, the following events occur: timer 42 is reset, thus generating a logic 1 at its output

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52; the Q output of memory element 46 toggles to a logic 1; AND gate 44 generates at its output 34A a logic 1, and relay 16 closes the circuit between power supply 12 and ancillary equipment 14.

5 If the user of equipment 10 desires to turn the equipment off, switch 22 is depressed or otherwise activated again. When this occurs, timer 42 is again reset, the Q output of memory element 46 toggles to a logic 0, and AND gate 44 generates at its output 34A a logic 0. Again, this 10 causes relay 16 to open the circuit between power supply 12 and ancillary equipment 14, shutting off power to ancillary equipment 14. The user may turn the power on again by pressing switch 22.

 If ancillary equipment 14 is in a powered on state 15 but ceases to generate an audio signal at its output 18 (as may occur when a CD has stopped playing, or when the user stops playing a musical instrument) level detector 24 generates at its output 32 a logic 0. If switch 22 is not depressed or otherwise activated, reset input 48 of timer 42 20 receives a logic 0, and timer 42 begins the timing operation. If switch 22 is not depressed before the timing operation is complete, timer 42 will generate at its output 52 a logic 0 when timing is complete. Thus, AND gate 44 will generate at its output 34A a logic 0, causing relay 16 to shut off power 25 to ancillary equipment 14, as described above. Memory element 46 may be configured such that it is cleared or reset (so that its Q output is at a logic 0) whenever timer 42 generates at its output 52 a logic 0. Again, if the user of equipment 10 wishes to restore power, all he or she needs to 30 do is press or activate switch 22.

 Referring now to Figure 3, a preferred analog embodiment of automatic shut off device 11 is shown.

 Ancillary equipment 14 receives power from power supply 12 via relay 16, in the manner discussed above with 35 respect to Figures 1 and 2.

 Again, the audio outputs 18 of ancillary equipment 14 may be directly coupled to an external speaker 20, or may

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be coupled to another piece of audio equipment such as an amplifier, mixer, recorder, etc.

Output 18 is coupled to an input of amplifier 62. An output of amplifier 62 is coupled to rectifier 66, which 5 is in turn coupled to an input of OR gate 68.

Switch 22 is preferably a toggle switch in this embodiment. The 'ON' contact of switch 22 is connected to switch debouncer 70, which is in turn coupled to differentiator circuit 72. The output of differentiator 10 circuit 72 is fed into an input of amplifier 74. The output of amplifier 74 is coupled to an input of monostable multivibrator (or one-shot) 76 via diode or rectifier 78. The output of monostable multivibrator 76 is coupled to a second input of OR gate 68.

15 The OFF contact of switch 22 is coupled to an input of switch debouncer 80. The output of switch debouncer 80 is coupled to an input of differentiator 82. Differentiator 82 generates an output signal which is used as an input by amplifier 84. The output of amplifier 84 is coupled to an 20 input of monostable multivibrator (or one-shot) 86. The output of monostable multivibrator 86 controls a transistor switch 88, which is operatively coupled to discharge the capacitor in parallel RC circuit 90.

The output of OR gate 68 is coupled to transistor 25 switch 92. Transistor switch 92 is coupled to RC circuit 90, and can rapidly charge the capacitor in RC circuit 90 to a predetermined voltage. The output voltage of RC circuit 90 is used as an input by high impedance comparator 94. The output of comparator 94 controls transistor switch 96. 30 Transistor switch 96 has an output 34B which is coupled to input 36 of relay 16.

The operation of the circuit shown in Figure 3 is as follows: when switch 22 in the OFF position, relay 16 is turned off and power supply 12 does not provide power to 35 ancillary equipment 14. When switch 22 is in the ON position, a predetermined voltage (labeled V+ here) appears at the input of switch debouncer 70 in a stepwise fashion.

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Switch debouncer 70 removes any switch bounce transient signals. A clean step waveform is then fed from switch debouncer 70 into differentiator 72. Differentiator 72 produces a single short pulse, which is received by amplifier
5 74.

Amplifier 72 then amplifies the pulse to provide a suitable triggering pulse for monostable multivibrator 76. Rectifier 78 assures that monostable multivibrator 76 only receives triggering pulses of one polarity. Should
10 monostable multivibrator 76 require negative trigger pulses, then rectifier 78 could be oriented in the opposite way.

Monostable multivibrator 76 produces a wide output pulse which is coupled into an input of OR gate 68. Subsequently, a pulse appears at the output of OR gate 68.
15 This output pulse is coupled into transistor switch 92. During the time that transistor switch 92 is ON, the power supply voltage V+ appears at the input to parallel RC circuit 90, charging the capacitor in the circuit 90.

Comparator 94 senses the output voltage of RC in
20 circuit 90, and produces a step voltage at its output, if the output voltage of RC circuit 90 is above a predetermined threshold. This step voltage activates transistor switch 96, which then turns on relay 16. The contacts of relay 16 are then closed, thereby allowing power to flow from power supply
25 12 to ancillary equipment 14.

When an audio signal above a predetermined level is present at output 18, this signal is amplified by amplifier 62, rectified by rectifier 66, and then presented as an input to OR gate 68. Depending upon the nature of the audio signal
30 generated by ancillary equipment 14, OR gate 68 may generate a series of logic 1 pulses, a constant logic 1 output, or a series of logic 1 pulses of varying length. Whenever a logic 1 is generated by OR gate 68, transistor switch 92 is turned on, and the capacitor in RC circuit 90 is charged. RC
35 circuit 90 is thereby maintained in a fully charged state, which keeps relay 16 in an ON state through the actions of comparator 94 and transistor switch 96, discussed above.

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Should ancillary equipment 14 stop generating an audio output signal, OR gate 68 will generate a logic 0 output, transistor switch 92 will turn off, and RC circuit 90 will discharge. The voltage on the capacitor in RC 90 circuit will decay over a user selected, or preselected time interval until it drops below the threshold required for comparator 94 to stay ON (i.e., to generate a logic 1 output). Comparator 94 will turn OFF (i.e., generate a logic 0 output) thereby turning OFF transistor switch 96 and subsequently turning OFF relay 16.

If the user desires to resume operation of equipment 10, then a cycling of switch 22 from ON to OFF back to ON again will duplicate the aforementioned sequence of events, resulting in re-activation of ancillary equipment 14.

Ancillary equipment 14 may also be immediately turned OFF by turning switch 22 to OFF. This results in a similar sequence of signals passing through switch debouncer 80, differentiator 82, amplifier 84, rectifier 85 and monostable multivibrator 86. Transistor switch 88 momentarily grounds the capacitor in RC circuit 90, thereby turning OFF comparator 94, then transistor switch 96 and ultimately relay 16.

It will be understood that certain conventional elements, well known to those skilled in the art, which are necessary to implement the disclosed embodiments (such as certain wiring, buffers, inverters, switch debouncers, etc.) have not been described in detail to avoid obscuring the invention.

The present invention has been described in terms of a preferred embodiment. The invention, however, is not limited to the embodiment depicted and described. Rather, the scope of the invention is defined by the appended claims.

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WHAT IS CLAIMED IS:

1. A device for automatically shutting off audio, audio/visual, or electronic musical instrument equipment generating an audio output signal, comprising:
 - 5 means for detecting the presence of the audio output signal; and
 - means for shutting off power to the equipment if the audio output signal has not been detected for a predetermined period of time.
- 10 2. The device of claim 1 wherein the audio output signal is an analog signal.
3. The device of claim 1 wherein the audio output signal is
15 a digital signal.
4. A method for controlling the supply of power to audio, audio/visual, or electronic musical instrument equipment generating an output signal with a variable level, the method
20 comprising the steps of:
 - detecting the audio output signal;
 - beginning a timing operation if the level of the audio output signal falls below a predetermined threshold;
 - and
 - 25 shutting off the equipment if the level of the output signal does not rise above a predetermined threshold for a predetermined period of time.
5. The method of claim 4 wherein the output signal is an
30 analog audio signal.
6. The method of claim 4 wherein the output signal is a digital audio signal.
- 35 7. A device for automatically shutting off audio, audio/visual, or electronic musical instrument equipment generating an audio output signal with a variable level, comprising:

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means for detecting the audio output signal;
means for beginning a timing operation if the level
of the audio output signal falls below a predetermined
threshold; and

- 5 means for shutting off the equipment if the level
of the audio output signal does not rise above a
predetermined threshold for a predetermined period of time.

8. In audio, audio/visual, or electronic musical instrument
10 equipment including a power supply, a user-controlled power
switch, and ancillary equipment whose power state is normally
controlled by the power switch, the ancillary equipment
generating an audio output signal, an automatic shut off
device comprising:

- 15 a power coupling device coupling the power supply
to the ancillary equipment, the power coupling device having
a first state in which power is transmitted to the ancillary
equipment, and a second state in which power is not
transmitted to the ancillary equipment;

- 20 a level detector coupled to the audio output
signal, the level detector generating a first output if the
level of the audio output signal is above a predetermined
threshold, and generating a second output if the level of the
audio output signal is below a predetermined threshold; and

- 25 a sequential circuit having inputs coupled to the
power switch and to the level detector;

the sequential circuit having an output which
controls the state of the power coupling device;

- the sequential circuit configured such that its
30 output will cause the power coupling device to be in its
first state if the user has activated the power switch to
turn on the audio, audio/visual, or electronic musical
instrument equipment, and if the level detector has not
generated its second output for more than a predetermined

- 35 period of time;

the sequential circuit also configured such that
its output will cause the power coupling device to be in its

second state if the user has activated the power switch to turn off the audio, audio/visual, or electronic musical instrument equipment, or if the level detector has generated its second output for more than a predetermined period of 5 time.

9. The automatic shut off device of claim 8 wherein the sequential circuit includes both logic and memory elements.

10 10. The automatic shut off device of claim 8 wherein the sequential circuit includes a timer, a flip flop, and at least one logic gate.

11. The automatic shut off device of claim 8 wherein the 15 user controlled power switch is a momentary contact switch.

12. The automatic shut off device of claim 8 wherein the sequential circuit includes an external clock.

20 13. The automatic shut off device of claim 8 wherein the sequential circuit includes an internal clock.

14. The automatic shut off device of claim 8 wherein the ancillary equipment generates a digital audio output signal. 25

15. The automatic shut off device of claim 8 wherein the ancillary equipment generates an analog audio output signal.

16. The automatic shut off device of claim 8 wherein the 30 power coupling device is a relay.

17. The automatic shut off device of claim 8 wherein the power coupling device is a semiconductor device.

35 18. The automatic shut off device of claim 8 wherein the power coupling device is a transistor.

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19. In audio, audio/visual, or electronic musical instrument equipment including a power supply, a user-controlled power switch, and ancillary equipment whose power state is normally controlled by the power switch, the ancillary equipment
5 generating an audio output signal, an automatic shut off device comprising:

a power coupling device coupling the power supply to the ancillary equipment, the power coupling device having a first state in which power is transmitted to the ancillary
10 equipment, and a second state in which power is not transmitted to the ancillary equipment;

means, coupled to the audio output signal, for generating a first output if the level of the audio output signal is above a predetermined threshold, and for generating
15 a second output if the level of the audio output signal is below a predetermined threshold;

an RC circuit, coupled to the means for generating, in which the capacitor is quickly charged when the means for generating generates the first output, and in which the
20 capacitor is slowly discharged when the means for generating generates the second output;

the RC circuit having an output voltage which controls the state of the power coupling device, the power coupling device being in its first state when the output
25 voltage of the RC circuit is above a predetermined threshold, and the power coupling device being in its second state when the voltage of the RC circuit is below a predetermined threshold; and

means for quickly discharging the capacitor in the
30 RC circuit, the means for quickly discharging activated if the user turns off the power switch.

20. The automatic shut off device of claim 19 wherein the user controlled power switch is a toggle switch.

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21. The automatic shut off device of claim 19 wherein the ancillary equipment generates an analog audio output signal.

22. The automatic shut off device of claim 19 wherein the ancillary equipment generates a digital audio output signal.

23. The automatic shut off device of claim 19 wherein the power coupling device is a relay.

24. The automatic shut off device of claim 19 wherein the power coupling device is a semiconductor device.

25. The automatic shut off device of claim 19 wherein the power coupling device is a transistor.

26. In audio, audio/visual, or electronic musical equipment generating an audio output signal, and having a component which is generally in a powered on state when the audio output signal is being generated and which is generally in a powered off state when the audio output signal is not being generated, a device for automatically shutting off the audio or audio/visual equipment comprising:

means for detecting whether the component is in a powered on or powered off state; and

means for shutting off power to the equipment if the component is in a powered off state for a predetermined period of time.

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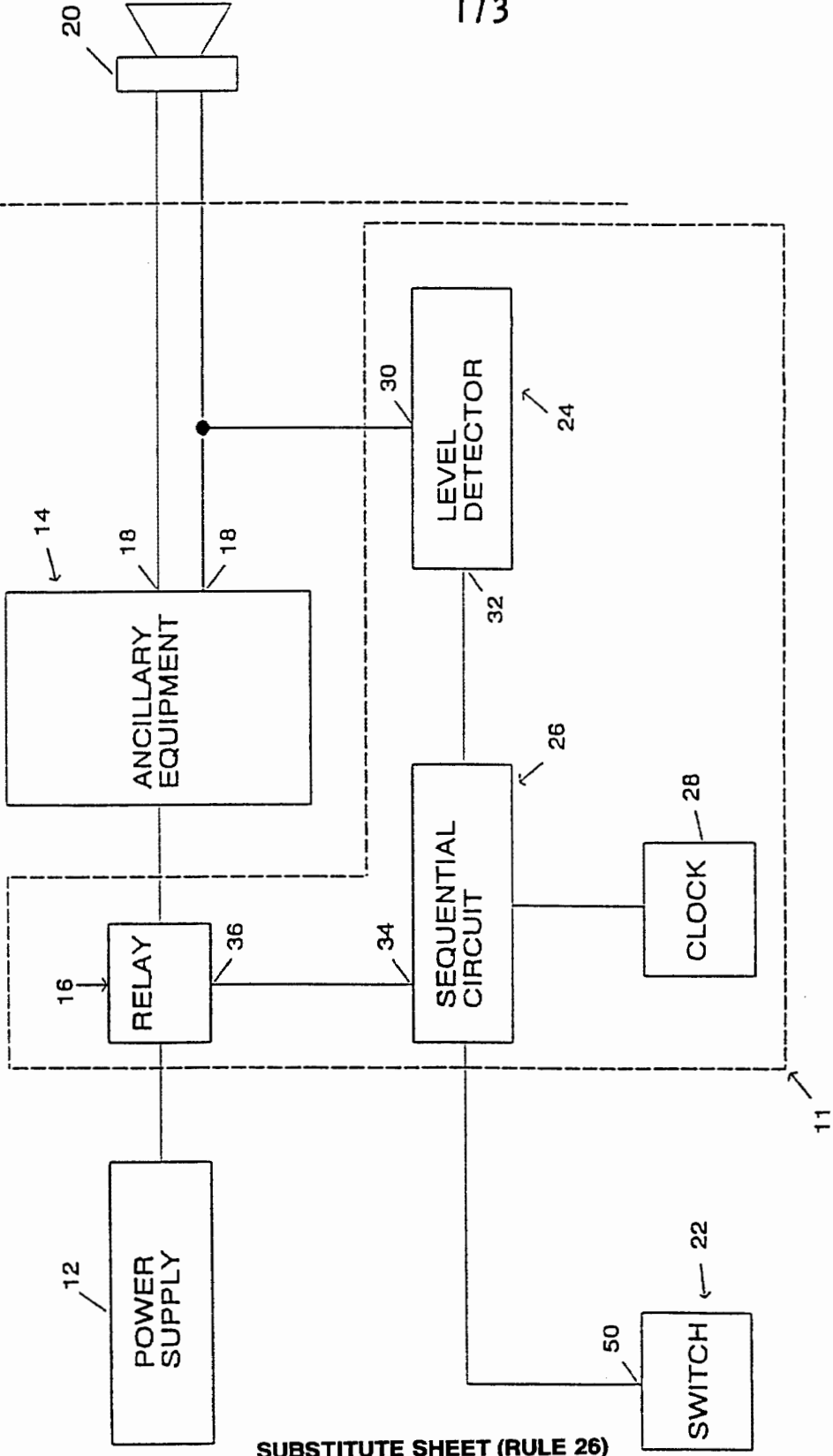


FIGURE 1

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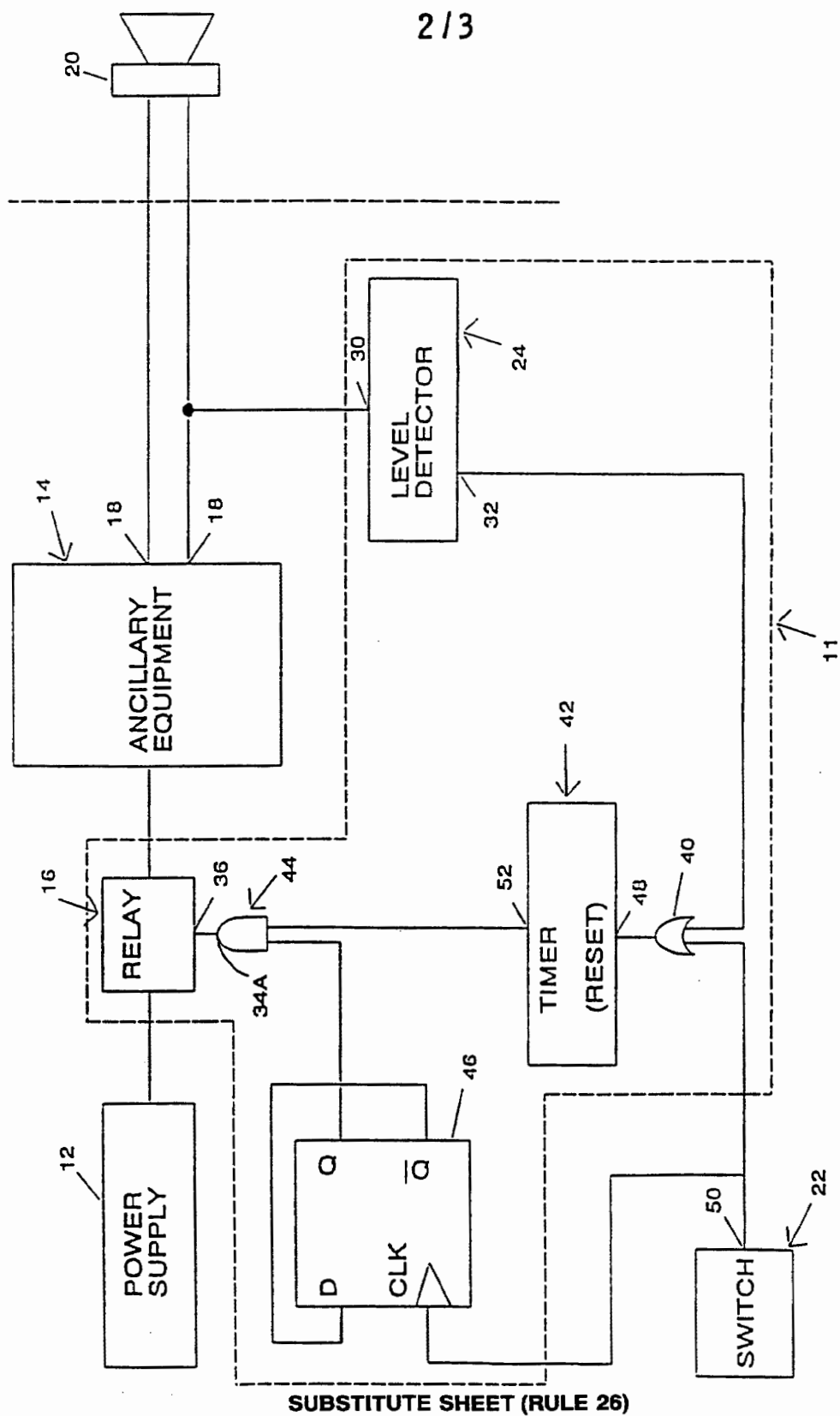


FIGURE 2

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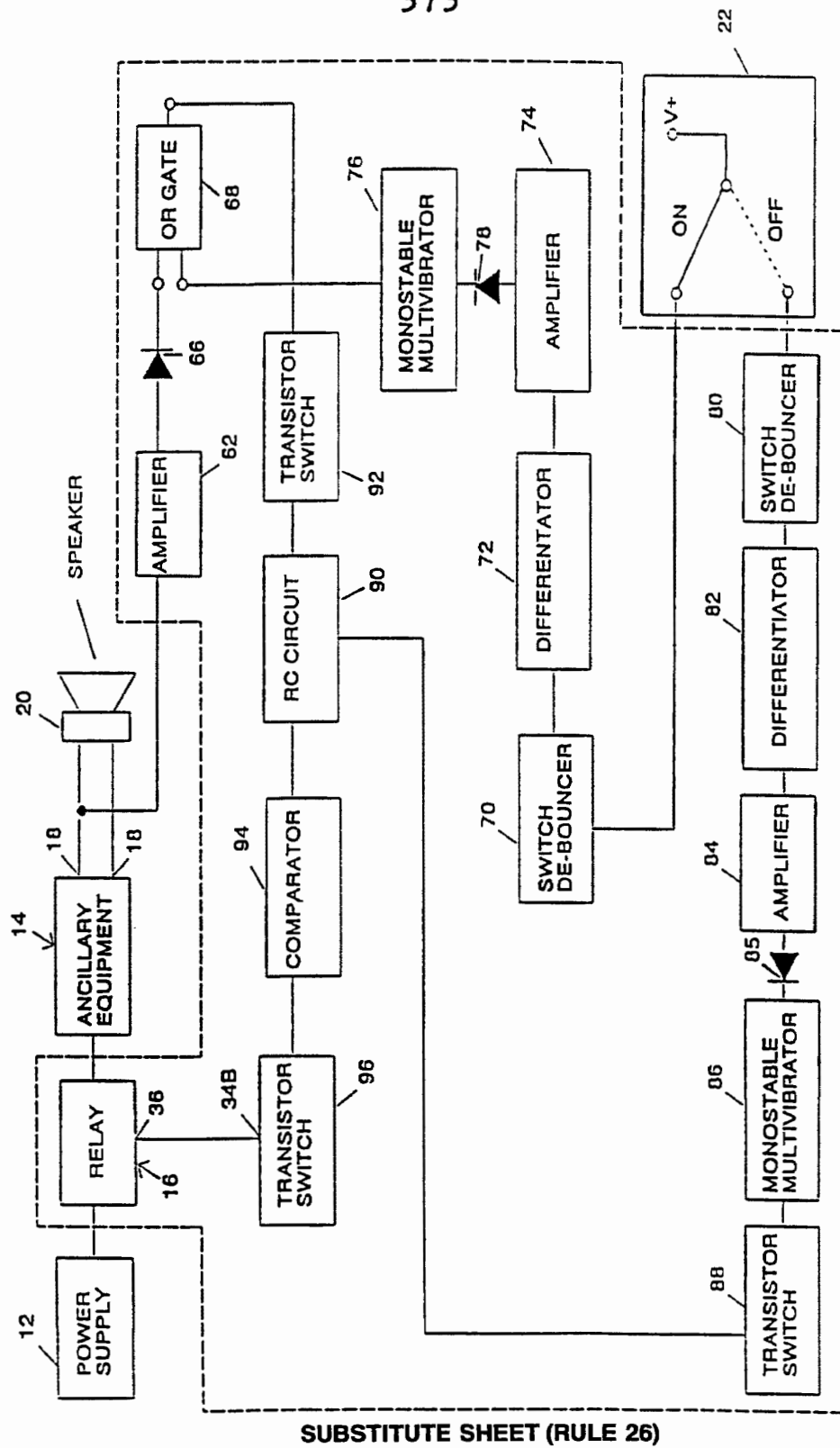


FIGURE 3

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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International Bureau



(43) International Publication Date
14 November 2002 (14.11.2002)

PCT

(10) International Publication Number
WO 02/091596 A2

- (51) International Patent Classification⁷: **H04B**
- (21) International Application Number: PCT/US02/14029
- (22) International Filing Date: 3 May 2002 (03.05.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
- | | | |
|------------|-------------------------|----|
| 09/849,694 | 4 May 2001 (04.05.2001) | US |
| 09/849,693 | 4 May 2001 (04.05.2001) | US |
| 09/849,698 | 4 May 2001 (04.05.2001) | US |
| 09/849,198 | 4 May 2001 (04.05.2001) | US |
- (71) Applicant: **M & S SYSTEMS, INC.** [US/US]; 2861 Congressman Lane, Dallas, TX 75220 (US).
- (72) Inventors: **TOMASSETTI, Stephen, Robert**; 350 Greenway Avenue, Newbury Park, CA 91320 (US). **SNEDIGAR, Donald, C.**; 4102 Esters Road, Unit No. 193, Irving, TX 75038-4759 (US). **WOJCIECHOWSKI, Thomas, Gerald**; 10841 South Ridgeway, Chicago, IL 60655 (US). **FARRIS, Bradford, Lowell**; 2101 Sumnerdale Avenue, Chicago, IL 60625 (US).
- (74) Agents: **SAMPLES, Kenneth, H.** et al.; Fitch, Even, Tabin & Flannery, Suite 1600, 120 South LaSalle Street, Chicago, IL 60603 (US).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— *without international search report and to be republished upon receipt of that report*
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: DIGITAL MULTI-ROOM, MULTI-SOURCE ENTERTAINMENT AND COMMUNICATIONS NETWORK

(57) Abstract: A peer-to-peer network of devices connected together with data being streamed over a digital network. Network devices include one or more data communication units that are locatable in two or more zones. Data communication units may be room stations and door stations connected to hub modules at an entertainment hub and local units connected to the entertainment hub. The entertainment hub may be connected to the Internet, either directly or, indirectly through one of the connected data communications units. Room stations include a sending unit, a receiving unit, and an intercom unit (provide intercom, paging and station monitoring) and are located in different zones, each controlling local reception of data from the data stream and each may place data into the data stream. Room stations operate independently of each other such that a person at a first room station may select to receive audio data from another unit while a second person at a second room station is receiving data from yet another unit, each individually setting sound volume and tone independent of the other. Audio sources may include a radio tuner, a compact disc player, a mini-disc player, a microphone, a cassette player and a compressed audio data source and, any unit may select audio data from any audio source independent of other units. Room stations may include an interactive display and keypad with commonly used commands in a command menu. A time display may be included and stations may be time programmable. Some units may selectively disable issuance of commands from other network devices.

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DIGITAL MULTI-ROOM, MULTI-SOURCE ENTERTAINMENT AND COMMUNICATIONS NETWORK

BACKGROUND OF THE INVENTION

Field of the Invention

5 The present invention is related to peer to peer local area networks (LANs) and, more particularly to a peer to peer network wherein control data and information, especially multimedia information, is provided to stations connected to the network.

Background

A typical audio system has a centralized receiver that includes a tuner and program
10 function selector (where a program source is selected) and one or more sets of speakers, e.g., a local speaker set and remote speaker sets. The centralized receiver controls the volume at all speaker sets, i.e., on both the local speaker set and on the remote speakers. The receiver selects a single program source for play at any and all of the speaker sets. Only one source is selected and available at all of the speaker sets at a time, even though
15 the receiver may have inputs from multiple devices. Input devices may include, for example, a turntable, tape player, a compact disc (CD) player, a mini-disk (MD) player and other auxiliary devices, such as a digital audio tape player, a digital versatile disc (DVD) player, a videocassette recorder (VCR) or television set.

Transferring multimedia information over a network is known, e.g., streaming
20 multimedia data over a network such as the internet or a local area network (LAN). The multimedia data may be raw audio or video data such as a wave file, a bitmap or a movie file. However, typically, multimedia files are compressed using, for example, the motion pictures expert group (MPEG) format to reduce the data volume that must be handled. Furthermore, music or songs may be encoded as compressed audio, for example, using the
25 MPEG layer 3 (MP3) standard. This compressed audio may also be made available as an MP3 file for compact storage, transport and handling. Depending upon the complexity of the audio data that is compressed, these audio compression techniques can reduce file size by 90% or more, without losing playback quality, i.e., with CD quality playback.

Reduced file size and CD quality sound have made compressed audio files very

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popular. So, MP3 file libraries are available at numerous internet sites, e.g., MP3.com. Further, various software interfaces are available for playing MP3 files, either directly, as they are downloaded to a personal computer (PC) from the internet or, from a cache of previously downloaded MP3 files, e.g., Winamp and RealPlayer. Software packages are also available to encode uncompressed audio, e.g., encoding a music cut from, for example, a CD into a MP3 file. After encoding (called "ripping") the condensed file may be stored on a PC either for subsequent playback at the PC or, for transfer to a dedicated MP3 player, such as the Lyra from RCA or the Rio from Diamond Multi-Media.

A typical such MP3 player looks like a small (about the size of a cigarette package) personal radio with mini-earphones for private listening. Usually, the MP3 files are stored in non-volatile memory in the MP3 player, which may hold an hour or more of encoded music. These dedicated MP3 players normally serve as personal music players that provide a single individual with music and songs selected for the listener's taste.

Another well-known way to deliver multimedia data to an individual is to use streaming audio/video, wherein multimedia data is continuously sent over a network, e.g., the Internet, and displayed/played on a computer as it is received. Numerous websites are available, currently providing streaming audio, e.g., broadcast.com. Still other sites include links to multimedia files that play as they are downloaded. However, these files use standard hypertext transport protocol to deliver the files, which are named to invoke a particular browser plug-in, such as RealPlayer, which plays the file.

Although the personal MP3 players may be attached to a sound system, e.g., as an auxiliary device, usually they are not. So, for example, a musical piece being played on a turntable attached to a sound system is not heard through speakers attached to a computer; and, a streaming audio or MP3 file being played on a computer is passed to a home theater system only with some difficulty. Consequently, a heavy metal music file downloaded by a teenager and being played on a PC in the teen's room may be disturbing everyone else in the house, while a sound system that is intentionally located in a remote, isolated family room may lie dormant. Light music that is being piped throughout the house from a sound system located in the family room and, played at a volume that is barely loud enough to be heard in the crowded family room, may be overly loud in

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another, nearly empty room. By contrast, the same music set at low volume in a nearly empty family room might not be heard in other rooms where people are standing and chatting. Further, if such disparate devices were connected together, the connected devices would require some type of command and control unit, such as an audio receiver or a dedicated computer, to direct and route audio, as desired. None of the currently available, state of the art entertainment devices are capable of independent operation in a network of such devices, especially where the network may have any number of remote nodes and some of those nodes may have limited functionality. In addition the remote nodes, typically, must be custom programmed by location.

Thus, there is a need for a multimedia system wherein a program source may be located in one zone or room and multimedia data may be streamed to one or more other zones or rooms where it may be independently selected, controlled and played.

SUMMARY OF THE INVENTION

It is therefore a purpose of the invention to distribute digital audio to different zones within the same structure;

It is another purpose of the invention to independently distribute separate audio data streams to different zones within the same structure;

It is yet another purpose of the invention to synchronously pass digital audio between zones in a structure;

It is yet another purpose of the invention to include point to point intercom and audio data in audio data streams distributed to different zones of a structure;

It is yet another purpose of the invention to control distribution of digital audio to different zones within the same structure and provide individual sound quality control of digital audio distributed and played in individual rooms of a house.

It is yet another purpose of the invention to share digital audio between zones in a structure;

It is yet another purpose of the invention to control multiple streams of data streaming simultaneously and independently between individual nodes of a peer-to-peer network.

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It is yet another purpose of the invention to distribute control function amongst peer nodes of a peer-to-peer network such that the network begins operation with all connected nodes operating synchronously and in cooperation with each other.

The present invention is a multi-zone entertainment and communications network
5 that includes a digital peer-to-peer network distributing data that is being streamed from multiple sources to multiple independent receivers and/or transceivers. The receivers and transceivers may be located in different zones from each other. The sources may be located in different zones from each other and, may be connected to or part of one of the transceivers. The receivers and transceivers may have independent volume and tone
10 control and are capable of locally manipulating the data stream output. Each source can inject data into the data stream independent of the other sources, which then is streamed on the network and made available to all receivers and transceivers, simultaneously. Each receiver may independently select a source of audio from the data stream. One or more of the sources act as an intercom, providing verbal communication between at least two
15 zones and provide paging to broadcast pages to all the receivers/transceivers on the network.

The preferred peer-to-peer network initialization sequence is an autonomous process. During normal network operation, data is streamed from one or more entertainment media source nodes to multiple independent other nodes and, then, passed
20 to connected receivers and/or transceivers. The receivers and transceivers may be located in different zones from each other. The zones may be different rooms in a building or house. During initialization, at least one backplane address is assigned to each network hub port and to each local node. One hub port is designated as backplane master. Upon power-up or a reset, a remote scan is initiated, automatically, from the hub ports to the
25 remote nodes. Each remote node acquires addresses from the hub backplane master which tie the particular remote node to the hub backplane. So, any remote node requiring an address responds to the remote scan indicating that one or more addresses are needed. Then, nodes requesting addresses enter a contention arbitration phase to select the next requesting node which is assigned addresses next. Addresses are assigned to the remote
30 mode nodes, giving priority according to serial number, lowest to highest. The backplane

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master manages the initialization process, providing addresses to each of the other remote nodes, as required.

Advantageously, the initialization scheme of the present invention allows the network to be dynamically auto-configurable. By using the auto-initialization sequence, the network dynamically “seeks” and assigns all devices at network nodes connected to it. Each remote node automatically identifies and defines its network connection and broadcasts its presence to all other connected devices at other nodes. After the initialization sequence, the system automatically reconfigures so that the “brains” of the system are distributed amongst the nodes and the peer-to-peer hub acts as passive device.

Any number and type of connected remote nodes may be included on the network and are each connected to hub ports. Nodes communicate synchronously with each other through the hub and can both receive and inject audio into the data stream. Further, once initialized, the multi-zone multimedia network of the present invention provides digital audio that is available to be played at each node, i.e., in different zones of a structure, such as in different rooms of a house. Each room station converts from digital to analog audio and back, locally, for clear CD quality local sound.

The control messaging structure of the present invention is a peer-to-peer communication protocol structure. Feature cards or remote devices are connected to peer nodes, which are controlled by control data passed between the nodes on the network over a control bus using the preferred control messaging structure. Likewise, information is shared over the control bus between devices connected to network nodes using the control messaging structure of the present invention. The preferred control message structure is a byte serial data stream wherein one byte per packet is passed over the control bus between communicating nodes. The control message includes a preamble, a destination address, a source address, a payload and a checksum. A field may also be included to designate payload size allowing a variable sized payload. Each node uses messages structured according to the control message structure to communicate with other nodes, gain access to the network, arbitrate contention for the control bus, and detect collisions with messages from other nodes.

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All active nodes constantly monitor the control bus for activity. When the control bus is quiet, any node with control/data to be sent, can begin transmission, sending a request for access to initiate contention arbitration for the control bus. Then, the requesting node monitors a corresponding return message. If the return message mirrors the request, the node has access to the bus and, the node may write a message to the control bus, structuring the message according to the control messaging structure of the present invention. If access is denied, then, the node must wait until the control bus is idle again before re-attempting to initiate contention arbitration.

Advantageously, the messages between nodes remains synchronous, allowing each node and feature card connected to the network to communicate with all other connected remote locations. Further, the preferred control messaging structure enables communication in multi-zone media network so as to make digital audio available to each zone of a building or other structure, such as through different room stations of a house. Also, the room stations can individually inject control data into the data stream and onto the network. Alarms or other minimal functionality features may be included, such as to the ability to monitor another remote station using the multi-zone media network's intercom function.

The network serially distributes data that is being streamed from multiple entertainment media sources simultaneously to multiple independent receivers and/or transceivers. The receivers and transceivers may be located in different zones. The zones may be different rooms of a building or house. Each data packet to each node is structured according to the data structure of the present invention. So, each packet includes a preamble that provides a precisely timed synchronization symbol. The preamble synchronizes the remote nodes to a hub and synchronizes each remote node's internal processes. A control bus status bit follows the preamble and indicates hub control bus status. Each packet includes a hub control field and a control data field carry control information. Audio data fields included in each packet carry audio data for an intercom channel and one or more stereo audio channels.

Advantageously, the multi-zone media entertainment network of the present invention provides digital audio, available for use at each zone of a structure, such as in

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different rooms of a house. Further, multi-zone media network includes room stations that can inject audio into the data stream and onto the network. So, packet data at each room station is converted from digital data to analog audio and, locally, amplified for clear CD quality sound. Since the audio data is synchronously transferred over the preferred multi-zone media network digitally, high-cost, low-loss wiring that is usually required to route high quality audio is unnecessary. Instead, relatively inexpensive CAT 5 wiring may be used to pass digital signals from the hub to the room stations. Each station is synchronized, locally, using the preamble at each packet arrival. This ensures that all devices attached to the system are synchronized from the beginning of the data structure. Because each data packet is structured, fixed in size, devices connected to the system can synchronize to the data stream and, independently, identify control data in the stream intended for that particular device. Further, the room stations independently control and select what is played in the room, selecting from one of several streaming audio data channels, rather than merely playing what is being broadcast from a single audio stream. In addition, each remote station itself can broadcast or receive independent of and simultaneously with other remote stations. Also, since stations operate independently of each other, but communicate with each other using the data structure of the present invention, each remote station can be programmed for individual specific needs such as including radio station presets on remote stations equipped with a radio tuner. Alarms or limited functionality may be included, such as to the ability to monitor another remote using the multi-zone media network's intercom function.

Further, prior art problems of synchronizing transfers between remotely located and connected nodes, such as unintentionally introduced delays and noise, are avoided using the data structure of the present invention. By placing the synchronization in the data frame using the preamble, which is sent to each node at a relatively low frequency of once per packet, the distance and delay problems otherwise associated with remote nodes is eliminated by the present invention

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BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, aspects and advantages will be better understood from the following detailed preferred embodiment description with reference to the drawings, in which:

5 FIG. 1 is schematic representation of a basic example of a local communication network according to the preferred embodiment of the present invention;

 FIG. 2 is an of the basic local communication network of FIG. 1;

 FIG. 3 is a block diagram of the preferred embodiment hub module;

10 FIGS. 4A-B show a timing diagram and data structure illustrating how messages and data are exchanged between the local nodes and the remote nodes across the backplane;

 FIG. 5 is an initialization timing diagram;

15 FIG. 6 is a state diagram showing how the preferred local communication network may be initialized;

 FIGS. 7A-B show a state diagram and control data structure in an example of how a node may gain access to the control bus;

 FIG. 8 is an example of a state diagram for message reception control;

20 FIG. 9 is an example of a typical preferred embodiment home communication system;

 FIG. 10 is an example of the room station;

 FIG. 11 is a block diagram of a remote station; and

 FIG. 12 is a block diagram of the digital loop filter.

**DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS
OF THE INVENTION**

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Referring now to the drawings, and more particularly, FIG. 1 is a block representation of a basic local communication network 100 according to the preferred embodiment of the present invention. In this example, the network 100 includes an

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expandable hub 102 that may include one or more hub modules 104, (two in this example) which are attached to and in communication with each other over a back plane 106. In addition, one or more local feature cards 108 may be locally attached to the back plane 106 for direct communication to the expandable hub 102. Remote stations 110 and
5 remote feature cards 112 may be located in remote zones (e.g., different rooms) and connected to the hub modules 104 over individual high speed data communications channels 114, e.g., a pair of Ethernet adapters sending/receiving a high speed (10Mbit/second) serial data stream over a twisted pair. The hub modules 104 and any optional local feature cards 108 may be aesthetically encased in a structured wiring
10 cabinet (not shown) to give the appearance of a typical state of the art home entertainment system. For convenience, an expandable arrangement 102 of hub modules 104 and optional feature cards 106 are referred to herein below, generically, as an entertainment hub 102. Thus, in this example, each hub module 104 includes hub ports 116; each local feature card 108 includes a local node 118; and, remote nodes 120 are
15 included in each remote station 110 and each remote feature 112. The hub ports 116 are interfaced to the back plane 106, each connecting a remote device, i.e., connecting a remote station 110 or feature card 112, to the network. The local nodes 118 interface the corresponding function of a local feature card 108 to the back plane 106. The remote nodes 120 interface the multimedia function of the remote stations 110 and the remote
20 feature cards 112 to the hub ports 116, providing and receiving data in a format suitable for inter unit serial data communication.

FIG. 2 is an example of the basic local communication network 100 of FIG. 1, which is, essentially, a peer-to-peer network of digital audio devices. Typically, a preferred embodiment system 100 includes a single entertainment hub 102. However,
25 it is understood that multiple entertainment hubs 102 may be included communicating over connected backplanes 106, e.g., with a network bridge. Further, the entertainment hub 102 may be located at a convenient location within a structure, such as a home, with the remote stations 110 and the remote feature cards 112 being located throughout the structure in different zones, i.e., in different rooms. In addition, in the basic example of
30 FIG. 2, a media/communications face plate is shown as an example of a local feature card

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108. In this example, the face plate includes a stereo audio input 122 (left and right), a stereo audio output 124 (both left and right) and an optional infrared (IR) port 126 for control. As further depicted, the IR interface 126 may include a separate infrared receiver jack 126I and an infrared emitter jack 126O or a suitable bidirectional IR port may be substituted. Preferably loud speakers 127 are attached to the room stations 110, 120 for playing music, receiving intercom information or, listening to other stations.

FIG. 3 is a block diagram of the preferred embodiment hub module 104 according to the present invention. As can be seen, the preferred hub module 104 includes preferably four hub ports 116. Each hub port 116 can interface up to four unique audio source address locations and one intercom source which shares a common address with the first audio source address. Each hub module 104 includes a serial interface that may be a local area network (LAN) or serial data interface function, in the example an Ethernet physical layer (Ethernet phy) 128, that connects the serial channel 114 to the hub ports 116. A hub interface 130 interfaces the hub ports 116 to the backplane 106. The serial data interface 128 may be readily available Ethernet chip such as, for example, the LU3X31T-64 FASTCAT phy chip interface (phy chip) from Lucent Technologies, the LTX905A Universal 10BASE-T Transceiver from Level One or an equivalent. Preferably, the hub ports 116 and hub interface function 130 are in a single integrated circuit chip such as the Altera 6024, 10K130 or an equivalent. The hub interface function 130 includes a hub port audio channel selector 132 passing digital audio and intercom data between the hub ports 116 and the back plane 106 through an audio/intercom buffer 134. A back plane controller 136 conducts device address polling/acquisition, selectively passing a unique product serial number for each of the attached devices and, when set as master (as described hereinbelow), the master backplane controller controls other attached hub modules 104 during such operations. The backplane controller 136 either actively drives bus signals at the backplane 106 or passively through the dot OR outputs of drivers 138 which are dot connected to other attached devices. A non-volatile storage interface 140 provides an interface to non-volatile storage 142, e.g., EEPROM. The non-volatile storage 142 is included in the hub module 104 for maintaining address assignments, etc., during power off. In the example of Figure 2, the non-volatile storage

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142 is provided for address and configuration data local storage at the hub module.

Thus, each remote node 120 is connected to a hub port 116 over a serial channel 114 using a suitable serial communication medium. The serial channel 114 may be a twisted differential pair connected at each end to an appropriate signaling interface, preferably, conforming with the Institute of Electrical and Electronics Engineers (IEEE) 802.3 specification for Ethernet, such as the above mentioned phy chip. Alternatively, an universal serial bus (USB) interface or an IEEE 1394 fire wire interface may be substituted for the Ethernet interface without departing from the scope of the invention. Further, standard category 5 (CAT 5) wire (4 twisted pairs) is preferred for the high speed data communications media in the channel 114 connecting the entertainment hub 102, i.e., the remote stations 110 and remote feature cards 112 to the hub modules 104. The serial data interface 128 passes locally synchronized serial data from the high speed serial channels 114 to/from the hub ports 116. The hub ports 116 convert the serial data from serial data interface 128 to parallel data which is passed to the backplane 106 and vice versa. Pulse Transformers (not shown) in each of the remote nodes 120 and hub ports 116 provide signal isolation. The hub modules 102 provide power to connected channels at a level sufficient to power a 10W Class D amplifier at each station. Channel power is forty eight volts (48V) DC and is distributed through two pair of conductors of the CAT 5 cabling, passed through to the wiring at the hub port 116 pulse transformers center taps. The current is extracted on the receiving end to power the remote nodes 120, drawn from the four current carrying CAT 5 conductors and the center taps of the remote node transformers.

For additional efficiency, the serial data clock for each channel (remote node 120 - hub port 116 connection) may be embedded into packet data for that channel using, for example, the well known Manchester encoding technique. Thus embedding the serial data clock also balances the data stream, thereby nearly eliminating the exposure to saturation in the pulse transformer. Once embedded in the data stream, the clock may be extracted from the data stream using a phase locked loop (PLL) with the link pulse function indicating the existence of a connection between each hub port 116 and its corresponding remote node 120.

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Data is transferred between the hub modules 102 and the remote nodes 120 using a non-Ethernet serial data frame structure at a preferred transfer rate of 10Mb/s. Preferably, data is transferred in full duplex, each packet being synchronized with the hub backplane. The packet structure is fixed, preferably at 197 bits, and includes a preamble field, a control bus status field, and specific frames for audio (Laudio 1-4 and Raudio 1-4), intercom (Icom), hub control, and for data control. The preamble is a signature bit stream, preferably 24 bits, for synchronizing the physical layer PLL of each channel. The control bus status (CBS) field may be a single bit field that indicates when the control bus is active. The eight audio frames (Laudio 1 - 4 and Raudio 1 - 4), two each per channel, each channel having enough bandwidth to pass compressed or uncompressed audio data to/from the remote nodes, preferably two eighteen bit stereo frames for each channel. Since the intercom channel is intended to carry only voice data, the Icom frame need not be as wide the audio frame and, so, is twelve bit mono. Both the hub control frame and the data control frame are a single byte wide.

FIG. 4A is a timing diagram showing how messages and data are exchanged between the local nodes 118 and the remote nodes 120 (through hub ports 116) across the backplane 106 using a data structure, for example, as in FIG. 4B. The backplane 106 includes a data bus for both audio data and intercom data, an address bus, a control bus and several control lines. For the preferred embodiment, the backplane 106 includes an eight bit Address Bus (A7-A0), with addresses being serially cycled, 0 - 200 in a burst at the 10 MHZ backplane clock rate, i.e., one burst in every frame of the 48KHz clock cycle. Addresses are assigned during initialization as described hereinbelow. Each address corresponds to a possible node in the network 100. The backplane includes stereo audio on two 18 bit channels, Audio Bus (ADL17-ADL0 and ADR17-ADR0), a right and left channel. Intercom data is provided as mono audio on a 12 bit Intercom Bus (I11-I0). Bus data is latched on the positive going edge of a Backplane Clock (BPCLK). An eight bit Control Bus (C7-C0) provides control data information for controlling communication among devices connected to the backplane 106. The Control Bus Status bit (CBS) signals hub ports connected to the backplane 106 when the control bus is active. A Frame Clock (FCLK) line is provided for synchronizing the hub ports 116 to

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the backplane 106. A Global Reset (Greset) signal initiates a hub wide system reset. A passive pull-up Need Initialization (*NEED_INIT) signal is pulled low by any device connected to the backplane that needs initialization.

FCLK synchronizes the entire network at the audio data-sampling rate, preferably 5 48Khz, although it may be 44.1Khz. Generally, the network sampling rate determines the number of possible addresses that can be polled at one time, and a different sampling rate may be selected with a corresponding adjustment in the number of addressable features. Since the entire network is synchronized to FCLK, all data sources and sinks (nodes 116, 120) must operate at the selected sample rate or some sub multiple thereof, 10 i.e., 24Khz or 12Khz.

FCLK also synchronizes the hub ports 118 to the backplane and to the address bus. Further, the preamble signature synchronizes hub port 118 to remote node 120. Since the hub ports 118 transmit a packet every FCLK cycle, the preamble provides a precise event which is detectable at the remote nodes 120 for synchronization. Generally, 15 all audio and intercom data conversion processes must be synchronized to the preamble detection to minimize aliasing. Thus, to maintain synchronization, each remote node 120 must initiate a transmission to its corresponding hub port 116 within one frame cycle of receiving a packet.

Sampled audio data is presented to the backplane 106 on a polled address basis, 20 preferably sampled at forty eight thousand samples per second (48KSPS). Alternately, any suitable sample rate may be selected such as 44.1KSPS, for example. Thus, the backplane operating at a 10Mhz BPCLK clock rate can support up to 200 addresses at this 48KSPS-frame rate. Accordingly, cycling through addresses 0 through 200 at the backplane clock rate in a burst, one burst of 0-200 every frame clock cycle, each value 25 addressing an audio source/sink (either at a local node 118 or at a remote device connected to a hub port 116) in the network, each addressed audio source/sink being presented with or providing data in turn. So, when an address is presented on the backplane 106, the appropriate control bus signals, intercom data and audio data for the selected node are also present on the backplane. For example, a person may be using a 30 remote station 110 to transmit an intercom message, while an audio clip may be provided

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to a local station 108. During each address burst, when the address corresponding to the remote station 110 is on the address bus, the intercom data is placed on the backplane intercom bus and, sampled audio is made available when the address of the local station 108 is on the address bus. Other stations remain passive, monitoring the bus for audio or intercom data that may be directed to that particular station or feature.

FIG. 5 is a timing diagram for initialization wherein addresses are assigned to attached devices. In each network 100, a single hub module 104 is assigned as backplane master. Preferably, backplane master hub module assignment is designated for a single unique slot in entertainment hub 102, although any suitable way of assigning a master may be substituted, e.g., jumper pins selecting a backplane master. The single hub module 104 master provides the drive signals for the Frame Clock, Backplane Clock, Address Bus, and Address-in-Use signals. The hub modules are interchangeable and any one may serve as backplane master, provided it is placed in the master slot position in the entertainment hub 102 (or otherwise selected). Thus, the hub interface function 130 includes master control functions that are disabled unless the particular hub module 116 is selected as master. The backplane master hub drives the backplane signals during normal operation and drives initialization signals during the network initialization process. Other devices, i.e., those not the backplane master, accept these signals as inputs.

During initialization the C7, C6, C5 and C0 control bus lines are used by the backplane master to provide individual initialization control. The C7 line is a contention/address acquisition (*CONT/*ACQ*) signal which is generated by the backplane master to coordinate between a contention cycle and an address acquisition cycle in the period labeled 150. The C6 line is a ready for initialization (INIT-RDY) signal that, when high, indicates that a device attached to the backplane is ready to start the initialization process. The C5 line acts as an address in use (ADD-IN-USE) signal indicating that a device address is already assigned to a node or port. The C0 line is a contention (CONT_BIT) signal both during initialization and during normal operation contention. After the last device has been configured in the period labeled 152, initialization is complete. Normal backplane operation of FIG. 4 begins in the period

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labeled 154.

FIG. 6 is a state diagram showing how the preferred local communication network 100 may be initialized. Network Initialization 160 is an automated process that occurs in the hub modules 104 on first power up 162 or, after a REINIT button (if included) has been pressed to request initialization. The process proceeds through three major phases: remote node scan 164, contention 166 and address acquisition 168. Each feature at a hub port 116 or local node 118 requires at least one backplane address for normal operation, which is assigned during initialization. First, on first power up 162 every device asserts the *NEED_INIT line, pulling it low to indicate to the backplane master that attached network devices need initialization. At the initial power up 162, the hub ports 116 provide power to corresponding connected remote nodes 120 and after a preset delay send a null packet that the remote node 120 uses for synchronization. Each remote node 120 responds returning a null packet that indicates the number of audio channels needed for that particular station or feature. Coincidentally, each remote node 120 also indicates if it needs additional audio channels by placing a non zero value in the left and right frames of a corresponding returned audio channel. Then, the remote nodes 120 provide the null packet for a selected minimum scan time. If any of a remote node's audio channels are unused, then the unused frames are driven to all zeros (00000h). Each corresponding hub port 140 requests addressing for each filled (non-zero) audio frame, with every requesting hub module 104 or feature card 108 holding the INIT_RDY line low during the remote scan sequence 164.

Following the remote node scan 164, every hub port 116 and each feature card 108 configures its backplane-connected audio bus port as a passive high, active low I/O port. Then, the unassigned hub ports 116 and feature cards 108 begin shifting their respective unique serial number (preferably a factory-set 36-bit number) onto the CONT_BIT line synchronized by the frame clock signal, while simultaneously monitoring the CONT_BIT. If for any monitoring device, the value of the CONT_BIT does not match what it shifted out, then another device is also requesting initialization, i.e., devices are in contention; and, each unmatched device discontinues shifting its serial number out and releases the passive pull-up CONT_BIT line for the remainder of the

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contention cycle. Each matching device continues to write their serial numbers to the CONT_BIT until, eventually, only a single device remains actively requesting addresses. The remaining unmatched devices, i.e., those that have placed their respective CONT_BIT output in a high impedance state, wait until the next contention cycle, when
5 the next unassigned device is selected. The matching device proceeds to the address acquisition cycle 168.

For each address acquisition cycle 168, again synchronized by the FCLK signal, the backplane master sequentially cycles through the all addresses as the matching device monitors the passive pull-up *ADD_IN_USE line. Each previously configured device
10 asserts the *ADD_IN_USE line as each of its addresses appears on the address bus. When an available address is identified (i.e., the ADD_IN_USE line is not asserted), the backplane master assigns the identified available address to the requesting internal hub port. Unassigned devices continue monitoring, identifying and requesting addresses until all port address assignment requirements have been fulfilled. As each acquiring device
15 has completed its configuration cycle, it releases the *NEED_INIT line and waits for the initialization process to complete. The contention cycle 166 and address acquisition cycle 168 are repeated until all attached devices have been configured, as indicated by the *NEED_INIT line being released high and then proceeding to Normal Operation 170. On each subsequent power up 162, unless a new device has been added, *NEED_INIT
20 will not be pulled low and so, will be high (all assignments having been retained in local or non-volatile storage) and the system proceeds directly to the Normal Operation 170 state. After initialization 160 and upon commencing Normal Operation 170, additional local nodes 118 or hub modules 116 may be added to the network by powering down the network 100, attaching the devices to the entertainment hub 102, another powering up
25 to re-execute the initialization process 160. On power up the newly-attached device asserts the *NEED_INIT line low. In response, the backplane master then enters the Initialization process 160, assigning addresses as required.

Additional remote nodes 120 may be attached to the network ("hot plugged") at a configured hub port 116 and so, do not need to be initialized. Further, if remote audio
30 sources/sinks are attached to an existing remote node and the attachment/replacement

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reduces or does not change the number of sources/sinks at that node, Normal Operation 170 may continue uninterrupted. However, if the number of audio sources/sinks is increased, e.g., a single audio source/sink at a remote node is replaced with a multiple audio sources/sinks, a power down cycle 162 must be initiated to restart the initialization
5 process 160. Then, when each hub module 104 scans its hub ports 116 through the remote node scan cycle 162, the added sources/sinks are detected and identified by asserting the *NEED_INIT line.

By contrast, removing nodes from the network, typically, does not require reinitialization. Remote nodes may be physically removed from the network 100 for
10 example, by simply disconnecting from the serial stream 114 cable or by turning off the device or remote feature card 112. The removed device's hub port retains its address so that the remote node 120 may be re-attached later and it may seamlessly begin to function provided a network re-initialization 160 or a power cycle 162 does not occur before reattachment. However, if the network is re-initialized or power cycled after removal,
15 reattaching the device requires a re-initialization 160, just as if a new device were being added. Initialized local nodes 118 also can be removed and reattached to the backplane without re-initialization, provided the reattached local node retains its address information. Otherwise, the local device should be reset and, network power cycled to re-initialize the new/replaced local device and node.

20 On the first initialization of a hub module 104, each hub port 116 acquires a backplane address. The hub port 116 then signals its address to its connected remote node 120, which may or may not use or respond to the address. Hub ports 116 do not require a response (ACK or ERR messaging) to their own initiated messages. However, each remote node 120 must signal its corresponding hub port 116 using a hub message to
25 change the listening settings of the hub port 116. The corresponding hub port 116 responds either with an ACK or an ERR response message within 2 frame clock cycles. The serial data stream may include hub control and data control messaging when initiated by a local node 118 or hub port 116 in addition to audio and intercom data which are transferred continuously. Hub control and data control messages are selectively included
30 in packets and passed in the serial stream, one byte per packet. The hub control message

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frame designates an audio or intercom channel in remote nodes 120. Each remote node 120 queries its corresponding hub port 116 for its present sourcing node and its listening channel settings, as well as, setting the listening channels. Automatically, on first hub power up or on re-initialization, each hub port 116 selects the sourcing channel. Each

5 frame cycle includes only one byte of hub messaging in the hub control field. As each hub message is passed, byte by byte, the entire message is re-assembled at the receiving node, i.e., either at the hub module 104 at one end or at the remote station/feature card 110, 112 at the other. Preferably, each hub message is four (4) bytes wide and prefaced with an attention byte (e.g., FFh) to notify the intended receiver (either hub module 104

10 or remote station/feature card 110, 112) that a hub message is to follow.

The attention byte may be followed by a command directing the receiving node regarding how to handle the audio data on the channel. Examples of commands provided in this second, command byte are shown in Table 1 below.

TABLE 1

15	NUL	00h	'do nothing, idle value
	SET	01h	'set the channel to value
	GET	02h	'get the channel's value
	ACK	03h	'acknowledge message with channel and value returned
	ERR	04h	'error with channel and value returned

20 The command byte is followed by a channel byte that, preferably, includes two (2) four (4) bit fields. The first 4-bit field indicates whether the receiving device is receiving or sending audio and, so, is a sink or a source. The second field selects an audio field, i.e., intercom, audio 1, audio 2, audio 3 and audio 4 for the received/sent audio data. The command byte is followed by an eight bit value ranging from 1 to 200

25 and indicating the channel address.

Local control messaging provides control for peer to peer communication between nodes, primarily for sharing information or controlling either a local feature card 108 or remote feature card 112. The control message structure may be similar to that of hub messaging wherein one byte in the data control field is passed per packet. However,

30 local control messaging within the communication hub 102 may be quite different. Each

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local control message contains a multibyte preamble, a destination address, a source address, an indication of the message size, the message and a checksum value for verifying the message validity. Within the communication hub 102, control information is sent over the control bus (C7-C0) which also is an 8 bit wide, contention bus. All hub
5 nodes 116 and local nodes 118 have access to this bus and must contend for control. Preferably, the control bus is passive pull up, active pull down. So, when all connected nodes are idle, the bus is all ones (FFh) indicating that a node is not accessing the bus.

FIG. 7A shows a state diagram 180 of how a node gains access to the control bus. First, before beginning its transmission, in state 182, nodes requiring access monitor the
10 bus until a quiet time is detected. If two or more nodes attempt to communicate simultaneously, an arbitration process 184 assigns priority based on the control message preamble. For confirmation, the values on the control bus are mirrored back to the remote node via the serial stream data frame, delayed by one frame. Local nodes are directly attached to the contention bus and compensate for the delay to remote nodes
15 during the arbitration process.

FIG. 7B shows an example of the preferred control message structure. The control message preamble, which is preferably 8-10 bytes, is utilized for bus access arbitration. Each preamble byte is one of two possible values, either zero (00h) or one (01h) and sets the contention bit CONT_BIT in the control bus. The 10 byte preamble
20 string represents a pseudo-random 10 bit binary number pattern, with the lowest 10 bit value has the highest bus priority. The preamble is followed by a destination address which is a single byte that contains the network address of the destination node. A single byte source address follows the destination address and contains the network address of the message source node. Two bytes are assigned to designate the Number Of Bytes
25 (NOB) in the control message payload. The payload may be as large as 64K Bytes and is the substance of the control message or data. Finally, the payload is followed by a two byte checksum that is the twos complement of the sum of the entire message less the preamble and the checksum itself. As noted above, idle nodes monitor the control bus for activity in 182. When the control bus is quiet and the *CBS bit is one, a node may
30 attempt to begin a transmission by asserting *CBS (pulling it low) in 184 and, begin bus

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arbitration by sending the preamble. The transmitting node must monitor its message transmission (via the return packet or directly at the control bus) to negotiate for control of the bus, detect a collision with another message, or to detect a serial stream data error. The node attempting to initiate transmission monitors the value of the preamble returned
5 from the bus to confirm whether that node has access to the bus. If the preamble value is returned without error, the node has access to the control bus and continues to transmit in 186. However, if the node does not have access it releases the *CBS bit, in 188, ceases transmission and waits until the control bus is idle before attempting to transmit again in 184.

10 FIG. 8 is an example of a control message reception state diagram 190. Nodes that are directly connected to the control bus (i.e., hub ports 116 and local nodes 118) through the backplane continually monitor the bus and the *CBS bit in 192. Message transmission begins with the assertion of the *CBS bit in 194 by the transmitting node. Each monitoring node parses the message header, which includes the preamble,
15 destination address, source address and NOB fields in 196 to determine if the node is the message destination. Either the message may be directed to a specific address or it may be broadcast, for example as an intercom message. If the message is addressed to a node in 198Y, that node continues processing the message. Otherwise, in 198N, the nodes discard the message and continue to monitor the *CBS bit until it returns to idle in 192,
20 to receive the next new message. As described above, addresses between 1 and 200 are assigned to each connected node in the initialization process 160. A remote node 120 sets its address by querying its corresponding hub port for its remote node address(s). Address OOh is reserved for broadcast messages and so, no node is assigned this address. All nodes process broadcast messages. Further, one or more addresses may be reserved
25 for the conference intercom function and only the conference feature node may acquire this reserved address. For synchronization, all backplane address locations must be polled within a FCLK cycle. Further, each serial stream transmission cycle (one upstream and one downstream) cycle completes, preferably, in less than a single frame clock cycle.

FIG. 9 is an example of a typical preferred embodiment home communication
30 system 200 with elements identical to the basic system 100 of FIG. 2 labeled identically.

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In addition to the entertainment hub 102, several room stations, 202, 204, 206, 208, 210 and 212 are shown that are physically located at different zones or rooms. A video doorbell 214 is locatable at an exterior door. A main communications panel 216 is provided for control from a conveniently selected location. Outside temperature sensors 218 are locatable to provide external temperature information to the system that may be retrieved at any room station 202-212 or other connected peripheral. In addition, since the network 200 is a digital, one or more computers 220, printers 222 may be attached, directly, to send or receive communications or entertainment data, the remote node/remote station feature being provided as a hardware feature of the computers 220 or in software executed by the computer 220. A wireless keyboard 224 may communicate with the system 200 over the computer 220 or directly, e.g. through an IR port 126. Further access to the Internet may be provided, either through the computer 220 or through a direct connection at the hub port, e.g., through a cable modem or digital subscriber line (DSL) modem.

15 A home theater system 226 may be connected to the network. The home theater system 226 may be capable of playing or displaying multimedia data received from the network or, of sending multimedia data, such as audio files over the home communications system 200 to individual room stations 202-212, for example. A telephone 228 may be included, such that music from the network is played as background music when the telephone 228 is placed on hold and, to provide voice mail that is stored on the system 200. An entertainment/sound system 230 may be connected to the network and located in a media room. Like the home theater system 226 the sound system 230 can play audio data directly received from the network and may be capable, for example, of placing audio data extracted from an audio cassette onto the network.

25 A television 232, e.g., digital audio TV or high definition TV (HDTV), can be connected to the network 200. The television 232, like the home theater system 226, and the sound system 230, can play audio or multimedia data directly from the network and is capable of placing multimedia data or audio data on the network 200. Also, local, specialized controls may be made available at different zones throughout the network. These local controls 234 can provide, for example, home or away settings to vary the capability of

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the system. Temperature control 236 for heating and cooling may be connected for independent control at any station 202-212. Also, a programmable logic controller (PLC) 238 may be adapted, if available, allowing independent remote control of lights 239 and other such controlled appliance from enabled stations 202-212.

5 FIG. 10 is an example of the room station, 110. In this example, the room station includes multiple buttons, 240, 242, 244, 246, 248, 250, 252, 254, for selecting various functions from the room stations. A microphone input 256 is provided for receiving vocal input and a small speaker 258 is included, if loudspeakers are not provided, for intercom function. Jacks, 260, 262, are also included for audio input. A digital
10 communication jack 264 in this example, an ethernet connection or category 5 wiring, is also included for connecting the local station 110 to the network. Also, a display 266, such as a liquid crystal diode (LCD) display, is included, providing a simple local graphical interface. Thus, preferred room stations include the capability to act as an audio source unit, an audio receiver unit and an intercom unit. Sound tone and volume
15 may be set at each individual room station 110 independently of settings at other room stations 110. Further, a door station does not require the audio source function and, so, a suitable door station results by omitting the audio function from a room station 110.

 FIG. 11 is a block diagram of a remote station 110. Remote station 110, typically, includes a serial data exchange 270, a programmable digital loop filter 272, an audio
20 compression/decompression (CODEC) 274, a microcontroller or microprocessor 276, a local interface 278 and local storage 280. The local interface 278 may include a display 282, such as a LCD display 266, for displaying status information and time, for example, and individual buttons 284 for manual input, such as providing commands to connected room stations, remotely disabling command input from other stations. Commonly used
25 commands may be maintained in a command menu provided at the display 282. The local storage 280 may be any suitable storage, in particular random access memory (RAM). Further, the RAM may be static RAM (SRAM), dynamic RAM (DRAM) or non-volatile RAM such as what is typically referred to as Flash memory. As described hereinabove, power 286 is supplied over the high speed serial data channel 114. The
30 serial data exchange 270 may be a transceiver or, a phy chip as described above with

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reference to the hub module 104. The audio CODEC 274 provides an analog/digital interface between analog audio (provided to the local station 110 from the network or provided by the local station 110, e.g., from a radio tuner) and digital audio to/from the programmable digital loop filter 272. The CODEC 274 converts digital audio data from the programmable digital loop filter 272 into analog audio for a local audio performance and converts analog audio received at the local station into digital audio data which is provided to the programmable digital loop filter 272. Preferably, the audio CODEC 274 is a Crystal CS4227 6-channel 20-bit CODEC chip from Cirrus Logic. The preferred CODEC 274 can support at least one 18-bit stereo/audio channel and one intercom channel. Additional, optional channels may be included. The non-volatile storage 280 locally maintains stored information and program control including a bootstrap program for bootstrap start up of the microcontroller 276. Preferably, the non-volatile storage is flash memory or EEPROM and may include up to several megabytes of storage. The serial data exchange 270 extracts received serial data from the high-speed serial data channel 114 and, embeds the serial data clock into serial data for transmission across a high-speed serial data channel 114.

FIG. 12 is a block diagram of the programmable digital loop filter 272. The programmable digital loop filter 272 includes a receive buffer 290, a transmit buffer 292, a CODEC interface 292 and a microcontroller interface 296. The receive buffer 290 is essentially a serial-to-parallel shift register receiving data (RXD) clocked by receiver clock (RXCLK) from the serial data exchange 270 and converts that serial data to parallel data which is provided as audio channel data on lines 298 to CODEC interface 294 and hub control and data on lines 300 to microcontroller control interface 296. The receive buffer 290 also provides intercom data 302 to the CODEC interface 294 and extracts a hub sync signal 304 from the received data. The transmit buffer 292 receives parallel data from the CODEC interface 294 and microcontroller interface 296 which it converts to serial data (TXD) that is provided to the serial data exchange 270, clocked by transmission clock (TXCLK). The transmit buffer also provides a transmit enable signal (TXEN) that indicates when the serial data from the station should be transferred through the serial data exchange 270 across the high-speed serial data channel 114.

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Parallel data from the CODEC interface 294 includes intercom data on lines 306 and audio channel data on lines 308 as well as hub control and data from the microcontroller interface on lines 310. The CODEC interface 294 passes received data from the receive buffer to the CODEC 274 and passes data from the CODEC 274 to the transmit buffer 292 for transmission across the high-speed data channel 114. The microcontroller 296 presents data from the receive buffer 290 to the microcontroller 276 and passes data from the microcontroller 276 back to the transmit buffer 292. The hub sync signal 304 is generated when the receive buffer 290 senses a preamble in the receive data stream, which initiates a pulse that is the hub sync signal 304. Additionally, the receive buffer 290 parses serial data from the serial data exchange 270 and identifies audio data for the audio channels 298 and control data and control signals 300 for the microcontroller interface 296. The hub sync signal 304 synchronizes the remote station to the hub. Although the data may be received at the remote station somewhat delayed from the original transmission, due to transmission channel delays, for example, the extracted signal is a true replica of what the hub transmits. Likewise the hub receives an exact replica of what the remote station transmits.

Local feature cards 108 may be formed by directly interfacing the hub function control 130 of the hub module with the CODEC 274, thereby providing the audio function directly to the hub control function which interfaces the audio digital data to the backplane instead of to hub ports. Local feature cards 108, may include, for example, a radio tuners providing broadcast radio, e.g., AM, FM and wideband radio such as weather band radio or television broadcast bands.

Thus, the multi-zone media network of the present invention provides digital audio available for use at each zone of a structure or different rooms of a house. Further, multi-zone media network includes room stations that can inject audio into the data stream and onto the network. So, at each room station is converted from digital data to analog audio and locally amplified for clear CD quality sound. Since the audio is transferred over the preferred multi-zone media network as digital data, high-cost, low-loss wiring that is required to route high quality audio is unnecessary. Instead, relatively inexpensive CAT 5 wiring may be used to pass data from the hub to the room stations.

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Further, the room stations independently control and select what is played in the room from one of several audio data channels being streamed, rather than merely play what is being broadcast. In addition, each remote station itself can broadcast or receive independent of and simultaneously with other remote stations. Also, each remote station
5 can be programmed for individual specific needs such as including radio station presets on remote stations equipped with a radio tuner. Alarms or limited functionality may be included, such as to the ability to monitor another remote using the multi-zone media network's intercom function.

While the invention has been described in terms of preferred embodiments, those
10 skilled in the art will recognize that the invention can be practiced with modification within the spirit and scope of the appended claims.

CLAIMS:

1. A peer-to-peer network of devices, said peer-to-peer network comprising:
a plurality of network devices locatable in two or more zones and connected
together over a digital network, data being streamed over said digital network, each of
5 said network devices including one or more data communication units;
at least two said network devices including a receiving unit, said at least two
devices being located at different ones of said zones, each of said receiving units
controlling local reception of data from said data stream; and
at least two said network devices including a source unit, each said source unit
10 selectively providing data to said data stream,
wherein a person at a first network device may select to receive data from a
first source unit while a second person at a second network device is receiving data
from a second source unit.
2. A peer-to-peer network as in claim 1, wherein the digital network further
15 comprises:
at least one network device including an intercom unit in communication with
receiving units, said intercom unit providing intercom, paging and station monitoring
functions.
3. A communication and entertainment network, said communication and
20 entertainment network comprising:
a plurality of peer-to-peer network devices attached to a central hub and
assigned a unique hub address, each of said network devices being locatable in one of
two or more zones, each of said network devices including one or more data
communication units, data being streamed over said central hub between connected
25 devices;
at least two said network devices including a receiving unit, said at least two
devices being located in different ones of said zones, each of said receiving units
controlling local reception of data from said data stream;

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at least one network device including an intercom unit in communication with receiving units, said intercom unit providing intercom, paging and station monitoring functions;

at least two said network devices including a source unit, each said source unit
5 selectively providing data to said data stream,

wherein a person at a first network device may select to receive data from a first source unit while a second person at a second network device is receiving data from a second source unit.

4. A network according to claim 2 or 3, wherein at least one source unit is an
10 audio source unit injecting audio data into the data stream.

5. A network as in claim 4, wherein at least one receiver unit is an audio receiver extracting audio data from the data stream, said audio data being converted to sound and provided to the zone in which said audio receiver is located.

6. A network as in claim 5, wherein at least one of the network devices is a room
15 station, each said room station including an audio source unit, an audio receiver unit and an intercom unit.

7. A network as in claim 6, wherein at least one of the network devices is a door station, each said door station including an audio receiver unit and an intercom unit.

8. A network as in claim 6, wherein at least one of the network devices is a dual
20 tuner, each said dual tuner including two audio receiver units.

9. A network as in claim 5, wherein sound volume is set at each said audio receiver independent of sound volume settings at other said audio receiver units.

10. A network as in claim 5, wherein sound tone is set at each said audio receiver independent of sound tone settings at other said audio receiver units.

25 11. A network as in claim 5, including a plurality of audio source units each providing audio data from one of a plurality of audio sources.

12. A network as in claim 11, wherein said plurality of audio sources includes a radio tuner, a compact disc player, a mini-disc player, a microphone, a cassette player and a compressed audio source and, wherein audio receiver unit may select audio data
30 from any audio source unit independent of other said audio receiver units.

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13. A network as in claim 11, wherein a plurality of said network devices include an interactive display displaying status information, commands being provided to units connected to said network through each said interactive display.
14. A network as in claim 13, wherein said interactive display provides a menu of
5 said commands, and wherein at least one interactive display displays time information.
15. A network as in claim 13, wherein ones of said network devices may selectively disable issuance of commands from other ones of said network devices.
16. A network as in claim 13, wherein at least one network device includes a
10 timer, said time being able to initiate execution of selected commands.
17. A network as in claim 3, wherein said digital network further includes a communication port selectively communicating with devices external to said digital network.
18. A data structure for transferring data between a hub and a connected remote
15 node, said data structure comprising:
a preamble for synchronizing the remote node to the hub;
a control bus status field for indicating status to the remote node of a control bus at said hub;
a hub control field for exchanging message control information between the
20 remote node and the hub;
a control data field for exchanging control data information between the remote node and the hub; and
a plurality of data fields for transferring data between the remote node and the hub synchronized with other nodes by a frame clock.
- 25 19. A data structure as in claim 18, wherein communication between the connected node and the hub is a serial transmission and the preamble includes a string of alternating ones and zeros.
20. A serial data structure as in claim 19, wherein the string of alternating ones and zeros is of sufficient length to extract a data transmission clock.

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21. A serial data structure as in claim 20, wherein the string of alternating ones and zeros is of a sufficient length to synchronize a phase locked loop.
22. A serial data structure as in claim 21, wherein the preamble provides information for extracting the frame clock.
- 5 23. A serial data structure as in claim 22, wherein the preamble is three bytes wide.
24. A data structure as in claim 18, wherein the hub control field is a single byte wide, each remote node corresponding with the corresponding connected hub port through the hub control field.
- 10 25. A data structure as in claim 24, wherein each hub message between any said hub port and a corresponding said connected remote node is four bytes long.
26. A data structure as in claim 25, wherein each hub message includes an attention field, a command field, a channel field and a value field.
27. A data structure as in claim 26, wherein when the attention field is all ones, an
15 indication is being provided that a hub message is beginning to be sent.
28. A data structure as in claim 26, wherein the channel field includes a channel number and an indication of whether a channel identified by said channel number is a listening channel or a source channel.
29. A data structure as in claim 26, wherein the command field includes a
20 command selected from the group of commands including a do nothing command, a set channel value command, a get channel value command, an acknowledge message and an error indication.
30. A data structure as in claim 18, wherein the control data field is a single byte wide and each communications packet between the hub and a connected remote node
25 includes a portion of a control message for control messaging between peers in said peer-to-peer network.
31. A control data structure as in claim 18, wherein the plurality of data fields includes an intercom data field and a plurality of left and right audio fields.
32. A data structure as in claim 31, wherein the intercom field is twelve bits long.

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33. A data structure as in claim 32, wherein each of the left and right audio fields is eighteen bits long.
34. A data structure as in claim 33, wherein the data structure includes four left and right audio channels corresponding to four stereo audio channels.
- 5 35. A control message structure for controlling communication between nodes on a peer-to-peer network, said control message structure comprising:
- a preamble for bus arbitration;
 - a destination address indicating a network address of a node to which a control message is being sent;
 - 10 a source address indicating a node as being a source of said message;
 - a payload containing said message; and
 - a checksum for checking whether the received message is valid.
36. A control message structure as in claim 35, said control message structure further comprising:
- 15 a payload size indicating a size of said message.
37. A control message structure as in claim 36, wherein the preamble is a plurality of bytes of data.
38. A control message structure as in claim 37, wherein each byte of the preamble contains one bit of a binary number pattern.
- 20 39. A control message structure as in claim 38, wherein the preamble is 10 bytes representing a 10-bit binary number.
40. The control message structure of claim 35, wherein each of the destination address and the source address is one byte wide.
41. The control message structure of claim 35, wherein the payload size is two
- 25 bytes wide, the value of the payload size indicating the number of bytes in the message.
42. The control message structure of claim 35, wherein the checksum is a twos compliment sum of the payload less the preamble and the checksum itself.
43. A method of controlling communication between nodes of a peer-to-peer
- 30 network, said method comprising the steps of:

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monitoring activity on a control bus to determine when messages are being sent and to determine when said control bus is quiet;

parsing header information to determine to which node a control message is directed when said control bus is determined to be carrying control message information, the node to which said control message is directed being a receiving node; and

parsing said message from said control message, said control message being parsed by said receiving node.

44. A method as in claim 43, wherein monitoring activity on the control bus further comprises monitoring a control bus active signal.

45. A method as in claim 44, wherein the step of parsing header information comprises retrieving a preamble, a destination address, a source address and a message size from said control bus.

46. A method as in claim 45, wherein when the control bus active signal is asserted, said method further comprises the step of:

monitoring the preamble to determine if other nodes are in contention for said control bus.

47. A method as in claim 43, wherein in the monitoring step when said control bus is determined to be quiet, said method further comprises the steps of:

20 sending a preamble;

monitoring transmission of said preamble to determine if a collision has occurred;

sending a balance of said message when a collision is determined not to have occurred; and

25 releasing said control bus after said message has been sent and monitoring said bus.

48. A method as in claim 47, wherein the step of sending said message comprises sending a destination address, a source address, a payload size, a payload and a checksum.

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49. A method as in claim 48, wherein the step of sending a preamble further comprises asserting a control bus status signal.
50. A method as in claim 49, wherein if in the step of monitoring transmission of the preamble it is determined that a collision has occurred, said method further
- 5 comprising the steps of:
- releasing the control bus status signal; and
 - monitoring the control bus until said control bus is determined to be quiet.
51. A method as in claim 50, wherein said control message is sent one byte at a time.
- 10 52. A method as in claim 51, wherein when said control bus is idle, all control bus signals are high.
53. A method as in claim 52, wherein one address is reserved for broadcast messages, all nodes processing broadcast messages.
54. A method as in claim 53, wherein a second address is reserved for a
- 15 conference/intercom function, only a conference feature node being able to acquire the address reserved for said conference/intercom function.
55. A method as in claim 54, wherein the preamble is 8 to 10 bytes wide.
56. A method as in claim 55, wherein each byte of said preamble is one of two values.
- 20 57. A method as in claim 56, wherein said payload size and said checksum are each two bytes wide.
58. A method as in claim 57, wherein said message may be between 1 byte and 64K bytes long.
59. A method of initializing a peer-to-peer network of devices, at least one of said
- 25 devices remotely located at a remote node, said remote node being connected to a hub port on said network, said method comprising the steps of:
- a) scanning remote nodes for nodes requesting communications channel addresses for unassigned active communications channels;
 - b) identifying a requesting node for channel address assignment;
 - 30 c) assigning an unassigned channel address to said identified node; and

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d) repeating steps (b) and (c) until all requesting nodes have received channel addresses for all corresponding active communications channels.

60. A method as in claim 59, wherein the step (a) of scanning remote nodes comprises the steps of:

- 5 i) providing a null packet to each remote node for synchronization;
 ii) receiving a return null packet from said each remote node, said return null packet indicating a number of unassigned active communications channels at said remote node.

61. A method as in claim 60, wherein the step (i) of scanning remote nodes further
10 comprises providing power to said remote nodes.

62. A method as in claim 60, wherein unassigned active communications channels are indicated by a non-zero value in a left frame and a right frame of each unassigned active communications channel.

63. A method as in claim 60, wherein the step (b) of identifying a requesting node
15 comprises the steps of:

- i) shifting a first bit of an identification number onto a signal line, said identification number being unique to the hub port connected to said requesting node;
 ii) monitoring said signal line to determine whether said signal line
20 matches such shifted bit;
 iii) shifting a next bit onto said signal line; and
 iv) repeating steps (ii) and (iii) until all bits have been shifted onto such signal line.

64. A method as in claim 63, wherein in the identification step (b)(ii), when the
25 signal line does not match the bit shifted onto the signal line, then at least one other node is requesting an address, said identification step (b) further comprising steps of:

- ii1) discontinuing identification;
 ii2) waiting until address assignment is complete for said other requesting node; and
30 ii3) returning to step (c)(i).

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65. A method as in claim 64, wherein when the first bit is shifted onto the signal line, step (b)(i) further includes asserting an initialization ready line; and, step (b)(ii1) further includes releasing said initialization ready line.

66. A method as in claim 65, wherein the step (b)(ii2) of waiting until address
5 assignment is complete comprises the steps of:

A) monitoring said initialization ready line for an indication that said other node is being initialized; and

B) waiting until said initialization ready line indicates said node has been initialized.

10 67. A method as in claim 66, wherein the step (c) of assigning addresses comprises the steps of:

- i) monitoring an address-in-use line;
- ii) sequentially placing addresses on an address bus; and
- iii) assigning addresses not indicated as being in use by said address-

15 in-use line.

68. A method as in claim 67, wherein one node is identified as a master node, the master node sequentially placing the addresses on the address bus and assigning addresses and, wherein as each address is presented on said address bus in step (ii), corresponding nodes, having been assigned said addresses, assert said address-in-use
20 line to indicate that said presented address is assigned.

69. A method as in claim 68, wherein in the step (b) of identifying a requesting node a plurality of nodes assert a need-initialization signal and, wherein when an address has been assigned to each node, said requesting node releases said need-initialization signal indicating the initialization process has been completed, said need-
25 initialization signal remaining asserted until addresses have been assigned to all active communications channels.

70. A method as in claim 69, wherein said initialization process is started responsive to a power on condition.

71. A method as in claim 69, wherein said initialization process is started
30 responsive to a manual initialization request.

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72. A method of adding new remote nodes to a media network, said method comprising connecting said requesting node and an associated device to a hub port and initializing as in claim 69.
73. A method of initializing a peer-to-peer network of devices, at least one of said
5 devices remotely located at a remote node, said remote node being connected to a hub port on said network, said method comprising the steps of:
- a) identifying one hub port as a bus master, said bus master asserting an initialization signal to being network initialization;
 - b) scanning remote nodes to identify if any nodes are requesting address
10 assignment for unassigned active communications channels responsive to said initialization signal;
 - c) identifying a requesting node for channel address assignment;
 - d) assigning an unassigned channel address to said identified node; and
 - e) repeating steps (c) and (d) until all requesting nodes have received channel
15 addresses for all corresponding active communications channels.
74. A method as in claim 73, wherein after all requesting nodes have been assigned addresses in step (e), said method further comprises placing said identified bus master port in a normal operating state, said bus master operating identically to other hub ports.
- 20 75. A method as in claim 74, wherein in the step (b) of scanning remote nodes comprises the steps of:
- i) providing a null packet to each remote node for synchronization;
and
 - ii) receiving a return null packet from said each remote node, each
25 said return null packet indicating a number of unassigned active communications channels at a corresponding said remote node.
76. A method as in claim 75, wherein unassigned active communications channels are indicated by a non-zero value in a left frame and a right frame of each unassigned active communications channel.

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77. A method as in claim 75, wherein each hub port connected to a remote node participates in said identification step (c), said identification step (c) comprising the steps of:

- i) shifting a first bit of an identification number onto a signal line, said
5 identification number being unique to the hub port connected to said requesting node;
- ii) monitoring said signal line to determine whether said signal line matches each shifted bit;
- iii) shifting a next bit onto said signal line; and
- iv) repeating steps (ii) and (iii) until all bits have been shifted onto
10 such signal line.

78. A method as in claim 77, wherein in the identification step (c)(ii), when said hub port determines that the signal line does not match the bit shifted onto the signal line, then at least one other node is requesting an address, said identification step (c) further comprising the steps of:

- ii1) discontinuing identification for said connected requesting node;
- ii2) waiting until address assignment is complete for another
15 requesting node connected to another hub port; and
- ii3) returning to step (c)(i).

79. A method as in claim 78, wherein when the first bit is shifted onto the signal
20 line, step (c)(i) further includes asserting an initialization ready line; and, step (d)(ii1) further includes releasing said initialization ready line.

80. A method as in claim 79, wherein the step (c)(ii2) of waiting until address assignment is complete comprises the steps of:

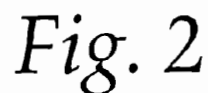
- A) monitoring said initialization ready line for an indication that said
25 other node is being initialized; and
- B) waiting until said initialization ready line indicates said other node has been initialized.

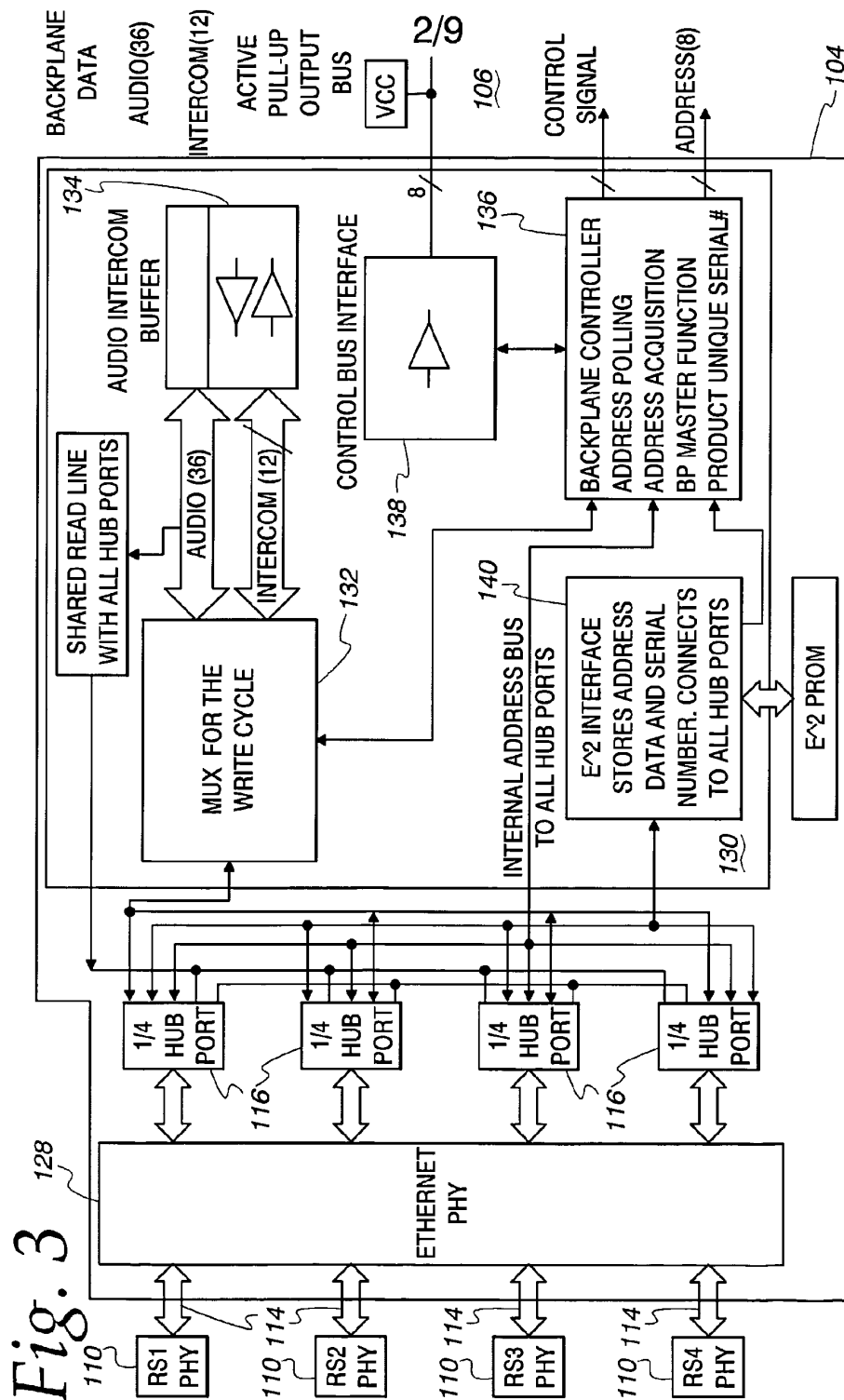
81. A method as in claim 78, wherein if in the identification step (c)(ii) the signal line matches every shifted bit, the matching hub port is assigned addresses in step (d),
30 the step (d) of assigning addresses comprising the steps of:

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- i) monitoring an address-in-use signal line;
 - ii) sequentially placing addresses on an address bus, each respective other hub port asserting said address-in-use signal responsive to an address on said address bus previously assigned to said other hub port, said bus master placing
5 addresses on said address bus; and
 - iii) automatically assigning addresses not indicated by said address-in-use line as being in use by other said hub ports.
82. A method as in claim 81, wherein said initialization process is started responsive to a power on condition.
- 10 83. A method as in claim 81, wherein said initialization process is started responsive to a manual initialization request.

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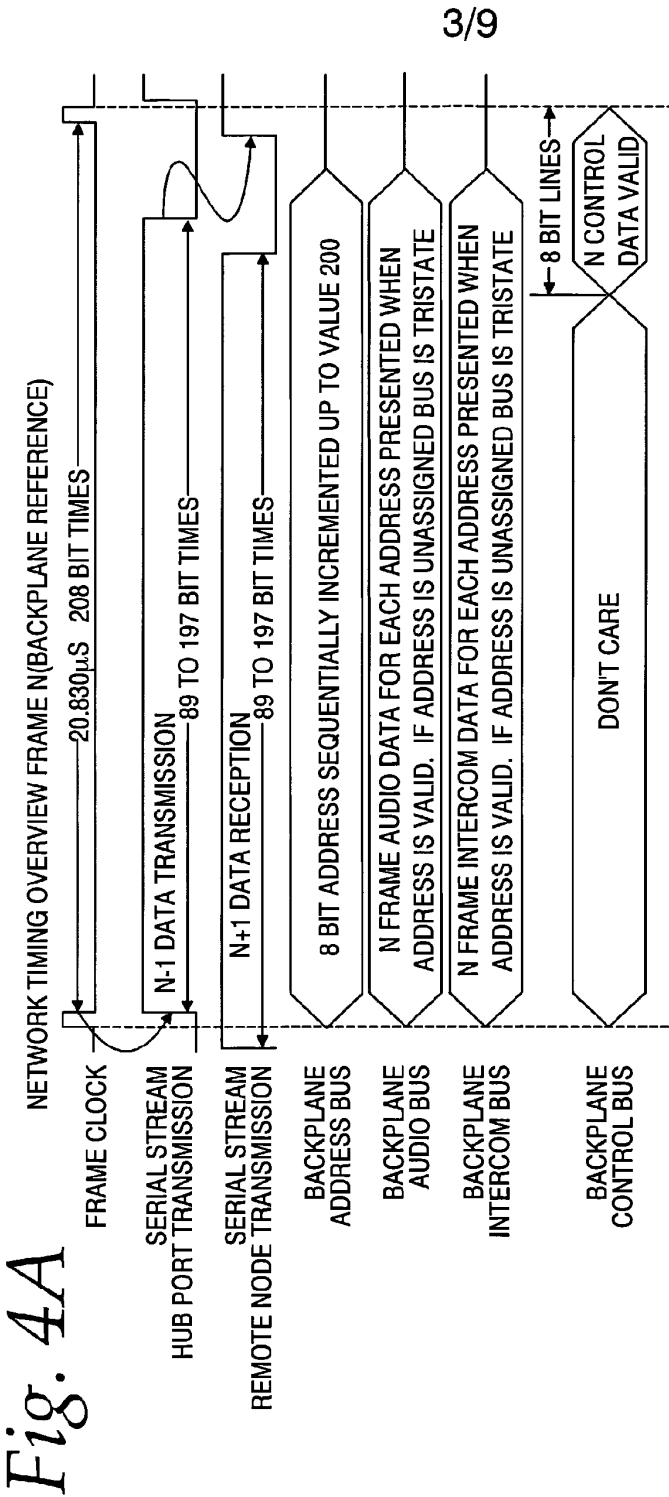


Fig. 4B

PREAMBLE	CBS	HUB CONTROL	DATA	ICOM	LEFT AUDIO 1	RIGHT AUDIO 1	LEFT AUDIO 2	RIGHT AUDIO 2	LEFT AUDIO 3	RIGHT AUDIO 3	LEFT AUDIO 4	RIGHT AUDIO 4
AAAAABh	CBS	HC7... HC0	D7... D0	I7... I0	A1L17... A1L0	A1R17... A1R0	A1L17... A2L0	A2R17... A2R0	A3L17... A3L0	A3R17... A3R0	A4L17... A4L0	A4R17... A4R0

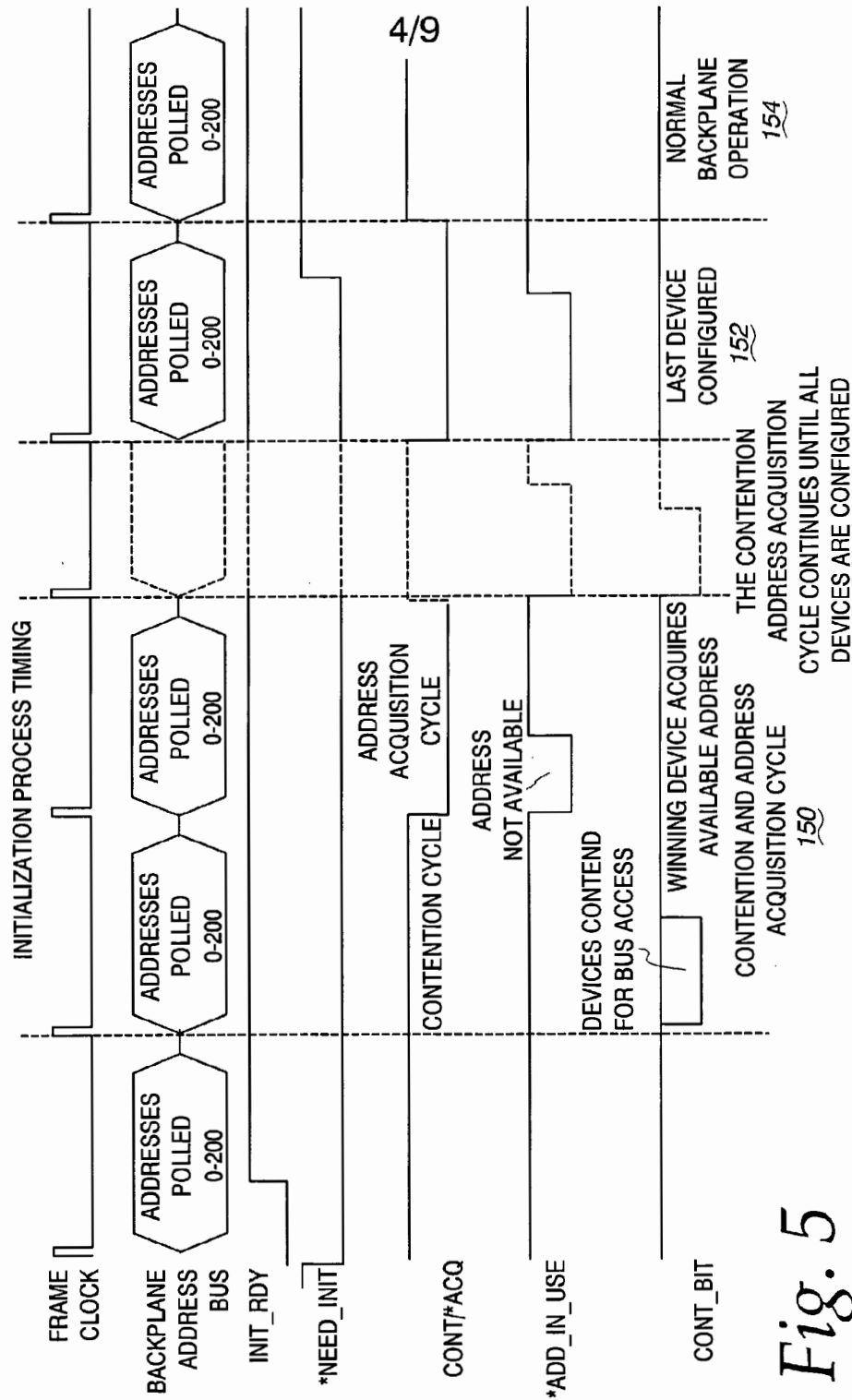
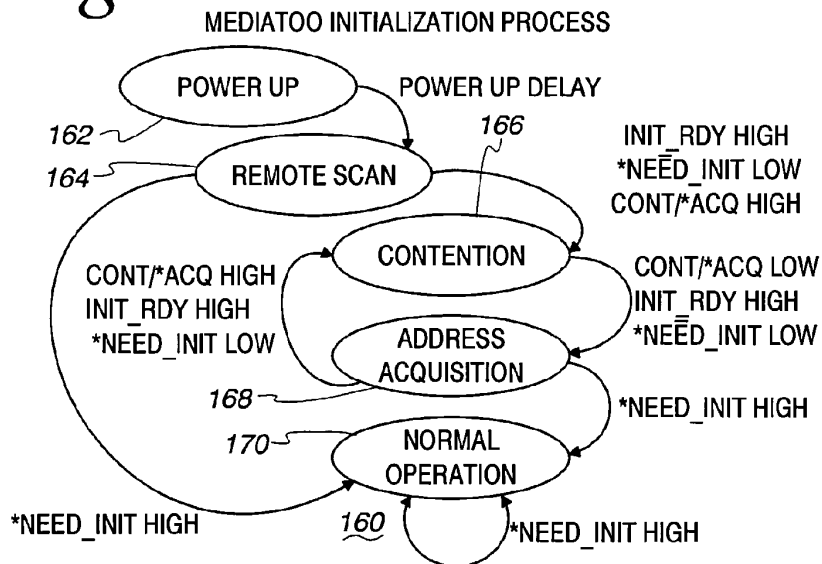
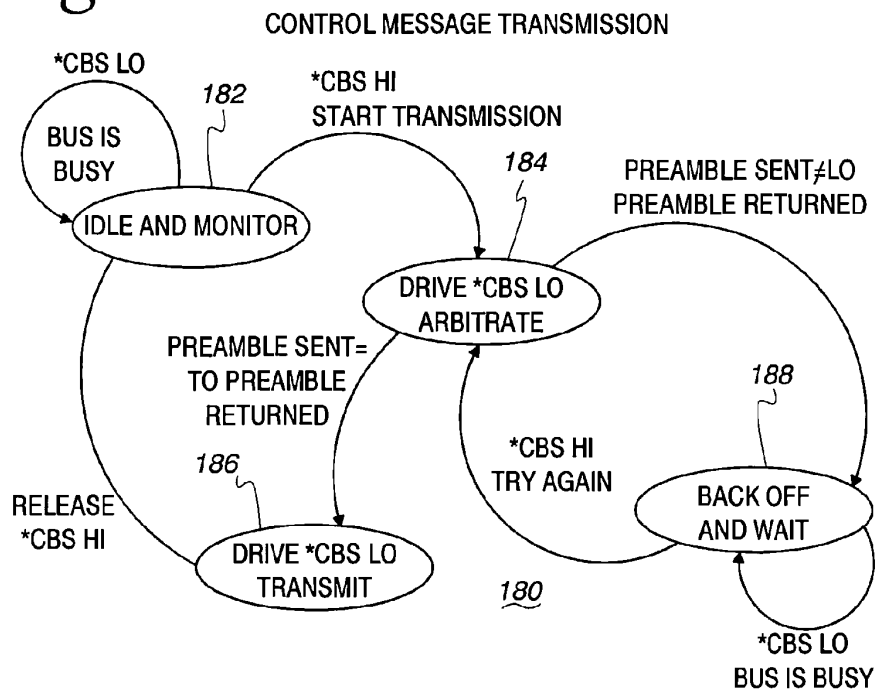


Fig. 5

Fig. 6

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*Fig. 7a*

PREAMBLE	DESTINATION ADDRESS	SOURCE ADDRESS	NUMBER OF BYTES IN PAYLOAD	PAYLOAD	CHECKSUM
10 BYTES	1 BYTE	1 BYTE	2 BYTES	0-65KBYTES	2 BYTES

Fig. 7b

CONTROL MESSAGE RECEPTION

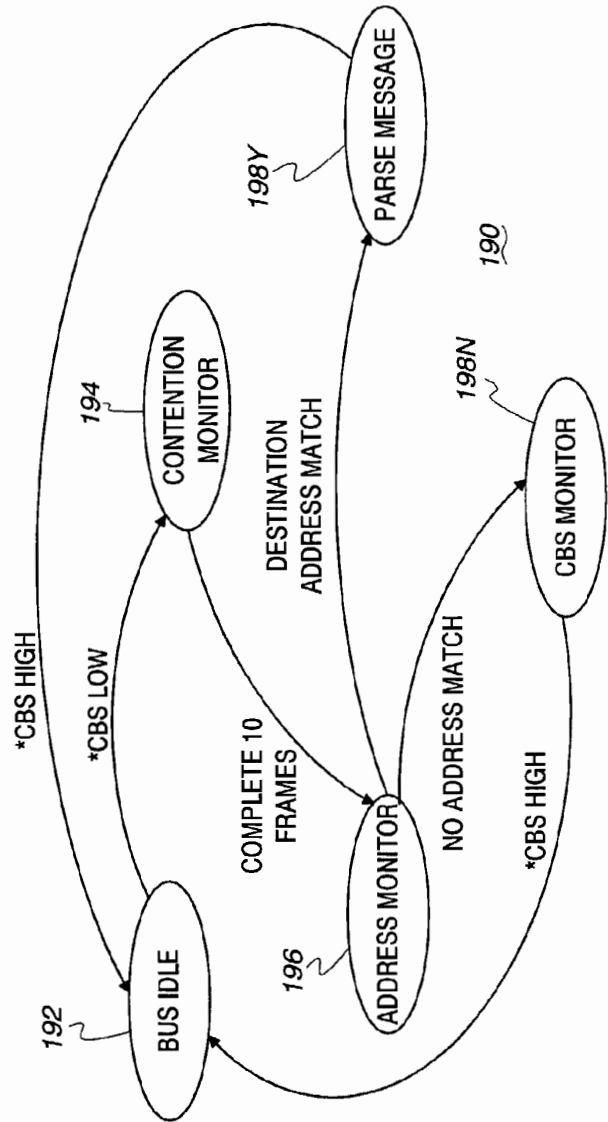


Fig. 8

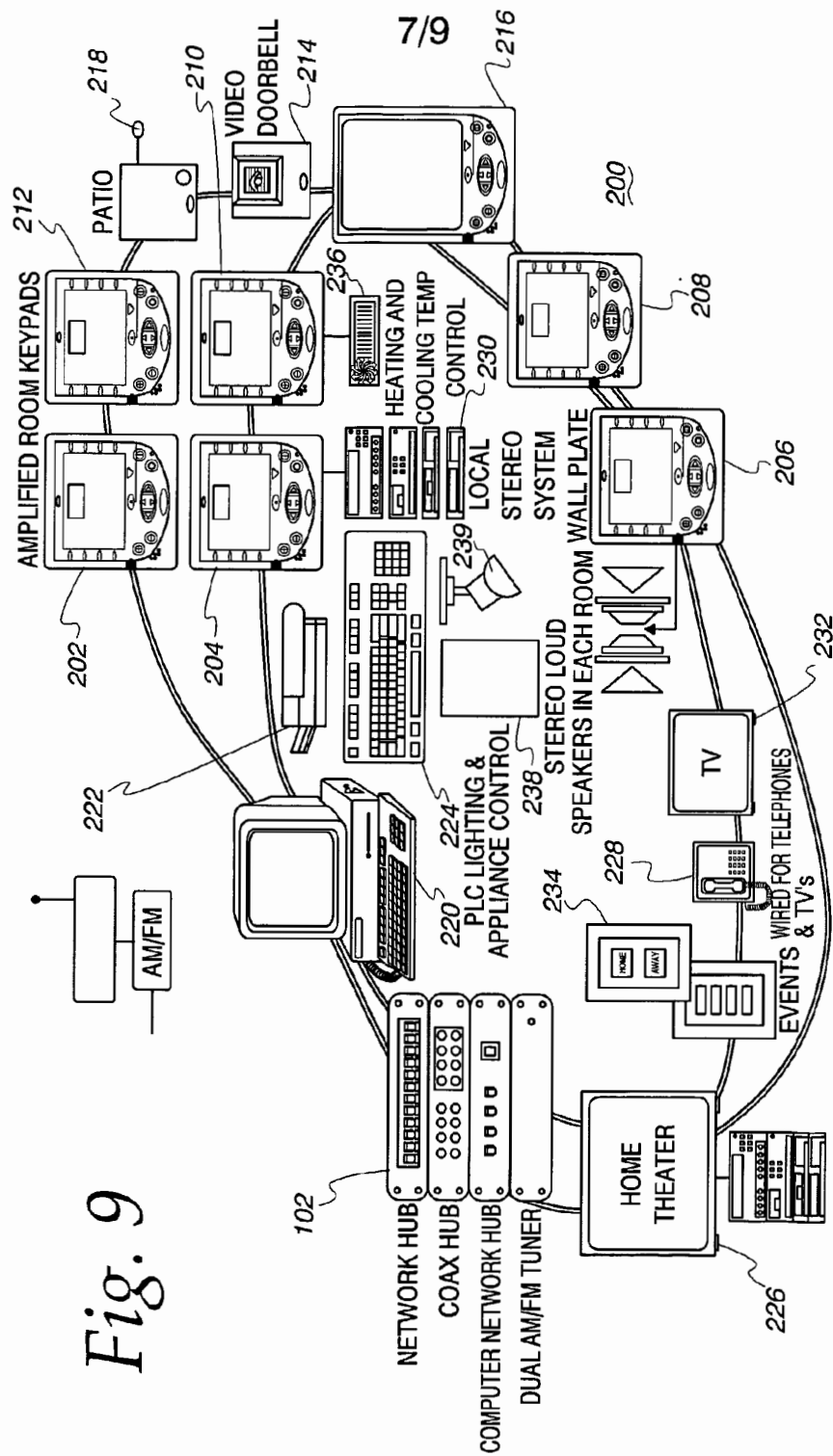
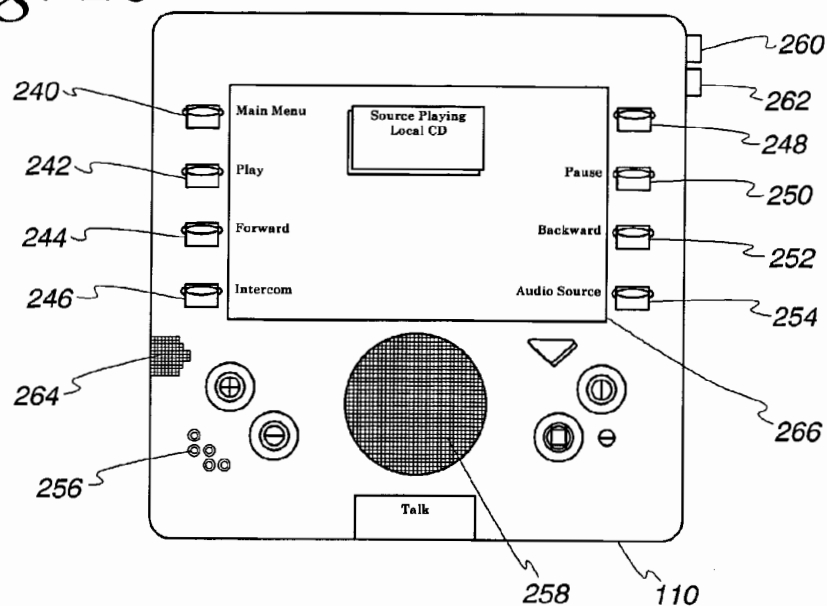
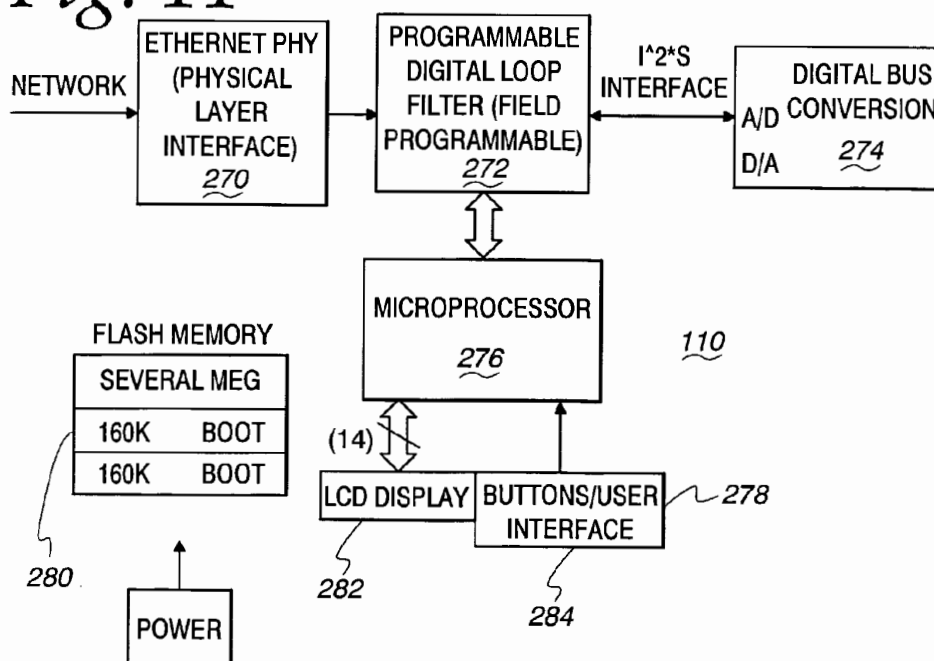


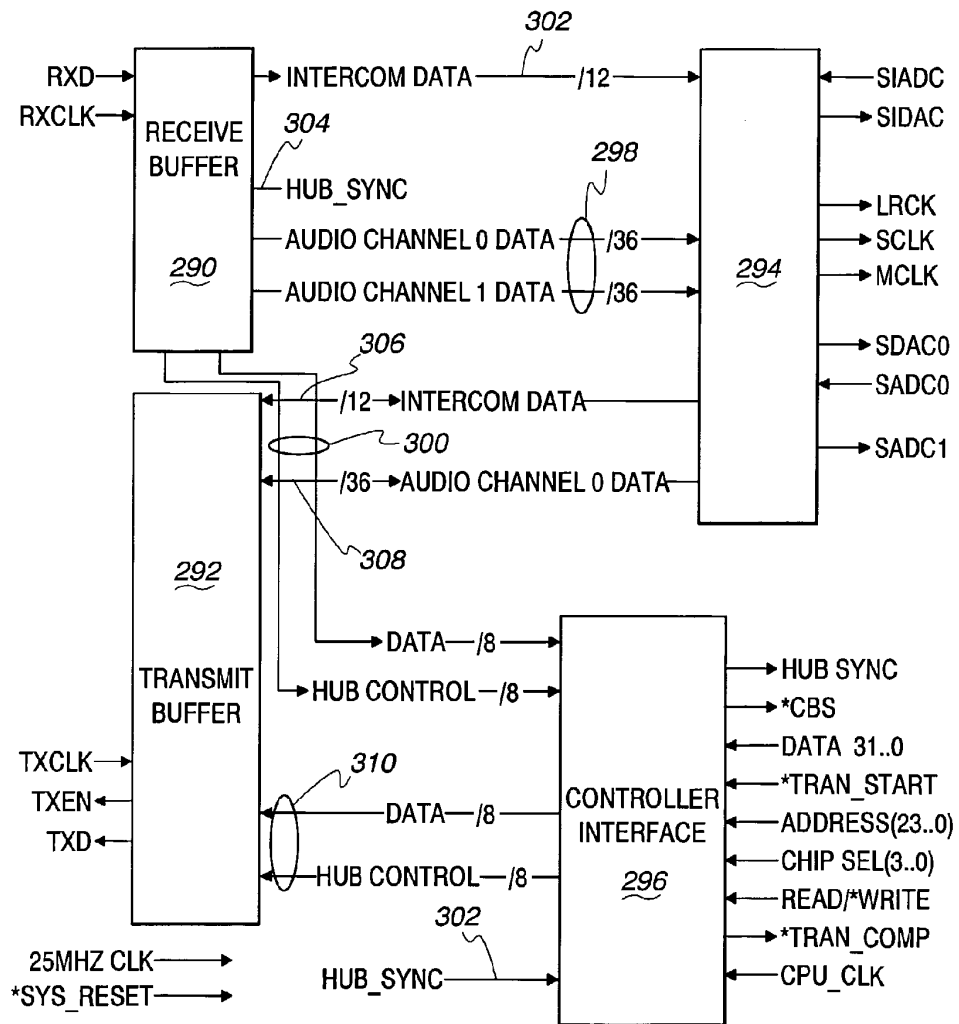
Fig. 10

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*Fig. 11*

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Fig. 12



**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Docket No. 13-0402)**

In re the Application of:	)	
	)	
Sonos, Inc.	)	
	)	Group Art Unit 2442
Serial No.: 13/864,249	)	
	)	
Filed: April 17, 2013	)	
	)	Examiner: Oleg Survillo
Confirmation No. 9806	)	
	)	
For: Concurrent Transmission and Playback	)	
Of Audio Information	)	

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

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Pursuant to 37 CFR § 1.34, the undersigned hereby confirms that the attached Information Disclosure Statement (IDS) is being filed in accordance with the undersigned's authority to act in a representative capacity on behalf of Applicant, Sonos, Inc., in connection with the preparation and filing of IDSs for the above-referenced matter.

Respectfully submitted,

Dated: November 25, 2019

By: /Brandon J. Kennedy/
Brandon J. Kennedy
Reg. No. 67,894
Lee Sullivan Shea & Smith LLP
656 W. Randolph St., Floor 5W
Chicago, Illinois 60661
(312) 754-9315
kennedy@ls3ip.com

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Brandon Jacob Kennedy/Jaden Knosher		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
Total in USD (\$)				240

Electronic Acknowledgement Receipt	
EFS ID:	37853943
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Brandon Jacob Kennedy
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	26-NOV-2019
Filing Date:	17-APR-2013
Time Stamp:	16:18:54
Application Type:	Utility under 35 USC 111(a)

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	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	2	Non-Final Office Action mailed on 22 July 2019, issued in connection with U.S. Patent Application No. 16/009182, filed on 14 June 2018, 23 pages.	
	3	Notice of Allowance mailed on 18 September 2019, issued in connection with U.S. Patent Application No. 16/459569, filed on 1 July 2019, 10 pages.	
	4	Notice of Allowance mailed on 21 May 2019, issued in connection with U.S. Patent Application No. 14/184522, filed on 19 February 2014, 9 pages.	
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	6	Patent Board Decision mailed on 31 May 2019, issued in connection with U.S. Patent Application No. 90/013959, filed on 16 June 2017, 9 pages.	
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	Filing Date	2013-04-17
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	Attorney Docket Number	13-0402

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4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Docket No. 13-0402)**

In re the Application of:	)	
	)	
Sonos, Inc.	)	
	)	Group Art Unit 2442
Serial No.: 13/864,249	)	
	)	
Filed: April 17, 2013	)	
	)	Examiner: Oleg Survillo
Confirmation No. 9806	)	
	)	
For: Concurrent Transmission and Playback	)	
Of Audio Information	)	

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

TRANSMITTAL WITH INFORMATION DISCLOSURE STATEMENT

Pursuant to 37 CFR § 1.34, the undersigned hereby confirms that the attached Information Disclosure Statement (IDS) is being filed in accordance with the undersigned's authority to act in a representative capacity on behalf of Applicant, Sonos, Inc., in connection with the preparation and filing of IDSs for the above-referenced matter.

Respectfully submitted,

Dated: September 27, 2019

By: /Brandon J. Kennedy/
Brandon J. Kennedy
Reg. No. 67894
Lee Sullivan Shea & Smith LLP
656 W. Randolph St., Floor 5W
Chicago, Illinois 60661
(312) 312-754-9602
kennedy@ls3ip.com

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Brandon Jacob Kennedy/Jaden Knosher		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
Total in USD (\$)				240

Electronic Acknowledgement Receipt	
EFS ID:	37307022
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Brandon Jacob Kennedy
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	30-SEP-2019
Filing Date:	17-APR-2013
Time Stamp:	15:59:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 240
RAM confirmation Number	E20199TG00232633
Deposit Account	506632
Authorized User	Brandon Kennedy
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)					
37 CFR 1.20 (Post Issuance fees)					
37 CFR 1.21 (Miscellaneous fees and charges)					
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)	13-0402_0_IDS_20190927144946.pdf	1053751	no	4
			dd095d06eef84c6fb31ff44aa0ebcb4772e9346e		
Warnings:					
Information:					
2	Non Patent Literature	14184522_NOA_14-0211_5-21-19_9pages.pdf	483554	no	9
			a567d18b9bfb79b29b8d56217e7224fec63fd4b6		
Warnings:					
Information:					
3	Non Patent Literature	2982726_CA_Examination_Report_04-0401-CA-DIV2_6-11-19_4pages.pdf	521630	no	4
			52c297b979785e91fa260f7a433475c9c9bfa086		
Warnings:					
Information:					
4	Non Patent Literature	16009182_NFOA_04-0601-CON0618_7-22-19_23pages.pdf	820294	no	23
			372cfc00f0b0848b7c9d087c09cd0d0e5f012d65		
Warnings:					
Information:					
5	Non Patent Literature	ProTools_Reference_Guide_2003_643pages.pdf	25706275	no	643
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Warnings:					
Information:					
6	Non Patent Literature	14184528_NOA_14-0213_7-26-19_7pages.pdf	416871	no	7
			3423a2a9df47265acce4c3a29987de98d640043		
Warnings:					
Information:					

7	Non Patent Literature	90013959_Petition_Board_Decision_04-0401-REEXAM_5-31-19_9pages.pdf	298622 a6fb5fa34f3292bdab6bfe13dc516131ec7c0b23	no	9
Warnings:					
Information:					
8	Non Patent Literature	16459569_NOA_04-0401-CON0719B_9-18-19_10pages.pdf	469019 f08dafa154a708d275c3de4686a9111cb71bad9e	no	10
Warnings:					
Information:					
9	Transmittal Letter	IDS_Transmittal.pdf	70967 e699476544852b861c43834efdbaea7e0720b1a	no	1
Warnings:					
Information:					
10	Fee Worksheet (SB06)	fee-info.pdf	30685 64bcf5842e3707dce0c47d2aeb1f0c5fb20b8708	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			29871668		
<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>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.</p> <p>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.</p> <p>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.</p>					



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806
107361	7590	09/27/2019	EXAMINER	
McDonnell Boehnen Hulbert & Berghoff LLP			SURVILLO, OLEG	
Sonos, Inc.				
300 South Wacker Drive			ART UNIT	
Chicago, IL 60606			PAPER NUMBER	
			2442	
			MAIL DATE	
			DELIVERY MODE	
			09/27/2019	
			PAPER	

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

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

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on September 3, 2019 has been entered.

Response to Amendment

1. Claims 47-73 are pending in the application. No claims are currently amended. Claims 1-46 have been canceled. Claims 47-73 are new.

Claim Rejections - 35 USC § 103

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

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

matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 56-73 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Isely et al. (US 2002/0124097 A1) in view of Goldberg et al. (US 2007/0142944 A1).

As to claim 56, Isely teaches a method performed by a first zone player [network attached audio device 105, 205] (Fig. 2), the method comprising:

receiving, via a network interface at the first zone player, a request to engage in synchronous playback of audio content as part of a synchrony group that includes at least a second zone player that is communicatively coupled to the first zone player via at least one data network [receiving user designation of devices in a group] (step 520, par. [0060]);

after receiving the request to enter into the synchrony group;

detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one or an audio-master mode or an audio-slave mode for the synchrony group [receiving control inputs] (par. [0036]); and

beginning to operate in the synchrony group in accordance with the indication (par. [0063]);

wherein, while operating in the control-master mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, first control information for the synchrony group from a network device [controller device 125] that is communicatively coupled to the first zone player [controller controls grouping of devices, volume and

song selection for each group of aggregated devices in different rooms] (par. [0018], [0056], [0060]); and

based on the first control information, cause, via the network interface, at least one playback action to be applied in the synchrony group [steps 530, 535, 630 in Figs. 5 and 6] (par. [0060], [0063]);

wherein, while operating in the control-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, second control information [control input change] (par. [0063]); and

perform one or more playback actions in accordance with the second control information [dynamically updating relationship that results in updated grouping of devices] (par. [0063]);

wherein, while operating in the audio-master mode for the synchrony group, the first zone player is configured to:

obtain audio information that is representative of the audio content (par. [0038]); and

wherein, while operating in the audio-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, audio information (par. [0038]); and

engage in synchronous playback of the received audio information with at least the second zone player (par. [0038], [0039]).

Isely fails to expressly teach that in the control-slave mode, the second control information is received from another zone player. Isely fails to expressly teach that in

the audio-master mode, the first zone player is configured to generate playback timing information associated with the obtained audio information that is indicative of one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information; and transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player. Isely fails to expressly teach that in the audio-slave mode, the first zone player is configured to receive playback timing information associated with the received audio information from another zone player, where the synchronous playback is based on the received playback timing information associated with the received audio information.

In the same field of endeavor of synchronized audio playback, Goldberg teaches a method performed by a first zone player [unit 100] (Fig. 1), the method comprising:

receiving, via a network interface at the first zone player, a request to engage in synchronous playback of audio content as part of a synchrony group that includes at least a second zone player that is communicatively coupled to the first zone player via at least one data network [receiving user selection to operate in one of the 3 states] (par. [0023], [0159]);

after receiving the request to enter into the synchrony group;

detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group [detecting which state of operation user has selected] (par. [0023], [0159]); and

beginning to operate in the synchrony group in accordance with the indication (par. [0024]);

wherein, while operating in the control-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, second control information from another zone player [exchanging messages to establish communication] (par. [0183]-[0184]); and

perform one or more playback actions in accordance with the second control information (par. [0188]);

wherein, while operating in the audio-master mode for the synchrony group, the first zone player is configured to:

obtain audio information that is representative of the audio content (par. [0340]);

generate playback timing information associated with the obtained audio information that is indicative of one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information [synchronization signals] (par. [0201]-[0206]); and

transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player (par. [0205]-[0206]); and

wherein, while operating in the audio-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, audio information playback timing information associated with the received audio information from another zone player [synchronization signals] (par. [0201]-[0206]); and

engage in synchronous playback of the received audio information with at least the second zone player based on the received playback timing information associated with the received audio information (par. [0205]-[0206]).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method and system of Isely by having in the control-slave mode, the second control information received from another zone player; in the audio-master mode, the first zone player being configured to generate playback timing information associated with the obtained audio information that is indicative of one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information; and transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player; in the audio-slave mode, having the first zone player being configured to receive playback timing information associated with the received audio information from another zone player, where the synchronous playback is based on the received playback timing information associated with the received audio information in order to allow a user to dynamically create and configure a plurality of zones, where playback device is instructed to playback audio based on user provided characteristics (par. [0011]-[0012] in Isely).

As to claim 57, Isely in view of Goldberg teaches that detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-master mode for the synchrony group and (b) the audio-master mode for the synchrony group, as discussed per claim 56.

As to claim 58, Isely in view of Goldberg teaches that detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-slave mode for the synchrony group and (b) the audio-master mode for the synchrony group, as discussed per claim 56.

As to claim 59, Isely in view of Goldberg teaches that beginning to operate in the synchrony group in accordance with the indication comprises either (a) transitioning from operating in the audio-master mode or operating in the audio-slave mode or (b) transitioning from operating in the audio-slave mode to operating in the audio-master mode (par. [0267]-[0272] in Goldberg).

As to claim 60, Isely in view of Goldberg teaches that the first control information identifies particular audio content to be played back by the synchrony group that is available at an audio source outside of the at least one data network (par. [0312] in

Goldberg), and wherein causing the at least one playback action to be applied in the synchrony group comprises causing a zone player operating in the audio-master mode to obtain audio information that is representative of the particular audio content (par. [0340] in Goldberg).

As to claim 61, Isely in view of Goldberg teaches that the one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information comprise at least one future time that is determined based on a local clock of a zone player other than the first zone player [time to play is determined locally based on the synchronization signal received and compared with local time] (par. [0206] in Goldberg).

As to claim 62, Isely in view of Goldberg teaches that the one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information comprise at least one future time that is determined based on a local clock of the first zone player (par. [0201]-[0205] in Goldberg).

As to claim 63, Isely in view of Goldberg teaches that the second control information comprises information indicative of a volume adjustment, and wherein performing one or more playback actions in accordance with the second control information comprises adjusting a playback volume of the first zone player (par. [0049] in Isely; par. [0299] in Goldberg).

As to claim 64, Isely in view of Goldberg teaches that the playback timing information that is received while operating in the audio-slave mode comprises at least one future time at which at least the first and second zone players are to engage in synchronous playback of the received audio information (par. [0201]-[0205] in Goldberg), and wherein operating in the audio-slave mode to engage in synchronous playback of the received audio information with at least the second zone player comprises: updating the at least one future time to account for a differential between a local clock time of the first zone player and a local clock time of another zone player (par. [0206] in Goldberg); and when the local clock time of the first zone player reaches the updated at least one future time, engaging in synchronous playback of the received audio information with at least the second zone player (par. [0206] in Goldberg).

As to claim 47, Isely in view of Goldberg teaches a first zone player [network attached audio device 105, 205 in Isely; unit 100 in Goldberg] (Fig. 2 in Isely; Fig. 1 in Goldberg) comprising:

- a network interface that is configured to communicatively couple the first zone player to at least one data network (Fig. 2 in Isely; Fig. 1 in Goldberg);

- at least one processor; a tangible, non-transitory computer-readable medium (Fig. 2 in Isely; Fig. 1 in Goldberg); and

- program instructions stored on the tangible, non-transitory computer-readable medium that are executable by the at least one processor such that the first zone player is configured to perform the method steps as discussed per claim 56 above.

As to claims 48-55, Isely in view of Goldberg teaches all the elements as discussed per claims 57-64 above.

As to claim 65, Isely in view of Goldberg teaches tangible, non-transitory computer-readable storage media having instructions stored therein, wherein the instructions, when executed, cause a first zone player to perform functions comprising method steps as discussed per claim 56 above.

As to claims 66-73, Isely in view of Goldberg teaches all the elements as discussed per claims 57-64 above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to OLEG SURVILLO whose telephone number is (571)272-9691. The examiner can normally be reached on 9:00am - 5:00pm.

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, William Trost can be reached on 571-272-7872. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/OLEG SURVILLO/
Primary Examiner, Art Unit 2442

<i>Applicant-Initiated Interview Summary</i>	Application No. 13/864,249	Applicant(s) Millington, Nicholas A. J.		
	Examiner OLEG SURVILLO	Art Unit 2442	AIA (First Inventor to File) Status No	Page 1 of 1

All participants (applicant, applicants representative, PTO personnel):

1. OLEG SURVILLO (Primary Examiner); Telephonic 2. Jeffrey Armstrong (Attorney of Record); Telephonic

Date of Interview: 24 September 2019

Claims Discussed: claims 47-73

Issues Discussed:

Claim Interpretation and/or scope:
Discussed whether newly added claims are directed to the same invention as in the previously allowed claim set. Examiner consulted with his SPE and confirmed that no election by original presentation is necessary. Agreed that newly added claims will be examined as presented.

/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	
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Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

<i>Index of Claims</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

✓	Rejected
=	Allowed

-	Cancelled
÷	Restricted

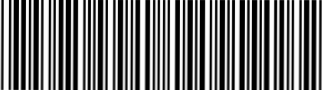
N	Non-Elected
I	Interference

A	Appeal
O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	11/08/2017	07/09/2018	01/05/2019	05/13/2019	09/25/2019				
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16	34	✓	✓	✓	=	-				
17	35	✓	✓	✓	=	-				
18	36	✓	✓	✓	=	-				
21	37	✓	✓	✓	=	-				
22	38	✓	✓	✓	=	-				
23	39	✓	✓	✓	=	-				
24	40	✓	✓	✓	=	-				
9	41		✓	✓	=	-				
19	42		✓	✓	=	-				

<i>Index of Claims</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CLAIM		DATE							
Final	Original	11/08/2017	07/09/2018	01/05/2019	05/13/2019	09/25/2019			
25	43		✓	✓	=	-			
10	44			✓	=	-			
20	45			✓	=	-			
26	46			✓	=	-			
	47					✓			
	48					✓			
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	72					✓			
	73					✓			

<i>Search Notes</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CPC - Searched*		
Symbol	Date	Examiner
G06F 3/167, 17/00, 17/3074, 3/048, 3/0482, 3/0484, 3/126, 3/16	09/25/2019	OS
H04L 65/60, 12/2812	09/25/2019	OS

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
709	219, 220, 231	09/25/2019	OS

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Updated Inventor search	09/25/2019	OS
Updated Assignee search	09/25/2019	OS
Updated EAST search in USPAT, US-PGPUB, EPO, JPO, and FPRS databases	09/25/2019	OS

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/OLEG SURVILLO/ Primary Examiner.Art Unit 2442	
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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S885	8284	G06F3/167.CPC.	US-PGPUB; USPAT	OR	ON	2019/09/16 12:57
S886	3795	G06F17/00.CPC.	US-PGPUB; USPAT	OR	ON	2019/09/16 12:57
S887	2	G06F17/3074.CPC.	US-PGPUB; USPAT	OR	ON	2019/09/16 12:57
S888	6628	G06F3/048.CPC.	US-PGPUB; USPAT	OR	ON	2019/09/16 12:57
S889	32324	G06F3/0482.CPC.	US-PGPUB; USPAT	OR	ON	2019/09/16 12:57
S890	12409	G06F3/0484.CPC.	US-PGPUB; USPAT	OR	ON	2019/09/16 12:57
S891	2315	G06F3/126.CPC.	US-PGPUB; USPAT	OR	ON	2019/09/16 12:57
S892	3403	G06F3/16.CPC.	US-PGPUB; USPAT	OR	ON	2019/09/16 12:57
S893	5127	H04L65/60.CPC.	US-PGPUB; USPAT	OR	ON	2019/09/16 12:57
S894	1030	H04L12/2812.CPC.	US-PGPUB; USPAT	OR	ON	2019/09/16 12:58
S895	15721	709/219.ccls.	US-PGPUB; USPAT	OR	ON	2019/09/16 12:59
S896	9128	709/220.ccls.	US-PGPUB; USPAT	OR	ON	2019/09/16 12:59
S897	7657	709/231.ccls.	US-PGPUB; USPAT	OR	ON	2019/09/16 12:59
S898	324	millington-nicholas\$.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/16 12:59
S899	64	sonos.as. and zone adj player.clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/16 12:59
S900	58135941	@ad< "20040401" or @rlad< "20040401"	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2019/09/16 14:11
S901	39	S900 and determin\$3 adj3 whether near8 (file or content or audio or song) with (local\$3) and request\$3	US-PGPUB; USPAT; FPRS; EPO;	OR	ON	2019/09/16 14:11

		near4 (remote or second or another) near2 (device or player or peer) with (file or content or audio or song)	JPO			
S902	39	S901	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/16 14:11
S903	693	sonos.as. and zone with (audio or sound) and (synchrony or synchroniz\$3 or synchronization) near4 (audio or sound or playback)	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2019/09/16 14:12
S904	693	S903	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/16 14:12
S905	26	zone adj player and volume near3 (control or controlling or controlled).clm.	US-PGPUB; USPAT	OR	ON	2019/09/16 14:12
S906	26	S905	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/16 14:12
S907	78	zone adj player and volume near3 (control or controlling or controlled or adjust\$3).clm.	US-PGPUB; USPAT	OR	ON	2019/09/16 14:21
S908	78	S907	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/16 14:21
S909	68	zone adj player and volume near3 (adjust\$3).clm.	US-PGPUB; USPAT	OR	ON	2019/09/16 14:21
S910	68	S909	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/16 14:21
S911	31	zone adj player and volume near3 (adjust\$3).clm.	USPAT	OR	ON	2019/09/16 14:21
S912	31	S911	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/16 14:21
S913	58135941	@ad< "20040401" or	US-PGPUB;	OR	ON	2019/09/16

		@rlad< "20040401"	USPAT; FPRS; EPO; JPO			14:28
S914	137	S913 and volume near3 (control or controlling or controlled or adjust\$3) with (slave or other or peer) near3 (player or device)	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2019/09/16 14:28
S915	137	S914	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/16 14:28
S916	31	S913 and volume near3 (control or controlling or controlled or adjust\$3) with (slave or other or peer) near3 (player or device) not millington.in.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2019/09/16 14:28
S917	31	S916	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/16 14:28
S919	1017	"s729"	US-PGPUB; USPAT	OR	ON	2019/09/16 14:35
S924	128	(playback or playing or play) near3 (music or audio or sound) with group and (master or control or controller or floor or director or leader) near3 indicator and (@ad< "20130529" or @rlad< "20130529")	US-PGPUB; USPAT	OR	ON	2019/09/19 19:04
S925	33	(synchrony or synchroniz\$3) near3 (playback or playing) with (audio or music or sound or song) with (transition\$3 or switch\$3) and (@ad< "20040401" or @rlad< "20040401")	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2019/09/19 19:05
S926	128	(playback or playing or play) near3 (music or audio or sound) with group and (master or control or controller or floor or director or leader) near3 indicator and (@ad< "20130529" or @rlad< "20130529")	US-PGPUB; USPAT	OR	ON	2019/09/19 19:06
S927	321	group\$3 near5 (player or output adj1 device or appliance or multimedia adj1 device) with (location or proximity or vicinity) and (gui or graphical near2 interface) and (player or output adj1 device or appliance or multimedia adj1 device) with (audio or music) and (@ad< "20130529" or @rlad< "20130529")	US-PGPUB; USPAT	OR	ON	2019/09/19 19:06
S933	1	"9137125".pn.	US-PGPUB; USPAT	OR	ON	2019/09/24 21:01

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S920	11	(volume near3 (control or controlling or controlled or adjust\$3) with (slave or other or peer) near3 (player or device)).clm.	US-PGPUB	OR	ON	2019/09/16 14:35
S921	11	S920	US-PGPUB	OR	ON	2019/09/16 14:35
S922	0	(volume near3 (adjustment) with (slave or other or peer) near3 (player or device)).clm.	US-PGPUB	OR	ON	2019/09/16 14:36
S923	35	(volume near3 (adjustment) with (slave or other or peer or second) near3 (player or device)).clm.	US-PGPUB	OR	ON	2019/09/16 14:36
S928	10	((playback or playing or play adj back) near3 (synchronize or synchrony or sync or synch or synchronization or synchronized) with clock with (audio or sound) and clock near4 (transmit\$4 or send or sending or sent or receiv\$3)).clm.	US-PGPUB	OR	ON	2019/09/19 19:06
S931	11	((synchrony or synchronous\$3) near2 (play or playing or playback) and (clock) with (send\$3 or transmit\$4) with (asynchronous or internet or network)).clm.	US-PGPUB	OR	ON	2019/09/19 19:08
S932	34	((playback or playing or play adj back) near3 (synchronize or synchrony or sync or synch or synchronization or synchronized) with clock with (audio or sound)).clm.	US-PGPUB	OR	ON	2019/09/19 19:08

9/ 25/ 2019 9:29:44 PM

C:\ Users\ osurvillo\ Documents\ EAST\ Workspaces\ 14186850.wsp



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806
107361	7590	09/17/2019	EXAMINER	
McDonnell Boehnen Hulbert & Berghoff LLP			SURVILLO, OLEG	
Sonos, Inc.				
300 South Wacker Drive			ART UNIT	
Chicago, IL 60606			PAPER NUMBER	
			2442	
			MAIL DATE	
			DELIVERY MODE	
			09/17/2019	
			PAPER	

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

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

<i>Decision Granting Request for Prioritized Examination (Track I)</i>	Application No. 13/864,249	Applicant(s) Millington, Nicholas A. J.	
	Examiner BRIAN W BROWN	Art Unit OPET	AIA (FITF) Status No
<p>1. THE REQUEST FILED <u>03 September 2019</u> IS GRANTED .</p> <p>The above-identified application has met the requirements for prioritized examination</p> <p>A. ☐ for an original nonprovisional application (Track I).</p> <p>B. ☒ for an application undergoing continued examination (RCE).</p> <p>2. The above-identified application will undergo prioritized examination. The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:</p> <p>A. filing a <u>petition for extension of time</u> to extend the time period for filing a reply;</p> <p>B. filing an <u>amendment to amend the application to contain more than four independent claims, more than thirty total claims</u>, or a multiple dependent claim;</p> <p>C. filing a <u>request for continued examination</u> ;</p> <p>D. filing a notice of appeal;</p> <p>E. filing a request for suspension of action;</p> <p>F. mailing of a notice of allowance;</p> <p>G. mailing of a final Office action;</p> <p>H. completion of examination as defined in 37 CFR 41.102; or</p> <p>I. abandonment of the application.</p> <p>Telephone inquiries with regard to this decision should be directed to BRIAN BROWN at (571)272-5338. In his/her absence, calls may be directed to Petition Help Desk at (571) 272-3282.</p>			
/BRIAN W BROWN/ Petitions Examiner, OPET			

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)			
First Named Inventor:	Millington	Nonprovisional Application Number (if known):	13/864,249
Title of Invention:	Concurrent Transmission and Playback of Audio Information		
APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.			
<ol style="list-style-type: none">1. The processing fee set forth in 37 CFR 1.17(i), the prioritized examination fee set forth in 37 CFR 1.17(c), and if not already paid, the publication fee set forth in 37 CFR 1.18(d) have been filed with the request. The basic filing fee, search fee, examination fee, and any required excess claims and application size fees are filed with the request or have been already been paid.2. The application contains or is amended to contain no more than four independent claims and no more than thirty total claims, and no multiple dependent claims.3. The applicable box is checked below:<ol style="list-style-type: none">I. ☐ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)<ol style="list-style-type: none">i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web. ---OR---(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.ii. An executed oath or declaration under 37 CFR 1.63 is filed with the application.II. ☒ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)<ol style="list-style-type: none">i. A request for continued examination has been filed with, or prior to, this form.ii. If the application is a utility application, this certification and request is being filed via EFS-Web.iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).			
Signature /Jeffrey P. Armstrong/		Date September 3, 2019	
Name (Print/Typed) Jeffrey P. Armstrong		Practitioner Registration Number 54,967	
Note: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required in accordance with 37 CFR 1.33 and 11.18. Please see 37 CFR 1.4(d) for the form of the signature. If necessary, submit multiple forms for more than one signature, see below*.			
☒ *Total of <u>1</u> forms are submitted.			

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No. 13-0402
(MBHB 15-518-CON)

In the Application of:	)	
Nicholas A. J. Millington	)	Examiner: SURVILLO, Oleg
	)	
Application No.: 13/864,249	)	Group Art Unit: 2442
	)	
Filed: April 17, 2013	)	Confirmation No. 9806
	)	
Title: Concurrent Transmission and	)	
Playback of Audio Information	)	
	)	
	)	

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

**AMENDMENT SUBMITTED WITH
A REQUEST FOR CONTINUED EXAMINATION**

Please enter the amendments submitted herewith in connection with a Request for Continued Examination.

AMENDMENTS TO THE CLAIMS begin on page 2.

REMARKS begin on page 15.

Please charge any underpayment of fees or credit any overpayment of fees in connection with the prosecution of the above-captioned application to Deposit Account 13-2490.

AMENDMENTS TO THE CLAIMS

1-46. (Canceled)

47. (New) A first zone player comprising:

a network interface that is configured to communicatively couple the first zone player to at least one data network;

at least one processor;

a tangible, non-transitory computer-readable medium; and

program instructions stored on the tangible, non-transitory computer-readable medium that are executable by the at least one processor such that the first zone player is configured to:

receiving, via the network interface, a request to engage in synchronous playback of audio content as part of a synchrony group that includes at least a second zone player that is communicatively coupled to the first zone player via the at least one data network;

after receiving the request to engage in synchronous playback of audio content as part of the synchrony group:

detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group; and

beginning to operate in the synchrony group in accordance with the indication;

wherein, while operating in the control-master mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, first control information for the synchrony group from a network device that is communicatively coupled to the first zone player; and

based on the first control information, cause, via the network interface, at least one playback action to be applied in the synchrony group;

wherein, while operating in the control-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, second control information from another zone player; and

perform one or more playback actions in accordance with the second control information;

wherein, while operating in the audio-master mode for the synchrony group, the first zone player is configured to:

obtain audio information that is representative of the audio content;

generate playback timing information associated with the obtained audio information that is indicative of one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information; and

transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player; and

wherein, while operating in the audio-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, audio information and playback timing information associated with the received audio information from another zone player; and

engage in synchronous playback of the received audio information with at least the second zone player based on the received playback timing information associated with the received audio information.

48. (New) The first zone player of claim 47, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-master mode for the synchrony group and (b) the audio-master mode for the synchrony group.

49. (New) The first zone player of claim 47, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-slave mode for the synchrony group and (b) the audio-master mode for the synchrony group.

50. (New) The first zone player of claim 47, wherein beginning to operate in the synchrony group in accordance with the indication comprises either (a) transitioning from operating in the audio-master mode to operating in the audio-slave mode or (b) transitioning from operating in the audio-slave mode to operating in the audio-master mode.

51. (New) The first zone player of claim 47, wherein the first control information identifies particular audio content to be played back by the synchrony group that is available at an audio source outside of the at least one data network, and wherein causing the at least one playback action to be applied in the synchrony group comprises causing a zone player operating in the audio-master mode to obtain audio information that is representative of the particular audio content.

52. (New) The first zone player of claim 47, wherein the one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information comprise at least one first future time that is determined based on a local clock of a zone player other than the first zone player.

53. (New) The first zone player of claim 47, wherein the one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information comprise at least one first future time that is determined based on a local clock of the first zone player.

54. (New) The first zone player of claim 47, wherein the second control information comprises information indicative of a volume adjustment, and wherein performing one or more playback actions in accordance with the second control information comprises adjusting a playback volume of the first zone player.

55. (New) The first zone player of claim 47, wherein the playback timing information that is received while operating in the audio-slave mode comprises at least one future time at which at least the first and second zone players are to engage in synchronous

playback of the received audio information, and wherein being configured while operating in the audio-slave mode to engage in synchronous playback of the received audio information with at least the second zone player comprises being configured to:

update the at least one future time to account for a differential between a local clock time of the first zone player and a local clock time of another zone player; and

when the local clock time of the first zone player reaches the updated at least one future time, engage in synchronous playback of the received audio information with at least the second zone player.

56. (New) A method performed by a first zone player, the method comprising:
receiving, via a network interface at the first zone player, a request to engage in synchronous playback of audio content as part of a synchrony group that includes at least a second zone player that is communicatively coupled to the first zone player via at least one data network;

after receiving the request to enter into the synchrony group:

detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group; and

beginning to operate in the synchrony group in accordance with the indication;

wherein, while operating in the control-master mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, first control information for the synchrony group from a network device that is communicatively coupled to the first zone player;
and

based on the first control information, cause, via the network interface, at least one playback action to be applied in the synchrony group;
wherein, while operating in the control-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, second control information from another zone player; and

perform one or more playback actions in accordance with the second control information;

wherein, while operating in the audio-master mode for the synchrony group, the first zone player is configured to:

obtain audio information that is representative of the audio content;

generate playback timing information associated with the obtained audio information that is indicative of one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information; and

transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player; and

wherein, while operating in the audio-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, audio information and playback timing information associated with the received audio information from another zone player; and

engage in synchronous playback of the received audio information with at least the second zone player based on the received playback timing information associated with the received audio information.

57. (New) The method of claim 56, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-master mode for the synchrony group and (b) the audio-master mode for the synchrony group.

58. (New) The method of claim 56, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-slave mode for the synchrony group and (b) the audio-master mode for the synchrony group.

59. (New) The method of claim 56, wherein beginning to operate in the synchrony group in accordance with the indication comprises either (a) transitioning from operating in the audio-master mode to operating in the audio-slave mode or (b) transitioning from operating in the audio-slave mode to operating in the audio-master mode.

60. (New) The method of claim 56, wherein the first control information identifies particular audio content to be played back by the synchrony group that is available at an audio source outside of the at least one data network, and wherein causing the at least one playback action to be applied in the synchrony group comprises causing a zone player operating in the

audio-master mode to obtain audio information that is representative of the particular audio content.

61. (New) The method of claim 56, wherein the one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information comprise at least one first future time that is determined based on a local clock of a zone player other than the first zone player.

62. (New) The method of claim 56, wherein the one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information comprise at least one first future time that is determined based on a local clock of the first zone player.

63. (New) The method of claim 56, wherein the second control information comprises information indicative of a volume adjustment, and wherein performing one or more playback actions in accordance with the second control information comprises adjusting a playback volume of the first zone player.

64. (New) The method of claim 56, wherein the playback timing information that is received while operating in the audio-slave mode comprises at least one future time at which at least the first and second zone players are to engage in synchronous playback of the received audio information, and wherein operating in the audio-slave mode to engage in synchronous playback of the received audio information with at least the second zone player comprises:

updating the at least one future time to account for a differential between a local clock time of the first zone player and a local clock time of another zone player; and

when the local clock time of the first zone player reaches the updated at least one future time, engaging in synchronous playback of the received audio information with at least the second zone player.

65. (New) Tangible, non-transitory computer-readable media having instructions stored therein, wherein the instructions, when executed, cause a first zone player to perform functions comprising:

receiving, via a network interface at the first zone player, a request to engage in synchronous playback of audio content as part of a synchrony group that includes at least a second zone player that is communicatively coupled to the first zone player via at least one data network;

after receiving the request to enter into the synchrony group:

detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group; and

beginning to operate in the synchrony group in accordance with the indication;

wherein, while operating in the control-master mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, first control information for the synchrony group from a network device that is communicatively coupled to the first zone player; and

based on the first control information, cause, via the network interface, at least one playback action to be applied in the synchrony group;

wherein, while operating in the control-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, second control information from another zone player; and

perform one or more playback actions in accordance with the second control information;

wherein, while operating in the audio-master mode for the synchrony group, the first zone player is configured to:

obtain audio information that is representative of the audio content;

generate playback timing information associated with the obtained audio information that is indicative of one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information; and

transmit, via the network interface, the obtained audio information and the generated playback timing information to the second zone player; and

wherein, while operating in the audio-slave mode for the synchrony group, the first zone player is configured to:

receive, via the network interface, audio information and playback timing information associated with the received audio information from another zone player; and

engage in synchronous playback of the received audio information with at least the second zone player based on the received playback timing information associated with the received audio information.

66. (New) The tangible, non-transitory computer-readable media of claim 65, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-master mode for the synchrony group and (b) the audio-master mode for the synchrony group.

67. (New) The tangible, non-transitory computer-readable media of claim 65, wherein detecting an indication that the first zone player is to operate in (a) one of a control-master mode or a control-slave mode for the synchrony group and (b) one of an audio-master mode or an audio-slave mode for the synchrony group comprises detecting an indication that the first zone player is to operate in (a) the control-slave mode for the synchrony group and (b) the audio-master mode for the synchrony group.

68. (New) The tangible, non-transitory computer-readable media of claim 65, wherein beginning to operate in the synchrony group in accordance with the indication comprises either (a) transitioning from operating in the audio-master mode to operating in the audio-slave mode or (b) transitioning from operating in the audio-slave mode to operating in the audio-master mode.

69. (New) The tangible, non-transitory computer-readable media of claim 65, wherein the first control information identifies particular audio content to be played back by the synchrony group that is available at an audio source outside of the at least one data network, and wherein causing the at least one playback action to be applied in the synchrony group comprises

causing a zone player operating in the audio-master mode to obtain audio information that is representative of the particular audio content.

70. (New) The tangible, non-transitory computer-readable media of claim 65, wherein the one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information comprise at least one first future time that is determined based on a local clock of a zone player other than the first zone player.

71. (New) The tangible, non-transitory computer-readable media of claim 65, wherein the one or more future times at which at least the first and second zone players are to engage in synchronous playback of the obtained audio information comprise at least one first future time that is determined based on a local clock of the first zone player.

72. (New) The tangible, non-transitory computer-readable media of claim 65, wherein the second control information comprises information indicative of a volume adjustment, and wherein performing one or more playback actions in accordance with the second control information comprises adjusting a playback volume of the first zone player.

73. (New) The tangible, non-transitory computer-readable media of claim 65, wherein the playback timing information that is received while operating in the audio-slave mode comprises at least one future time at which at least the first and second zone players are to engage in synchronous playback of the received audio information, and wherein operating in the audio-slave mode to engage in synchronous playback of the received audio information with at least the second zone player comprises:

updating the at least one future time to account for a differential between a local clock time of the first zone player and a local clock time of another zone player; and

when the local clock time of the first zone player reaches the updated at least one future time, engaging in synchronous playback of the received audio information with at least the second zone player.

REMARKS

Applicant has canceled claims 1-20 and claims 21-46. Claims 47-73 are pending; claims 47, 56, and 65 are independent. If further dialog would advance consideration and entry of the present amendment, Applicant invites the Office to telephone the undersigned at 312-913-0001.

Respectfully submitted,
McDonnell Boehnen Hulbert & Berghoff LLP

Date: September 3, 2019

By: /Jeffrey P. Armstrong/
Jeffrey P. Armstrong
Reg. No. 54,967

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Jeffrey Armstrong		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
REQUEST FOR PRIORITIZED EXAMINATION	1817	1	4000	4000
Pages:				
Claims:				
Miscellaneous-Filing:				
PROCESSING FEE, EXCEPT PROV. APPLS.	1830	1	140	140
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	1820	1	1900	1900
Total in USD (\$)				6040

Electronic Acknowledgement Receipt	
EFS ID:	37053474
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Jeffrey Armstrong
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	03-SEP-2019
Filing Date:	17-APR-2013
Time Stamp:	17:35:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$6040
RAM confirmation Number	E201993H35310369
Deposit Account	132490
Authorized User	Jeffrey Armstrong
<p>The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:</p> <p>37 CFR 1.16 (National application filing, search, and examination fees)</p> <p>37 CFR 1.17 (Patent application and reexamination processing fees)</p>	

37 CFR 1.19 (Document supply fees)
 37 CFR 1.20 (Post Issuance fees)
 37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	13-0402_RCE.pdf	76737	no	2
			3de8b45d685a5f9ce798a765573342198ce55507		
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
2	TrackOne Request	13-0402_Track_One_Request.pdf	108099	no	1
			100bd720176e03615055089939a02f773d28ffe2		
Warnings:					
Information:					
3		13-0402_Amendment.pdf	85421	yes	15
			800068242b3ecbfc8c289f3a39a179bfd177e1f2		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Amendment Submitted/Entered with Filing of CPA/RCE		1	1	
	Claims		2	14	
	Applicant Arguments/Remarks Made in an Amendment		15	15	
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	34347	no	2
			9e46b9b66d99253aff30c711f9c9923750c38a73		
Warnings:					
Information:					
Total Files Size (in bytes):			304604		

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)

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

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL (Submitted Only via EFS-Web)							
Application Number	13864249	Filing Date	2013-04-17	Docket Number (if applicable)	13-0402 (15-518-CON)	Art Unit	2442
First Named Inventor	Millington			Examiner Name	Survillo		
This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application. Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV							
SUBMISSION REQUIRED UNDER 37 CFR 1.114							
Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).							
☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.							
☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____							
☐ Other _____							
☒ Enclosed							
☒ Amendment/Reply							
☐ Information Disclosure Statement (IDS)							
☐ Affidavit(s)/ Declaration(s)							
☒ Other _____ CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e)							
MISCELLANEOUS							
☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(l) required)							
☐ Other _____							
FEES							
☒ The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed. The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No <u>132490</u>							
SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED							
☒ Patent Practitioner Signature							
☐ Applicant Signature							

EFS - Web 2.1.15

Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)

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

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Signature of Registered U.S. Patent Practitioner			
Signature	/Jeffrey P. Armstrong/	Date (YYYY-MM-DD)	2019-09-03
Name	Jeffrey P. Armstrong	Registration Number	54967

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 13/864,249		Filing Date 04/17/2013		☐ To be Mailed					
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO													
APPLICATION AS FILED - PART I													
		(Column 1)	(Column 2)										
FOR		NUMBER FILED	NUMBER EXTRA		RATE (\$)		FEE (\$)						
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A		N/A								
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A	N/A		N/A								
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A		N/A								
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 =	*		x \$80 =								
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =	*		x \$420 =								
☐ 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).											
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))													
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL							
APPLICATION AS AMENDED - PART II													
		(Column 1)	(Column 2)		(Column 3)								
AMENDMENT		09/03/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)			ADDITIONAL FEE (\$)		
		Total (37 CFR 1.16(i))	* 27	Minus	** 26	= 1		x \$100 =			100		
		Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x \$460 =			0		
		☐ Application Size Fee (37 CFR 1.16(s))											
		☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))											
								TOTAL ADD'L FEE		100			
		(Column 1)	(Column 2)		(Column 3)								
AMENDMENT			CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)			ADDITIONAL FEE (\$)		
		Total (37 CFR 1.16(i))	*	Minus	**	=		x \$0 =					
		Independent (37 CFR 1.16(h))	*	Minus	***	=		x \$0 =					
		☐ Application Size Fee (37 CFR 1.16(s))											
		☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))											
								TOTAL ADD'L FEE					
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.								LIE					
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".								/DORIS M KING/					
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".													
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.													

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806
107361	7590	08/29/2019	EXAMINER	
McDonnell Boehnen Hulbert & Berghoff LLP			SURVILLO, OLEG	
Sonos, Inc.			ART UNIT	PAPER NUMBER
300 South Wacker Drive			2442	
Chicago, IL 60606			MAIL DATE	DELIVERY MODE
			08/29/2019	PAPER

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

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

**UNITED STATES DEPARTMENT OF COMMERCE****U.S. Patent and Trademark Office**

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR/ PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
13/864,249	04/17/2013	Millington, Nicholas A. J.	13-0402 (MBHB 15-

McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606		EXAMINER	
		OLEG SURVILLO	
		ART UNIT	PAPER
		2442	20190827

DATE MAILED: _____

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Commissioner for Patents**To Whom This May Concern:**

Two Information Disclosure Statements dated 11/10/2017 have been considered again by the Examiner as it appears that copy of the considered IDS was not attached with the previous correspondence.

NO SEPARATE RESPONSE TO THIS COMMUNICATION IS REQUIRED

/OLEG SURVILLO/
Primary Examiner, Art Unit 2442

dated 11/10/2017

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)

Approved for use through 07/31/2016. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

1	Notice of Allowance mailed on 01 June 2017, issued in connection with U.S. Patent Application No. 14/290493, filed on 29 May 2014, 12 pages
2	Notice of Allowance mailed on 02 June 2017, issued in connection with U.S. Patent Application No. 14/486667, filed on 15 September 2014, 10 pages
3	Notice of Allowance mailed on 12 July 2017, issued in connection with U.S. Patent Application No. 13/894179, filed on 14 May 2013, 10 pages
4	Notice of Allowance mailed on 13 July 2017, issued in connection with U.S. Patent Application No. 13/895076, filed on 15 May 2013, 10 pages
5	Notice of Allowance mailed on 14 August 2012, issued in connection with U.S. Patent Application No. 11/147116, filed on 06 June 2005, 33 pages
6	Notice of Allowance mailed on 18 July 2014, issued in connection with U.S. Patent Application No. 13/618829, filed on 14 September 2012, 8 pages
7	Notice of Allowance mailed on 23 November 2016, issued in connection with U.S. Patent Application No. 14/803953, filed on 20 July 2015, 21 pages
8	Notice of Allowance mailed on 25 April 2017, issued in connection with U.S. Patent Application No. 15/156392, filed on 17 May 2016, 8 pages
9	Notice of Allowance mailed on 27 April 2015, issued in connection with U.S. Patent Application No. 13/932864, filed on 01 July 2013, 20 pages.
10	Notice of Allowance mailed on 27 March 2017, issued in connection with U.S. Patent Application No. 15/089758, filed on 04 April 2016, 7 pages
11	Notice of Allowance mailed on 28 March 2017, issued in connection with U.S. Patent Application No. 15/088906, filed on 01 April 2016, 7 pages

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

12	Notice of Allowance mailed on 28 March 2017, issued in connection with U.S. Patent Application No. 15/155149, filed on 16 May 2016, 7 pages
13	Notice of Allowance mailed on 29 April 2015, issued in connection with U.S. Patent Application No. 13/863083, filed on 15 April 2013, 19 pages.
14	Notice of Allowance mailed on 29 March 2017, issued in connection with U.S. Patent Application No. 14/803953, filed on 20 July 2015, 8 pages
15	Notice of Allowance mailed on 3 April 2017, issued in connection with U.S. Patent Application No. 15/088678, filed on 1 April 2016, 8 pages
16	Notice of Allowance mailed on 30 March 2017, issued in connection with U.S. Patent Application No. 15/088532, filed on 01 April 2016, 7 pages
17	Notice of Allowance mailed on 6 April 2017, issued in connection with U.S. Patent Application No. 15/088283, filed on 1 April 2016, 7 pages
18	Notice of Incomplete Re-Exam Request mailed on 25 May 2017, issued in connection with U.S. Patent Application No. 90/013959 , filed on 01 April 2016, 10 pages
19	Notice of Intent to Issue Re-Examination Certificate mailed on 03 August 2017, issued in connection with U.S. Patent Application No. 90/013882, filed on 27 December 2016, 20 pages
20	"Sonos Multi-Room Music System User Guide," Version 090401, Sonos, Inc. 1 April 2009, 256 pages
21	Pre-Brief Conference Decision mailed on 11 May 2017, issued in connection with U.S. Patent Application No. 14/504812, filed on 2 October 2014, 2 pages
22	Reexam Non-Final Office Action mailed on 09 November 2016, issued in connection with U.S. Patent Application No. 90/013774, filed on 29 June 2016, 35 pages

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

23	Renewed Request for Ex Parte Re-Examination, U.S. Application No. 90/013959 filed 16 June 2017, 126 pages.
24	Request for Ex Parte Reexamination submitted in U.S. Patent 9213357 on May 22, 2017, 85 pages
25	Sonos System Overview, Version 1.0, July 2011, 12 pages
26	"Symantec pcAnywhere User's Guide," v 10.5.1, 1995-2002, 154 pages.

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/OLEG SURVILLO/	Date Considered	08/27/2019
--------------------	-----------------	-----------------	------------

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

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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.

☒ A certification statement is not submitted herewith.

SIGNATURE

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	/Kerry T. Creeron/	Date (YYYY-MM-DD)	2017-11-10
Name/Print	Kerry T. Creeron	Registration Number	70,004

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The information provided by you in this form will be subject to the following routine uses:

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dated 11/10/2017

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	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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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	5636345		1997-06-03	VALDEVIT; Ezio	
	2	5732059		1998-03-24	KATSUYAMA; Akira et al.	
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	8	6611813		2003-08-26	BRATTON; Timothy Robert	

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10	6795852		2004-09-21	KLEINROCK; Leonard et al.	
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21	7433324	2008-10-07	SWITZER; David et al.
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	1	Advisory Action mailed on 01 November 2013, issued in connection with U.S. Patent Application No. 13/618829, filed on 14 September 2012, 3 pages	
	2	Advisory Action mailed on 10 August 2017, issued in connection with U.S. Patent Application No. 13/864250, filed on 17 April 2013, 3 pages	
	3	Advisory Action mailed on 16 August 2017, issued in connection with U.S. Patent Application No. 13/864248, filed on 17 April 2013, 5 pages	

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6	Advisory Action mailed on 27 April 2016, issued in connection with U.S. Patent Application No. 14/486667, filed on 15 September 2014, 7 pages
7	Corrected Notice of Allowability mailed on 23 December 2016, issued in connection with U.S. Patent Application No. 14/803953 filed on 20 July 2015, 18 pages
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9	File History of Re-Examination Application No. 90/013,423 (Sonos Ref. No. 12-0902-REX) retrieved from the U.S. Patent Office (PAIR) on December 5, 2016, 313 pages.
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37	Non-Final Office Action mailed on 07 November 2011, issued in connection with U.S. Patent Application No. 11/147116, filed 06 June 2005, 48 pages
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43	Non-Final Office Action mailed on 18 January 2013, issued in connection with U.S. Patent Application No. 13/618829, filed on 14 September 2012, 58 pages
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CERTIFICATION STATEMENT

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Signature	/Kerry T. Creeron/	Date (YYYY-MM-DD)	2017-11-10
Name/Print	Kerry T. Creeron	Registration Number	70,004

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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.



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

107361 7590 06/03/2019
McDonnell Boehnen Hulbert & Berghoff LLP
Sonos, Inc.
300 South Wacker Drive
Chicago, IL 60606

EXAMINER	
SURVILLO, OLEG	
ART UNIT	PAPER NUMBER
2442	

DATE MAILED: 06/03/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806

TITLE OF INVENTION: CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	09/03/2019

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)

107361 7590 06/03/2019
McDonnell Boehnen Hulbert & Berghoff LLP
Sonos, Inc.
300 South Wacker Drive
Chicago, IL 60606

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.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806

TITLE OF INVENTION: CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	09/03/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
SURVILLO, OLEG	2442	709-219000

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 _____
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. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518 CON)	9806
107361	7590	06/03/2019	EXAMINER	
McDonnell Boehnen Hulbert & Berghoff LLP			SURVILLO, OLEG	
Sonos, Inc.				
300 South Wacker Drive			ART UNIT	
Chicago, IL 60606			PAPER NUMBER	
			2442	

DATE MAILED: 06/03/2019

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. 13/864,249	Applicant(s) Millington, Nicholas A. J.	
	Examiner OLEG SURVILLO	Art Unit 2442	AIA (FITF) Status No

-- 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 amendment after Non-Final rejection, response dated 04/08/2019.
☐ 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 21-46. 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 areply 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 <u>04/19/19</u> .	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. <u>20190510</u> .	

/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	
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EXAMINER'S COMMENT

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Response to Arguments

With regard to the Applicants' Remarks dated April 8, 2019:

Regarding the rejection of claims 44-46 under 35 U.S.C. 112, second paragraph, Applicant's amendment and arguments have been fully considered and are sufficient. Therefore, the rejection has been withdrawn.

Regarding the rejection of claims 21-46 under 35 U.S.C. 103(a), Applicant's amendment and arguments have been fully considered and are persuasive. Applicants argue that Hardwick in view of Goldberg fails to teach all of the claimed elements, as amended. Examiner agrees. Therefore, the rejection has been withdrawn. Upon further search and consideration, no new grounds of rejection are made.

As to any arguments not specifically addressed, they are the same as those discussed above.

Allowed Claims

Claims 21-46 are allowed.

Allowable Subject Matter

The following is an examiner's statement of reasons for allowance:

none of the qualifying prior art references of record, taken alone or in combination, disclose or reasonably suggest: a combination of elements as claimed in independent claim where “*the timing information comprises a plurality of future playback times for a corresponding plurality of portions of the first audio information at which the first zone player and the third zone player are to play the corresponding plurality of portions of the first audio information; the first zone player and the third zone player receiving the first audio information and the timing information from the second zone player and using the timing information to play the first audio information in synchrony with each other, wherein using the timing information to play the first audio information in synchrony with each other comprises the first zone player using the plurality of future playback times to play the corresponding plurality of portions of the first audio information in synchrony with the third zone player based on a timing difference between a clock of the second zone player and a clock of the first zone player*”. Other independent claims 29 and 37 recite similar features.

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.”

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to OLEG SURVILLO whose telephone number is (571)272-9691. The examiner can normally be reached on 9:00am - 5:00pm.

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, William Trost can be reached on 571-272-7872. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/OLEG SURVILLO/
Primary Examiner, Art Unit 2442

<i>Examiner-Initiated Interview Summary</i>	Application No. 13/864,249	Applicant(s) Millington, Nicholas A. J.		
	Examiner OLEG SURVILLO	Art Unit 2442	AIA (First Inventor to File) Status No	Page 1 of 1

All participants (applicant, applicants representative, PTO personnel):

1. OLEG SURVILLO (Primary Examiner); Telephonic 2. Jeffrey Armstrong (Attorney of Record); Telephonic

Date of Interview: 10 May 2019

Claims Discussed: claims 21-46

Issues Discussed:

Double Patenting:
Discussed potential Double Patenting rejection with US Patent 10,296,283 and allowed, but not yet issued application 15/972,383. Applicant argued that the last limitation "while..." patentably distinguishes from US Patent 10,296,283 and allowed, but not yet issued application 15/972,383. Upon further consideration, it was agreed that Terminal Disclaimer is not necessary.

/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	
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Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

<i>Search Notes</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CPC - Searched*		
Symbol	Date	Examiner
G06F 3/167, 17/00, 17/3074, 3/048, 3/0482, 3/0484, 3/126, 3/16	05/13/2019	OS
H04L 65/60, 12/2812	05/13/2019	OS

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
709	219, 220, 231	05/13/2019	OS

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Updated Inventor search	05/13/2019	OS
Updated Assignee search	05/13/2019	OS
Updated EAST search in USPAT, US-PGPUB, EPO, JPO, and FPRS databases	05/13/2019	OS

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	Text search in US-PGPUB database - See Interference search history printout	05/13/2019	OS

/OLEG SURVILLO/ Primary Examiner.Art Unit 2442	
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<i>Index of Claims</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	11/08/2017	07/09/2018	01/05/2019	05/13/2019					
	1	-	-	-	-					
	2	-	-	-	-					
	3	-	-	-	-					
	4	-	-	-	-					
	5	-	-	-	-					
	6	-	-	-	-					
	7	-	-	-	-					
	8	-	-	-	-					
	9	-	-	-	-					
	10	-	-	-	-					
	11	-	-	-	-					
	12	-	-	-	-					
	13	-	-	-	-					
	14	-	-	-	-					
	15	-	-	-	-					
	16	-	-	-	-					
	17	-	-	-	-					
	18	-	-	-	-					
	19	-	-	-	-					
	20	-	-	-	-					
1	21	✓	✓	✓	=					
2	22	✓	✓	✓	=					
3	23	✓	✓	✓	=					
4	24	✓	✓	✓	=					
5	25	✓	✓	✓	=					
6	26	✓	✓	✓	=					
7	27	✓	✓	✓	=					
8	28	✓	✓	✓	=					
11	29	✓	✓	✓	=					
12	30	✓	✓	✓	=					
13	31	✓	✓	✓	=					
14	32	✓	✓	✓	=					
15	33	✓	✓	✓	=					
16	34	✓	✓	✓	=					
17	35	✓	✓	✓	=					
18	36	✓	✓	✓	=					
21	37	✓	✓	✓	=					
22	38	✓	✓	✓	=					
23	39	✓	✓	✓	=					
24	40	✓	✓	✓	=					
9	41		✓	✓	=					
19	42		✓	✓	=					

<p><i>Index of Claims</i></p> 	<p>Application/Control No.</p> <p>13/864,249</p>	<p>Applicant(s)/Patent Under Reexamination</p> <p>Millington, Nicholas A. J.</p>
	<p>Examiner</p> <p>OLEG SURVILLO</p>	<p>Art Unit</p> <p>2442</p>

CLAIM		DATE								
Final	Original	11/08/2017	07/09/2018	01/05/2019	05/13/2019					
25	43		✓	✓	=					
10	44			✓	=					
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Issue Classification 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.	
	Examiner OLEG SURVILLO	Art Unit 2442	

CPC						
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H04R	/	27	/	00	I	2013-01-01
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H04L	/	65	/	60	I	2013-01-01
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NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	26	
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	13 May 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	21	2

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Part of Paper No.: 20190513

Issue Classification 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.	
	Examiner OLEG SURVILLO	Art Unit 2442	

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CPC Combination Sets						
Symbol			Type	Set	Ranking	Version
	/		/			

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(Primary Examiner)	(Date)	21	2

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	Examiner OLEG SURVILLO	Art Unit 2442

INTERNATIONAL CLASSIFICATION			
CLAIMED			
G06F	/	15	/ 16
NON-CLAIMED			
	/		/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	26	
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☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
CLAIMS															
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	7		16	5	25	16	34	25	43						
	8		17	6	26	17	35	10	44						
	9		18	7	27	18	36	20	45						

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 26	
/OLEG SURVILLO/ Primary Examiner, Art Unit 2442 (Primary Examiner) _____ (Date) 13 May 2019		O.G. Print Claim(s) 21	O.G. Print Figure 2

U.S. Patent and Trademark Office

Part of Paper No.: 20190513

EAST Search History

EAST Search History (Prior Art)

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S834	7258	G06F3/167.CPC.	US-PGPUB; USPAT	OR	ON	2019/03/15 20:22
S835	3723	G06F17/00.CPC.	US-PGPUB; USPAT	OR	ON	2019/03/15 20:22
S836	30128	G06F3/0482.CPC.	US-PGPUB; USPAT	OR	ON	2019/03/15 20:22
S837	1002	H04L12/2812.CPC.	US-PGPUB; USPAT	OR	ON	2019/03/15 20:22
S838	4932	H04L65/60.CPC.	US-PGPUB; USPAT	OR	ON	2019/03/15 20:22
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S841	22	(playback or playing) with (audio or music or sound or song) with future adj2 time and (@ad<"20040401" or @rlad<"20040401")	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2019/03/15 20:23
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S845	1	"20030164084"	US-PGPUB; USPAT	OR	ON	2019/05/13 11:15
S846	4	"10063896"	US-PGPUB; USPAT	OR	ON	2019/05/13 13:13
S847	1	"10063896".pn.	US-PGPUB; USPAT	OR	ON	2019/05/13 13:13

EAST Search History (Interference)

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S844	9	((playback or playing or play adj back) near3 (synchronize or synchrony or sync or synch or	US- PGPUB	OR	ON	2019/03/15 20:26

EAST Search History

	synchronization or synchronized) with clock with (audio or sound) and clock near4 (transmit\$4 or send or sending or sent or receiv\$3)).clm.				
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dated 04/19/2019

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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		
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U.S.PATENT APPLICATION PUBLICATIONS							Remove	
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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	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	None						
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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

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EXAMINER SIGNATURE

Examiner Signature	/OLEG SURVILLO/	Date Considered	05/13/2019
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	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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.

☒ A certification statement is not submitted herewith.

SIGNATURE

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	/Michael E. Coyne/	Date (YYYY-MM-DD)	2019-04-18
Name/Print	Michael E. Coyne	Registration Number	58443

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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	1	None						
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
<p>That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).</p>			
OR			
<p>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).</p>			
<p>☐ See attached certification statement.</p>			
<p>☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.</p>			
<p>☒ A certification statement is not submitted herewith.</p>			
SIGNATURE			
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	/Michael E. Coyne/	Date (YYYY-MM-DD)	2019-04-18
Name/Print	Michael E. Coyne	Registration Number	58443
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

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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.

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Docket No. 13-0402)**

In re the Application of:	)	
	)	
Nicholas A. J. Millington	)	
	)	Group Art Unit 2442
Serial No.: 13/864,249	)	
	)	
Filed: April 17, 2013	)	
	)	Examiner: Oleg Survillo
Confirmation No. 9806	)	
	)	
For: Concurrent Transmission and Playback	)	
Of Audio Information	)	

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

TRANSMITTAL WITH INFORMATION DISCLOSURE STATEMENT

Pursuant to 37 CFR § 1.34, the undersigned hereby confirms that the attached Information Disclosure Statement (IDS) is being filed in accordance with the undersigned's authority to act in a representative capacity on behalf of Applicant, Sonos, Inc., in connection with the preparation and filing of IDSs for the above-referenced matter.

Respectfully submitted,

Dated: April 18, 2019

By: /Michael E. Coyne/
Michael E. Coyne
Reg. No. 58,443
Lee Sullivan Shea & Smith LLP
656 W. Randolph St., Floor 5W
Chicago, Illinois 60661
(312) 754-9577
coyne@ls3ip.com

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Michael E. Coyne/Jaden Knosher		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
Total in USD (\$)				240

Electronic Acknowledgement Receipt	
EFS ID:	35769791
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Michael E. Coyne
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	19-APR-2019
Filing Date:	17-APR-2013
Time Stamp:	08:18:02
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 240
RAM confirmation Number	041919INTEFSW08183100
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	Non Patent Literature	16009182_AA_04-0601-CON0618_3-22-19_3PAGES.PDF	146833	no	3
			66db462794926e938868c7f5067a452fb4c5f5f0		
Warnings:					
Information:					
2	Non Patent Literature	2016163042_JP_OA_04-0401-JP-DIV4_2-5-19_6PAGES.PDF	1281097	no	6
			5e787f089cf0bb050e4cfa1127894838cd0fd6		
Warnings:					
Information:					
3	Non Patent Literature	2016163042_JP_OA_TRANSLATION_04-0401-JP-DIV4_2-5-19_4PAGES.PDF	85787	no	4
			23633f530ea1ce2d3b6c8f974c5e6e1e041a041f		
Warnings:					
Information:					
4	Non Patent Literature	14184522_NFOA_14-0211_1-7-19_14PAGES.PDF	511855	no	14
			167d2f8d1a2ff2dc0d6fddb55f486c8879aaf166		
Warnings:					
Information:					
5	Non Patent Literature	16180920_NOA_14-0204-CON1118A_2-11-19_10PAGES.PDF	524517	no	10
			7545224de67fd4a1dd1e279d782574d8b7ceec1e		
Warnings:					
Information:					
6	Non Patent Literature	16181342_NOA_04-0401-CON1118B_2-11-19_15PAGES.PDF	635588	no	15
			6bffa14162ba70dd3997a748753ce43f0f8fc6f93		
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Information:					

7	Non Patent Literature	15243355_NOA_04-0601- CON0816_3-11-19_17PAGES. PDF	726287	no	17
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Information:					
8	Non Patent Literature	14808875_NOA_13-0506- CON0715_3-14-19_14PAGES. PDF	636073	no	14
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9	Non Patent Literature	16128404_NOA_04-0401- CON0918_24PAGES.PDF	929404	no	24
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Warnings:					
Information:					
10	Non Patent Literature	15972383_NOA_04-0401- CON0418_3-25-19_9PAGES. PDF	476603	no	9
			3e8348fcee1d64547b6ac0c72afde07f35b36e2f		
Warnings:					
Information:					
11	Non Patent Literature	16181270_NOA_14-0204- CON1118B_1-28-19_10PAGES. PDF	542660	no	10
			a501d82aeec1ddfa0e1a67b451fda8466f907f2		
Warnings:					
Information:					
12	Non Patent Literature	15095145_NOA_04-0601- CON0316_3-29-19_7PAGES. PDF	405969	no	7
			78ee497a138b3474148334259177dce83a8a5028		
Warnings:					
Information:					
13	Non Patent Literature	16181327_NOA_04-0401- CON1118A_3-6-19_16PAGES. PDF	666907	no	16
			55ebb454a4057a50fc9b8e72ce16257e87b42efa		
Warnings:					
Information:					

14	Non Patent Literature	13864252_NOA_13-0406_1-8-19_10PAGES.PDF	519843	no	10
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Warnings:					
Information:					
15	Information Disclosure Statement (IDS) Form (SB08)	13-0402_0_IDS_20190418163307.pdf	1053897	no	5
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Warnings:					
Information:					
16	Transmittal Letter	13-0402_Transmittal_Letter.pdf	70343	no	1
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Warnings:					
Information:					
17	Fee Worksheet (SB06)	fee-info.pdf	30574	no	2
			c2b95aff214a2a02a3c1b1a72d86ac6308a6c2e9		
Warnings:					
Information:					
Total Files Size (in bytes):			9244237		
<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>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.</p> <p>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.</p> <p>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.</p>					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No. 13-0402
(MBHB 15-518-CON)

In the Application of:	)	
Nicholas A. J. Millington	)	Examiner: SURVILLO, Oleg
	)	
Application No.: 13/864,249	)	Group Art Unit: 2442
	)	
Filed: April 17, 2013	)	Confirmation No. 9806
	)	
Title: Concurrent Transmission and	)	
Playback of Audio Information	)	
	)	
	)	

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

**RESPONSE TO THE NON-FINAL OFFICE ACTION
MAILED JANUARY 7, 2019**

Please consider the following **AMENDMENTS** and **REMARKS** in response to the
Non-Final Office Action mailed on January 7, 2019, in the above-captioned application.

AMENDMENTS TO THE CLAIMS begin on page 2.

REMARKS begin on page 12.

Please charge any fee due or credit any overpayment to Deposit Account 13-2490.

AMENDMENTS TO THE CLAIMS

1-20. (Canceled)

21. (Currently Amended) In a network comprising a first zone player, a second zone player, and a third zone player, a method comprising:

the second zone player transmitting first audio information and timing information to the first zone player and the third zone player over the network, wherein the network comprises at least one of a local area network and a wide area network, and wherein the timing information comprises a plurality of future playback times for a corresponding plurality of portions of the first audio information at which the first zone player and the third zone player are to play the corresponding plurality of portions of the first audio information;

the first zone player and the third zone player receiving the first audio information and the timing information from the second zone player and using the timing information to play the first audio information in synchrony with each other, wherein using the timing information to play the first audio information in synchrony with each other comprises the first zone player using the plurality of future playback times to play the corresponding plurality of portions of the first audio information in synchrony with the third zone player based on a timing difference between a clock of the second zone player and a clock of the first zone player; and

while the first zone player and the third zone player are using the timing information to play the first audio information in synchrony with each other, the second zone player simultaneously (i) playing second audio information while (ii) transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information.

22. (Previously Presented) The method of claim 21 wherein the second audio information comprises an audio track.

23. (Previously Presented) The method of claim 21 wherein the timing information comprises first timing information, and wherein the second zone player playing the second audio information comprises the second zone player using second timing information to play the second audio information, wherein the second timing information is different from the first timing information.

24. (Currently Amended) The method of claim 21 wherein the timing information further comprises ~~[[first]]~~ clock timing information of the clock of the second zone player, and wherein the second zone player playing the second audio information comprises the second zone player using at least a portion of the ~~[[first]]~~ timing information to play the second audio information, ~~wherein the first timing information comprises clock timing information of the second zone player.~~

25. (Currently Amended) The method of claim 21 wherein ~~the timing information comprises at least one of playback timing information and clock timing information~~ the second zone player transmitting first audio information and timing information to the first zone player and the third zone player over the network comprises the second zone player sending a plurality of frames to the first zone player and the third zone player, wherein an individual frame comprises at least one of the plurality of future playback times and at least one portion of the first audio information corresponding to the at least one of the plurality of future playback times.

26. (Currently Amended) The method of claim 21 wherein the timing information further comprises clock timing information of the clock of the second zone player.

27. (Previously Presented) The method of claim 21 wherein the method further comprises:

the second zone player receiving audio information from an audio information source that is connected to the second zone player; and

the second zone player converting the audio information received from the audio information source into the first audio information prior to transmitting the first audio information and the timing information to the first zone player and the third zone player.

28. (Previously Presented) The method of claim 27, wherein the audio information source is directly connected to the second zone player, wherein the audio information received from the audio information source comprises analog audio information, and wherein the second zone player converting the audio information received from the audio information source into the first audio information comprises the second zone player converting the analog audio information into digital audio information.

29. (Currently Amended) A system comprising a first zone player, a second zone player, and a third zone player, wherein the first zone player, the second zone player, and the third zone player each comprise at least one processor and tangible non-transitory computer-readable memory comprising instructions that, when executed, cause the system to perform functions comprising:

the second zone player transmitting first audio information and timing information to the first zone player and the third zone player over a network, wherein the network comprises at

least one of a local area network and a wide area network, and wherein the timing information comprises a plurality of future playback times for a corresponding plurality of portions of the first audio information at which the first zone player and the third zone player are to play the corresponding plurality of portions of the first audio information;

the first zone player and the third zone player using the timing information to play the first audio information in synchrony with each other, wherein using the timing information to play the first audio information in synchrony with each other comprises the first zone player using the plurality of future playback times to play the corresponding plurality of portions of the first audio information in synchrony with the third zone player based on a timing difference between a clock of the second zone player and a clock of the first zone player; and

while the first zone player and the third zone player are using the timing information to play the first audio information in synchrony with each other, the second zone player simultaneously (i) playing second audio information while (ii) transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information.

30. (Previously Presented) The system of claim 29 wherein the second audio information comprises an audio track.

31. (Previously Presented) The system of claim 29 wherein the timing information comprises first timing information, and wherein the second zone player playing the second audio information comprises the second zone player using second timing information to play the second audio information, wherein the second timing information is different from the first timing information.

32. (Currently Amended) The system of claim 29 wherein the timing information further comprises ~~[[first]]~~ clock timing information of the clock of the second zone player, wherein the second zone player playing the second audio information comprises the second zone player ~~playing the second audio information based on~~ using at least a portion of the ~~[[first]]~~ timing information to play the second audio information, ~~wherein the first timing information comprises clock timing information.~~

33. (Currently Amended) The system of claim 29 wherein ~~the timing information comprises at least one of playback timing and clock timing information~~ the second zone player transmitting first audio information and timing information to the first zone player and the third zone player over the network comprises the second zone player sending a plurality of frames to the first zone player and the third zone player, wherein an individual frame comprises at least one of the plurality of future playback times and at least one portion of the first audio information corresponding to the at least one of the plurality of future playback times.

34. (Currently Amended) The system of claim 29 wherein the timing information further comprises clock timing information of the clock of the second zone player.

35. (Previously Presented) The system of claim 29 wherein the functions further comprise:

the second zone player receiving audio information from an audio information source that is connected to the second zone player; and

the second zone player converting the audio information received from the audio information source into the first audio information prior to transmitting the first audio information and the timing information to the first zone player and the third zone player.

36. (Previously Presented) The system of claim 35, wherein the audio information source is directly connected to the second zone player, wherein the audio information received by the second zone player from the audio information source comprises analog audio information, and wherein the second zone player converting the audio information received from the audio information source into the first audio information comprises the second zone player converting the analog audio information into digital audio information.

37. (Currently Amended) A tangible, non-transitory computer-readable medium having instructions stored thereon that when executed cause a first zone player to perform functions comprising:

transmitting first audio information and timing information to each of a second zone player and a third zone player over at least one of a local area network and a wide area network, and wherein the timing information comprises a plurality of future playback times for a corresponding plurality of portions of the first audio information at which the second zone player and the third zone player are to play the corresponding plurality of portions of the first audio information;

causing the second zone player and the third zone player to use the timing information to play the first audio information in synchrony with each other, wherein using the timing information to play the first audio information in synchrony with each other comprises the second zone player using the plurality of future playback times to play the corresponding

plurality of portions of the first audio information in synchrony with the third zone player based on a timing difference between a clock of the first zone player and a clock of the second zone player; and

while the second zone player and the third zone player are using the timing information to play the first audio information in synchrony with each other, the first zone player simultaneously (i) playing second audio information while (ii) transmitting the first audio information and the timing information to the second zone player and the third zone player, wherein the second audio information is different from the first audio information.

38. (Previously Presented) The tangible, non-transitory computer readable medium of claim 37 wherein the second audio information comprises an audio track.

39. (Previously Presented) The tangible, non-transitory computer readable medium of claim 37 wherein the timing information comprises first timing information, and wherein the first zone player playing the second audio information comprises the first zone player using second timing information to play the second audio information, wherein the second timing information is different from the first timing information.

40. (Currently Amended) The tangible, non-transitory computer readable medium of claim 37 wherein the timing information further comprises [[first]] clock timing information of the clock of the first zone player, wherein the first zone player playing the second audio information comprises the first zone player using at least a portion of the [[first]] timing information to play the second audio information ~~wherein the first timing information comprises clock timing information.~~

41. (Previously Presented) The method of claim 21, wherein the timing information comprises first timing information, and wherein the method further comprises:

the second zone player receiving second timing information from a fourth zone player, and wherein the second zone player playing the second audio information while (i) the first zone player and the third zone player are playing the first audio information in synchrony with each other and (ii) the second zone player is transmitting the first audio information and the first timing information to the first zone player and the third zone player comprises the second zone player using the second timing information to play the second audio information in synchrony with the fourth zone player.

42. (Currently Amended) The ~~method~~ system of claim [[21]] 29, wherein the timing information comprises first timing information, and wherein the ~~method~~ functions further comprise[[s]]:

the second zone player receiving the second audio information and [[the]] second timing information from a fourth zone player, and wherein the second zone player playing the second audio information while (i) the first zone player and the third zone player are playing the first audio information in synchrony with each other and (ii) the second zone player is transmitting the first audio information and the first timing information to the first zone player and the third zone player comprises the second zone player using the second timing information to play the second audio information in synchrony with the fourth zone player.

43. (Currently Amended) The ~~method~~ tangible, non-transitory computer-readable media of claim [[21]] 37, wherein the timing information comprises first timing information, and wherein the ~~method~~ functions further comprise[[s]]:

the ~~second~~ first zone player ~~transmitting~~ receiving the second audio information and second timing information ~~[[to]]~~ from a fourth zone player, and wherein the ~~second~~ first zone player playing second audio information while (i) the ~~first~~ second zone player and the third zone player are playing the first audio information in synchrony with each other and (ii) the ~~second~~ first zone player is transmitting the first audio information and the timing information to the ~~first~~ second zone player and the third zone player comprises the ~~second~~ first zone player using the second timing information to play the second audio information in synchrony with the fourth zone player.

44. (Currently Amended) The method of claim 21, wherein the timing information further comprises ~~playback timing information and~~ clock timing information of the clock of the second zone player, and wherein the first zone player and the third zone player using the timing information to play the first audio information in synchrony with each other comprises:

the first zone player using the clock timing information of the clock of the second zone player to determine a ~~time~~ the timing difference ~~comprising a difference between a clock at the first zone player and a clock at the second player, and~~ the first zone player using the ~~playback timing information~~ the plurality of future playback times and the ~~time~~ timing difference to play the first audio information in synchrony with the third zone player.

45. (Currently Amended) The system of claim 29, wherein the timing information further comprises ~~playback timing information and~~ clock timing information of the clock of the second zone player, and wherein the first zone player and the third zone player using the timing information to play the first audio information in synchrony with each other comprises:

the first zone player using the clock timing information of the clock of the second zone player to determine ~~a time~~ the timing difference ~~comprising a difference between a clock at the first zone player and a clock at the second player~~, and using the ~~playback timing information~~ the plurality of future playback times and the ~~time~~ timing difference to play the first audio information in synchrony with the third zone player.

46. (Currently Amended) The tangible, non-transitory computer-readable medium of claim 37, wherein the timing information further comprises ~~playback timing information and~~ clock timing information of the clock of the first zone player, and wherein ~~the first zone player and the third zone player using the timing information to play the first audio information in synchrony with each other~~ causing the second zone player and the third zone player to use the timing information to play the first audio information in synchrony with each other comprises:

causing the first second zone player ~~using~~ to use the clock timing information of the clock of the first zone player to determine ~~a time~~ the timing difference ~~comprising a difference between a clock at the first zone player and a clock at the second player~~, and using and use the ~~playback timing information~~ the plurality of future playback times and the ~~time~~ timing difference to play the first audio information in synchrony with the third zone player.

REMARKS**I. Status of the Claims**

Claims 21-46 are pending; claims 21, 29, and 37 are independent. Without conceding the merits of the rejections, and solely to advance prosecution, Applicant has amended claims 21, 24-26, 29, 32-34, 37, 40, and 42-46 to further clarify the claim language and to generally put the claims in better condition for allowance and issue. The subject matter of the amendments is supported generally throughout Applicant's originally-filed specification. No new matter has been added. Applicant reserves the right to pursue the originally-filed and/or previously-pending claims in one or more continuation applications.

II. Summary of the Non-Final Office Action

In the Non-Final Office Action mailed on January 7, 2019, the Examiner (i) rejected claims 44-46 under 35 U.S.C. § 112, second paragraph, as allegedly indefinite; (ii) rejected claims 21-43 under 35 U.S.C. § 103 based on U.S. Pat. 8,131,389 (Hardwick) and U.S. Pub. 2007/0142944 (Goldberg); and (iii) rejected claims 44-46 under 35 U.S.C. § 103 based on Hardwick, Goldberg, and U.S. Pub. 2001/0022823 (Renaud).

III. Response to the § 112 Rejections

Applicant has amended claims 44-46 thereby rendering the § 112 rejections moot. Applicant requests that the Office withdraw the § 112 rejections in view of the amendments.

IV. Response to the § 103 Rejections

The pending claims are patentable over Hardwick, Goldberg, and Renaud for at least the reason that Hardwick, Goldberg, and Renaud, individually or in combination, fail to teach or suggest all the elements recited in the claims.

For example, with reference to independent claim 21, the combination of Hardwick, Goldberg, and Renaud fails to teach or suggest at least “the second zone player transmitting first audio information and timing information to the first zone player and the third zone player over the network, wherein the network comprises at least one of a local area network and a wide area network, and wherein the timing information comprises a plurality of future playback times for a corresponding plurality of portions of the first audio information at which the first zone player and the third zone player are to play the corresponding plurality of portions of the first audio information” and “the first zone player and the third zone player receiving the first audio information and the timing information from the second zone player and using the timing information to play the first audio information in synchrony with each other, wherein using the timing information to play the first audio information in synchrony with each other comprises the first zone player using the plurality of future playback times to play the corresponding plurality of portions of the first audio information in synchrony with the third zone player based on a timing difference between a clock of the second zone player and a clock of the first zone player,” in combination with the other elements recited in the claims. The combination of Hardwick, Goldberg, and Renaud also fails to teach or suggest “while the first zone player and the third zone player are using the timing information to play the first audio information in synchrony with each other, the second zone player simultaneously (i) playing second audio information while (ii) transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information,” in combination with the other elements recited in the claims.

Additionally, because independent claims 29 and 37 recite elements similar to those recited in independent claim 21, independent claims 29 and 37 are likewise patentable over the

combination of Hardwick, Goldberg, and Renaud for reasons similar to those articulated herein for claim 21. Further, and without conceding the merits of the other assertions in the Office Action, the pending dependent claims are patentable over the combination of Hardwick, Goldberg, and Renaud for at least the reason that they depend from patentable independent claims.

V. Conclusion

Applicant submits that the pending claims are patentable, and Applicant requests a Notice of Allowance. If further discussion would advance the application to allowance and issue, the Examiner is invited to telephone the undersigned at 312-913-0001.

Respectfully submitted,
McDonnell Boehnen Hulbert & Berghoff LLP

Date: April 8, 2019

By: /Jeffrey P. Armstrong/
Jeffrey P. Armstrong
Reg. No. 54,967

Electronic Acknowledgement Receipt	
EFS ID:	35656725
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Jeffrey Armstrong
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	08-APR-2019
Filing Date:	17-APR-2013
Time Stamp:	14:36:40
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		13-0402_Response.pdf	121563	yes	14
			ad27146315db7135bc502ab6e809da70d0522353		

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	11
	Applicant Arguments/Remarks Made in an Amendment	12	14
Warnings:			
Information:			
Total Files Size (in bytes):		121563	
<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>			



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806
107361	7590	01/07/2019	EXAMINER	
McDonnell Boehnen Hulbert & Berghoff LLP			SURVILLO, OLEG	
Sonos, Inc.				
300 South Wacker Drive			ART UNIT	
Chicago, IL 60606			PAPER NUMBER	
			2442	
			MAIL DATE	
			DELIVERY MODE	
			01/07/2019	
			PAPER	

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

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

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submissions filed on October 25, 2018 and December 11, 2018 have been entered.

Response to Amendment

1. Claims 21-46 are pending in the application. Claims 21, 23, 24, 27-29, 37, and 39-43 are currently amended. Claims 1-20 have been canceled. Claims 44-46 are new.

Response to Arguments

2. With regard to Applicant's remarks dated October 25, 2018:

Regarding the rejection of claims 21-43 under 35 U.S.C. 103(a), Applicant's amendment and arguments have been fully considered.

Applicants argue at pages 11-13 of the Remarks as filed that Hardwick fails to teach the concept of simultaneously playing second audio information while transmitting first audio information. However, Applicants failed to articulate on their argument,

therefore, rendering it unpersuasive. Examiner maintains that Hardwick teaches the concept of simultaneously playing one audio stream while transmitting a different audio stream. Applicants further argue regarding teachings of Goldberg that *"Goldberg does not contemplate any scenario where a broadcast unit simultaneously (i) plays one audio stream while (ii) transmitting a different audio stream and the timing information for that different audio stream to receive units"*. However, Applicants admit that Goldberg discloses functionality where "the playback device plays and transmits the same audio stream to other playback devices". Therefore, the main source of argument appears that the played and transmitted audio in Goldberg is the same while claims state that transmitted audio is different from played audio. However, Applicants failed to explain how played audio being different from transmitted audio is patentably distinct from disclosure of Goldberg and how this amounts to a technological improvement versus a mere design choice that would have been obvious to one of ordinary skill in the art. Applicants further failed to consider teachings of Hardwick in combination with Goldberg, instead attacking references individually. Examiner maintains that playing second audio information via the second zone player is a separate and independent from functions performed by other zone players. There is nothing in the claim or the specification that would suggest linkage between playback of the second audio information and playback of the first audio information. Therefore, the specific timing argued by Applicants, i.e., "while" is nothing but coincidental and merely demonstrates an ability of the second zone player to perform "multitasking", that is, performing two unrelated functions at the same time. Teachings of Hardwick and Goldberg demonstrate an ability of devices to perform more than one function at the same time. Teachings of

Hardwick and Goldberg also disclose each and every claimed function. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to perform one disclosed function "while" performing another unrelated function such as fulfill ability of the device to "multitask".

Regarding Applicant's argument that "*there is no motivation to modify Hardwick with Goldberg*", the Federal Circuit has "[held] that while an analysis of obviousness always depends on evidence that supports the required *Graham* factual findings, it also may include recourse to logic, judgment, and common sense available to the person of ordinary skill that do not necessarily require explication in any reference or expert opinion." *Perfect Web Techs., Inc. v. InfoUSA, Inc.*, 587 F.3d 1324, 1329 (Fed. Cir. 2009); *see also Nat'l Steel Car, Ltd. v. Canadian Pacific Ry., Ltd.*, 357 F.3d 1319, 1337 (Fed. Cir. 2004) ("It has long been the law that the motivation to combine need not be found in prior art references, but equally can be found 'in the knowledge generally available to one of ordinary skill in the art.'" (Quoting *In re Jones*, 958 F.2d 347, 351 (Fed. Cir. 1992))). The Court further instructs that [w]hen there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. *KSR Intl Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007). Therefore, since a concept of synchronously playing an audio information by multiple devices has been well known in the art at the time of the invention, it would have been obvious to one of ordinary skill in the art to have two of the multiple DASs of Hardwick grouped together in one zone and

synchronously play the first audio information based on the timing information while another DAS is playing the second audio information in another zone. It is further noted that the claims are rejected as obvious over Hardwick in view of Goldberg, not the other way around as Applicants attempt to argue.

Applicants further argue that *“performing the multiple functions simultaneously enables the system to operate in a novel and non-obvious configuration”*. Examiner disagrees. Applicants failed to show any aspects of the network configurations that would not be possible if playing second audio information via the second zone player was to be performed **before or after** playing first audio information via the first and third zone players. It appears that the claimed invention would function equally well when playing second audio information does not overlap (is not while) playing first audio information via the first and third zone players. Therefore, Examiner maintains that performing these multiple functions simultaneously as recited in the claim is a mere matter of design choice. Therefore, Applicant’s argument cannot be held as persuasive. Thus, the rejection is maintained.

As to any arguments not specifically addressed they are the same as those discussed above.

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 44-46 are rejected under 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter

which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

As to claims 44-46, it is unclear how determining a time difference between a clock at the first zone player and a clock at the second zone player (emphasis added) allows for synchronous playback with the third zone player (emphasis added). Appropriate correction or explanation is required.

Claim Rejections - 35 USC § 103

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

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

4. Claims 21-43 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Hardwick et al. (US Patent 8,131,389 B1) in view of Goldberg et al. (US 2007/0142944 A1).

As to claim 21, Hardwick teaches in a network comprising a first zone player [DAS#2 410 with connected amplifier 425 and speakers 430], a second zone player [DAS#1 405 with connected amplified speakers 420 and CD changer 415], and a third zone player [Hardwick envisions having multiple DASs besides the two depicted in Fig. 4] (col. 12 line 63 - col. 13 line 6), a method comprising:

the second zone player transmitting first audio information to the first zone player over the network, wherein the network comprises at least one of a local area network

and a wide area network [DAS 405 and DAS 410 are connected via an Ethernet network] (col. 14 lines 39-60, Fig. 4);

the first zone player receiving the first audio information from the second zone player and playing the first audio information [DAS 410 performs read and playback of the music stored in the main server DAS 405] (col. 14 lines 50-60); and

while the first zone player playing the first audio information, the second zone player simultaneously (i) playing second audio information while (ii) transmitting the first audio information to the first zone player, wherein the second audio information is different from the first audio information [multi-zone feature that allows different music selections to be simultaneously played in different rooms] (col. 11 lines 44-63, col. 12 line 63 to col. 13 line 6).

While Hardwick anticipates having more than two DASs [diskless DAS may read and play one selection of music from the server while other DASs on the LAN are simultaneously playing other selections] (col. 12 line 63 - col. 13 line 6), Hardwick fails to expressly teach that the first audio information is transmitted to the third zone player [additional DAS]. Hardwick also fails to teach transmitting timing information and using the timing information to play the first audio information in synchrony via the first and third zone players.

However, a concept of synchronously playing an audio information by multiple devices has been well known in the art at the time of the invention. In particular, Goldberg, in the same field of music playback, teaches a first zone player and a third zone player forming a first zone [sub-cluster 701] (Figs. 9A, 33) and a second zone player [broadcast unit 710] (Figs. 9A, 33). In particular, Goldberg teaches:

second zone player transmitting first audio information (par. [0254]) and timing information [synchronization signal] to the first zone player and the third zone player over a network (step 1902, Fig. 34A, par. [0200]-[0202]); and

first zone player and third zone player using the timing information to play the first audio information in synchrony (par. [0200]-[0202]).

It would have been obvious to one of ordinary skill the art at the time of the invention to modify the system of Hardwick to have two of the multiple DASs grouped together in one zone and synchronously play the first audio information based on the timing information while another DAS is playing the second audio information in another zone in order to allow the user of Hardwick to keep listening to the same music when entering a master bathroom adjacent to Room #2 without interruption while still allowing different music selection to be played in Room #1 (col. 11 lines 44-63 in Hardwick).

As to claim 22, Hardwick teaches that the second audio information comprises an audio track (col. 11 lines 44-63).

As to claim 23, Hardwick in view of Goldberg teaches that the timing information comprises first timing information (as discussed per claim 21), and wherein the second zone player playing the second audio information comprises the second zone player using second timing information to play the second audio information, wherein the second timing information is different from the first timing information [it is noted that "second timing information" is undefined and thus is interpreted broadly as any

information that is different from the first timing information, such as internal time counter in Hardwick] (col. 27 lines 25-46 in Hardwick).

As to claim 24, Hardwick in view of Goldberg teaches that the timing information comprises first timing information (as discussed per claim 21), and wherein the second zone player playing the second audio information comprises the second zone player using the first timing information to play the second audio information, wherein the first timing information comprises clock timing information of the second zone player [it is noted that “clock timing information” is undefined and thus is interpreted broadly as any information that is somehow related to clock timing, such as internal time counter in Hardwick] (col. 27 lines 25-46 in Hardwick).

As to claim 25, Hardwick in view of Goldberg teaches that the timing information comprises playback timing information (step 1902, Fig. 34A, par. [0200]-[0202] in Goldberg).

As to claim 26, Hardwick in view of Goldberg teaches that the timing information comprising clock timing information [it is noted that “clock timing information” is undefined and thus is interpreted broadly as any information that is somehow related to clock timing, such as internal time counter in Hardwick] (col. 27 lines 25-46 in Hardwick).

As to claim 27, Hardwick in view of Goldberg teaches the second zone player receiving audio information from an audio information source that is connected to the second zone player (col. 14 lines 39-49 in Hardwick); and

the second zone player converting the audio information received from the audio information source in the first audio information prior to transmitting the first audio information and the timing information to the first zone player and the third zone player (col. 10 line 64 to col. 11 line 16 in Hardwick).

As to claim 28, Hardwick in view of Goldberg teaches that the audio information source is directly connected to the second zone player, wherein the audio information received from the audio information source comprises analog audio information (col. 14 lines 39-49 in Hardwick), and wherein the second zone player converting the audio information received from the audio information source into the first audio information comprises the second zone player converting the analog audio information into digital audio information (col. 10 line 64 to col. 11 line 16 in Hardwick).

As to claim 29, Hardwick in view of Goldberg teaches a system comprising a first zone player, a second zone player, and a third zone player, each comprising at least one processor and tangible non-transitory computer-readable memory comprising instructions (Figs. 3 and 4 in Hardwick) that, when executed, cause the corresponding first, second, and third zone players to perform operations as discussed per claim 21 above.

As to claims 30-36, Hardwick in view of Goldberg teaches all the elements as discussed per corresponding claims 22-28 above.

As to claim 37, Hardwick in view of Goldberg teaches a tangible, non-transitory computer-readable medium having instructions stored thereon [inventions of Hardwick and Goldberg are computer implemented] that when executed cause a first zone player [DAS#1 405 in Hardwick] to perform the method steps as discussed per claim 21 above.

As to claims 38-40, Hardwick in view of Goldberg teaches all the elements as discussed per claims 22-24 above.

As to claim 41, Hardwick in view of Goldberg teaches the second zone player receiving second timing information [synchronization signal] from a fourth zone player (step 1902, Fig. 34A, par. [0200]-[0202] in Goldberg) and the second zone player using the second timing information to play the second audio information in synchrony with the fourth zone player (par. [0200]-[0202] in Goldberg).

As to claim 42, Hardwick in view of Goldberg teaches the second zone player receiving the second audio information (par. [0254] in Goldberg) and second timing information [synchronization signal] from a fourth zone player (step 1902, Fig. 34A, par. [0200]-[0202] in Goldberg) and the second zone player using the second timing information to play the second audio information in synchrony with the fourth zone player (par. [0200]-[0202] in Goldberg).

As to claim 43, Hardwick in view of Goldberg teaches the second zone player transmitting the second audio information (par. [0254] in Goldberg) and second timing information [synchronization signal] to a fourth zone player (step 1902, Fig. 34A, par. [0200]-[0202] in Goldberg) and the second zone player using the second timing information to play the second audio information in synchrony with the fourth zone player (par. [0200]-[0202] in Goldberg).

5. Claims 44-46 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Hardwick et al. in view of Goldberg et al. and in further view of Renaud et al. (US 2001/0022823 A1).

As to claim 44, Hardwick in view of Goldberg teaches that the timing information comprises playback timing information [synchronization signals in Goldberg].

Hardwick in view of Goldberg fails to expressly teach that the timing information comprises clock timing information and wherein the first zone player and the third zone player using the timing information to play the first audio information in synchrony with each other comprises the first zone player using the clock timing information to determine a time difference comprising a difference between a clock at the first zone player and a clock at the second zone player, and using the playback timing information and the time difference to play the first audio information in synchrony with the third zone player.

Renaud teaches that the first audio playback device is configured to receive clock timing information and determine a time differential between the clock at the receiver device and the clock timing information (par. [0008], [0029]).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method and system of Hardwick in view of Goldberg by determining a time differential between the clock at the first zone player and the clock timing information and playing back the first audio information based on the time differential in order to synchronize internal clocks of the playback devices (par. [0008], [0029] in Renaud).

As to claims 45 and 46, Hardwick in view of Goldberg and Renaud teaches all the elements as discussed per corresponding device claim 44 above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to OLEG SURVILLO whose telephone number is (571)272-9691. The examiner can normally be reached on 9:00am - 5:00pm.

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, Glenton Burgess can be reached on 571-272-3949. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/OLEG SURVILLO/
Primary Examiner, Art Unit 2442

<i>Search Notes</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CPC - Searched*		
Symbol	Date	Examiner
G06F 3/167, 17/00, 17/3074, 3/048, 3/0482, 3/0484, 3/126, 3/16	01/05/2019	OS
H04L 65/60, 12/2812	01/05/2019	OS

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
709	219, 220, 231	01/05/2019	OS

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Updated Inventor search	01/05/2019	OS
Updated Assignee search	01/05/2019	OS
Updated EAST search in USPAT, US-PGPUB, EPO, JPO, and FPRS databases	01/05/2019	OS

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/OLEG SURVILLO/ Primary Examiner.Art Unit 2442	
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<i>Index of Claims</i> 	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination Millington, Nicholas A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	11/08/2017	07/09/2018	01/05/2019						
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	39	✓	✓	✓						
	40	✓	✓	✓						
	41		✓	✓						
	42		✓	✓						

<p><i>Index of Claims</i></p> 	<p>Application/Control No.</p> <p>13/864,249</p>	<p>Applicant(s)/Patent Under Reexamination</p> <p>Millington, Nicholas A. J.</p>
	<p>Examiner</p> <p>OLEG SURVILLO</p>	<p>Art Unit</p> <p>2442</p>

CLAIM		DATE								
Final	Original	11/08/2017	07/09/2018	01/05/2019						
	43		✓	✓						
	44			✓						
	45			✓						
	46			✓						

dated 12/27/2018

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	6816104		2004-11-09	BENG, Corp [Tw] Lin	

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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	20030210347		2003-11-13	KONDO; Tetsujiro	
	2	20040189363		2004-09-30	TAKANO; Midori	
	3	20050102699		2005-05-12	KIM; Jae-Kwon et al.	
	4	20060215741		2006-09-28	CHIN; Yi-Lon et al.	
	5	20080212729		2008-09-04	SHAANAN; Tamir	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ^{2j}	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	2002141915	JP	A	2002-05-17	YAMAHA CORP.		

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	1	Advisory Action mailed on 11 June 2018, issued in connection with U.S. Reexamination Control No. 90/013959 for U.S. Patent No. 9,213,357, filed on 16 June 2017, 3 pages.	
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	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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41	Solid State Logic G Series Master Studio System: SSL G Series Console, 1988, 113 pages.
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☐ See attached certification statement. The fee set forth in 37 CFR 1.17 (p) has been submitted herewith. ☒ A certification statement is not 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	/Kerry T. Creeron/	Date (YYYY-MM-DD)	2018-12-27
Name/Print	Kerry T. Creeron	Registration Number	70004
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	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	3	20050102699		2005-05-12	KIM; Jae-Kwon et al.		
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CERTIFICATION STATEMENT

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Signature	/Kerry T. Creeron/	Date (YYYY-MM-DD)	2018-12-27
Name/Print	Kerry T. Creeron	Registration Number	70004

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Electronic Acknowledgement Receipt	
EFS ID:	34705408
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	John Gerrard Tolomei
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	27-DEC-2018
Filing Date:	17-APR-2013
Time Stamp:	15:46:41
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.)
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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.



Espacenet

Bibliographic data: JP2002141915 (A) — 2002-05-17

COMMUNICATION CONTROL SYSTEM AND METHOD

Inventor(s): FUJIMORI JUNICHI ± (FUJIMORI JUNICHI)

Applicant(s): YAMAHA CORP ± (YAMAHA CORP)

Classification: - international: G06F13/00; G10H1/00; H01S5/227; H01S5/34; H04J3/06; H04L12/28; H04L29/02; H04L7/00; (IPC1-7): G06F13/00; H04L12/28; H04L29/02
 - cooperative: B82Y20/00; G10H1/0058; H01S5/227; H04J3/0641; H04L7/0079; G10H2240/175; H04H60/04; H04J3/0661; H04L7/0029

Application number: JP20000333656 20001031

Priority number(s): JP20000333656 20001031

Also published as: CA2360715 (A1), CA2360715 (C), EP1202490 (A2), EP1202490 (A3), EP1746752 (A2), more

Abstract of JP2002141915 (A)

PROBLEM TO BE SOLVED: To provide a communication control method that can easily discriminate a real connection state between nodes in the case of sending/receiving a music signal or the like via a network in compliance with the IEEE 1394 and the USB specifications and facilitates the connection setting and revision. **SOLUTION:** The communication control method selects one node or more on a network and sets them as one group. Each node stores group identification information of its own group. The group identification information is added to a header of transmitted packets, the group identification information of the header is collated with that at a received node and the node forming a group to receive data in common can easily be specified. A node can be selected to act like a node with a specific function such as a clock master node, and in this case, a node having acted like the node with the specific function is eliminated from the group and only one node with the specific function is controlled to be in existence in one group

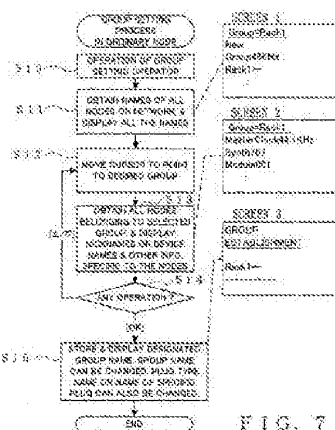


FIG. 7

(51) Int.Cl. ⁷	識別記号	F I	テーマコード*(参考)
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	3 5 7	H 0 4 L 11/00	3 1 0 A 5 K 0 3 4
H 0 4 L 29/02		13/00	3 0 1 Z

審査請求 未請求 請求項の数16 O L (全 17 頁)

(21) 出願番号 特願2000-333656(P2000-333656)

(22) 出願日 平成12年10月31日(2000.10.31)

(71) 出願人 000004075

ヤマハ株式会社

静岡県浜松市中沢町10番1号

(72) 発明者 藤森 潤一

静岡県浜松市中沢町10番1号 ヤマハ株式会社内

(74) 代理人 100077539

弁理士 飯塚 義仁

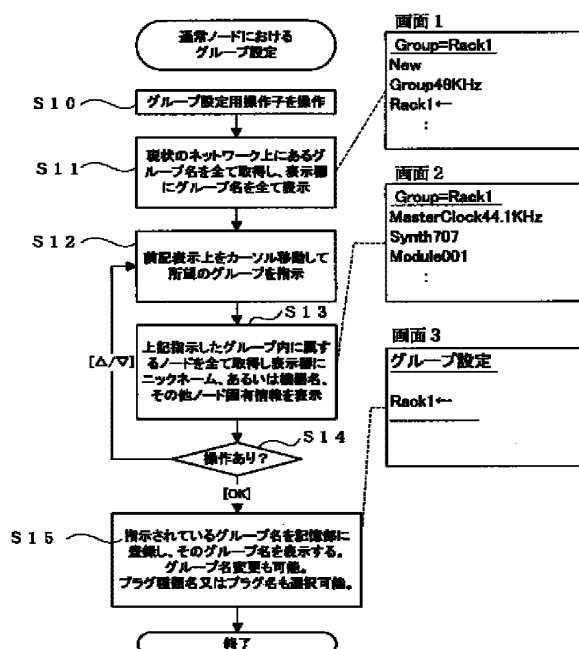
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(54) 【発明の名称】 通信制御装置及び方法

(57) 【要約】

【課題】 IEEE1394やUSB仕様のネットワークを介して楽音信号等を授受する場合に、ノード間の実際の接続状態を容易に判別できるようにし、また、その接続設定と変更を容易にする。

【解決手段】 ネットワーク上の1又は複数のノードを選択してそれらを1つのグループとして設定する。各ノードにおいて自己のグループのグループ識別情報を記憶しておく。グループ識別情報を送信パケットのヘッダに付加し、受信ノード側のグループ識別情報と照合することで、共通にデータ受信すべきグループを形成しているノードを容易に特定できる。或るノードにおいて自己がクロックマスタノードのような特定機能のノードとなるべきことを選択することができ、その場合、それまで特定機能のノードの役目を果たしていたノードをグループから削除し、該特定機能のノードが1つのグループにつき1つだけ存在するように制御する。



【特許請求の範囲】

【請求項1】 ネットワークに接続された複数のノードの中から1又は複数のノードを選択してそれらを1つのグループとして分類するグループ設定手段と、

前記1つのグループに設定された各ノードに対応して当該グループを識別するグループ識別情報を登録する登録手段とを具え、前記グループ識別情報を用いて少なくとも共通にデータ受信すべきグループを形成しているノードを特定できることを特徴とする通信制御装置。

【請求項2】 前記グループ設定手段は、複数のノードを選択してそれらのノードからなる新規のグループを設定するものである請求項1に記載の通信制御装置。

【請求項3】 前記グループ設定手段は、前記ネットワークに存在する1又は複数のグループの中から選択した1つのグループについて、そのノード構成を変更する選択操作を行なうものである請求項1に記載の通信制御装置。

【請求項4】 前記通信制御装置は前記ネットワークに接続される1つのノードに含まれるものであり、前記グループ設定手段は、前記ネットワークに存在する1又は複数のグループの中から自己のノードが所属すべきグループを選択するものであり、前記登録手段は、自己のノードにおいて前記グループ識別情報を記憶するものである請求項1に記載の通信制御装置。

【請求項5】 新規に設定したグループのグループ名を命名する、もしくは既存のグループ名を変更するために新たなグループ名を命名するための入力を行なう入力手段を具え、命名したグループ名が前記グループ識別情報として登録される請求項1乃至4のいずれかに記載の通信制御装置。

【請求項6】 前記グループ識別情報は前記ネットワークを介して送信されるデータに付加されることで、同一グループの複数ノードに対して該データの送信を行なえるようにした請求項1乃至5のいずれかに記載の通信制御装置。

【請求項7】 ネットワークに接続されるノードに含まれる通信制御装置であって、ネットワークに接続された複数のノードが1又は複数のグループのいずれかに分類されており、自己のノードの所属するグループのグループ識別情報を記憶している記憶手段と、前記ネットワークにデータを送信するとき、該データにグループ識別情報を付加して送信する送信手段とを具える通信制御装置。

【請求項8】 ネットワークに接続されるノードに含まれる通信制御装置であって、ネットワークに接続された複数のノードが1又は複数のグループのいずれかに分類されており、自己のノードの所属するグループのグループ識別情報を記憶している記

憶手段と、

前記ネットワークを介してデータを受信するための受信手段であって、前記ネットワークを介して送信されるデータには該データを受信すべきノードの属するグループを示すグループ識別情報が付加されており、前記ネットワークを介して送信されてきたデータに付加されているグループ識別情報が前記記憶手段に記憶している自己のグループ識別情報に一致しているならば、該データを受信するものとする通信制御装置。

【請求項9】 1つのノードが複数種類のデータ入力又は出力用のプラグを有し、前記グループ設定手段は、各ノードの各プラグ種類毎にグループの設定をすることが可能であり、前記登録手段は、当該ノードの各プラグ種類毎に設定されたグループの前記グループ識別情報を登録するものである請求項1乃至7のいずれかに記載の通信制御装置。

【請求項10】 1つのノードが複数のデータ入力又は出力用のプラグを有し、前記グループ設定手段は、各ノードの各プラグ毎にグループの設定をすることが可能であり、前記登録手段は、当該ノードの各プラグ毎に設定されたグループの前記グループ識別情報を登録するものである請求項1乃至9のいずれかに記載の通信制御装置。

【請求項11】 ネットワークに接続された複数のノードを1又は複数のグループのいずれかに分類する手段と、

或るノードが特定機能のノードとなるべきことを選択する選択手段と、

前記特定機能のノードが1つのグループにつき1つだけ存在するように制御する制御手段とを具備する通信制御装置。

【請求項12】 ネットワークに接続された複数のノードが1又は複数のグループのいずれかに分類される環境において、該ネットワークに接続されるノードに含まれる通信制御装置であって、

自己のノードが特定機能のノードとなるべきことを選択する選択手段と、

前記選択手段によって自己のノードが特定機能のノードとなるべきことが選択されたとき、該自己のノードが所属するグループにおいて前記特定機能のノードが1つだけ存在するように、それまで該特定機能を担って他のノードについての該特定機能をキャンセルする制御手段とを具備する通信制御装置。

【請求項13】 ネットワークに接続されるノードに含まれる通信制御装置であって、

自己のノードが特定機能のノードとなるべきことを選択する選択手段と、

前記選択手段によって自己のノードが特定機能のノードとなるべきことが選択されたとき、該特定機能を表す所定の名称を獲得する手段と、

前記所定の名称を用いてネットワークの他のノードと通信する手段とを具備する通信制御装置。

【請求項14】 ネットワークに接続されるノードに含まれる通信制御装置であって、前記ネットワークを介して特定機能のノードと通信するとき、該特定機能を表す所定の名称を所持しているノードを該特定機能のノードと認識して通信する手段を具備する通信制御装置。

【請求項15】 前記特定機能は、ワードクロックマスタの機能である請求項11乃至14のいずれかに記載の通信制御装置。

【請求項16】 ネットワークに接続された複数のノードの中から1又は複数のノードを選択してそれらを1つのグループとして設定するステップと、前記1つのグループに設定された各ノードに対応して当該グループを識別するグループ識別情報を登録するステップと、グループ識別情報に基づき共通にデータ受信すべきグループを形成しているノードを特定するステップとを具備し、グループ単位で通信が行なえることを特徴とする通信制御方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 この発明は、オーディオデータやMIDIデータのような音楽演奏データなど音楽関連信号を含むデータを、ネットワークを介して複数のノード間で授受する技術に関し、詳しくはそのために使用される通信制御装置及び方法に関する。

【0002】

【従来の技術】 最近のオーディオ・ビデオシステムでは、システムを構成する多くの電子機器（例えばビデオディスプレイ、ビデオテープレコーダ、オーディオコンポーネント、カラオケ機器など）を相互に関連させて接続することでシステムを構築するようになっている。また、電子楽器においては、MIDI (Musical Instrument Digital Interface) というような統一規格を用いて複数の電子楽器あるいはシーケンサ、パソコン等を相互に接続し、アンサンブル演奏システム等を構築することが行なわれている。ネットワークを介して接続された複数のノード間で音楽関連信号を授受する技術としては、特開平9-298558号公報、特開平10-190736号公報、特開2000-78170号公報、特許第2830766号公報などに示されたものがある。音楽関連信号を扱うノードの場合、機器間の同期をとるために所定のマスタクロックノードから同期信号を受信し、これに基づいて音楽信号の再生に際して各ノード間で同期をとるようにしている。概略的には、複数のノードにおいて同期をとりながら、或るノードではオーディオ波形信号の読み出しとその送信を行ない、別のノードではその受信とそれに基づく再生等の処理を各々行えるように

するために、ネットワーク上にワードクロックマスタなるノードを設け、ここから所定周期毎に基準タイムスタンプを各ノード（スレーブ）に送信する。送信ノードではこの基準タイムスタンプに基づきオーディオ波形信号の読み出しを行ない、送信時のタイムスタンプを生成し、該タイムスタンプをオーディオデータに添付してネットワークに送信する。受信ノードにおいても、前述の基準タイムスタンプにより同期をとり、送信ノードから送られてくるタイムスタンプとデータをもとにオーディオデータをリアルタイム再生する。このようにして複数の各機器（ノード）間においてリアルタイムの同期をとることができる。

【0003】 一方、楽音・オーディオ・ビデオ関連の複数の電子機器を相互接続するネットワークの組み方として、最近では、IEEE1394規格やUSB (Universal Serial Bus) 規格などに従うデジタルシリアル通信方式が採用されるようになってきている。IEEE1394規格やUSB規格などに従う高速ネットワークにおいては、リアルタイム処理を要する多数のノードを接続し、大規模で複雑なネットワークを構成することが可能である。そのようなIEEE1394やUSBに従う通信方式においては、各ノード間をそれぞれ1本の信号線で接続し、連鎖的なディジーチェーン又はツリー状のネットワークを形成する。ネットワーク上を伝送されるデータにはヘッダが付加されており、このヘッダに該データを受け取るべきノードを指示する情報が含まれている。ネットワークに接続されたノードにおいて、ネットワーク上に伝送されたデータのヘッダが自己のノードを指定しているならば該データを取り込んで処理をする。また、他のノードに対してデータを転送する場合は、転送するデータのヘッダに受け取るべきノードを指示する情報を付加してネットワーク上に伝送する。

【0004】

【発明が解決しようとする課題】 しかし、これらのIEEE1394やUSBの場合は、1つの信号線上を楽音関連信号、制御信号、及びその他のネットワーク機器に関連する各種信号が流通しており、各機器（ノード）同士も1本の線で結線されているにすぎず、実際にはどの機器（ノード）とどの機器（ノード）が接続関係（データを実際に授受する関係）にあるのか、あるいはどのような種類のデータがやり取りされているのか、等が一見ただけでは殆ど把握できない状態にある。例えば、1つのノードにおける設定状態を見ただけでは、他のノードがそのノードを指定するように設定されている状態までは判明せず、結局すべてのノードの個別の設定状態をチェックするしかない。しかし、1本の信号線を介して連鎖的に接続されるディジーチェーンは無限に拡がり得るものであるため、ネットワークにつながるすべてのノードの設定状態をチェックすることは得策ではない。

【0005】 一方、ネットワークを介してノード間で楽

音関連信号を授受する場合の同期の基準となる前記ワードクロックマスタノードについて考慮してみると、例えば複数のノードでリアルタイムのアンサンブル演奏を行なうような場合、それらのノードで使用するワードクロックマスタノードを或るクロック周波数のマスタノードから別のクロック周波数のマスタノードに切り換えるには、各ノード（スレーブノード）毎にそのワードクロックマスタノードの設定を切り換えなければならない。そのような設定変更操作は大変面倒である。

【0006】この発明は上述の点に鑑みてなされたもので、ネットワークを介して接続された複数のノード同士の実際の接続状態を容易に判別できるようにした通信制御装置及び方法を提供しようとするものである。また、ネットワークを介して接続された複数のノード同士の実際の接続状態の設定を行なったり、その設定内容を変更することの容易な通信制御装置及び方法を提供しようとするものである。更には、ワードクロックマスタノードのような特定機能のノードの設定変更が容易な通信制御装置及び方法を提供しようとするものである。

【0007】

【課題を解決するための手段】この発明に係る通信制御装置は、ネットワークに接続された複数のノードの中から1又は複数のノードを選択してそれらを1つのグループとして分類するグループ設定手段と、前記1つのグループに設定された各ノードに対応して当該グループを識別するグループ識別情報を登録する登録手段とを具え、前記グループ識別情報を用いて少なくとも共通にデータ受信すべきグループを形成しているノードを特定できることを特徴とする。これにより、各ノードのグループ識別情報を見るだけで、実際にどのノードとどのノードが接続関係（データを実際に授受する関係）にあるのが判明し、複数のノード同士の実際の接続状態を容易に判別することができる。また、或る1つのノードの所属するグループを別のグループに変更するだけで、該別のグループに存在している全てのノードとの接続関係を確立することが可能であり、ネットワークを介して接続された複数のノード同士の実際の接続状態の設定を行なったり、その設定内容を変更することが容易に行なえる。

【0008】一例として、前記グループ設定手段は、複数のノードを選択してそれらのノードからなる新規のグループを設定するものであってよい。別の例として、前記グループ設定手段は、前記ネットワークに存在する1又は複数のグループの中から選択した1つのグループについて、そのノード構成を変更する選択操作を行なうものであってよい。別の例として、通信制御装置はネットワークに接続される1つのノードに含まれるものであり、前記グループ設定手段は、前記ネットワークに存在する1又は複数のグループの中から自己のノードが所属すべきグループを選択するものであり、前記登録手段は、自己のノードにおいて前記グループ識別情報を記憶

するものであってよい。

【0009】ネットワークにおける1つのノードは、例えば1つの電子機器に対応する。1つのノードつまり1つの電子機器は、1種類のデータ入力又は出力用のプラグに限らず、例えば「オーディオ入力」、「オーディオ出力」、「MIDI入力」、「MIDI出力」などのように複数種類のデータ入力又は出力用のプラグを有する。その場合、この発明に従うグループ設定は、各プラグ種類毎にそれぞれ行なうようにしてもよい。あるいは、この発明に従うグループ設定は、個々の各プラグ毎にそれぞれ行なうようにしてもよい。すなわち、同じノードであっても、プラグ種類毎に、または各プラグ毎に、それぞれ複数のグループのいずれかに適切に分類されるようにグループ設定を行なうようにすることができる。

【0010】前記グループ識別情報は前記ネットワークを介して伝送されるデータに付加されるようになっている。これにより、グループ識別情報を利用して、同一グループのノード間で該データの授受を行なうことができる。別の観点に従えば、この発明に係る通信制御装置は、ネットワークに接続されるノードに含まれる通信制御装置であって、ネットワークに接続された複数のノードが1又は複数のグループのいずれかに分類されており、自己のノードの所属するグループのグループ識別情報を記憶している記憶手段と、前記ネットワークにデータを送信するとき、該データに前記グループ識別情報を付加して送信する送信手段とを具えるものである。また、別の観点に従えば、この発明に係る通信制御装置は、ネットワークに接続されるノードに含まれる通信制御装置であって、ネットワークに接続された複数のノードが1又は複数のグループのいずれかに分類されており、自己のノードの所属するグループのグループ識別情報を記憶している記憶手段と、前記ネットワークを介してデータを受信するための受信手段であって、前記ネットワークを介して送信されるデータには該データを受信すべきノードの属するグループを示すグループ識別情報が付加されており、前記ネットワークを介して送信されてきたデータに付加されているグループ識別情報が前記記憶手段に記憶している自己のグループ識別情報に一致しているならば、該データを受信するものと具えるものである。

【0011】更に別の観点に従うこの発明に係る通信制御装置は、ネットワークに接続された複数のノードを1又は複数のグループのいずれかに分類する手段と、或るノードが特定機能のノードとなるべきことを選択する選択手段と、前記特定機能のノードが1つのグループにつき1つだけ存在するように制御する制御手段とを具備する。このように、特定機能のノードが1つのグループにつき1つだけ存在するように制御することにより、特定機能のノードを或るノードから別のノードに変更す

るような設定変更を容易に行なうことができる。例えば、特定機能のノードを或るノードから別のノードに変更するときにグループ分類構成の組替えを行なうことなく、特定機能のノードの変更のみで対処できる。従って、ワードクロックマスタノードのような特定機能のノードの設定変更が容易となる。

【0012】また、別の観点に従えば、この発明に係る通信制御装置は、ネットワークに接続された複数のノードが1又は複数のグループのいずれかに分類される環境において、該ネットワークに接続されるノードに含まれる通信制御装置であって、自己のノードが特定機能のノードとなるべきことを選択する選択手段と、前記選択手段によって自己のノードが特定機能のノードとなるべきことが選択されたとき、該自己のノードが所属するグループにおいて前記特定機能のノードが1つだけ存在するように、それまで該特定機能を担って他のノードについての該特定機能をキャンセルする制御手段とを具備する。この場合も上記と同様に、特定機能のノードを或るノードから別のノードに変更するような設定変更を容易に行なうことができ、また、ワードクロックマスタノードのような特定機能のノードの設定変更が容易となる。

【0013】更に別の観点に従えば、この発明に係る通信制御装置は、ネットワークに接続されるノードに含まれる通信制御装置であって、自己のノードが特定機能のノードとなるべきことを選択する選択手段と、前記選択手段によって自己のノードが特定機能のノードとなるべきことが選択されたとき、該特定機能を表す所定の名称を獲得する手段と、前記所定の名称を用いてネットワークの他のノードと通信する手段とを具備する。この場合、他のノードが、特定機能のノードとデータの授受を行なう場合、該特定機能のノードが具体的にどのノードであるのか区別する必要がなく、前記所定の名称を用いて該特定機能のノードを特定すればよいことになる。従って、該特定機能のノードが変更されたとしても、他のノードはその変更を意識することなく、常に前記所定の名称を用いて該特定機能のノードを特定すれば済むこととなり、ワードクロックマスタノードのような特定機能のノードの設定変更が容易となる。別の観点に従えば、この発明に係る通信制御装置は、ネットワークに接続されるノードに含まれる通信制御装置であって、前記ネットワークを介して特定機能のノードと通信するとき、該特定機能を表す所定の名称を所持しているノードを該特定機能のノードと認識して通信する手段を具備する。この場合も、特定機能のノードと通信しようとする他のノードは、該特定機能のノードが具体的にどのノードであるのか区別する必要がなく、前記所定の名称を用いて該特定機能のノードを特定すればよいことになり、ワードクロックマスタノードのような特定機能のノードの設定変更が容易に対処することができることとなる。

【0014】この発明は、装置の発明として実施するこ

とができるのみならず、方法の発明として実施することも可能である。また、本発明は、コンピュータまたはDSP等のプロセッサのプログラムの形態で実施することができるし、そのようなプログラムを記憶した記録媒体の形態で実施することもできる。

【0015】

【発明の実施の形態】以下、添付図面を参照してこの発明の実施の形態を詳細に説明しよう。まず、それ自体は公知であるが、本発明においても採用される通信ネットワークの構成例について説明する。図1は、複数のノードN1～N9、MN1～MN3を接続した通信ネットワークの構成例を示すブロック図である。このネットワークにおけるデータの伝送は、例えばIEEE1394規格やUSB規格など所定の規格に準拠するデジタルシリアルパケット転送で行なう。例えば、各ノードN1～N9、MN1～MN3は、ビデオディスプレイ、ビデオテープレコーダ、オーディオコンポーネント、カラオケ機器などのAV電子機器、あるいはキーボードやその他の電子楽器、シーケンサ、パソコン等の電子楽器関連の電子機器であり、このネットワークでは、オーディオ波形信号などの楽音信号及びMIDIデータのような楽音演奏データ及び楽音制御信号（これらを楽音関連信号と総称する）が伝送される。勿論、ネットワーク上を伝送される信号は楽音関連信号に限らず、画像データやテキストデータなど任意のデジタルデータを含む。また、楽音関連信号とは全く無関係のノードが同じネットワーク上に存在していてもよい。ノードMN1～MN3はワードクロックマスタノードであり、それぞれ44.1kHzあるいは48kHzなど所定のクロック周波数に従い基準タイムスタンプを発生する機能を有する。ノードN1～N9は上記マスタノードに対するスレーブノードである。なお、今はスレーブノードとして機能しているノードN1～N9であっても、マスタクロック発生機能を持つものは操作者による選択操作に応じてマスタノードに機能転換し得る。また、マスタノードMN1～MN3であっても、マスタクロック発生機能に限らず、楽音発生機能や演奏データ発生機能など他の適宜の機能を併せて持ち得る。

【0016】公知のように、IEEE1394規格やUSB規格では、各ノード（機器）を1本の信号線（シリアルバス）で接続するだけでネットワーク内の全てのノード間で信号の授受を行なうことができる。勿論、ネットワークの構造は図示のようなディジーチェーン型に限らず、配線の途中にハブを介在させてツリー状の構造とすることもできる。また、ネットワーク内の1つのノードを別のネットワークに接続すると、該ネットワーク内の他のノードも連鎖的に該別のネットワークに接続されることになる。

【0017】ネットワーク上で伝送される信号のパケットデータフォーマットの概略は図2のようであり、1パ

ケットはヘッダとデータの実体とから構成される。このヘッダは、従来は、通信に必要な送信側のID（送信ノード識別情報）、タイムスタンプ、データ種類を示す情報、プラグID（プラグ識別情報）、その他の情報から構成されている。本発明の実施にあたっては、更にグループ識別情報がヘッダに含まれるが、この点については後述する。ネットワーク上に接続された各ノードは、バスから入力ポートに与えられたデータが自己のノードで取り扱うべきものであればそれを取り込んで処理する。また、入力ポートから入力したデータは出力ポートからバスに渡されることで他のノードに即座に転送される。各ノードが自機で処理すべきか否かはデータに付与されているヘッダから判断する。例えば、従来は、自己のノードにおいて、どのノードのどのプラグから送信されてきたデータを受け取るべし、との受信条件設定がなされており、この条件設定に合ったデータをヘッダの内容から判別して自機に取り込む。本発明の実施にあたっては、従来と同様の受信条件設定が可能であり、更にグループ識別情報を考慮した受信制御が可能であるが、この点については後述する。

【0018】図3は、1つのノードにおける処理機能を大まかに示す図であり、大別して通信部10R、10Tと信号処理部11R、11Tの機能を有する。受信に際しての通信部10Rの機能は、シリアルバスから入力ポートを介して受信したパケットデータのヘッダを読み、自機で受理すべきデータであればそれを取り込んで、デパケットし、送信側のプラグIDから自機の入力プラグを特定し、デパケットしたデータの実体部分を該特定した入力プラグに対応づけて信号処理部11Rに渡す。信号処理部11Rでは該特定した入力プラグに対応して該データの実体部分を入力し、該入力プラグに対応する所定の処理を行なう。信号処理部11Tでは、他のノードに対して送信するデータを用意する。送信用の通信部10Tでは、用意されたデータにヘッダを付加してパケットデータを作成し、これを出力ポートを介してシリアルバスに送信する。ヘッダには、自己のノードを示す送信ノードIDと、信号処理部11Tで用意されたデータの出力プラグを示すプラグIDが含まれる。また、楽音信号（オーディオ波形信号）や楽音制御信号（MIDIデータ）のように時間情報を付加すべきデータを送信する場合は、時間を示すタイムスタンプがヘッダに付加される。

【0019】図4は、1つのノードにおけるハードウェア構成を例示する図である。必要最小限のハードウェアは、CPU12、RAM13、ROM14などを含むコンピュータ又はマイクロコンピュータと、ネットワークの規格に合った通信インタフェース15である。更に、個々のノードの個別機能に合わせて、音源装置16、外部記憶装置17、ディスプレイ装置18、入力装置（操作パネル）19など、必要な電子機器要素が設けられる

のは勿論である。

【0020】なお、公知のように、プラグとは機器を接続するときの端子に相当するものである。公知のように、各機器毎に様々なタイプのプラグが使用されている。一例を示すと、図5のようである。例えば、プラグ種類には、「オーディオ入力」、「オーディオ出力」、「MIDI入力」、「MIDI出力」、「クロック入力」、「クロック出力」など様々な種類がある。また、1つのプラグ種類において、複数の個別のプラグが用意されている場合がある。例えば、同じ「オーディオ入力」でも「オーディオ入力1」と「オーディオ入力2」のように複数のプラグが存在し得、更に同じ「オーディオ入力1」でも「R」（右チャンネル）と「L」（左チャンネル）のように細分化されたプラグが存在し得る。勿論、1つのプラグ種類に対応して1つのプラグしか存在していない場合もあり得る。

【0021】従来の典型的な機器間の信号配線接続にあつては、各プラグに対応して個別の端子が物理的に設けられており、各端子を個別の配線でそれぞれ接続していた。ところが、IEEE1394規格やUSB規格などにおいては、1本の信号配線（シリアルバス）上を様々な信号が流通し、各信号の出力元及び入力先は、シリアルバスを介して伝送されるパケットのヘッダに添付されているノードIDとプラグIDによって論理的に区別される。よって、論理的プラグはヘッダのフォーマットが許す限りいくらかでも数や種類を増やすことができるが、その一方で、いっそうネットワークの状況は複雑になる。

【0022】そこで、この発明においては、これら複雑なネットワークにおいてシステム構成を把握しやすくするために、ネットワークに接続できるノード（機器）にてグループ設定処理を行い、どのグループに属するかを各ノード毎に各々設定可能にしている。また、グルーピングした各々のグループ名を自由に付けたり変更したりできるようにして管理を行うようにしている。さらに、各ノード（機器）毎に自分の属するグループを識別するグループ識別情報（若しくはグループ名）を記憶手段に記憶できるようにしている。また更に、上記グループ分けすなわちどのグループに属するかの設定は、ノード（機器）単位に限らず、各ノード（機器）内のプラグ種類毎にあるいは個別プラグ単位で設定できるようにもしている。

【0023】次に、本発明の一実施例に従う各ノードのグループ化設定処理について説明する。図6は、ノードにおいてグループ化設定処理の際に使用される操作パネル（図4の入力装置19）の一例を示す。操作子S1は、ネットワーク上の管理を行なうときに操作する管理操作子であり、グループ化設定処理を行なうとき、あるいはクロックマスタノードの設定を行なうときなどに操作するものである。操作子S2は表示器DPYで表示す

るページを前進又は後退切り換えするときに操作するものである。操作子S3はカーソル操作キーであり、表示器DPYで表示されているカーソルを上下左右に動かすときに操作する。操作子S4は確定（OK）キーであり、カーソルによる選択・指示を確定するとき操作する。操作子TKYはテンキーであり、データ入力するときに操作する。グループ名称など文字入力するときは、操作子TKYによるテンキー操作と表示器DPYにおける案内表示との組み合わせで所望の文字入力を行う。勿論、これに限らず、文字入力キーボードを具備しているノードにあっては、文字入力キーボードを使用してグループ名称など所望の文字入力を行なうことができる。

【0024】図7は、通常のノードで行ないうるグループ設定処理の一例を示すフローチャートである。この処理においては、ネットワークに存在する1又は複数のグループのいずれかを選択し、該選択したグループの構成メンバーとして自己のノードを追加すること、又は自己のノードが所属するグループを変更することと、該選択したグループの名称（ニックネーム）を変更する処理などを行なうことができる。まず、管理操作子S1でグループ設定用操作子の入力操作を行なうと、このグループ設定処理のルーチンがスタートする（ステップS10）。次に、現状のネットワーク上に存在する全てのグループの名称を取得し、取得した全てのグループ名称（グループリスト）を表示器DPYで表示する（ステップS11）。右側に併記した画面1は、表示器DPYにおけるグループ名称の表示例を示しており、そこに表示された「New」、「Group48kHz」、「Rack1」などはグループ名である。なお、「New」という名称のグループはデフォルトグループであり、ネットワーク上に存在する全てのスレーブノード（ワードクロックマスタノードではないノード）を1つのグループとするものである。ユーザによって何もグループ設定がされていないときは、このデフォルトグループである「New」の表示のみがなされる。ユーザによる新規のグループ設定・分類処理が進行すると、各ノードは「New」以外のグループに所属するようになるので、デフォルトグループである「New」に所属する（残される）ノードは減少していくことになる。

【0025】ネットワーク上に存在する全てのグループの名称を取得する手法はどのようなものであってもよい。基本的には、各ノードが自機が所属しているグループのグループ識別情報（又はグループ名称）をそれぞれ記憶しているものとしているので、ネットワークを通じて各ノードに問い合わせて各ノードのグループ識別情報（又はグループ名称）を取得するようにしてよい。別の手法として、各ノードの中に管理的機能を果たしうる特定のノード（例えばパーソナルコンピュータ）があれば、その特定のノードにおいてネットワーク内のグループ設定状態を記憶しておき、その特定のノードに問い合

わせることで、各ノードのグループ識別情報（又はグループ名称）を取得するようにしてよい。あるいは、自己のノードにおいてネットワーク内のグループ設定状態を記憶しておくことができれば、ネットワークに問い合わせを行なうことなく、各ノードのグループ識別情報（又はグループ名称）を取得することも可能である。

【0026】次に、表示器DPYにおけるグループ名称の表示画面においてカーソルを移動させて所望のグループを選択・指示する（ステップS12）。図の画面1における矢印はカーソルを示し、カーソルが指示しているグループ名が、画面の最上部にアップされる。図示例では「Rack1」というグループが指示されている。所定の選択確定操作を行なうと、カーソル指示が確定し、ステップS13に行く。ステップS13では、カーソルで指示されたグループ内に属するノード名（又はノードID）を取得し、これを表示器DPYに表示する。右側に併記した画面2は、表示器DPYにおける1グループ内の所属ノード名の表示例を示しており、そこに表示された「MasterClock44.1kHz」、「Synth707」、「Module001」などはノード名（ノードのニックネーム）であり、最上部における「Group=Rack1」は「Rack1」という名称のグループであることを示す。画面表示例では特に示していないが、該ノードの機器名（キーボード、CDプレーヤー、ビデオプレーヤー、シーケンサーなど）を合わせて表示するとよい。また、その他の各ノードに固有の情報（例えばニックネームではなく、該ノードを識別する絶対的な情報）を合わせて表示してもよい。特に、当該グループに属するのが、ノードつまり機器の全体ではなく、該ノード中の特定のプラグ種類あるいは特定のプラグである場合は、ノード名のみならず、プラグ種類名あるいはプラグ名も併せて表示する。

【0027】次のステップS14では操作パネルの確定（OK）操作子S4でグループ選択を確定する操作がなされたかどうかを判定する。確定（OK）操作子S4が操作された場合はステップS15に行くが、画面切り換え操作子S2が操作された場合は、ステップS12に戻り、グループリスト表示画面（画面1）で別のグループが選択できるようにする。ステップS15では、選択確定したグループ名（グループ識別情報）を自己のノードにおける所定の記憶部に記憶することで、自己のノードがそのグループに所属する旨の登録を行なう。そして、登録確定したグループ名を表示部DPYで表示する。右側に併記した画面3は、表示器DPYにおける登録確定したグループ名称の表示例を示しており、図示例では「Rack1」というグループに登録されたことを示している。このステップS15における画面表示状態で、データ入力操作子TKY等を用いて自己の所属するグループのグループ名（又はグループ識別情報）を変更することが可能である。もし、グループ名（又はグループ識

別情報)を変更した場合は、自己のノードにおける記憶部に記憶するグループ名(又はグループ識別情報)の記憶を書き換えるのは勿論のこと、該同一グループ内に所属する他の各ノードに対して、ネットワークを介して、グループ名(又はグループ識別情報)の変更を知らせるデータを送信し、それら同一グループ内に所属する他の各ノードにおける記憶部に記憶するグループ名(又はグループ識別情報)の記憶をそれぞれ書き換えさせるよう制御する。更に、この選択したグループに所属する旨の設定を、自己のノード全体ではなく、所望のプラグ種類又は個別プラグについて行なう場合は、該選択したグループに所属させようとするプラグ種類又は個別プラグ名を選択・指定し、選択・指定したプラグ種類又は個別プラグ名を示す情報をグループ名(又はグループ識別情報)に対応づけて記憶しておく。

【0028】以上のようにして、各ノードにおいては、ネットワークに存在する1又は複数のグループのいずれかを選択し、該選択したグループの構成メンバーとして自己のノードを追加すること、又は自己のノードが所属するグループを変更することが出来る。このように各ノードで自己のノードがどのグループに所属するかを自由に設定することにより、ネットワークにおけるグループ化つまりグループ設定を行なうことができる。また、自己のノードが所属するグループの名称(ニックネーム又はID)を自由に変更することも出来る。図10は、このようにして設定されるネットワークにおけるグループ設定例を模式的に示している。図10では、1つのグループ1(仮称)にクロックマスタノードMN1とノードN1、N2、N5、N7が所属し、別のグループ2(仮称)にクロックマスタノードMN2とノードN4、N6が所属し、更に別のグループ3(仮称)にクロックマスタノードMN3とノードN8、N9が所属するようにグループ設定がなされている。

【0029】しかも、このようなグループ設定及び管理を、ノード全体のみならず、ノード内のプラグ種類又は個別プラグ毎に、行なうことができる。例えば、同じノードであっても、プラグ種類によって異なるグループに登録する例としては、ミキサーノード(オーディオミキシング機能を持つノード)の場合を指摘することができる。例えば、或るミキサーノードにおいて、その「オーディオ入力」のプラグ種類をグループ1(仮称)に登録し、その「オーディオ出力」のプラグ種類をグループ2(仮称)に登録することがあり得る。そうすると、グループ1のオーディオ信号がミキサーノードの「オーディオ入力」に入力されて、その「オーディオ出力」から出力され、グループ2に属する他のノードに対して出力されるといったような、異なるグループ間をまたぐような入出力の設定を行うことができる。プラグ種類毎のグループ設定は、同じプラグ種類に属する個別プラグ(例えば「オーディオ入力」のプラグ種類における「オーディ

オ入力1-R」や「オーディオ入力1-L」、「オーディオ入力2-R」、「オーディオ入力2-L」など)は共通のグループに設定される。

【0030】一方、同じノードの同じプラグ種類であっても、個別プラグによって異なるグループに登録する例としては、サンプリングコンバータノード(サンプリング周波数変換器として機能するノード)の場合を指摘することができる。例えば、グループ1(仮称)がマスタークロック周波数48kHzのワードクロックマスタノード(例えば図1のMN2)を含むとし、グループ2(仮称)がマスタークロック周波数44.1kHzのワードクロックマスタノード(例えば図1のMN1)を含むとする。サンプリングコンバータノードにおいては、サンプリング周波数を変換するという機能のため、「クロック入力」のプラグ種類において、「クロック入力1」と「クロック入力2」という少なくとも2つのプラグを持つ。そして、「クロック入力1」から入力されるクロック周波数を持つ入力オーディオ信号を「クロック入力2」から入力されるクロック周波数を持つオーディオ信号にサンプリング周波数変換することが、このサンプリングコンバータノードの機能であるとする。その場合、「クロック入力1」プラグをグループ1に設定し、「クロック入力2」のプラグをグループ2に設定し、「オーディオ入力」のプラグ種類又は個別プラグをグループ1に設定し、「オーディオ出力」のプラグ種類又は個別プラグをグループ2に設定することで、「オーディオ入力」を介して入力されるサンプリングクロック周波数48kHzのグループ1のオーディオ信号のサンプリング周波数を、「クロック入力2」から入力されるクロック周波数44.1kHzのサンプリング周波数に変換して「オーディオ出力」から出力することができる。

【0031】上述したいくつかの具体例から理解できるように、グループ設定を、ノード毎に行なうか、プラグ種類に応じて行なうか、あるいは個別プラグに応じて行なうか、ということは排他的なことではなく、併存しうることである。例えば、最初にとりあえず1つのノード全体を所望の1つのグループ1(仮称)に所属するように設定し、次に、同じノード中の所望の一部のプラグ種類について別のグループ2(仮称)に所属するように設定し、次に、同じノード中の所望の一部の個別プラグについて別のグループ3(仮称)に所属するように設定することも、格段の矛盾が生じない限り、不可能ではない。そのような場合、逆階層化の順序で所属グループを決定すればよい。つまり、特定のグループ(上記のグループ2又は3)に所属するものと設定された特定のプラグ種類又は個別プラグについてはそのグループに属するものとし、当該ノード中のそれ以外のプラグ種類及び個別プラグについては当該ノード全体について設定されたグループ(上記のグループ1)に所属するものと取り扱うことができる。

【0032】図7の例は、個別のノードにおいて所望のグループを選択することによって当該ノードが所属するグループがどのグループであるかを設定するようにしている。このような手法は、上述のように、ネットワークに存在する既存の1又は複数のグループのいずれかを選択し、該選択したグループの構成メンバーとして自己のノードを追加すること、又は自己のノードが所属するグループを変更することに適している。今までに存在していなかった新規のグループを設定する場合は、例えば図7のステップS12で、例えばカーソルを既存グループ名表示の最下位の下の空白位置を指示したときに、グループ新設モードとなるようにすればよい。そのようなグループ新設モードにおいては、ステップS14で表示される画面ではグループ名は表示されず、また、グループ所属ノードも表示されないようにし、ステップS15で表示される画面でグループ名表示箇所をプリントさせて、新設グループ名を入力するように促すようにすればよい。そして、新設グループ名（グループ識別情報）がユーザによって入力されると、そのグループ名（グループ識別情報）が自己のノードの記憶部に記憶され、新たなグループが設定される。この場合、新設グループに所属するノードは、最初は1つだけであるが、他のノードで該グループを選択する操作を行えば、所属ノードは増す。

【0033】しかし、グループ設定の手法は、上記のような手法に限らず、他の手法であってもよい。例えば、パソコンのような管理機能を持つ特定のノードにおいて、グループを設定する処理を行なうようにしてもよい。その場合、該特定のノードにおけるグループ設定処理においては、1つのグループに所属すべき複数のノードをネットワークに接続されたノードの中から選択することをユーザによる入力操作によって行ない、これらの選択された複数のノードによって構成される1つのグループの名称（グループ識別情報）をユーザによる入力操作によって付与する。こうして、グループ設定が確定すると、当該グループを構成する各ノードに対してネットワークを介してグループ名称（グループ識別情報）を通知し、これを各ノードの記憶部において記憶させることで、グループ設定・登録を行なう。その場合、グループ構成の変更・設定も該特定のノードで行なうことができる。勿論、該特定のノードにおけるグループ設定処理は、前述と同様に、各ノードにおけるプラグ種類又は個別プラグに対応付けて行なうこともできる。このように特定のノードによるグループ設定処理と、図7のような通常ノードによるグループ設定処理は併存しうる。すなわち、特定のノードによって設定したグループ設定状態は、図7のような通常ノードによるグループ設定処理によって変更しうる。

【0034】以上のように各ノードにおいて自己のノードが所属する（あるいは特定のプラグ種類又は個別プ

ラグが所属する）グループ識別情報を登録・記憶するようにしたので、シリアルバスを介したデータ伝送にあたって、このグループ識別情報を用いることにより、データ授受を適切に制御することができる。すなわち、送信ノードにおいては、シリアルバスに送信するパケットのヘッダに自己のグループ識別情報を含めるようにする。そして、受信ノードでは、自己のノードの記憶部に記憶しているグループ識別情報を用いて、シリアルバスを介して送信されてきたパケットのヘッダにあるグループ識別情報が、自己のグループ識別情報に一致するかを判定する。一致すればそのパケットを取り込み、一致しなければ取り込まない。これによって、各ノード（受信ノード）において、自己のどのノードからのデータを受信すべきかをいちいち設定しておく必要がなくなる。よって、本発明によれば、送受信するノードの組合せが変更されるような場合でも、各ノード毎に受信すべきノードの個別設定状態をいちいち変更する必要がなく、グループ化の設定状態を変更するだけで済む。このように、本発明によれば、グループの登録先を変更する（グループ化の設定状態を変更する）だけでネットワーク上の結線を自由に変更することが可能になり、また、どのような結線関係にあるかも、各ノードのグループ識別情報をチェックするだけでわかるので、把握しやすくなる。

【0035】次に、楽音関連信号を取り扱うネットワークにおいて、上記実施例に示したようにグループ設定を行なう場合に考慮すべき工夫について説明する。ネットワークを介して各ノードに伝送される楽音関連信号の同期を取るために、周知のように、ワードクロックマスタノードから発生される基準タイムスタンプが利用される。そのため、複数のノードによって構成される1グループにおいては、基準タイムスタンプを生成するワードクロックマスタノードは1つだけ存在すればよい。ネットワークに接続されたノードにおいては、パソコンのような多機能機器のようにマスタクロックを発生し得るノードもあれば、ミキサのような単機能機器のようにマスタクロックを発生し得ないノードもある。マスタクロックを発生し得るノードは、どれでも潜在的にワードクロックマスタノードとなり得る。よって、ネットワークを構築する過程でどのノードがワードクロックマスタノードとなるのか不確定的であり、その点を適切に処理できるようにすることが望ましい。以下述べる工夫は、グループ分類概念を伴うネットワークを構築する過程で、1グループ内にワードクロックマスタノードが重複して存在しないようにするものである。

【0036】図8は、ワードクロックマスタノードとなり得る潜在能力を持ったノードで行ないうるクロックマスタノード設定処理の一例を示すフローチャートである。まず、管理操作子S1で所定のマスタ設定用の入力操作を行なうと、このクロックマスタノード設定処理のルーチンがスタートする（ステップS20）。次に、図

7のステップS11と同様の手法で、現状のネットワーク上に存在する全てのグループの名称を取得し、取得した全てのグループ名称（グループリスト）を表示器DPYで表示する（ステップS21）。右側に併記した画面1は、図7の画面1と同様に、表示器DPYにおけるグループ名称の表示例を示している。

【0037】次に、図7のステップS12と同様に、表示器DPYにおけるグループ名称の表示画面においてカーソルを移動させて所望のグループを選択・指示する（ステップS22）。所定の選択確定操作を行なうと、カーソル指示が確定し、ステップS23に行く。ステップS23では、カーソルで指示された1つのグループ内に存在するクロックマスタノードの名称（ノードID）を取得し、これを表示器DPYに表示する。右側に併記した画面2'は、表示器DPYにおける1グループ内のクロックマスタノードの表示例を示しており、「MasterClock44.1kHz」が該クロックマスタノードの名称である。画面表示例では特に示していないが、該ノードの機器名や、その他の該ノードに固有の情報を合わせて表示してもよい。

【0038】次のステップS24では操作パネルの確定（OK）操作子S4でグループ選択を確定する操作がなされたかどうかを判定する。確定（OK）操作子S4が操作された場合はステップS25に行くが、画面切り換え操作子S2が操作された場合は、ステップS22に戻り、グループリスト表示画面（画面1）で別のグループが選択できるようにする。ステップS25では、選択確定したグループ名（グループ識別情報）を自己のノードにおける所定の記憶部に記憶すると共に、自己のノードが該グループのクロックマスタノードとなったことを、クロックマスタとしての固有情報を該所定の記憶部に記憶することで、登録する。同時に、それまで該グループのクロックマスタノードであったノードに対して、クロックマスタノードの役割をキャンセルする（剥奪する）旨のメッセージをネットワークを介して与える。このメッセージを受けて、それまで「MasterClock44.1kHz」の名称を持っていた他のノードでは、該グループのグループ識別情報を記憶から削除することで該グループから離脱すると共に、クロックマスタノードである旨の固有情報の記憶を削除する。このようにして、当該グループにおけるクロックマスタノードの役割が図8のクロックマスタノード設定処理を行なったノードに移行する。ステップS25では、必要に応じてクロックマスタノードの名称（ニックネーム）を変更することも可能である。しかし、クロックマスタノードである旨の役割を示す固有情報（固有ID）は、変わらない。これによって、該グループに所属する他のノード（スレーブノード）は、クロックマスタノードの変更があったことを意識することなく、送受信処理を遂行することができる。

【0039】このように、特定機能のノードつまりクロックマスタノードが1つのグループにつき1つだけ存在しうるように制御することにより、特定機能のノードつまりクロックマスタノードを成るノードから別のノードに変更するような設定変更を容易に行なうことができる。新たにクロックマスタノードとなったノードでは、クロックマスタノードであることを示す所定の名称若しくは固有IDを用いてネットワーク上の他のノード（スレーブノード）と通信する。例えば、ネットワークに送信する同期信号パケットのヘッダにクロックマスタノードである旨のIDを付加する。ネットワーク上の他のノード（スレーブノード）では、ネットワークから送信されてくる同期信号パケットのヘッダに自己のグループの識別情報とクロックマスタノードである旨のIDが付加されていれば、自己の所属するグループのクロックマスタノードからのデータであると認識し、該パケットを受信して処理する。従って、クロックマスタノードが具体的にどのノードであるかの区別をすることなく、スレーブノードでの処理を行なうことができるので、簡便である。

【0040】次に、ネットワークを介して行なうデータ送受信処理の一例につき、図9を参照して簡単に説明する。図9（A）は、バスリセット時の各ノードの立ち上げ処理（ネットワーク立ち上げ時の各ノードの処理）を示すフロー図である。ネットワークの立ち上げ時における各ノードの処理の詳細は、グループに関連する処理以外の処理は、例えば特許第2830766号などに示された公知の手法と同様のものを採用してよい。図9

（A）には、グループに関連する処理のみを示している。まず、各ノードでは自機の記憶部から自己が所属するグループID（グループ識別情報）を読み出し、グループ認識を行なう（ステップS30）。このグループ認識の詳細には、種々の仕様が有り得る。例えば、単に、自己のグループ識別情報を送信パケットのヘッダに付加しうるように準備しておくと共に、受信パケットのヘッダに含まれるグループ識別情報と自己のグループ識別情報とを比較照合できるように準備しておくだけでもよい。その場合は、パケット送信に際してヘッダにグループ識別情報を付加することは不可欠となる。別の例として、このネットワークの立ち上げ時のステップS30の処理において、他のノードからそれぞれのグループ識別情報を取得し、自己と同一グループに所属するノードがどれとどれであるか（若しくは該ノード内のどのプラグ種類又はプラグが自己と同一グループに所属するか）を示すリストを自己の記憶部に作成するようにしてもよい。その場合は、リストを参照することで、自己と同一グループのノード（又はプラグ種類又はプラグ）が判別するので、パケット送信に際してヘッダにグループ識別情報を付加することは不可欠ではなく、ノードIDが付加されていればよいことになる。しかし、その場合は、グル

ープ設定が変更される毎に該リストの更新を行なう必要がある。

【0041】次に、ステップS31では、自己のノードの所属するグループ内のクロックマスタノードに接続し、該クロックマスタノードから同期信号パケットを受け取る態勢を設定する。すなわち、送信ノード及び受信ノード共に、同期信号パケットはグループ内のクロックマスタノードから直接受取り、これに基づき各ノードでの処理の同期をとるようになっている。これにより同期の精度をいっそう向上させることができる。なお、同期処理が不要なノードにあってはステップS31の処理は不要である。勿論、自己のノードがクロックマスタノードである旨の識別子（固有ID）を有している場合も、ステップS31の処理は不要である。

【0042】図9（B）は、グループ識別情報を利用したデータ送信処理（つまり送信ノードでの処理）の一例を示すフロー図である。図9（C）は、グループ識別情報を利用したデータ受信処理（つまり受信ノードでの処理）の一例を示すフロー図である。送信ノードにおいては、送信すべきデータのヘッダに自己のノードが所属するグループのグループ識別情報（グループID）を付加する（ステップS32）。そして、このヘッダとデータをパケット化してシリアルバスに送信する（ステップS33）。ヘッダに付加するグループ識別情報（グループID）は、自己のグループIDに限らず、データを受信してもらいたい他のグループのグループ識別情報（グループID）であってもよい。その場合は、受信先として所望の1又は複数のグループを選択し、そのグループ識別情報（グループID）をヘッダに付加する（ステップS32）。受信ノードでは、シリアルバスから受け取ったパケットのヘッダにあるグループ識別情報（グループID）を検出する（ステップS34）。そして、該パケットのグループ識別情報（グループID）が自己のグループ識別情報（グループID）と一致している場合は、該パケットを自己のノードに取り込んでデパケットし、そのデータ又はコマンドを解釈して必要な処理を行なう（ステップS35）。一致していない場合は、何も処理を行なわない。このようにグループ識別情報を用いることにより、複雑に論理接続されているノード間のデータの授受形態をわかりやすく処理することができ、また、複数の必要なノードのみを容易に抽出してリアルタイムでのデータやコマンドのやり取りを行うことが容易にできるようになる。

【0043】

【発明の効果】以上のとおり、この発明によれば、ネットワークに接続された複数のノードの中から1又は複数のノードを選択してそれらを1つのグループとして分類し各ノードにてそのグループ識別情報を登録し、該グループ識別情報により共通のデータ授受グループを形成しているノードを判別できるようにしたので、各ノードの

グループ識別情報を見るだけで、実際にどのノードとどのノードが接続関係（データを実際に授受する関係）にあるのかが判明し、複数のノード同士の実際の接続状態を容易に判別することができる。また、或る1つのノードの所属するグループを別のグループに変更するだけで、該別のグループに存在している全てのノードとの接続関係を確立することが可能であり、ネットワークを介して接続された複数のノード同士の実際の接続状態の設定を行なったり、その設定内容を変更することが容易に行なえる。

【0044】また、この発明によれば、ワードクロックマスタノードのような特定機能のノードが1つのグループにつき1つだけ存在するように制御することにより、特定機能のノードを或るノードから別のノードに変更するような設定変更を容易に行なうことができる。例えば、特定機能のノードを或るノードから別のノードに変更するときにグループ分類構成の組替えを行なうことなく、特定機能のノードの変更のみで対処できる。従って、ワードクロックマスタノードのような特定機能のノードの設定変更が容易となる。また、ワードクロックマスタノードのような該特定機能のノードが変更されたとしても、該特定機能に特有の識別情報又は名称を用いて他のノードと通信するようにしたことにより、他のノードではその変更を意識することなく、常に前記特有の識別情報又は名称を用いて該特定機能のノードを特定すれば済むこととなり、ワードクロックマスタノードのような特定機能のノードの設定変更が容易となる。

【図面の簡単な説明】

【図1】 複数のノードを接続した通信ネットワークの構成例を示すブロック図。

【図2】 パケットデータの形式を示す図。

【図3】 1つのノードにおける処理を大まかに示す機能ブロック図。

【図4】 1つのノードにおけるハードウェア構成を示すブロック図。

【図5】 ノードにおけるプラグ種類と個別プラグの一例を示す図。

【図6】 ノードにおける操作パネル（入力装置）の一例を示す図。

【図7】 本発明の一実施例を示すもので、ノードで行なうグループ設定処理の一例を示すフローチャート。

【図8】 本発明の別の実施例を示すもので、クロックマスタノード設定処理の一例を示すフローチャート。

【図9】 ネットワークを介して行なうデータ送受信処理の一例を示すフローチャート。

【図10】 本発明の一実施例に従うネットワークにおけるグループ設定例を模式的に示す図。

【符号の説明】

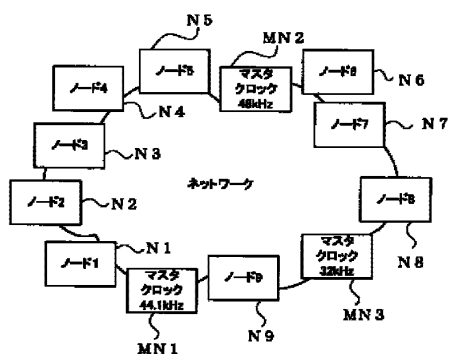
N1～N9 ノード

MN1～MN ワードクロックマスタノード

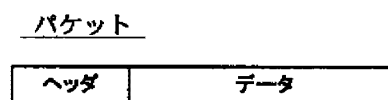
12 CPU
13 RAM
14 ROM
15 通信インタフェース
16 音源装置
17 外部記憶装置

18 ディスプレイ装置
19 入力装置（操作パネル）
DPY 操作パネルにおける表示器
TKY 操作パネルにおけるデータ入力操作子
S1 操作パネルにおける管理操作子

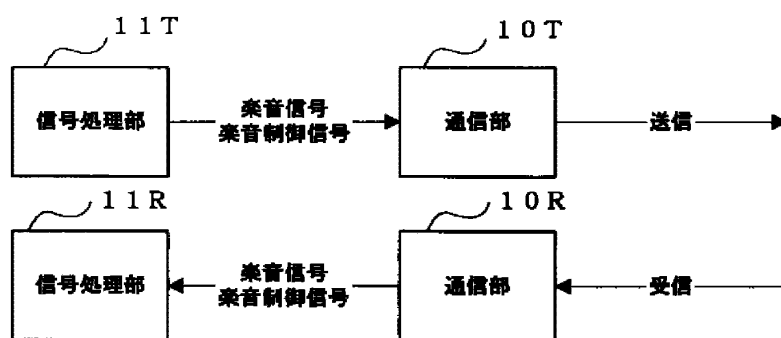
【図1】



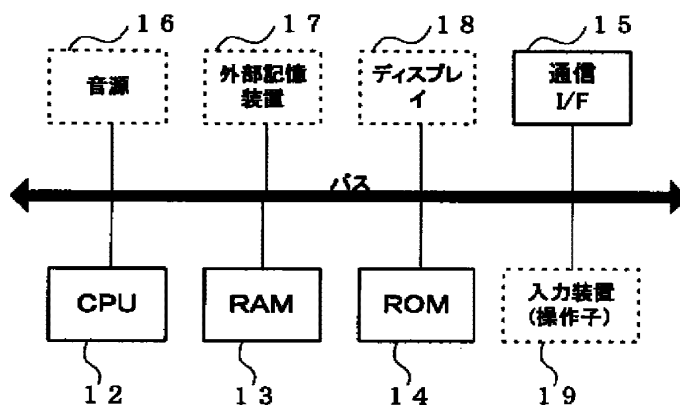
【図2】



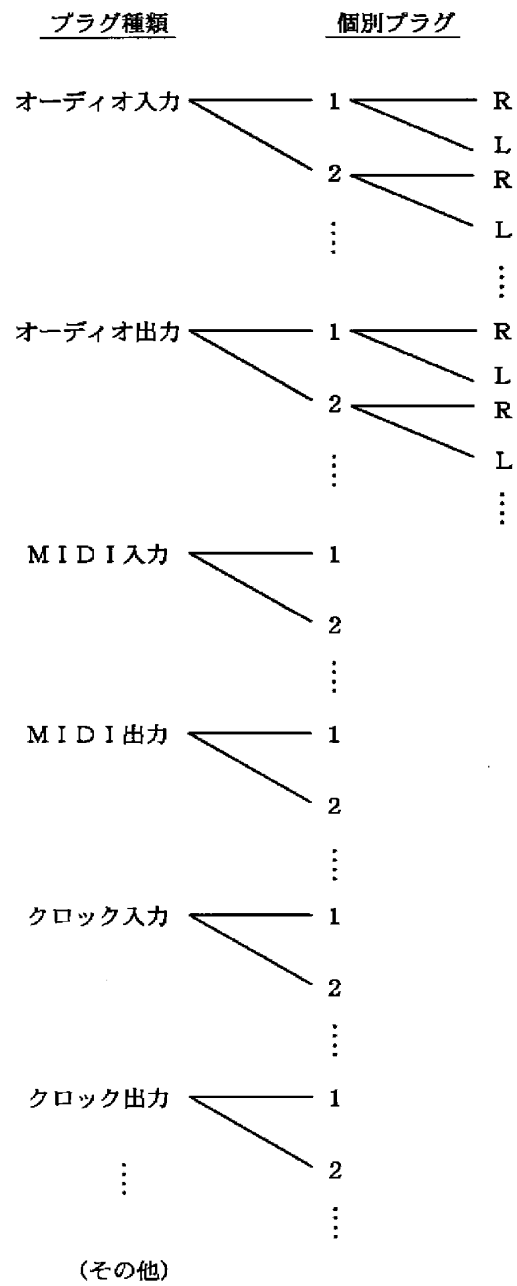
【図3】



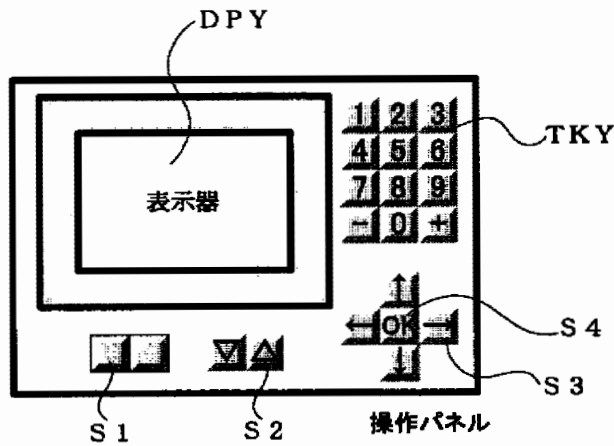
【図4】



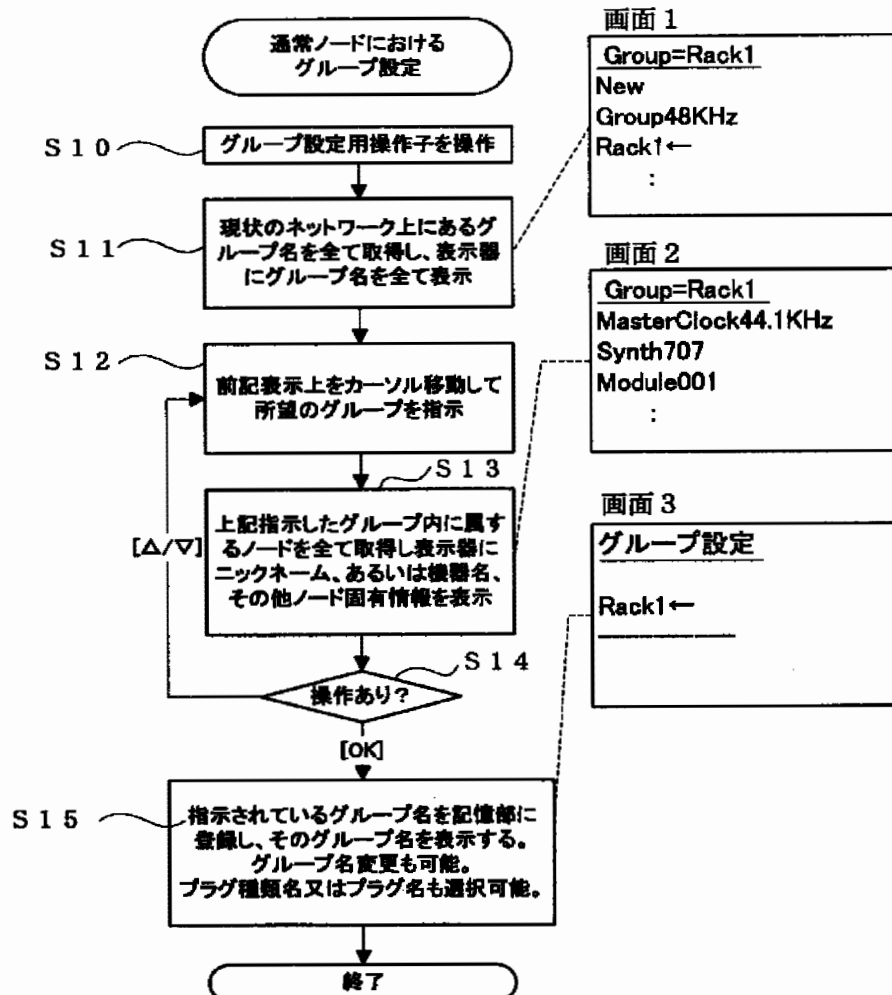
【図 5】



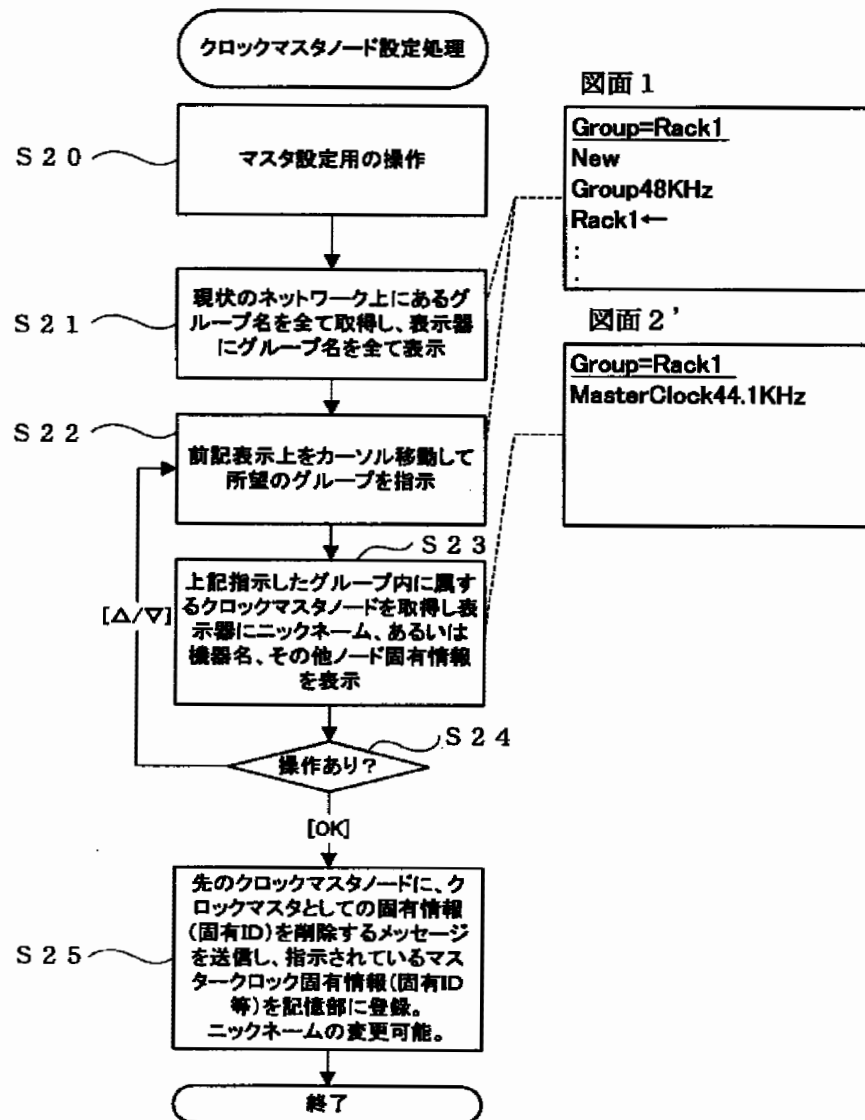
【図6】



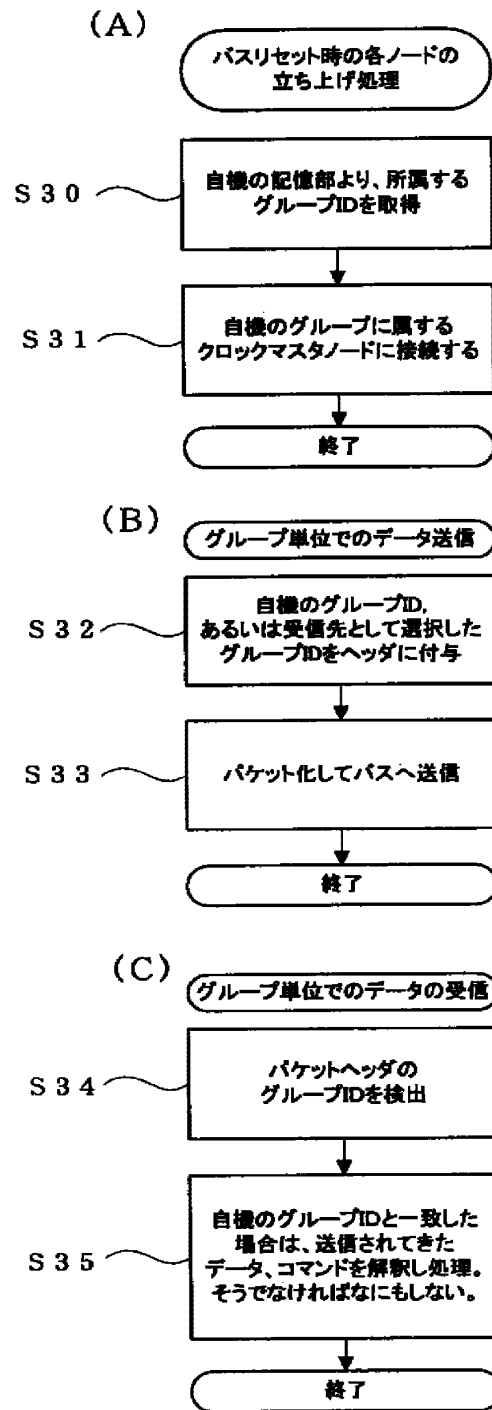
【図7】



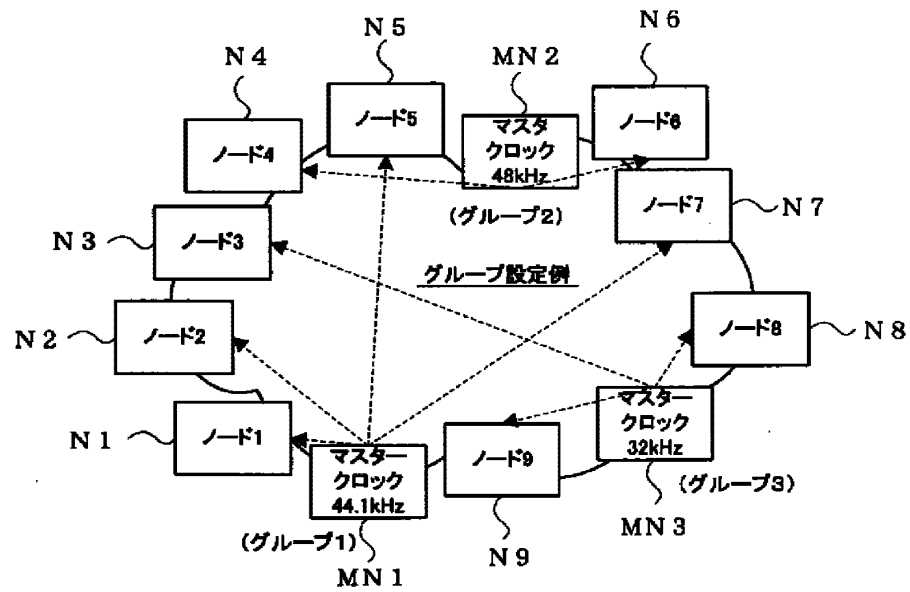
【図 8】



【図 9】



【図 10】



フロントページの続き

F ターム(参考) 5B089 HA17 HA18 JA35 JB14 JB23
 KA13 KB04 KC31
 5K033 AA09 BA13 BA14 CB01 CB15
 CC01 DA01 DA13 DB16
 5K034 AA19 AA20 CC05 DD02 EE10
 FF02 GG06 HH01 HH02 HH05
 HH12 LL01 MM39

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

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

Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)

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

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL (Submitted Only via EFS-Web)							
Application Number	13864249	Filing Date	2013-04-13	Docket Number (if applicable)	13-0402 (15-518-CON)	Art Unit	2442
First Named Inventor	Millington			Examiner Name	Survillo		
This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application. Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV							
SUBMISSION REQUIRED UNDER 37 CFR 1.114							
Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).							
☒ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.							
☒ Consider the arguments in the Appeal Brief or Reply Brief previously filed on <u>2018-10-25</u>							
☐ Other _____							
☒ Enclosed							
☐ Amendment/Reply							
☐ Information Disclosure Statement (IDS)							
☐ Affidavit(s)/ Declaration(s)							
☒ Other <u>PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)</u>							
MISCELLANEOUS							
☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(l) required)							
☐ Other _____							
FEES							
☒ The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed. The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No <u>132490</u>							
SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED							
☒ Patent Practitioner Signature							
☐ Applicant Signature							

EFS - Web 2.1.15

Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)

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

U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/Jeffrey P. Armstrong/	Date (YYYY-MM-DD)	2018-12-11
Name	Jeffrey P. Armstrong	Registration Number	54967

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

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

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)		Docket Number (Optional) 13-0402 (15-518-CON)																																		
Application Number 13/864,249	Filed April 17, 2013																																			
For Millington																																				
Art Unit 2442	Examiner Survillo																																			
<p>This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.</p> <p>The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):</p> <table style="width: 100%; border-collapse: collapse;"><thead><tr><th></th><th style="text-align: center;"><u>Fee</u></th><th style="text-align: center;"><u>Small Entity Fee</u></th><th style="text-align: center;"><u>Micro Entity Fee</u></th><th></th></tr></thead><tbody><tr><td>☐ One month (37 CFR 1.17(a)(1))</td><td style="text-align: center;">\$200</td><td style="text-align: center;">\$100</td><td style="text-align: center;">\$50</td><td>\$ _____</td></tr><tr><td>☒ Two months (37 CFR 1.17(a)(2))</td><td style="text-align: center;">\$600</td><td style="text-align: center;">\$300</td><td style="text-align: center;">\$150</td><td>\$ 600.00</td></tr><tr><td>☐ Three months (37 CFR 1.17(a)(3))</td><td style="text-align: center;">\$1,400</td><td style="text-align: center;">\$700</td><td style="text-align: center;">\$350</td><td>\$ _____</td></tr><tr><td>☐ Four months (37 CFR 1.17(a)(4))</td><td style="text-align: center;">\$2,200</td><td style="text-align: center;">\$1,100</td><td style="text-align: center;">\$550</td><td>\$ _____</td></tr><tr><td>☐ Five months (37 CFR 1.17(a)(5))</td><td style="text-align: center;">\$3,000</td><td style="text-align: center;">\$1,500</td><td style="text-align: center;">\$750</td><td>\$ _____</td></tr></tbody></table> <p>☐ Applicant asserts small entity status. See 37 CFR 1.27.</p> <p>☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.</p> <p>☐ A check in the amount of the fee is enclosed.</p> <p>☐ Payment by credit card. Form PTO-2038 is attached.</p> <p>☒ The Director has already been authorized to charge fees in this application to a Deposit Account.</p> <p>☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number <u>13-2490</u>.</p> <p>☒ Payment made via EFS-Web.</p> <p>WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.</p> <p>I am the</p> <p>☐ applicant/inventor.</p> <p>☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).</p> <p>☒ attorney or agent of record. Registration number <u>54,967</u></p> <p>☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.</p> <table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 50%; vertical-align: bottom;"><u>/Jeffrey P. Armstrong/</u> Signature</td><td style="width: 50%; vertical-align: bottom;"><u>December 11, 2018</u> Date</td></tr><tr><td style="width: 50%; vertical-align: bottom;"><u>Jeffrey P. Armstrong</u> Typed or printed name</td><td style="width: 50%; vertical-align: bottom;"><u>312-913-0001</u> Telephone Number</td></tr></table> <p>NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.</p> <p>☐ * Total of _____ forms are submitted.</p>				<u>Fee</u>	<u>Small Entity Fee</u>	<u>Micro Entity Fee</u>		☐ One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ _____	☒ Two months (37 CFR 1.17(a)(2))	\$600	\$300	\$150	\$ 600.00	☐ Three months (37 CFR 1.17(a)(3))	\$1,400	\$700	\$350	\$ _____	☐ Four months (37 CFR 1.17(a)(4))	\$2,200	\$1,100	\$550	\$ _____	☐ Five months (37 CFR 1.17(a)(5))	\$3,000	\$1,500	\$750	\$ _____	<u>/Jeffrey P. Armstrong/</u> Signature	<u>December 11, 2018</u> Date	<u>Jeffrey P. Armstrong</u> Typed or printed name	<u>312-913-0001</u> Telephone Number
	<u>Fee</u>	<u>Small Entity Fee</u>	<u>Micro Entity Fee</u>																																	
☐ One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ _____																																
☒ Two months (37 CFR 1.17(a)(2))	\$600	\$300	\$150	\$ 600.00																																
☐ Three months (37 CFR 1.17(a)(3))	\$1,400	\$700	\$350	\$ _____																																
☐ Four months (37 CFR 1.17(a)(4))	\$2,200	\$1,100	\$550	\$ _____																																
☐ Five months (37 CFR 1.17(a)(5))	\$3,000	\$1,500	\$750	\$ _____																																
<u>/Jeffrey P. Armstrong/</u> Signature	<u>December 11, 2018</u> Date																																			
<u>Jeffrey P. Armstrong</u> Typed or printed name	<u>312-913-0001</u> Telephone Number																																			

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

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

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Jeffrey Armstrong		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 2 months with \$200 paid	1252	1	400	400
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	1820	1	1900	1900
Total in USD (\$)				2300

Electronic Acknowledgement Receipt	
EFS ID:	34556300
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Jeffrey Armstrong
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	11-DEC-2018
Filing Date:	17-APR-2013
Time Stamp:	21:26:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 2300
RAM confirmation Number	121218INTEFSW21270700
Deposit Account	132490
Authorized User	Jeffrey Armstrong
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)
37 CFR 1.20 (Post Issuance fees)
37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	13-0402_RCE.pdf	76526	no	2
			943cfae29b8544031b51cf49f87fc1d13b39a69d		

Warnings:

This is not a USPTO supplied RCE SB30 form.

Information:

2	Extension of Time	13-0402_EOT.pdf	138038	no	1
			146266a3b260c29e3b415ccc9657bfdcd47c6c4d		

Warnings:

Information:

3	Fee Worksheet (SB06)	fee-info.pdf	32672	no	2
			45bc26ffec09a3fa99582045d6c5547631c33715		

Warnings:

Information:

Total Files Size (in bytes):	247236
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 13/864,249		Filing Date 04/17/2013		☐ To be Mailed				
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO													
APPLICATION AS FILED – PART I													
(Column 1)			(Column 2)										
FOR		NUMBER FILED		NUMBER EXTRA		RATE (\$)		FEE (\$)					
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A		N/A		N/A							
☐ SEARCH FEE (37 CFR 1.16(k), (j), or (m))		N/A		N/A		N/A							
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A		N/A		N/A							
TOTAL CLAIMS (37 CFR 1.16(j))		minus 20 =		*		X \$ =							
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =		*		X \$ =							
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$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).											
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))													
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL							
APPLICATION AS AMENDED – PART II													
(Column 1)			(Column 2)			(Column 3)							
AMENDMENT	12/11/2018		CLAIMS REMAINING AFTER AMENDMENT			HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))		* 23		Minus	** 23		= 0		x \$100 =		0	
	Independent (37 CFR 1.16(h))		* 2		Minus	*** 3		= 0		x \$460 =		0	
	☐ Application Size Fee (37 CFR 1.16(s))												
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))												
	TOTAL ADD'L FEE											0	
(Column 1)			(Column 2)			(Column 3)							
AMENDMENT			CLAIMS REMAINING AFTER AMENDMENT			HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		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												
<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 number found in the appropriate box in column 1.</p>											SLIE ADRIENE SELLMAN		

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

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No. 13-0402
(MBHB 15-518-CON)

In the Application of:	)	
Nicholas A. J. Millington	)	Examiner: SURVILLO, Oleg
	)	
Application No.: 13/864,249	)	Group Art Unit: 2442
	)	
Filed: April 17, 2013	)	Confirmation No. 9806
	)	
Title: Concurrent Transmission and	)	
Playback of Audio Information	)	
	)	
	)	

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

**RESPONSE TO THE FINAL OFFICE ACTION
MAILED JULY 11, 2018**

Please consider the following Amendments and Remarks in response to the Final Office Action mailed on July 11, 2018, in the above-captioned application. A request for consideration under the After Final Consideration Pilot (AFCP 2.0) program is submitted herewith.

Amendments begin on page 2.

Remarks begin on page 11.

Please charge any fee due or credit any overpayment to Deposit Account 13-2490.

CERTIFICATION AND REQUEST FOR CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0		
Practitioner Docket No.: 13-0402 (15-518-CON)	Application No.: 13/864,249	Filing Date: April 17, 2013
First Named Inventor: Millington	Title: Concurrent Transmission and Playback of Audio Information	
<p>APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0 (AFCP 2.0) OF THE ACCOMPANYING RESPONSE UNDER 37 CFR 1.116.</p> <ol style="list-style-type: none"> The above-identified application is (i) an original utility, plant, or design nonprovisional application filed under 35 U.S.C. 111(a) [a continuing application (e.g., a continuation or divisional application) is filed under 35 U.S.C. 111(a) and is eligible under (i)], or (ii) an international application that has entered the national stage in compliance with 35 U.S.C. 371(c). The above-identified application contains an outstanding final rejection. Submitted herewith is a response under 37 CFR 1.116 to the outstanding final rejection. The response includes an amendment to at least one independent claim, and the amendment does not broaden the scope of the independent claim in any aspect. This certification and request for consideration under AFCP 2.0 is the only AFCP 2.0 certification and request filed in response to the outstanding final rejection. Applicant is willing and available to participate in any interview requested by the examiner concerning the present response. This certification and request is being filed electronically using the Office's electronic filing system (EFS-Web). Any fees that would be necessary consistent with current practice concerning responses after final rejection under 37 CFR 1.116, e.g., extension of time fees, are being concurrently filed herewith. [There is no additional fee required to request consideration under AFCP 2.0.] By filing this certification and request, applicant acknowledges the following: <ul style="list-style-type: none"> Reissue applications and reexamination proceedings are not eligible to participate in AFCP 2.0. The examiner will verify that the AFCP 2.0 submission is compliant, i.e., that the requirements of the program have been met (see items 1 to 7 above). For compliant submissions: <ul style="list-style-type: none"> The examiner will review the response under 37 CFR 1.116 to determine if additional search and/or consideration (i) is necessitated by the amendment and (ii) could be completed within the time allotted under AFCP 2.0. If additional search and/or consideration is required but cannot be completed within the allotted time, the examiner will process the submission consistent with current practice concerning responses after final rejection under 37 CFR 1.116, e.g., by mailing an advisory action. If the examiner determines that the amendment does not necessitate additional search and/or consideration, or if the examiner determines that additional search and/or consideration is required and could be completed within the allotted time, then the examiner will consider whether the amendment places the application in condition for allowance (after completing the additional search and/or consideration, if required). If the examiner determines that the amendment does not place the application in condition for allowance, then the examiner will contact the applicant and request an interview. <ul style="list-style-type: none"> The interview will be conducted by the examiner, and if the examiner does not have negotiation authority, a primary examiner and/or supervisory patent examiner will also participate. If the applicant declines the interview, or if the interview cannot be scheduled within ten (10) calendar days from the date that the examiner first contacts the applicant, then the examiner will proceed consistent with current practice concerning responses after final rejection under 37 CFR 1.116. 		
Signature /Jeffrey P. Armstrong/		Date October 25, 2018
Name (Print/Typed) Jeffrey P. Armstrong		Practitioner Registration No. 54967
<p>Note: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.</p>		
☒ * Total of <u>1</u> forms are submitted.		

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Jeffrey Armstrong		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 1 month with \$0 paid	1251	1	200	200
Miscellaneous:				
Total in USD (\$)				200

Electronic Acknowledgement Receipt	
EFS ID:	34120241
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Jeffrey Armstrong
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	25-OCT-2018
Filing Date:	17-APR-2013
Time Stamp:	18:06:18
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 200
RAM confirmation Number	102618INTEFSW18070200
Deposit Account	132490
Authorized User	Jeffrey Armstrong
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37 CFR 1.19 (Document supply fees)					
37 CFR 1.20 (Post Issuance fees)					
37 CFR 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		13-0402_After_Final_Response.pdf	169985	yes	17
			113a8d782472551a3264eb65387d62dc623c16da		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Applicant Arguments/Remarks Made in an Amendment		11	17	
	Claims		2	10	
	Response After Final Action		1	1	
Warnings:					
Information:					
2	After Final Consideration Program Request	13-0402_AFCP_Request.pdf	134598	no	1
			c70d851e71aa134ebafcd3744a92ae59a69237146		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	31010	no	2
			9d66906f57420318ad96f5085336d213de45d0e4		
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Total Files Size (in bytes):			335593		

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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.

REMARKS**I. Status of the Claims**

Claims 21-46 are pending; claims 21, 29, and 37 are independent. Without conceding the merits of the rejections, and solely to advance prosecution, Applicant has added new claims 44-46 and amended claims 21, 23-24, 27-29, 37, and 39-43 to further clarify the claim language and to generally put the claims in better condition for allowance and issue. The subject matter of the amendments is supported generally throughout Applicant's originally-filed specification, including but not limited to ¶¶ 19-20, 28, 30, and 33 of Applicant's U.S. Pub. 2013/0238108. No new matter has been added. Applicant reserves the right to pursue the originally-filed and/or previously-pending claims in one or more continuation applications.

II. Summary of the Final Office Action

In the Final Office Action, the Examiner rejected claims 21-43 under § 103 based on U.S. Pat. 8,131,389 (Hardwick) and U.S. Pub. 2007/0142944 (Goldberg).

III. Response to the § 103 Rejections

The claims are patentable over the combination of Hardwick and Goldberg for at least the reasons that (i) Hardwick and Goldberg fail to teach or suggest all the elements recited in the claims and (ii) there is no motivation to combine the teachings of Hardwick and Goldberg in the manner proposed in the Office Action to practice the claimed invention.

A. Hardwick and Goldberg fail to teach or suggest the recited claim elements

With reference to independent claim 21, Hardwick and Goldberg fail to teach or suggest at least "while the first zone player and the third zone player are using the timing information to play the first audio information in synchrony with each other, the second zone player

simultaneously (i) playing second audio information while (ii) transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information” in combination with the other elements recited in the claims.

Hardwick fails to teach or suggest the above-recited combination of functions. The Office Action acknowledges, and Applicant agrees, that “Hardwick fails to expressly teach that the first audio information is transmitted to the third zone player [additional DAS]” and “transmitting timing information and using the timing information to play the first audio information in synchrony via the first and third zone players.” Office Action, p. 6. Therefore, Hardwick necessarily fails to teach or suggest “while the first zone player and the third zone player are using the timing information to play the first audio information in synchrony with each other, the second zone player simultaneously (i) playing second audio information while (ii) transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information” in combination with the other elements recited in the claims.

The addition of Goldberg fails to overcome the deficiencies of Hardwick because Goldberg also fails to teach or suggest the above-recited combination of functions. Goldberg discloses a cluster of playback devices, where one playback device is the broadcast unit and other playback devices are receive units. Goldberg, ¶ 188. The playback device functioning as the broadcast unit streams audio content and “synchronization signals” to all the other playback devices functioning as receive units so that the broadcast unit and all the receive units can all play the same audio content in synchrony with each other. Goldberg, ¶¶ 200-203. However, Goldberg does not contemplate any scenario where a broadcast unit simultaneously (i) plays one

audio stream while (ii) transmitting a different audio stream and the timing information for that different audio stream to receive units. At best, a playback device in Goldberg's cluster can switch between three states (i) a standalone state where the playback device plays audio without transmitting the audio to other devices, (ii) a broadcast unit state where the playback device plays and transmits the same audio stream to other playback devices (i.e. the receive units), and (iii) a receive unit state where the playback device plays an audio stream received from a broadcast unit. Goldberg, ¶¶ 23, 176, 267-272. Goldberg never discloses or suggests a playback device operating in some hybrid combination of the three disclosed states. Accordingly, Goldberg fails to teach or suggest "while the first zone player and the third zone player are using the timing information to play the first audio information in synchrony with each other, the second zone player simultaneously (i) playing second audio information while (ii) transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information" in combination with the other elements recited in the claims.

B. There is no motivation to modify Hardwick with Goldberg

The Office Action contends that "Hardwick and Goldberg demonstrate an ability of devices to perform more than one function at the same time," "Hardwick and Goldberg... disclose each and every claimed function," and "[t]herefore, it would have been obvious...to perform one disclosed function 'while' performing another unrelated function such as fulfil ability of the device to 'multitask,'" and that "performing these multiple functions simultaneously as recited in the claim is a mere matter of design choice." Office Action, p. 3.

Regarding the first assertion in the Office Action that "Hardwick and Goldberg demonstrate an ability of devices to perform more than one function at the same time," the fact

that Hardwick or Goldberg may disclose devices that can perform *some* functions simultaneously does not suggest that a person of skill in the art would have been motivated to modify a combination of Hardwick and Goldberg to perform the specific combination of particular functions recited in the claims in the same manner recited in the claims. Moreover, even if a device described in one reference could perhaps be modified with the teachings of a second reference, that alone is not sufficient to support the conclusion that a person of skill in the art would have been motivated to do so. *InTouch Technologies v. VGO Communications*, 751 F.3d 1327, 1352 (Fed. Cir. 2014) (reversing a finding of obviousness that was based on “conclusory references to [the expert’s] belief that one of ordinary skill in the art could combine these references, not that they would have been motivated to do so.”) (emphasis original). And contrary to second assertion in the Office Action that “Hardwick and Goldberg... disclose each and every claimed function,” Hardwick and Goldberg do not teach or suggest all the elements recited in the claims for at least the reasons explained above. Section III-A, *supra*.

Moreover, even if the Office Action’s first two assertions were true, the Office Action’s conclusion that “[t]herefore, it would have been obvious...to perform one disclosed function ‘while’ performing another unrelated function such as fulfil ability of the device to ‘multitask,’” does not logically follow from those assertions because a generic desire to “multitask” neither (i) establishes that it would have been obvious to perform the specific combination of functions recited in the claims in the specific manner recited in the claims, nor (ii) explains why a person of ordinary skill in the art would have been motivated to modify Hardwick’s DAS with the teachings of Goldberg to perform the specific functions recited in the claims in the specific manner recited in the claims.

The Office Action states, “One of ordinary skill in the art at the time of the invention would have wanted to group multiple DASs of Hardwick as belonging to the same zone in the same way disclosed by Goldberg in order to keep listening to the same music when entering a master bathroom adjacent to Room #2 without interruption while still allowing different music selection to be played in Room #1.” Office Action, p. 4. But neither Hardwick nor Goldberg describe or suggest this scenario proposed in the Office Action that the Office Action contends would have allegedly motivated persons of skill in the art to modify Hardwick and Goldberg.

Contrary to the assertions in the Office Action, a person of skill in the art would have no reason to modify Hardwick’s DAS to use Goldberg’s “synchronization signals” because Hardwick does not disclose or contemplate multiple DASs playing the same audio content in synchrony with each other. And a person of skill in the art would have no reason to modify Goldberg’s broadcast unit to simultaneously play one audio stream while transmitting a different audio stream and “synchronization signals” to receive units because a scenario where Goldberg’s broadcast unit plays audio content that is different from the audio content played by Goldberg’s receive units would be contrary to Goldberg’s stated purposes of “provid[ing] users a means of listening to music together using mobile devices,” “provid[ing] users a means of choosing with whom to listen to music,” “provid[ing] users the ability to monitor the people that are listening together,” and “provid[ing] users a means of demonstrating their identity with other people they are listening to music with,” among other social/group listening goals and objectives. Goldberg, ¶¶ 11-16 (emphasis added). The only motivation to modify Hardwick and Goldberg as proposed in the Office Action comes from the features described in Applicant’s own disclosure -- not from the prior art. And when the only motivation in the record to produce the claimed invention is based on Applicant’s own disclosure, the § 103 rejection is an exercise in impermissible

hindsight and should be withdrawn. *Ex Parte Hongwei Kong*, Appeal 2013-0092361 (PTAB, Oct. 22, 2015).

Further, and contrary to the last assertion in the Office Action, “performing these multiple functions simultaneously” is not “a mere matter of design choice” because, in at least some embodiments, performing the multiple functions simultaneously enables the system to operate in novel and non-obvious configurations that are not contemplated by either Goldberg or Hardwick, including but not necessarily limited to configurations where:

- (i) the second zone player operates as an audio information channelization device and/or master of a synchrony group comprising the first and third zone players while simultaneously playing content different than the content played by the synchrony group, as described, e.g., at ¶¶ 19-20 of U.S. Pub. 2013/0238108;
- (ii) the second zone player operates as an audio information channel device and/or master for a synchrony group comprising the first and third zone players, as described, e.g., at ¶ 28 of U.S. Pub. 2013/0238108;
- (iii) the audio information channelization device and/or master responsibilities of a synchrony group comprising the first and third zone players are migrated from one of the first or third zone players to the second zone players, as described, e.g., at ¶ 30 of U.S. Pub. 2013/0238108; and/or
- (iv) the second zone player operates as an audio information channelization device and/or master of a synchrony group comprising the first and third zone players while simultaneously operating as a master or slave of another synchrony group, as described, e.g., at ¶ 33 of U.S. Pub. 2013/0238108.

Without the ability to perform the function of “while the first zone player and the third zone player are using the timing information to play the first audio information in synchrony with each other, the second zone player simultaneously (i) playing second audio information while (ii) transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information” in combination with the other elements recited in the claims, many aspects of the novel and non-obvious network configurations described above would not be possible, and

thus, performing these multiple functions simultaneously as recited in the claim cannot be considered mere matter of design choice.

C. The claims are patentable over Hardwick and Goldberg

Therefore, in view of the foregoing, independent claim 21 is patentable over the combination of Hardwick and Goldberg. Independent claims 29 and 37 recite similar elements, and thus, independent claims 29 and 37 are likewise patentable over the combination of Hardwick and Goldberg for reasons similar to those articulated herein for claim 21. Further, and without conceding the merits of the other assertions in the Office Action, the pending dependent claims are patentable over the combination of Hardwick and Goldberg for at least the reason that they depend from patentable independent claims.

IV. Conclusion

Applicant submits that the pending claims are patentable, and Applicant requests a Notice of Allowance. If further discussion would advance the application to allowance and issue, the Examiner is invited to telephone the undersigned at 312-913-0001.

Respectfully submitted,
McDonnell Boehnen Hulbert & Berghoff LLP

Date: October 25, 2018

By: /Jeffrey P. Armstrong/
Jeffrey P. Armstrong
Reg. No. 54,967

CLAIMS

1-20. (Canceled)

21. (Currently Amended) In a network comprising a first zone player, a second zone player, and a third zone player, a method comprising:

the second zone player transmitting first audio information and timing information to the first zone player and the third zone player ~~via the second zone player~~ over the network, wherein the network comprises at least one of a local area network and a wide area network;

the first zone player and the third zone player receiving the first audio information and the timing information from the second zone player and using the timing information to play the first audio information in synchrony with each other ~~via the first zone player and the third zone player~~; and

while the first zone player and the third zone player are using the timing information to play the first audio information in synchrony with each other, the second zone player simultaneously (i) playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is while (ii) transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information.

22. (Previously Presented) The method of claim 21 wherein the second audio information comprises an audio track.

23. (Currently Amended) The method of claim 21 wherein the timing information comprises first timing information, and wherein the second zone player playing the second audio

information comprises the second zone player using second timing information to play the second audio information, wherein the second timing information is different from the first timing information.

24. (Currently Amended) The method of claim 21 wherein the timing information comprises first timing information, and wherein the second zone player playing the second audio information comprises the second zone player using the first timing information to play the second audio information, wherein the first timing information comprises clock timing information of the second zone player.

25. (Previously Presented) The method of claim 21 wherein the timing information comprises at least one of playback timing information and clock timing information.

26. (Previously Presented) The method of claim 21 wherein the timing information comprises clock timing information.

27. (Currently Amended) The method of claim 21 wherein the method further comprises:

the second zone player receiving audio information from an audio information source that is connected to the second zone player; and

the second zone player converting the audio information received from the audio information source into the first audio information ~~via the second zone player~~ prior to transmitting the first audio information and the timing information to the first zone player and the third zone player.

28. (Currently Amended) The method of claim 27, wherein the audio information source is directly connected to the second zone player, wherein the audio information received from the audio information source comprises analog audio information, and wherein the second zone player converting comprising the audio information received from the audio information source into the first audio information comprises the second zone player converting the analog audio information into digital audio information.

29. (Currently Amended) A system comprising a first zone player, a second zone player, and a third zone player, wherein the first zone player, the second zone player, and the third zone player each comprise at least one processor and tangible non-transitory computer-readable memory comprising instructions that, when executed, cause the system to perform functions comprising:

the second zone player transmitting first audio information and timing information to the first zone player and the third zone player over a network, wherein the network comprises at least one of a local area network and a wide area network;

the first zone player and the third zone player using the timing information to play the first audio information in synchrony with each other; and

while the first zone player and the third zone player are using the timing information to play the first audio information in synchrony with each other, the second zone player simultaneously (i) playing second audio information while (i) the first zone player and the third zone player play the second audio information in synchrony with each other and (ii) the second zone player transmits (ii) transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information.

30. (Previously Presented) The system of claim 29 wherein the second audio information comprises an audio track.

31. (Previously Presented) The system of claim 29 wherein the timing information comprises first timing information, and wherein the second zone player playing the second audio information comprises the second zone player using second timing information to play the second audio information, wherein the second timing information is different from the first timing information.

32. (Previously Presented) The system of claim 29 wherein the timing information comprises first timing information, wherein the second zone player playing the second audio information comprises the second zone player playing the second audio information based on the first timing information, wherein the first timing information comprises clock timing information.

33. (Previously Presented) The system of claim 29 wherein the timing information comprises at least one of playback timing and clock timing information.

34. (Previously Presented) The system of claim 29 wherein the timing information comprises clock timing information.

35. (Previously Presented) The system of claim 29 wherein the functions further comprise:

the second zone player receiving audio information from an audio information source that is connected to the second zone player; and

the second zone player converting the audio information received from the audio information source into the first audio information prior to transmitting the first audio information and the timing information to the first zone player and the third zone player.

36. (Previously Presented) The system of claim 35, wherein the audio information source is directly connected to the second zone player, wherein the audio information received by the second zone player from the audio information source comprises analog audio information, and wherein the second zone player converting the audio information received from the audio information source into the first audio information comprises the second zone player converting the analog audio information into digital audio information.

37. (Currently Amended) A tangible, non-transitory computer-readable medium having instructions stored thereon that when executed cause a first zone player to perform functions comprising:

transmitting first audio information and timing information to each of a second zone player and a third zone player over at least one of a local area network and a wide area network;

causing the second zone player and the third zone player to use the timing information to play the first audio information in synchrony with each other; and

while the second zone player and the third zone player are using the timing information to play the first audio information in synchrony with each other, the first zone player simultaneously (i) playing second audio information while (i) the second zone player and the third zone player are synchronously playing the first audio information and (ii) the first zone player is (ii) transmitting the first audio information and the timing information to the second

zone player and the third zone player, wherein the second audio information is different from the first audio information.

38. (Previously Presented) The tangible, non-transitory computer readable medium of claim 37 wherein the second audio information comprises an audio track.

39. (Currently Amended) The tangible, non-transitory computer readable medium of claim 37 wherein the timing information comprises first timing information, and wherein the first zone player playing the second audio information comprises the first zone player using second timing information to play the second audio information, wherein the second timing information is different from the first timing information.

40. (Currently Amended) The tangible, non-transitory computer readable medium of claim 37 wherein the timing information comprises first timing information, wherein the first zone player playing the second audio information comprises the first zone player using the first timing information to play the second audio information wherein the first timing information comprises clock timing information.

41. (Currently Amended) The method of claim 21, wherein the timing information comprises first timing information, and wherein the method further comprises:

the second zone player receiving second timing information from a fourth zone player, and wherein the second zone player playing the second audio information ~~via the second zone player~~ while (i) the first zone player and the third zone player are ~~synchronously~~ playing the first audio information in synchrony with each other and (ii) the second zone player is transmitting the first audio information and the first timing information to the first zone player and the third

zone player comprises the second zone player using the second timing information to play the second audio information in synchrony with the fourth zone player.

42. (Currently Amended) The method of claim 21, wherein the timing information comprises first timing information, and wherein the method further comprises:

the second zone player receiving the second audio information and the second timing information from a fourth zone player, and wherein the second zone player playing the second audio information ~~via the second zone player~~ while (i) the first zone player and the third zone player are ~~synchronously~~ playing the first audio information in synchrony with each other and (ii) the second zone player is transmitting the first audio information and the first timing information to the first zone player and the third zone player comprises the second zone player using the second timing information to play the second audio information in synchrony with the fourth zone player.

43. (Currently Amended) The method of claim 21, wherein the timing information comprises first timing information, and wherein the method further comprises:

the second zone player transmitting the second audio information and second timing information to a fourth zone player, and wherein the second zone player playing second audio information ~~via the second zone player~~ while (i) the first zone player and the third zone player are ~~synchronously~~ playing the first audio information in synchrony with each other and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player comprises the second zone player using the second timing information to play the second audio information in synchrony with the fourth zone player.

44. (New) The method of claim 21, wherein the timing information comprises playback timing information and clock timing information, and wherein the first zone player and the third zone player using the timing information to play the first audio information in synchrony with each other comprises:

the first zone player using the clock timing information to determine a time difference comprising a difference between a clock at the first zone player and a clock at the second player, and using the playback timing information and the time difference to play the first audio information in synchrony with the third zone player.

45. (New) The system of claim 29, wherein the timing information comprises playback timing information and clock timing information, and wherein the first zone player and the third zone player using the timing information to play the first audio information in synchrony with each other comprises:

the first zone player using the clock timing information to determine a time difference comprising a difference between a clock at the first zone player and a clock at the second player, and using the playback timing information and the time difference to play the first audio information in synchrony with the third zone player.

46. (New) The tangible, non-transitory computer-readable medium of claim 37, wherein the timing information comprises playback timing information and clock timing information, and wherein the first zone player and the third zone player using the timing information to play the first audio information in synchrony with each other comprises:

the first zone player using the clock timing information to determine a time difference comprising a difference between a clock at the first zone player and a clock at the second player,

and using the playback timing information and the time difference to play the first audio information in synchrony with the third zone player.

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 13/864,249		Filing Date 04/17/2013		☐ To be Mailed	
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO									
APPLICATION AS FILED – PART I									
(Column 1)		(Column 2)							
FOR		NUMBER FILED		NUMBER EXTRA		RATE (\$)		FEE (\$)	
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A		N/A		N/A			
☐ SEARCH FEE (37 CFR 1.16(k), (j), or (m))		N/A		N/A		N/A			
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A		N/A		N/A			
TOTAL CLAIMS (37 CFR 1.16(j))		minus 20 =		*		X \$		=	
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =		*		X \$		=	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$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).							
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL			
APPLICATION AS AMENDED – PART II									
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT	10/25/2018	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 26	Minus	** 23	= 3	x \$100 =		300	
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0	x \$460 =		0	
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						TOTAL ADD'L FEE		300	
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	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			
<p>* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.</p>									

LIE
NICOLE NICHOLSON

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806
107361 7590 07/11/2018 McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606			EXAMINER SURVILLO, OLEG	
			ART UNIT 2442	PAPER NUMBER
			MAIL DATE 07/11/2018	DELIVERY MODE PAPER

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

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

Office Action Summary	Application No. 13/864,249	Applicant(s) MILLINGTON, NICHOLAS A. J.	
	Examiner OLEG SURVILLO	Art Unit 2442	AIA (First Inventor to File) Status No

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1) ☒ Responsive to communication(s) filed on March 13, 2018.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.

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

3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.

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

Disposition of Claims*

5) ☒ Claim(s) 21-43 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.

6) ☐ Claim(s) ____ is/are allowed.

7) ☒ Claim(s) 21-43 is/are rejected.

8) ☐ Claim(s) ____ is/are objected to.

9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, 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.

Application Papers

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

11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

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

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)).

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

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date 03/30/18.

3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.

4) ☐ Other: ____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Response to Amendment

1. Claims 21-43 are pending in the application. Claims 21, 23, 24, 27, 29, 31, 32, 35-37, 39, and 40 are currently amended. Claims 1-20 have been canceled. Claims 41-43 are new.

Response to Arguments

2. With regard to Applicant's remarks dated March 13, 2018:

Regarding the rejection of claims 24, 29-36, and 40 under 35 U.S.C. 112, second paragraph, Applicant's amendment and arguments have been fully considered and are sufficient. Therefore, the rejection has been withdrawn.

Regarding the rejection of claims 21-40 under 35 U.S.C. 103(a), Applicant's amendment and arguments have been fully considered.

Applicants argue at pages 11-13 of the Remarks as filed that "*A. The rejection fails to consider the invention as a whole*". In particular, Applicants argue that "*it is legally improper to consider the features of (i) and (ii) in isolation from the feature of "playing second audio information" because under the express claim language, the second playback device performs features (i) and (ii) **while** "playing second audio information"*". Examiner disagrees. Playing second audio information via the second zone player is a separate and independent function from features (i) and (ii). There is

nothing in the claim or the specification that would suggest linkage between playback of the second audio information and features (i) and (ii). Therefore, the specific timing argued by Applicants, i.e., "while" is nothing but coincidental and merely demonstrates an ability of the second zone player to perform "multitasking", that is, performing two unrelated functions at the same time. Teachings of Hardwick and Goldberg demonstrate an ability of devices to perform more than one function at the same time. Teachings of Hardwick and Goldberg also disclose each and every claimed function. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to perform one disclosed function "while" performing another unrelated function such as fulfil ability of the device to "multitask". Applicants further argue that *"without the ability to perform the function of "playing second audio information via the second zone player while (i) ... and (ii) ..." many aspects of the novel and non-obvious network configurations described above would not be possible, and thus, performing these multiple functions simultaneously in the claim cannot be considered mere matter of design choice"*. Examiner disagrees. Applicants failed to show any aspects of the network configurations that would not be possible if playing second audio information via the second zone player was to be performed **before or after** claimed features (i) and (ii). It appears that the claimed invention would function equally well when playing second audio information does not overlap (is not while) execution of features (i) and (ii). Therefore, Examiner maintains that performing these multiple functions simultaneously as recited in the claim is a mere matter of design choice.

Applicants argue at pages 13-15 of the Remarks as filed that *"B. Hardwick and Goldberg fail to teach or suggest all the recited claim elements"*. In particular, Applicants argue that Hardwick fails to teach the "while" aspect of the claimed invention. Examiner disagrees. Hardwick clearly discloses performing **simultaneous** playback of different audio selections, thus satisfying claimed playing second audio information via the second zone player **while** the first zone player is playing the first audio information. Therefore, Applicant's argument cannot be held as persuasive. Applicants also argue that Goldberg fails to teach the "while" aspect of the claimed invention. However, Goldberg was not relied on to teach this feature, although, playback devices of Goldberg are fully capable of multitasking.

Applicants argue at pages 15-17 of the Remarks as filed that *"C. The rejection is based on impermissible hindsight reasoning"*. In particular, Applicants argue that *"because Hardwick does not address or even contemplate synchronous playback, a person of skill in the art at the time of the invention would have had no reason to look to Goldberg for modifying Hardwick's DASs to add synchronous playback features without using Applicant's claims as a roadmap"*. Examiner disagrees. Hardwick discloses a multi-zone system and having multiple DASs. One of ordinary skill in the art at the time of the invention would have wanted to group multiple DASs of Hardwick as belonging to the same zone in the same way disclosed by Goldberg in order to keep listening to the same music when entering a master bathroom adjacent to Room #2 without interruption while still allowing different music selection to be played in Room #1. At the time of the invention, playing music in synchrony by multiple devices was known. Therefore, desire

to synchronize multiple devices in Hardwick for play back of the same music was expected. Applicants are advised to further specify in the claims how the synchronization is accomplished, which is the gist of Applicant's disclosed invention.

As to any arguments not specifically addressed they are the same as those discussed above.

Claim Rejections - 35 USC § 103

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

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

3. Claims 21-43 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Hardwick et al. (US Patent 8,131,389 B1) in view of Goldberg et al. (US 2007/0142944 A1).

As to claim 21, Hardwick teaches in a network comprising a first zone player [DAS#2 410 with connected amplifier 425 and speakers 430], a second zone player [DAS#1 405 with connected amplified speakers 420 and CD changer 415], and a third zone player [Hardwick envisions having multiple DASs besides the two depicted in Fig. 4] (col. 12 line 63 - col. 13 line 6), a method comprising:

transmitting first audio information to the first zone player via the second zone player over the network, wherein the network comprises at least one of a local area

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network and a wide area network [DAS 405 and DAS 410 are connected via an Ethernet network] (col. 14 lines 39-60, Fig. 4);

playing the first audio information via the first zone player [DAS 410 performs read and playback of the music stored in the main server DAS 405] (col. 14 lines 50-60); and

playing second audio information via the second zone player while (i) the first zone player is playing the first audio information and (ii) the second zone player is transmitting the first audio information to the first zone player, wherein the second audio information is different from the first audio information [multi-zone feature that allows different music selections to be simultaneously played in different rooms] (col. 11 lines 44-63, col. 12 line 63 to col. 13 line 6).

While Hardwick anticipates having more than two DASs [diskless DAS may read and play one selection of music from the server while other DASs on the LAN are simultaneously playing other selections] (col. 12 line 63 - col. 13 line 6), Hardwick fails to expressly teach that the first audio information is transmitted to the third zone player [additional DAS]. Hardwick also fails to teach transmitting timing information and using the timing information to play the first audio information in synchrony via the first and third zone players.

However, a concept of synchronously playing an audio information by multiple devices has been well known in the art at the time of the invention. In particular, Goldberg, in the same field of music playback, teaches a first zone player and a third

zone player forming a first zone [sub-cluster 701] (Figs. 9A, 33) and a second zone player [broadcast unit 710] (Figs. 9A, 33). In particular, Goldberg teaches:

transmitting first audio information (par. [0254]) and timing information [synchronization signal] to the first zone player and the third zone player via the second zone player over a network (step 1902, Fig. 34A, par. [0200]-[0202]); and

using the timing information to play the first audio information in synchrony via the first zone player and the third zone player (par. [0200]-[0202]).

It would have been obvious to one of ordinary skill the art at the time of the invention to modify the system of Hardwick to have two of the multiple DASs grouped together in one zone and synchronously play the first audio information based on the timing information while another DAS is playing the second audio information in another zone in order to allow the user of Hardwick to keep listening to the same music when entering a master bathroom adjacent to Room #2 without interruption while still allowing different music selection to be played in Room #1 (col. 11 lines 44-63 in Hardwick).

As to claim 22, Hardwick teaches that the second audio information comprises an audio track (col. 11 lines 44-63).

As to claim 23, Hardwick in view of Goldberg teaches that the timing information comprises first timing information (as discussed per claim 21), and wherein playing the second audio information comprises using second timing information to play the second audio information, wherein the second timing information is different from the first timing

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information [it is noted that “second timing information” is undefined and thus is interpreted broadly as any information that is different from the first timing information, such as internal time counter in Hardwick] (col. 27 lines 25-46 in Hardwick).

As to claim 24, Hardwick in view of Goldberg teaches that the timing information comprises first timing information (as discussed per claim 21), and wherein playing the second audio information comprises using the first timing information to play the second audio information, wherein the first timing information comprises clock timing information of the second zone player [it is noted that “clock timing information” is undefined and thus is interpreted broadly as any information that is somehow related to clock timing, such as internal time counter in Hardwick] (col. 27 lines 25-46 in Hardwick).

As to claim 25, Hardwick in view of Goldberg teaches that the timing information comprises playback timing information (step 1902, Fig. 34A, par. [0200]-[0202] in Goldberg).

As to claim 26, Hardwick in view of Goldberg teaches that the timing information comprising clock timing information [it is noted that “clock timing information” is undefined and thus is interpreted broadly as any information that is somehow related to clock timing, such as internal time counter in Hardwick] (col. 27 lines 25-46 in Hardwick).

As to claim 27, Hardwick in view of Goldberg teaches receiving audio information from an audio information source that is connected to the second zone player (col. 14 lines 39-49 in Hardwick); and

converting the audio information received from the audio information source in the first audio information via the second zone player prior to transmitting the first audio information and the timing information to the first zone player and the third zone player (col. 10 line 64 to col. 11 line 16 in Hardwick).

As to claim 28, Hardwick in view of Goldberg teaches that the audio information source is directly connected to the second zone player, wherein the audio information received from the audio information source comprises analog audio information (col. 14 lines 39-49 in Hardwick), and wherein the converting comprising converting the analog audio information into digital audio information (col. 10 line 64 to col. 11 line 16 in Hardwick).

As to claim 29, Hardwick in view of Goldberg teaches a system comprising a first zone player, a second zone player, and a third zone player, each comprising at least one processor and tangible non-transitory computer-readable memory comprising instructions (Figs. 3 and 4 in Hardwick) that, when executed, cause the corresponding first, second, and third zone players to perform operations as discussed per claim 21 above.

As to claims 30-36, Hardwick in view of Goldberg teaches all the elements as discussed per corresponding claims 22-28 above.

As to claim 37, Hardwick in view of Goldberg teaches a tangible, non-transitory computer-readable medium having instructions stored thereon [inventions of Hardwick and Goldberg are computer implemented] that when executed cause a first zone player [DAS#1 405 in Hardwick] to perform the method steps as discussed per claim 21 above.

As to claims 38-40, Hardwick in view of Goldberg teaches all the elements as discussed per claims 22-24 above.

As to claim 41, Hardwick in view of Goldberg teaches the second zone player receiving second timing information [synchronization signal] from a fourth zone player (step 1902, Fig. 34A, par. [0200]-[0202] in Goldberg) and the second zone player using the second timing information to play the second audio information in synchrony with the fourth zone player (par. [0200]-[0202] in Goldberg).

As to claim 42, Hardwick in view of Goldberg teaches the second zone player receiving the second audio information (par. [0254] in Goldberg) and second timing information [synchronization signal] from a fourth zone player (step 1902, Fig. 34A, par. [0200]-[0202] in Goldberg) and the second zone player using the second timing

information to play the second audio information in synchrony with the fourth zone player (par. [0200]-[0202] in Goldberg).

As to claim 43, Hardwick in view of Goldberg teaches the second zone player transmitting the second audio information (par. [0254] in Goldberg) and second timing information [synchronization signal] to a fourth zone player (step 1902, Fig. 34A, par. [0200]-[0202] in Goldberg) and the second zone player using the second timing information to play the second audio information in synchrony with the fourth zone player (par. [0200]-[0202] in Goldberg).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to OLEG SURVILLO whose telephone number is

(571)272-9691. The examiner can normally be reached on Monday-Thursday 10:00am - 8:30pm EST.

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, Glenton B. Burgess can be reached on 571-272-3949. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/OLEG SURVILLO/
Primary Examiner, Art Unit 2442

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S669	1	"20150016626"	US-PGPUB; USPAT	OR	ON	2018/06/21 13:13
S670	57292828	@ad< "20040401" or @rlad< "20040401"	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2018/06/21 13:38
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S672	39	S670 and determin\$3 adj3 whether near8 (file or content or audio or song) with (local\$3) and request\$3 near4 (remote or second or another) near2 (device or player or peer) with (file or content or audio or song)	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2018/06/21 13:43
S673	8	S670 and generat\$3 near4 (playback or play adj back) adj1 (time or timing) same audio same frame not millington.in.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2018/06/21 13:43
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S676	484	sonos.as. and zone with (audio or sound) and (synchrony or synchroniz\$3 or synchronization) near4 (audio or sound or playback)	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2018/06/21 13:44
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S681	53	zone adj player and volume near3 (control or controlling or controlled or adjust\$3).clm.	US-PGPUB; USPAT	OR	ON	2018/06/21 16:58
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"20090171487"	"8364296"	
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"20090097818"	"8880648"	
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S686	6	S684 and S685	US- PGPUB; USPAT	OR	OFF	2018/06/21 17:20
S687	265	S684 or S685	US- PGPUB; USPAT	OR	OFF	2018/06/21 17:20
S688	21	S687 and (playlist or play adj list) near3 (temporary or dynamic or dynamically)	US- PGPUB; USPAT	OR	OFF	2018/06/21 17:21
S689	24313706	@ad<"20130529" or @rlad<"20130529"	US- PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/21 20:00
S690	33104	S689 and maintain\$3 near4 ((playback or play adj back) near2 queue) or (playlist or play adj list)	US- PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/21 20:02
S691	8048	S689 and maintain\$3 near4 ((playback or play adj back) near2 queue) or (playlist or play adj list) with (control or controlling or controlled)	US- PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/21 20:02
S692	61	S689 and maintain\$3 near4 ((playback or play adj back) near2 queue) or (playlist or play adj list) with (control or controlling or controlled) near3 (migrate or migration or migrated or relinquish\$3)	US- PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/21 20:03
S693	45	S689 and (maintain\$3 near4 ((playback or play adj back) near2 queue) or (playlist or play adj list) with (control or controlling or controlled) near3 (migrate or migration or migrated or relinquish\$3))	US- PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/21 20:09
S694	52	S689 and ((distribut\$3) near3 (playlist or play adj list or queue) and (control or controlling or controlled) near3 (migrate or migration or migrated or relinquish\$3))	US- PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/21 20:14
S695	0	S689 and ((distribut\$3) near3 (playlist or play adj list or queue near4 (playback or play\$3 adj1 back)) and (control or controlling or controlled) near3 (migrate or migration or migrated or relinquish\$3))	US- PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/21 20:16
S696	609	S689 and ((distribut\$3) near3 (playlist or play adj list or queue near4 (playback or play\$3 adj1 back)))	US- PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/21 20:16
S697	87	S689 and ((distribut\$3) near3	US-	OR	ON	2018/06/21

		(playlist or play adj list or queue near4 (playback or play\$3 adj1 back)) and maintain\$3 near2 (playlist or play adj list or queue near4 (playback or play\$3 adj1 back)))	PGPUB; USPAT; EPO; JPO			20:17
S698	65	S689 and ((distribut\$3 or maintain\$3 or shar\$3) near3 (playlist or play adj list or queue near4 (playback or play\$3 adj1 back)) same (migrat\$3 or switch\$4 or relinquish\$3))	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/21 20:27
S699	1	S689 and ((distribut\$3 or maintain\$3 or shar\$3) near3 (playlist or play adj list or queue near4 (playback or play\$3 adj1 back)) same (migrat\$3 or relinquish\$3))	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/21 20:48
S700	3126	S689 and ((distribut\$3 or maintain\$3 or shar\$3) near3 (playlist or play adj list or queue near4 (playback or play\$3 adj1 back)))	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/21 20:48
S701	1889	S689 and ((shar\$3) near3 (playlist or play adj list or queue near4 (playback or play\$3 adj1 back)))	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/21 20:50
S702	1730	S689 and ((shar\$3) near3 (playlist or play adj list or queue near4 (playback or play\$3 adj1 back))) not sonos.as.	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/21 20:50
S703	31	S689 and ((shar\$3) near3 (playlist or play adj list or queue near4 (playback or play\$3 adj1 back)) with (peer or p2p))	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/21 20:52
S704	24313706	@ad< "20130529" or @rlad< "20130529"	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/22 15:09
S705	16	S704 and (relinquish\$3 near4 control or migrat\$3 or chang\$3 near3 group\$3) with (playback or playing adj back) with (adjust\$3 or paus\$3 or mut\$3)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/22 15:17
S706	11	S704 and (connection near3 (loss or lost or drop or dropped or interrupt\$4)) with (playback or playing adj back) with (paus\$3 or mut\$3)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/22 15:38
S707	763	S704 and (loss or lost or drop or dropped or interrupt\$4 or separat\$3 or leav\$3 or migrat\$3 or relinquish\$3) with (playback or playing adj back) with (paus\$3)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/22 15:45
S708	421	S704 and (loss or lost or drop or dropped or interrupt\$4 or separat\$3 or leav\$3 or migrat\$3 or relinquish\$3) with (playback or playing adj back) near3 (paus\$3)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/22 15:45
S709	164	S704 and (loss or lost or drop or dropped or interrupt\$4 or separat\$3 or leav\$3 or migrat\$3 or relinquish\$3) near4 (playback or playing adj back) near3 (paus\$3)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/22 15:45

S710	61	S704 and (loss or lost or drop or dropped or separat\$3 or leav\$3 or migrat\$3 or relinquish\$3) near4 (playback or playing adj back) near3 (paus\$3)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/22 15:52
S711	744	S704 and ((loss or lost or drop or dropped) near2 (connection or communication) or leav\$3 or migrat\$3 or relinquish\$3) near4 (paus\$3)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/22 15:56
S712	0	S704 and ((loss or lost or drop or dropped) near2 (connection or communication)) near4 (paus\$3) near2 (playback or playing or output or stream\$3)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/22 16:02
S713	0	S704 and ((loss or lost or drop or dropped) near2 (connection or communication)) near5 (paus\$3) near2 (playback or playing or output or stream\$3)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2018/06/22 16:03
S714	0	S704 and ((loss or lost or drop or dropped) near2 (connection or communication)) near5 (paus\$3) near2 (playback or playing or output or stream\$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2018/06/22 16:03
S715	0	((loss or lost or drop or dropped) near2 (connection or communication)) near5 (paus\$3) near2 (playback or playing or output or stream\$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2018/06/22 16:03
S716	6	((loss or lost or drop or dropped) near2 (connection or communication)) near5 (adjust\$3) near2 (playback or playing or output or stream\$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2018/06/22 16:04
S717	4	S704 and ((loss or lost or drop or dropped) near2 (connection or communication)) with (paus\$3) near2 (playback or playing or output or stream\$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2018/06/22 16:04
S718	121	S704 and ((loss or lost or drop or dropped)) with (paus\$3) near2 (playback or playing or output)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2018/06/22 16:05
S719	93	S704 and ((loss or lost or dropped)) with (paus\$3) near2 (playback or playing or output)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2018/06/22 16:06
S720	8	S704 and migrat\$3 with (paus\$3) near2 (playback or playing or output)	US-PGPUB; USPAT; FPRS;	OR	ON	2018/06/22 16:08

			EPO; JPO; DERWENT			
S721	1	S704 and (switchover or failover) with (paus\$3) near2 (playback or playing or output)	US- PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2018/06/22 16:09
S722	0	S704 and (pause or pausing or paused) near2 (playback or playing or output) near3 (media or audio or sound or song) with reconfigur\$3	US- PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2018/06/22 16:11
S723	21	S704 and (pause or pausing or paused) near2 (playback or playing or output) near3 (media or audio or sound or song) with condition	US- PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2018/06/22 16:12
S724	57292828	@ad< "20040401" or @rlad< "20040401"	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2018/06/23 19:09
S725	15	sonos.as. and player with volume.clm.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2018/06/23 19:10
S726	0	S724 and player with volume near3 (control or controlling or controlled or adjust\$3) with (slave or other or peer) near3 (player or device)	US- PGPUB; USPAT	OR	ON	2018/06/23 19:11
S727	103	S724 and volume near3 (control or controlling or controlled or adjust\$3) with (slave or other or peer) near3 (player or device)	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2018/06/23 19:12
S728	28	S724 and volume near3 (control or controlling or controlled or adjust\$3) with (slave or other or peer) near3 (player or device) not millington.in.	US- PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2018/06/23 19:13
S730	1	zone adj player and (difference or differential) with adjust\$3 near4 clock.clm.	US- PGPUB; USPAT	OR	ON	2018/06/23 22:44
S731	22	zone adj player and (difference or differential) with clock.clm.	US- PGPUB; USPAT	OR	ON	2018/06/23 22:45
S732	19	zone adj player and (difference or differential) near6 clock.clm.	US- PGPUB; USPAT	OR	ON	2018/06/23 22:45
S733	1	zone adj player and (difference or differential) with rate near4 clock.clm.	US- PGPUB; USPAT	OR	ON	2018/06/23 22:46
S734	1	"8234395".pn.	US- PGPUB; USPAT	OR	ON	2018/06/23 22:54

S735	15125945	@ad< "20040401" or @rlad< "20040401"	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/06/23 23:31
S736	26	S735 and adjust\$3 near3 converter adj2 clock	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/06/23 23:39
S737	25	S735 and adjust\$3 near3 converter adj2 clock not millington.in.	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/06/23 23:39
S740	0	S735 and adjust\$3 near3 converter adj2 clock same playback not millington.in.	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/06/23 23:44
S741	0	S735 and adjust\$3 near3 converter adj2 clock same play\$3 not millington.in.	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/06/23 23:44
S742	7	S735 and adjust\$3 near3 rate adj3 clock same play\$3 not millington.in.	US- PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/06/23 23:50
S745	1	"20130238108"	US- PGPUB; USPAT	OR	ON	2018/07/09 10:00
S746	126	(US-20070142944-\$ or US- 20020062406-\$ or US-20040252400- \$ or US-20040078383-\$ or US- 20140173432-\$ or US-20140181270- \$ or US-20140181173-\$ or US- 20070299778-\$ or US-20020194309- \$ or US-20030073432-\$ or US- 20120192071-\$ or US-20040019497- \$ or US-20130231765-\$ or US- 20120191232-\$ or US-20070249295- \$ or US-20040093096-\$ or US- 20040143852-\$ or US-20050011388- \$ or US-20030110329-\$ or US- 20030061428-\$ or US-20040143368- \$ or US-20020177411-\$ or US- 20050027821-\$ or US-20020173273- \$ or US-20050062637-\$ or US- 20040098754-\$).did. or (US- 20040213230-\$ or US-20040228367- \$ or US-20130097506-\$ or US- 20030018797-\$ or US-20040208158- \$ or US-20020114354-\$ or US- 20020080783-\$ or US-20060098936- \$ or US-20030200001-\$ or US- 20030198257-\$ or US-20030198255- \$ or US-20030198254-\$ or US- 20020124097-\$ or US-20100299639- \$ or US-20070043847-\$ or US- 20040248601-\$ or US-20030035072-	US- PGPUB; USPAT	OR	OFF	2018/07/09 10:31

		\$ or US-20020114359-\$ or US-20040048569-\$ or US-20030023741-\$ or US-20040224638-\$ or US-20040012620-\$ or US-20050166135-\$ or US-20050015551-\$ or US-20010047377-\$ or US-20020159596-\$ or US-20030219007-\$).did. or (US-20040141576-\$ or US-20050125222-\$ or US-20140075311-\$ or US-20020067909-\$ or US-20040058706-\$ or US-20040032421-\$ or US-20070155313-\$ or US-20020131398-\$ or US-20060161742-\$ or US-20030063528-\$ or US-20130268104-\$ or US-20030123853-\$ or US-20020035621-\$ or US-20050146444-\$ or US-20040117491-\$ or US-20030050058-\$ or US-20020194260-\$ or US-20030182254-\$ or US-20020150053-\$ or US-20060049966-\$ or US-20030118158-\$ or US-20140181199-\$ or US-20140177875-\$ or US-20140052770-\$ or US-20130290419-\$ or US-20060041577-\$ or US-20080157991-\$).did. or (US-20030210347-\$ or US-20050102699-\$).did. or (US-6598172-\$ or US-6255961-\$ or US-7571014-\$ or US-7711774-\$ or US-6816818-\$ or US-5923869-\$ or US-6687664-\$ or US-5726989-\$ or US-6970482-\$ or US-7130368-\$ or US-6343028-\$ or US-6526325-\$ or US-6108485-\$ or US-8234395-\$ or US-6778493-\$ or US-8588949-\$ or US-7206367-\$ or US-7702403-\$ or US-7068596-\$ or US-6823225-\$ or US-6122668-\$ or US-8611559-\$ or US-8218790-\$ or US-7672470-\$ or US-7319764-\$ or US-7257398-\$).did. or (US-5596696-\$ or US-5198603-\$ or US-7945143-\$ or US-6917592-\$ or US-8483853-\$ or US-7710941-\$ or US-6032202-\$ or US-6611537-\$ or US-7006758-\$ or US-5838909-\$ or US-8131389-\$ or US-6446080-\$ or US-6526411-\$ or US-7167765-\$ or US-6639584-\$ or US-7756743-\$ or US-5732059-\$ or US-6910078-\$).did.				
S747	1	S746 and hardwick.in.	US-PGPUB; USPAT	OR	OFF	2018/07/09 10:32
S748	2	S746 and goldberg.in.	US-PGPUB; USPAT	OR	OFF	2018/07/09 10:49

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S677	25	zone and clocked.clm. and (first or analog or local) near4 source.clm.	US-PGPUB	OR	ON	2018/06/21 13:45

EAST Search History

S678	4	zone and clocked.clm. and (first or analog or local) near4 source.clm. same (network\$3 near5 source).clm.	US-PGPUB	OR	ON	2018/06/21 13:46
S679	7	player and clocked.clm. and (first or analog or local) near4 source.clm. same (network\$3 near5 source).clm.	US-PGPUB	OR	ON	2018/06/21 13:47
S729	8	(volume near3 (control or controlling or controlled or adjust\$3) with (slave or other or peer) near3 (player or device)).clm.	US-PGPUB	OR	ON	2018/06/23 19:41
S743	0	(adjust\$3 near3 rate adj3 clock same play\$3).clm.	US-PGPUB	OR	ON	2018/06/23 23:53
S744	0	(adjust\$3 near3 converter adj2 clock same play\$3).clm.	US-PGPUB	OR	ON	2018/06/23 23:53

7/9/2018 12:02:47 PM

C:\Users\osurvillo\Documents\EAST\Workspaces\14186850.wsp

dated 03/30/2018

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)

Approved for use through 07/31/2016. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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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	7106224		2006-09-12	KNAPP; David J. et al.	
	2	8234305		2012-07-31	SELIGMANN; Doree Duncan et al.	
	3	8275910		2012-09-25	HAUCK; Jerrold V.	
	4	8689036		2014-04-01	MILLINGTON; Nicholas A.J. et al.	
	5	8938637		2015-01-20	MILLINGTON; Nicholas A.J. et al.	
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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	20040032922		2004-02-19	KNAPP; David J. et al.	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

	2	20040143675		2004-07-22	AUST; Andreas Matthias	
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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	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
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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	Advisory Action mailed on 10 January 2018, issued in connection with U.S. Patent Application No. 13/871785, filed on 26 April 2013, 3 pages	
	2	Final Office Action mailed on 1 March 2018, issued in connection with U.S. Patent Application No. 13/705176, filed on 5 December 2012, 16 pages	
	3	Final Office Action mailed on 15 February 2018, issued in connection with U.S. Patent Application No. 14/516883, filed on 17 October 2014, 17 pages	
	4	Final Office Action mailed on 16 March 2018, issued in connection with U.S. Patent Application No. 90/013959, filed on 16 June 2017, 39 pages	
	5	Non-Final Office Action mailed on 10 January 2018, issued in connection with U.S. Patent Application No. 13/848932, filed on 22 March 2013, 18 pages	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

6	Non-Final Office Action mailed on 14 December 2017, issued in connection with U.S. Patent Application No. 15/081911, filed on 27 March 2016, 17 pages
7	Non-Final Office Action mailed on 14 November 2017, issued in connection with U.S. Patent Application No. 13/864252, filed on 17 April 2013, 11 pages
8	Non-Final Office Action mailed on 15 November 2017, issued in connection with U.S. Patent Application No. 15/228639, filed on 4 August 2016, 14 pages
9	Non-Final Office Action mailed on 15 November 2017, issued in connection with U.S. Patent Application No. 15/243186, filed on 22 August 2016, 13 pages
10	Non-Final Office Action mailed on 28 November 2017, issued in connection with U.S. Patent Application No. 13/864248, filed on 17 April 2013, 12 pages
11	Non-Final Office Action mailed on 9 January 2018, issued in connection with U.S. Patent Application No. 13/864250, filed on 17 April 2013, 13 pages
12	Notice of Allowance mailed on 31 January 2018, issued in connection with U.S. Patent Application No. 13/871785, filed on 26 April 2013, 6 pages
13	Sonos, Inc. v. D&M Holdings Inc. et al., Defendants' 35 U.S.C. § 282 Notice filed November 2, 2017, 31 pages.

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Examiner Signature	/OLEG SURVILLO/	Date Considered	07/09/2018
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

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	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
<p>That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).</p>			
OR			
<p>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).</p>			
<p>☐ See attached certification statement.</p>			
<p>☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.</p>			
<p>☒ A certification statement is not submitted herewith.</p>			
SIGNATURE			
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	/Kerry T. Creeron/	Date (YYYY-MM-DD)	2018-03-29
Name/Print	Kerry T. Creeron	Registration Number	70004
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

Privacy Act Statement

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

<p align="center"><i>Index of Claims</i></p> 	Application/Control No. 13864249	Applicant(s)/Patent Under Reexamination MILLINGTON, NICHOLAS A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant				☐ CPA		☐ T.D.		☐ R.1.47	
CLAIM		DATE							
Final	Original	11/08/2017	07/09/2018						
	1	-	-						
	2	-	-						
	3	-	-						
	4	-	-						
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	21	✓	✓						
	22	✓	✓						
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	32	✓	✓						
	33	✓	✓						
	34	✓	✓						
	35	✓	✓						
	36	✓	✓						

<i>Index of Claims</i> 	Application/Control No. 13864249	Applicant(s)/Patent Under Reexamination MILLINGTON, NICHOLAS A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

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CLAIM		DATE													
Final	Original	11/08/2017	07/09/2018												
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	38	✓	✓												
	39	✓	✓												
	40	✓	✓												
	41		✓												
	42		✓												
	43		✓												

Search Notes 	Application/Control No. 13864249	Applicant(s)/Patent Under Reexamination MILLINGTON, NICHOLAS A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CPC- SEARCHED		
Symbol	Date	Examiner
G06F 3/167, 17/00, 17/3074, 3/048, 3/0482, 3/0484, 3/126, 3/16	7/9/2018	OS
H04L 65/60, 12/2812	7/9/2018	OS

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
709	219, 220, 231	7/9/2018	OS

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
Updated Inventor search	7/9/2018	OS
Updated Assignee search	7/9/2018	OS
Updated EAST search in USPAT, US-PGPUB, EPO, JPO, and FPRS databases	7/9/2018	OS

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

	/OLEG SURVILLO/ Primary Examiner.Art Unit 2442
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	1	7106224		2006-09-12	KNAPP; David J. et al.	
	2	8234305		2012-07-31	SELIGMANN; Doree Duncan et al.	
	3	8275910		2012-09-25	HAUCK; Jerrold V.	
	4	8689036		2014-04-01	MILLINGTON; Nicholas A.J. et al.	
	5	8938637		2015-01-20	MILLINGTON; Nicholas A.J. et al.	
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	1	20040032922		2004-02-19	KNAPP; David J. et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

	2	20040143675		2004-07-22	AUST; Andreas Matthias	
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	1	Advisory Action mailed on 10 January 2018, issued in connection with U.S. Patent Application No. 13/871785, filed on 26 April 2013, 3 pages	
	2	Final Office Action mailed on 1 March 2018, issued in connection with U.S. Patent Application No. 13/705176, filed on 5 December 2012, 16 pages	
	3	Final Office Action mailed on 15 February 2018, issued in connection with U.S. Patent Application No. 14/516883, filed on 17 October 2014, 17 pages	
	4	Final Office Action mailed on 16 March 2018, issued in connection with U.S. Patent Application No. 90/013959, filed on 16 June 2017, 39 pages	
	5	Non-Final Office Action mailed on 10 January 2018, issued in connection with U.S. Patent Application No. 13/848932, filed on 22 March 2013, 18 pages	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
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	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

6	Non-Final Office Action mailed on 14 December 2017, issued in connection with U.S. Patent Application No. 15/081911, filed on 27 March 2016, 17 pages
7	Non-Final Office Action mailed on 14 November 2017, issued in connection with U.S. Patent Application No. 13/864252, filed on 17 April 2013, 11 pages
8	Non-Final Office Action mailed on 15 November 2017, issued in connection with U.S. Patent Application No. 15/228639, filed on 4 August 2016, 14 pages
9	Non-Final Office Action mailed on 15 November 2017, issued in connection with U.S. Patent Application No. 15/243186, filed on 22 August 2016, 13 pages
10	Non-Final Office Action mailed on 28 November 2017, issued in connection with U.S. Patent Application No. 13/864248, filed on 17 April 2013, 12 pages
11	Non-Final Office Action mailed on 9 January 2018, issued in connection with U.S. Patent Application No. 13/864250, filed on 17 April 2013, 13 pages
12	Notice of Allowance mailed on 31 January 2018, issued in connection with U.S. Patent Application No. 13/871785, filed on 26 April 2013, 6 pages
13	Sonos, Inc. v. D&M Holdings Inc. et al., Defendants' 35 U.S.C. § 282 Notice filed November 2, 2017, 31 pages.

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

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
<p>That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).</p>			
OR			
<p>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).</p>			
<p>☐ See attached certification statement.</p>			
<p>☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.</p>			
<p>☒ A certification statement is not submitted herewith.</p>			
SIGNATURE			
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	/Kerry T. Creeron/	Date (YYYY-MM-DD)	2018-03-29
Name/Print	Kerry T. Creeron	Registration Number	70004
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		John Gerrard Tolomei		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	240	240
Total in USD (\$)				240

Electronic Acknowledgement Receipt	
EFS ID:	32193216
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	John Gerrard Tolomei
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	30-MAR-2018
Filing Date:	17-APR-2013
Time Stamp:	11:06:09
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 240
RAM confirmation Number	033018INTEFSW11064500
Deposit Account	506632
Authorized User	Kerry Creeron
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)					
37 CFR 1.20 (Post Issuance fees)					
37 CFR 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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Information:					
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Information:					

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Information:					
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Warnings:					
Information:					
Total Files Size (in bytes):			8146619		
<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>					



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806
107361 7590 03/26/2018 McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606			EXAMINER SURVILLO, OLEG	
			ART UNIT 2442	PAPER NUMBER
			MAIL DATE 03/26/2018	DELIVERY MODE PAPER

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

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

<i>Applicant-Initiated Interview Summary</i>	Application No.	Applicant(s)		
	13/864,249	MILLINGTON, NICHOLAS A. J.		
	Examiner	Art Unit	AIA (First Inventor to File) Status	Page
	OLEG SURVILLO	2442	No	1 of 1

All participants (applicant, applicant's representative, PTO personnel):

1. OLEG SURVILLO (Primary Examiner); In-Person
2. Jeffrey Armstrong (Attorney); In-Person
3. John Tolomei (Attorney); In-Person

Date of Interview: 12 March 2018

Claim(s) discussed: claim 21

Identification of prior art discussed: Hardwick, Goldberg

Issues Discussed:

Item(s) under 35 U.S.C. 103:

Discussed combination of Hardwick and Goldberg. Went over arguments presented in the Agenda. Examiner advised Applicants to provide more arguments explaining how "while" timing is significant and whether functions (i) and (ii) have any affect on playing second audio information via the second zone player. Examiner's position is that playing second audio information via the second zone player is separate and distinct from functions (i) and (ii) that are performed "while" playing second audio information, therefore, concurrent execution of additional functions (i) and (ii) is circumstantial. No agreement has been reached.

Attachment(s): Agenda, Proposed Arguments

/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	
<p>Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable time limit of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.</p> <p>Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.</p> <p>Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicant's responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04</p> <p>Please further see:</p> <p>MPEP 713.04 Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b) 37 CFR § 1.2 Business to be transacted in writing</p>	



McDonnell Boehnen Hulbert & Berghoff
Law Offices

300 South Wacker Drive
Chicago, Illinois 60606-6709
www.mbhb.com

312-913-0001 phone
312-913-0002 fax

March 8, 2018

Via email: oleg.survillo@uspto.gov

Examiner Oleg Survillo
U.S. Patent & Trademark Office
P.O. Box 1450
Arlington, VA 22313-1450

RE: Agenda for App. 13/864,249 (Sonos 13-0402; MBHB 15-518-CON)

Examiner Survillo:

Thank you for agreeing to interview the above-referenced application on March 12, 2018. An agenda of topics is outlined below:

Agenda for the Examiner Interview:

- The Non-Final Office mailed 11-Nov-2017
 - the § 112, ¶ 2, rejections for indefiniteness
 - the § 103 rejections
- Claim 21
- Cited references:
 - U.S. Pat. 8,131,389 (Hardwick)
 - U.S. Pub. 2007/0142944 (Goldberg)

Representative Claim:

21. In a network comprising a first zone player, a second zone player, and a third zone player, a method comprising:

transmitting first audio information and timing information to the first zone player and the third zone player via the second zone player over the network, wherein the network comprises at least one of a local area network and a wide area network;

synchronously playing the first audio information via the first zone player and the third zone player based on the timing information; and

playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second

zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information.

Arguments for Consideration:

- The claims are patentable over Hardwick and Goldberg for at least the reasons that:
 1. The § 103 rejection fails to consider the claimed invention as a whole
 2. Hardwick and Goldberg fail to teach or suggest all the recited claim elements
 3. The § 103 rejection is based on impermissible hindsight bias

1. The rejection fails to consider the invention as a whole

- Analyzing individual claim terms out of context and divorced from the claim term's contribution to the inventive solution is contrary to the legal requirement to consider the claimed invention as a whole. MPEP 2141.02(I) ("In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious.") (emphasis added).
- Here, the claims recite "playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information." (emphasis added)
- The Office Action suggests that Goldberg teaches features (i) and (ii) and that Hardwick teaches different devices playing different content and that it would have been obvious to modify and combine Goldberg and Hardwick. Office Action, pp. 4-6.
- However, it is legally improper to consider the features of (i) and (ii) in isolation from the feature of "playing second audio information" because under the express claim language, the second playback device performs features (i) and (ii) while "playing second audio information."
- Because the Office Action fails to even consider this individual claim element "as a whole," the Office Action necessarily fails to consider the claimed invention "as a whole" as required under 35 U.S.C. § 103, and thus, the § 103 analysis is legally flawed.

2. Hardwick and Goldberg fail to teach or suggest all the recited claim elements

- Hardwick and Goldberg fail to teach or suggest at least "playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information," in combination with the other elements recited in the claims. (emphasis added).

A. Hardwick fails to teach or suggest all the recited claim elements

- The Office Action acknowledges, and Applicant agrees, that "Hardwick fails to expressly teach that the first audio information is transmitted to the third zone

player” or “transmitting timing information and synchronously playing the first audio information based on the timing information.” Office Action, p. 5.

- Therefore, Hardwick necessarily fails to teach or suggest “playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information.”

B. The addition of Goldberg fails to overcome the deficiencies of Hardwick

- The Office Action contends Goldberg teaches “transmitting timing information [synchronization signal] to the first zone player and the third zone player via the second zone player over a network...” and “synchronously playing the first audio information via the first zone player and the third zone player based on the timing information.” Office Action, p. 6.
- Even assuming *arguendo* Goldberg teaches the individual claim elements for which it is cited, Goldberg still fails to teach or suggest “playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information.”

3. The rejection is based on impermissible hindsight reasoning

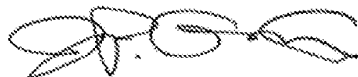
- The Office Action contends it would have been obvious “to modify the system of Hardwick to have two of the multiple DASs grouped together in one zone and synchronously play the first audio information based on the timing information while another DAS is playing the second audio information in another zone in order to allow the user of Hardwick to keep listening to the same music when entering a master bathroom adjacent to Room #2 without interruption while still allowing different music selection to be played in Room #1.” Office Action, p. 6 (emphasis added).
- Hardwick doesn’t mention the use case proposed in the Office Action in support of the alleged motivation to modify and combine Hardwick and Goldberg to perform the claimed features.
- Hardwick discloses a network of Digital Audio Servers (DAS) where “multiple DASs on the same local network [can] communication with each to form a multi-zone system in which the music is stored in one or more main server units..., and in which the stored music is accessible by each DAS on the local network” in an arrangement so that “different music selections [can] be simultaneously played in different rooms.” Hardwick, 11:44-55.
- However, Hardwick does not address or even contemplate the concept of multiple DASs playing back the same content in synchrony with each other.
 - At best, Hardwick explains that “different music selections [can] be simultaneously played in different rooms” but nothing about different DASs in different rooms (or even the same room) playing the same content in synchrony with each other. Hardwick, 11:54-55 (emphasis added).
 - Indeed, Hardwick does not need to perform synchronous playback as recited in the claims because in an individual room, the speakers are connected to an “audio

output” of the DAS in a conventional fashion. For example, Figure 4 of Hardwick shows DAS #1 405 in Room #1 providing audio output to amplified speakers 420 and DAS #2 410 in Room #2 providing audio output to amplifier 425 connected to speakers 430 in a conventional fashion -- Hardwick has no need for synchronous playback.

- Because Hardwick does not address or even contemplate synchronous playback, a person of skill in the art at the time of the invention would have had no reason to look to Goldberg for modifying Hardwick’s DASs to add synchronous playback features without using Applicant’s claims as a roadmap.
- Further, even if a prior art device could perhaps be modified with the teachings of a second reference, that alone is not sufficient to support the conclusion that a person of skill in the art would have been motivated to do so. *InTouch Technologies v. VGO Communications*, 751 F.3d 1327, 1352 (Fed. Cir. 2014) (reversing a finding of obviousness that was based on “conclusory references to [the expert’s] belief that one of ordinary skill in the art could combine these references, not that they would have been motivated to do so.”) (emphasis original).
- In this case, the Office Action fails to explain why a person of skill in the art at the time of the invention would have been motivated to modify Hardwick’s DASs for synchronous playback according to Goldberg’s disclosed playback protocol when Hardwick does not even contemplate synchronous playback. Hardwick, 11:39-43.
- In the absence of any rational motivation to modify Hardwick’s DASs to perform the claimed features as proposed in the Office Action, Applicant’s own claim language is the only apparent basis in the record for modifying Hardwick’s DASs with Goldberg’s synchronous playback protocol as proposed in the Office Action.
- Where, as here, the only roadmap in the record to the claimed invention is based on Applicant’s own disclosure, the § 103 rejection is an exercise in impermissible hindsight and should be withdrawn. *Ex Parte Hongwei Kong*, Appeal 2013-0092361 (PTAB, Oct. 22, 2015).

If you have questions, or if you would like additional information to prepare for the interview, please feel free to call me.

Best regards,



Jeff Armstrong
312-913-2104 (office)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No. 13-0402
(MBHB 15-518-CON)

In the Application of:	)	
Nicholas A. J. Millington	)	Examiner: SURVILLO, Oleg
	)	
Application No.: 13/864,249	)	Group Art Unit: 2442
	)	
Filed: April 17, 2013	)	Confirmation No. 9806
	)	
Title: Concurrent Transmission and	)	
Playback of Audio Information	)	
	)	
	)	

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

**RESPONSE TO THE NON-FINAL OFFICE ACTION
MAILED NOVEMBER 13, 2017**

Please consider the following Amendments and Remarks in response to the Non-Final Office Action mailed on November 13, 2017, in the above-captioned application.

Amendments begin on page 2.

Remarks begin on page 10.

Please charge any fee due or credit any overpayment to Deposit Account 13-2490.

CLAIMS

1-20. (Canceled)

21. (Currently Amended) In a network comprising a first zone player, a second zone player, and a third zone player, a method comprising:

transmitting first audio information and timing information to the first zone player and the third zone player via the second zone player over the network, wherein the network comprises at least one of a local area network and a wide area network;

using the timing information to synchronously playing ~~play~~ the first audio information in synchrony via the first zone player and the third zone player ~~based on the timing information~~; and

playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information.

22. (Previously Presented) The method of claim 21 wherein the second audio information comprises an audio track.

23. (Currently Amended) The method of claim 21 wherein the timing information comprises first timing information, and wherein playing the second audio information comprises using second timing information to play ~~playing~~ the second audio information ~~based on second timing information~~, wherein the second timing information is different from the first timing information.

24. (Currently Amended) The method of claim 21 wherein the timing information comprises first timing information, and wherein playing the second audio information comprises using the first timing information to play ~~playing~~ the second audio information ~~based on second timing information~~, wherein the ~~second~~ first timing information comprises clock timing information of the second zone player, ~~and wherein the first timing information comprises the clock timing information.~~

25. (Previously Presented) The method of claim 21 wherein the timing information comprises at least one of playback timing information and clock timing information.

26. (Previously Presented) The method of claim 21 wherein the timing information comprises clock timing information.

27. (Currently Amended) The method of claim 21 wherein the method further comprises:

receiving audio information from an audio information source that is connected to the second zone player; and

converting the audio information received from the audio information source into the first audio information via the second zone player prior to ~~the transmission of~~ transmitting the first audio information and the timing information to the first zone player and the third zone player.

28. (Previously Presented) The method of claim 27, wherein the audio information source is directly connected to the second zone player, wherein the audio information received from the audio information source comprises analog audio information, and wherein the converting comprising converting the analog audio information into digital audio information.

29. (Currently Amended) A system comprising a first zone player, a second zone player, and a third zone player, wherein ~~each of the first zone player, the second zone player,~~ and the third zone player each comprise ~~at least one processor and tangible non-transitory computer-readable memory comprising instructions that, when executed, cause the system to perform functions comprising:~~

~~the first zone player and the third zone player to synchronously play first audio information based on timing information; and~~

~~the second zone player includes at least one processor and tangible non-transitory computer-readable memory comprising instructions that, when executed, cause the second zone player to perform second operations, the second operations comprising:~~

~~transmitting the first audio information and the timing information over at least one of a local area network and a wide area network to the first zone player and the second zone player, and~~

~~playing second audio information while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information~~

the second zone player transmitting first audio information and timing information to the first zone player and the third zone player over a network, wherein the network comprises at least one of a local area network and a wide area network;

the first zone player and the third zone player using the timing information to play the first audio information in synchrony with each other; and

the second zone player playing second audio information while (i) the first zone player and the third zone player play the second audio information in synchrony with each other and (ii) the second zone player transmits the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information.

30. (Previously Presented) The system of claim 29 wherein the second audio information comprises an audio track.

31. (Currently Amended) The system of claim 29 wherein the timing information comprises first timing information, and wherein the second zone player playing the second audio information comprises the second zone player using second timing information to play ~~playing~~ the second audio information ~~based on second timing information~~, wherein the second timing information is different from the first timing information.

32. (Currently Amended) The system of claim 29 wherein the timing information comprises first timing information, wherein the second zone player playing the second audio information comprises the second zone player playing the second audio information based on ~~second~~ the first timing information, ~~wherein the second timing information comprises clock timing information, and~~ wherein the first timing information comprises [[the]] clock timing information.

33. (Previously Presented) The system of claim 29 wherein the timing information comprises at least one of playback timing and clock timing information.

34. (Previously Presented) The system of claim 29 wherein the timing information comprises clock timing information.

35. (Currently Amended) The system of claim 29 wherein the ~~second operations~~ functions further comprise:

the second zone player receiving audio information from an audio information source that is connected to the second zone player; and

the second zone player converting the audio information received from the audio information source into the first audio information ~~via the second zone player~~ prior to ~~the transmission of~~ transmitting the first audio information and the timing information to the first zone player and the third zone player.

36. (Currently Amended) The system of claim 35, wherein the audio information source is directly connected to the second zone player, wherein the audio information received by the second zone player from the audio information source comprises analog audio information, and wherein the second zone player converting the audio information received from the audio information source into the first audio information ~~comprising~~ comprises the second zone player converting the analog audio information into digital audio information.

37. (Previously Presented) A tangible, non-transitory computer-readable medium having instructions stored thereon that when executed cause a first zone player to perform functions comprising:

transmitting first audio information and timing information to each of a second zone player and a third zone player over at least one of a local area network and a wide area network;

causing the second zone player and the third zone player to ~~synchronously~~ use the timing information to play the first audio information based on the timing information in synchrony with each other;

playing second audio information while (i) the second zone player and the third zone player are synchronously playing the first audio information and (ii) the first zone player is transmitting the first audio information and the timing information to the second zone player and the third zone player, wherein the second audio information is different from the first audio information.

38. (Previously Presented) The tangible, non-transitory computer readable medium of claim 37 wherein the second audio information comprises an audio track.

39. (Currently Amended) The tangible, non-transitory computer readable medium of claim 37 wherein the timing information comprises first timing information, and wherein playing the second audio information comprises using second timing information to play ~~playing~~ the second audio information ~~based on second timing information~~, wherein the second timing information is different from the first timing information.

40. (Currently Amended) The tangible, non-transitory computer readable medium of claim 37 wherein the timing information comprises first timing information, wherein playing the second audio information comprises using the first timing information to play ~~playing~~ the second audio information ~~based on second timing information, wherein the second timing information comprises clock timing information, and~~ wherein the first timing information comprises [[the]] clock timing information.

41. (New) The method of claim 21, wherein the timing information comprises first timing information, and wherein the method further comprises:

the second zone player receiving second timing information from a fourth zone player, and wherein playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the first timing information to the first zone player and the third zone player comprises the second zone player using the second timing information to play the second audio information in synchrony with the fourth zone player.

42. (New) The method of claim 21, wherein the timing information comprises first timing information, and wherein the method further comprises:

the second zone player receiving the second audio information and the second timing information from a fourth zone player, and wherein playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the first timing information to the first zone player and the third zone player comprises the second zone player using the second timing information to play the second audio information in synchrony with the fourth zone player.

43. (New) The method of claim 21, wherein the timing information comprises first timing information, and wherein the method further comprises:

the second zone player transmitting the second audio information and second timing information to a fourth zone player, and wherein playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player comprises the second zone player using the second timing information to play the second audio information in synchrony with the fourth zone player.

REMARKS**I. Status of the Claims**

Claims 21-43 are pending; claims 21, 29, and 37 are independent. Without conceding the merits of the rejections, and solely to advance prosecution, Applicant has amended claims 21, 23-24, 27, 29, 31-32, 35, 36-37, and 39-40 to further clarify the claim language and to generally put the claims in better condition for allowance and issue, and Applicant has added new claims 41-43. The subject matter of the amendments is supported generally throughout Applicant's originally-filed specification, including but not limited to ¶¶ 19-20, 28, 30, and 33 of Applicant's U.S. Pub. 2013/0238108. No new matter has been added. Applicant reserves the right to pursue the originally-filed and/or previously-pending claims in one or more continuation applications.

II. Summary of the Non-Final Office Action

In the Final Office Action mailed November 13, 2017, the Examiner: (i) withdrew the previous 35 U.S.C. § 112 rejections, (ii) rejected claims 24, 29-36, and 40 under 35 U.S.C. § 112, ¶ 2, as allegedly indefinite; and (iii) rejected claims 21-40 under § 103 based on U.S. Pat. 8,131,389 (Hardwick) and U.S. Pub. 2007/0142944 (Goldberg).

III. Summary of the Examiner Interview on March 12, 2018

An in-person Examiner Interview took place on March 12, 2018, at the Patent Office. Participants included Examiner Oleg Survillo and Applicant's representatives, John Tolomei and Jeff Armstrong. During the interview, the participants discussed claim 21 and the Hardwick and Goldberg references. No demonstrations were conducted and no exhibits were shown. No agreement on the claims was reached. Applicant agreed to file a response with amendments and arguments for further review and consideration.

IV. Response to the 35 U.S.C. § 112, ¶ 2, Rejections

Claims 24, 29-36, and 40 stand rejected under 35 U.S.C. § 112, ¶ 2, for alleged indefiniteness. Office Action, pp. 4-5. Without conceding the merits of the rejections, and solely to advance prosecution, Applicant has amended the claims to clarify the claim language and to generally put the claims in better condition for allowance. Applicant requests that the Office withdraw the § 112 rejections in view of the amendments.

V. Response to the § 103 Rejections

The claims are patentable over Hardwick and Goldberg for at least the reasons that: (i) the § 103 rejection fails to consider the claimed invention as a whole; (ii) Hardwick and Goldberg fail to teach or suggest all the recited claim elements; and (iii) the § 103 rejection is based on impermissible hindsight bias.

A. The rejection fails to consider the invention as a whole

Analyzing individual claim terms out of context and divorced from the claim term's contribution to the inventive solution is contrary to the legal requirement to consider the claimed invention as a whole. MPEP 2141.02(I) ("In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious.") (emphasis added).

Here, independent claim 21 recites "playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second

audio information is different from the first audio information.” (emphasis added). Independent claims 29 and 37 recite similar features. The Office Action suggests that Goldberg teaches features (i) and (ii) and that Hardwick teaches different devices playing different content and that it would have been obvious to modify and combine Goldberg and Hardwick. Office Action, pp. 4-6. However, it is legally improper to consider the features of (i) and (ii) in isolation from the feature of “playing second audio information” because under the express claim language, the second playback device performs features (i) and (ii) while “playing second audio information.”

The second zone player “playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information” is an important component of the overall inventive concept because it illustrates the flexibility of the invention. For example, in some embodiments, the above-recited feature enables the system to operate in novel and non-obvious configurations, including but not necessarily limited to configurations where:

- (i) the second zone player operates as an audio information channelization device and/or master of a synchrony group comprising the first and third zone players while simultaneously playing content different than the content played by the synchrony group, as described, e.g., at ¶¶ 19-20 of U.S. Pub. 2013/0238108;
- (ii) the second zone player operates as an audio information channel device and/or master for a synchrony group comprising the first and third zone players, as described, e.g., at ¶ 28 of U.S. Pub. 2013/0238108;

- (iii) the audio information channelization device and/or master responsibilities of a synchrony group comprising the first and third zone players are migrated from one of the first or third zone players to the second zone players, as described, e.g., at ¶ 30 of U.S. Pub. 2013/0238108; and/or
- (iv) the second zone player operates as an audio information channelization device and/or master of a synchrony group comprising the first and third zone players while simultaneously operating as a master or slave of another synchrony group, as described, e.g., at ¶ 33 of U.S. Pub. 2013/0238108.

Without the ability to perform the function of “playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information,” many aspects of the novel and non-obvious network configurations described above would not be possible, and thus, performing these multiple functions simultaneously as recited in the claim cannot be considered mere matter of design choice.

Because the Office Action fails to even consider this individual claim element “as a whole,” the Office Action necessarily fails to consider the claimed invention “as a whole” as required under 35 U.S.C. § 103, and thus, the § 103 analysis is legally flawed.

B. Hardwick and Goldberg fail to teach or suggest all the recited claim elements

Hardwick and Goldberg fail to teach or suggest at least “playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is

transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information,” in combination with the other elements recited in the claims. (emphasis added).

Hardwick fails to teach or suggest all the recited claim elements. The Office Action acknowledges, and Applicant agrees, that “Hardwick fails to expressly teach that the first audio information is transmitted to the third zone player” or “transmitting timing information and synchronously playing the first audio information based on the timing information.” Office Action, p. 5. Therefore, Hardwick necessarily fails to teach or suggest “playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information.”

The addition of Goldberg fails to overcome the deficiencies of Hardwick. The Office Action contends Goldberg teaches “transmitting timing information [synchronization signal] to the first zone player and the third zone player via the second zone player over a network...” and “synchronously playing the first audio information via the first zone player and the third zone player based on the timing information.” Office Action, p. 6. Even assuming *arguendo* Goldberg teaches the individual claim elements for which it is cited, Goldberg still fails to teach or suggest “playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the

first zone player and the third zone player, wherein the second audio information is different from the first audio information.”

C. The rejection is based on impermissible hindsight reasoning

The Office Action contends it would have been obvious “to modify the system of Hardwick to have two of the multiple DASs grouped together in one zone and synchronously play the first audio information based on the timing information while another DAS is playing the second audio information in another zone in order to allow the user of Hardwick to keep listening to the same music when entering a master bathroom adjacent to Room #2 without interruption while still allowing different music selection to be played in Room #1.” Office Action, p. 6 (emphasis added). But importantly, Hardwick does not mention the use case proposed in the Office Action in support of the alleged motivation to modify and combine Hardwick and Goldberg to perform the claimed features, so the purported motivation to combine is not grounded in the prior art.

Hardwick discloses a network of Digital Audio Servers (DAS) where “multiple DASs on the same local network [can] communication with each to form a multi-zone system in which the music is stored in one or more main server units..., and in which the stored music is accessible by each DAS on the local network” in an arrangement so that “different music selections [can] be simultaneously played in different rooms.” Hardwick, 11:44-55. But Hardwick does not address or even contemplate the concept of multiple DASs playing back the same content in synchrony with each other.

At best, Hardwick explains that “different music selections [can] be simultaneously played in different rooms” but nothing about different DASs in different rooms (or even the same room) playing the same content in synchrony with each other. Hardwick, 11:54-55

(emphasis added). Indeed, Hardwick does not need to perform synchronous playback as recited in the claims because in an individual room, the speakers are connected to an “audio output” of the DAS in a conventional fashion. For example, Figure 4 of Hardwick shows DAS #1 405 in Room #1 providing audio output to amplified speakers 420 and DAS #2 410 in Room #2 providing audio output to amplifier 425 connected to speakers 430 in a conventional fashion -- Hardwick has no need for synchronous playback.

Because Hardwick does not address or even contemplate synchronous playback, a person of skill in the art at the time of the invention would have had no reason to look to Goldberg for modifying Hardwick’s DASs to add synchronous playback features without using Applicant’s claims as a roadmap.

Further, even if a prior art device could perhaps be modified with the teachings of a second reference, that alone is not sufficient to support the conclusion that a person of skill in the art would have been motivated to do so. *InTouch Technologies v. VGO Communications*, 751 F.3d 1327, 1352 (Fed. Cir. 2014) (reversing a finding of obviousness that was based on “conclusory references to [the expert’s] belief that one of ordinary skill in the art could combine these references, not that they would have been motivated to do so.”) (emphasis original).

In this case, the Office Action fails to explain why a person of skill in the art at the time of the invention would have been motivated to modify Hardwick’s DASs for synchronous playback according to Goldberg’s disclosed playback protocol when Hardwick does not even contemplate synchronous playback, much less the type of synchronous playback features recited in the claims. Hardwick, 11:39-43. In the absence of any rational motivation to modify Hardwick’s DASs to perform the claimed features as proposed in the Office Action, Applicant’s own claim language is the only apparent basis in the record for modifying Hardwick’s DASs to

add Goldberg's synchronous playback protocol as proposed in the Office Action. Where, as here, the only roadmap in the record to the claimed invention is based on Applicant's own disclosure, the § 103 rejection is an exercise in impermissible hindsight and should be withdrawn. *Ex Parte Hongwei Kong*, Appeal 2013-0092361 (PTAB, Oct. 22, 2015).

VI. Conclusion

Applicant submits that the pending claims are patentable, and Applicant requests a Notice of Allowance. If further discussion would advance the application to allowance and issue, the Examiner is invited to telephone the undersigned at 312-913-0001.

Respectfully submitted,
McDonnell Boehnen Hulbert & Berghoff LLP

Date: March 13, 2018

By: /Jeffrey P. Armstrong/
Jeffrey P. Armstrong
Reg. No. 54,967

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)		Docket Number (Optional) 13-0402 (15-518-CON)																																		
Application Number 13/864,249	Filed April 17, 2013																																			
For Millington																																				
Art Unit 2442	Examiner Survillo																																			
<p>This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.</p> <p>The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):</p> <table style="width: 100%; border-collapse: collapse;"><thead><tr><th></th><th style="text-align: center;"><u>Fee</u></th><th style="text-align: center;"><u>Small Entity Fee</u></th><th style="text-align: center;"><u>Micro Entity Fee</u></th><th></th></tr></thead><tbody><tr><td>☒ One month (37 CFR 1.17(a)(1))</td><td style="text-align: center;">\$200</td><td style="text-align: center;">\$100</td><td style="text-align: center;">\$50</td><td style="text-align: right;">\$ <u>200.00</u></td></tr><tr><td>☐ Two months (37 CFR 1.17(a)(2))</td><td style="text-align: center;">\$600</td><td style="text-align: center;">\$300</td><td style="text-align: center;">\$150</td><td style="text-align: right;">\$ _____</td></tr><tr><td>☐ Three months (37 CFR 1.17(a)(3))</td><td style="text-align: center;">\$1,400</td><td style="text-align: center;">\$700</td><td style="text-align: center;">\$350</td><td style="text-align: right;">\$ _____</td></tr><tr><td>☐ Four months (37 CFR 1.17(a)(4))</td><td style="text-align: center;">\$2,200</td><td style="text-align: center;">\$1,100</td><td style="text-align: center;">\$550</td><td style="text-align: right;">\$ _____</td></tr><tr><td>☐ Five months (37 CFR 1.17(a)(5))</td><td style="text-align: center;">\$3,000</td><td style="text-align: center;">\$1,500</td><td style="text-align: center;">\$750</td><td style="text-align: right;">\$ _____</td></tr></tbody></table> <p>☐ Applicant asserts small entity status. See 37 CFR 1.27.</p> <p>☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.</p> <p>☐ A check in the amount of the fee is enclosed.</p> <p>☐ Payment by credit card. Form PTO-2038 is attached.</p> <p>☒ The Director has already been authorized to charge fees in this application to a Deposit Account.</p> <p>☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number <u>13-2490</u>.</p> <p>☒ Payment made via EFS-Web.</p> <p>WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.</p> <p>I am the</p> <p>☐ applicant/inventor.</p> <p>☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).</p> <p>☒ attorney or agent of record. Registration number <u>54,967</u></p> <p>☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.</p> <table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 50%; padding: 5px;"><u>/Jeffrey P. Armstrong/</u> Signature</td><td style="width: 50%; padding: 5px;"><u>March 13, 2018</u> Date</td></tr><tr><td style="padding: 5px;"><u>Jeffrey P. Armstrong</u> Typed or printed name</td><td style="padding: 5px;"><u>312-913-0001</u> Telephone Number</td></tr></table> <p>NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.</p> <p>☒ * Total of <u>1</u> forms are submitted.</p>				<u>Fee</u>	<u>Small Entity Fee</u>	<u>Micro Entity Fee</u>		☒ One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ <u>200.00</u>	☐ Two months (37 CFR 1.17(a)(2))	\$600	\$300	\$150	\$ _____	☐ Three months (37 CFR 1.17(a)(3))	\$1,400	\$700	\$350	\$ _____	☐ Four months (37 CFR 1.17(a)(4))	\$2,200	\$1,100	\$550	\$ _____	☐ Five months (37 CFR 1.17(a)(5))	\$3,000	\$1,500	\$750	\$ _____	<u>/Jeffrey P. Armstrong/</u> Signature	<u>March 13, 2018</u> Date	<u>Jeffrey P. Armstrong</u> Typed or printed name	<u>312-913-0001</u> Telephone Number
	<u>Fee</u>	<u>Small Entity Fee</u>	<u>Micro Entity Fee</u>																																	
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<u>/Jeffrey P. Armstrong/</u> Signature	<u>March 13, 2018</u> Date																																			
<u>Jeffrey P. Armstrong</u> Typed or printed name	<u>312-913-0001</u> Telephone Number																																			

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

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

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Jeffrey Armstrong		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 1 month with \$0 paid	1251	1	200	200
Miscellaneous:				
Total in USD (\$)				200

Electronic Acknowledgement Receipt	
EFS ID:	32042395
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Jeffrey Armstrong
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	13-MAR-2018
Filing Date:	17-APR-2013
Time Stamp:	18:04:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 200
RAM confirmation Number	031418INTEFSW18045100
Deposit Account	132490
Authorized User	Jeffrey Armstrong
<p>The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:</p> <p>37 CFR 1.16 (National application filing, search, and examination fees)</p> <p>37 CFR 1.17 (Patent application and reexamination processing fees)</p>	

37 CFR 1.19 (Document supply fees)					
37 CFR 1.20 (Post Issuance fees)					
37 CFR 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		13-0402_Response.pdf	173260	yes	17
			f1dadfc85d77388176d280cf13ae103e4461ce5d		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Amendment/Req. Reconsideration-After Non-Final Reject		1	1	
	Claims		2	9	
	Applicant Arguments/Remarks Made in an Amendment		10	17	
Warnings:					
Information:					
2	Extension of Time	13-0402_EOT.pdf	138316	no	1
			668d103e4f43c0f2b0d745c902f035fa39e89062		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	31013	no	2
			990d1a91eb28f36a10301e2d1ef566d8f14fd48a		
Warnings:					
Information:					
Total Files Size (in bytes):			342589		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 13/864,249		Filing Date 04/17/2013		☐ To be Mailed	
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO									
APPLICATION AS FILED - PART I									
		(Column 1)		(Column 2)					
FOR		NUMBER FILED		NUMBER EXTRA		RATE (\$)		FEE (\$)	
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A		N/A		N/A			
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A		N/A		N/A			
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A		N/A		N/A			
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 = *				x \$80 =			
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *				x \$420 =			
☐ 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).							
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL			
APPLICATION AS AMENDED - PART II									
AMENDMENT		(Column 1)		(Column 2)		(Column 3)			
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)	
		ADDITIONAL FEE (\$)							
		03/13/2018							
		Total (37 CFR 1.16(i))		* 23 Minus ** 20		= 3		x \$100 =	
Independent (37 CFR 1.16(h))		* 3 Minus *** 3		= 0		x \$460 =		0	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE		300	
AMENDMENT		(Column 1)		(Column 2)		(Column 3)			
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)	
		ADDITIONAL FEE (\$)							
		Total (37 CFR 1.16(i))		* Minus **		=		x \$ 0 =	
Independent (37 CFR 1.16(h))		* Minus ***		=		x \$ 0 =			
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						LIE			
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						Moliki I May			
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".									
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.									

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

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806
107361 7590 11/13/2017 McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606			EXAMINER SURVILLO, OLEG	
			ART UNIT 2442	PAPER NUMBER
			MAIL DATE 11/13/2017	DELIVERY MODE PAPER

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

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

Office Action Summary	Application No. 13/864,249	Applicant(s) MILLINGTON, NICHOLAS A. J.	
	Examiner OLEG SURVILLO	Art Unit 2442	AIA (First Inventor to File) Status No

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1) ☒ Responsive to communication(s) filed on October 5, 2017.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.

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

3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.

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

Disposition of Claims*

5) ☒ Claim(s) 21-40 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.

6) ☐ Claim(s) ____ is/are allowed.

7) ☒ Claim(s) 21-40 is/are rejected.

8) ☐ Claim(s) ____ is/are objected to.

9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, 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.

Application Papers

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

11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

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

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)).

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

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)	3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. ____.
2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date ____.	4) ☐ Other: ____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 5, 2017 has been entered.

Response to Amendment

1. Claims 21-40 are pending in the application. Claims 21-40 are currently amended. Claims 1-20 have been canceled. No new claims are currently added.

Response to Arguments

2. With regard to Applicant's remarks dated October 5, 2017:

Regarding the rejection of claim 27 under 35 U.S.C. 112, second paragraph, Applicant's amendment and arguments have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.

Regarding the rejection of claims 27 and 35 under 35 U.S.C. 112, fourth paragraph, Applicant's amendment and arguments have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.

Regarding the rejection of claims 21-40 under 35 U.S.C. 103(a), Applicant's amendment has been fully considered and is persuasive for the reasons discussed in the Advisory action dated 08/22/2017. However, new grounds of rejection are made.

As to any arguments not specifically addressed they are the same as those discussed above.

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 24, 29-36, and 40 are rejected under 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

As to claims 24, 32, and 40, Applicant's designation of a "first timing information" and a "second timing information" is ambiguous because both of the first timing information and the second timing information refer to the same timing information, i.e., "clock timing information" rendering segregation of the timing information into "first" and "second" unclear. In particular, the claims specify that both the first and second timing information comprise exactly the same "clock timing information". In their arguments dated 10/5/2017 at page 13, as filed, Applicants also stated that each of the first and

Art Unit: 2442

second timing information comprises the same clock timing information (e.g., device clock timing of the second zone player). In such a case, it is unclear why the same device timing of the second zone player is separated as two supposedly distinct "first" and "second" timing information where, in fact, both the "first" and "second" information is the same information, rendering designation of a "first" and "second" ambiguous.

As to claim 29, it is unclear where the preamble ends and body of the claim begins. It is noted that "wherein" is not a proper transitional word. Therefore, Applicants are advised to move a colon from after "wherein" to after the word "comprising" at line 1 such that the language following the word "comprising" is clearly part of the claim body.

Claim Rejections - 35 USC § 103

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

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

4. Claims 21-40 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Hardwick et al. (US Patent 8,131,389 B1) in view of Goldberg et al. (US 2007/0142944 A1).

As to claim 21, Hardwick teaches in a network comprising a first zone player [DAS#2 410 with connected amplifier 425 and speakers 430], a second zone player [DAS#1 405 with connected amplified speakers 420 and CD changer 415], and a third

Art Unit: 2442

zone player [Hardwick envisions having multiple DASs besides the two depicted in Fig.

4] (col. 12 line 63 - col. 13 line 6), a method comprising:

transmitting first audio information to the first zone player via the second zone player over the network, wherein the network comprises at least one of a local area network and a wide area network [DAS 405 and DAS 410 are connected via an Ethernet network] (col. 14 lines 39-60, Fig. 4);

playing the first audio information via the first zone player [DAS 410 performs read and playback of the music stored in the main server DAS 405] (col. 14 lines 50-60); and

playing second audio information via the second zone player while (i) the first zone player is playing the first audio information and (ii) the second zone player is transmitting the first audio information to the first zone player, wherein the second audio information is different from the first audio information [multi-zone feature that allows different music selections to be simultaneously played in different rooms] (col. 11 lines 44-63, col. 12 line 63 to col. 13 line 6).

While Hardwick anticipates having more than two DASs [diskless DAS may read and play one selection of music from the server while other DASs on the LAN are simultaneously playing other selections] (col. 12 line 63 - col. 13 line 6), Hardwick fails to expressly teach that the first audio information is transmitted to the third zone player [additional DAS]. Hardwick also fails to teach transmitting timing information and synchronously playing the first audio information based on the timing information.

However, a concept of synchronously playing an audio information by multiple devices has been well known in the art at the time of the invention. In particular, Goldberg, in the same field of music playback, teaches a first zone player and a third zone player forming a first zone [sub-cluster 701] (Figs. 9A, 33) and a second zone player [broadcast unit 710] (Figs. 9A, 33). In particular, Goldberg teaches:

transmitting first audio information (par. [0254]) and timing information [synchronization signal] to the first zone player and the third zone player via the second zone player over a network (step 1902, Fig. 34A, par. [0200]-[0202]); and

synchronously playing the first audio information via the first zone player and the third zone player based on the timing information (par. [0200]-[0202]).

It would have been obvious to one of ordinary skill the art at the time of the invention to modify the system of Hardwick to have two of the multiple DASs grouped together in one zone and synchronously play the first audio information based on the timing information while another DAS is playing the second audio information in another zone in order to allow the user of Hardwick to keep listening to the same music when entering a master bathroom adjacent to Room #2 without interruption while still allowing different music selection to be played in Room #1 (col. 11 lines 44-63 in Hardwick).

As to claim 22, Hardwick teaches that the second audio information comprises an audio track (col. 11 lines 44-63).

As to claim 23, Hardwick in view of Goldberg teaches that the timing information comprises first timing information (as discussed per claim 21), and wherein playing the second audio information comprises playing the second audio information based on second timing information, wherein the second timing information is different from the first timing information [it is noted that “second timing information” is undefined and thus is interpreted broadly as any information that is different from the first timing information, such as internal time counter in Hardwick] (col. 27 lines 25-46 in Hardwick).

As to claim 24, Hardwick in view of Goldberg teaches that the timing information comprises first timing information (as discussed per claim 21), and wherein playing the second audio information comprises playing the second audio information based on second timing information, wherein the second timing information comprises clock timing information, and wherein the first timing information comprises the clock timing information [it is noted that “clock timing information” is undefined and thus is interpreted broadly as any information that is somehow related to clock timing, such as internal time counter in Hardwick] (col. 27 lines 25-46 in Hardwick).

As to claim 25, Hardwick in view of Goldberg teaches that the timing information comprises playback timing information (step 1902, Fig. 34A, par. [0200]-[0202] in Goldberg).

As to claim 26, Hardwick in view of Goldberg teaches that the timing information comprising clock timing information [it is noted that “clock timing information” is undefined and thus is interpreted broadly as any information that is somehow related to clock timing, such as internal time counter in Hardwick] (col. 27 lines 25-46 in Hardwick).

As to claim 27, Hardwick in view of Goldberg teaches receiving audio information from an audio information source that is connected to the second zone player (col. 14 lines 39-49 in Hardwick); and

converting the audio information received from the audio information source in the first audio information via the second zone player prior to transmission of the first audio information and the timing information to the first zone player and the third zone player (col. 10 line 64 to col. 11 line 16 in Hardwick).

As to claim 28, Hardwick in view of Goldberg teaches that the audio information source is directly connected to the second zone player, wherein the audio information received from the audio information source comprises analog audio information (col. 14 lines 39-49 in Hardwick), and wherein the converting comprising converting the analog audio information into digital audio information (col. 10 line 64 to col. 11 line 16 in Hardwick).

As to claim 29, Hardwick in view of Goldberg teaches a system comprising a first zone player, a second zone player, and a third zone player, each comprising at least one processor and tangible non-transitory computer-readable memory comprising instructions (Figs. 3 and 4 in Hardwick) that, when executed, cause the corresponding first, second, and third zone players to perform operations as discussed per claim 21 above.

As to claims 30-36, Hardwick in view of Goldberg teaches all the elements as discussed per corresponding claims 22-28 above.

As to claim 37, Hardwick in view of Goldberg teaches a tangible, non-transitory computer-readable medium having instructions stored thereon [inventions of Hardwick and Goldberg are computer implemented] that when executed cause a first zone player [DAS#1 405 in Hardwick] to perform the method steps as discussed per claim 21 above.

As to claims 38-40, Hardwick in view of Goldberg teaches all the elements as discussed per claims 22-24 above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to OLEG SURVILLO whose telephone number is

(571)272-9691. The examiner can normally be reached on Mon-Thu 10:00am - 7:30pm; Fri 10:00am - 6:30pm EST.

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, Glenton B. Burgess can be reached on 571-272-3949. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/OLEG SURVILLO/
Primary Examiner, Art Unit 2442

Search Notes 	Application/Control No. 13864249	Applicant(s)/Patent Under Reexamination MILLINGTON, NICHOLAS A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CPC- SEARCHED		
Symbol	Date	Examiner
G06F 3/167, 17/00, 17/3074, 3/048, 3/0482, 3/0484, 3/126, 3/16	11/8/2017	OS
H04L 65/60, 12/2812	11/8/2017	OS

CPC COMBINATION SETS - SEARCHED		
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US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
709	219, 220, 231	11/8/2017	OS

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SEARCH NOTES		
Search Notes	Date	Examiner
Updated Inventor search	11/8/2017	OS
Updated Assignee search	11/8/2017	OS
Updated EAST search in USPAT, US-PGPUB, EPO, JPO, and FPRS databases	11/8/2017	OS

INTERFERENCE SEARCH			
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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant			☐ CPA			☐ T.D.			☐ R.1.47		
CLAIM		DATE									
Final	Original	11/08/2017									
	1	-									
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	3	-									
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	35	✓									
	36	✓									

<p><i>Index of Claims</i></p> 	Application/Control No. 13864249	Applicant(s)/Patent Under Reexamination MILLINGTON, NICHOLAS A. J.
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CLAIM		DATE								
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	38	✓								
	39	✓								
	40	✓								

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	2	Advisory Action mailed on 10 August 2017, issued in connection with U.S. Patent Application No. 13/864250, filed on 17 April 2013, 3 pages	
	3	Advisory Action mailed on 16 August 2017, issued in connection with U.S. Patent Application No. 13/864248, filed on 17 April 2013, 5 pages	

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6	Advisory Action mailed on 27 April 2016, issued in connection with U.S. Patent Application No. 14/486667, filed on 15 September 2014, 7 pages
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Signature	/Kerry T. Creeron/	Date (YYYY-MM-DD)	2017-11-10
Name/Print	Kerry T. Creeron	Registration Number	70,004
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EFS ID:	30913229
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	John Gerrard Tolomei/Kerry Creeron
Filer Authorized By:	John Gerrard Tolomei
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	10-NOV-2017
Filing Date:	17-APR-2013
Time Stamp:	19:00:41
Application Type:	Utility under 35 USC 111(a)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	13618829_ADVISORY_ACTION_11-1-13.PDF	172491 f1f2c70079699792306d90b45658ad8fc48a352d	no	3

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

1	Notice of Allowance mailed on 01 June 2017, issued in connection with U.S. Patent Application No. 14/290493, filed on 29 May 2014, 12 pages
2	Notice of Allowance mailed on 02 June 2017, issued in connection with U.S. Patent Application No. 14/486667, filed on 15 September 2014, 10 pages
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

12	Notice of Allowance mailed on 28 March 2017, issued in connection with U.S. Patent Application No. 15/155149, filed on 16 May 2016, 7 pages
13	Notice of Allowance mailed on 29 April 2015, issued in connection with U.S. Patent Application No. 13/863083, filed on 15 April 2013, 19 pages.
14	Notice of Allowance mailed on 29 March 2017, issued in connection with U.S. Patent Application No. 14/803953, filed on 20 July 2015, 8 pages
15	Notice of Allowance mailed on 3 April 2017, issued in connection with U.S. Patent Application No. 15/088678, filed on 1 April 2016, 8 pages
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19	Notice of Intent to Issue Re-Examination Certificate mailed on 03 August 2017, issued in connection with U.S. Patent Application No. 90/013882, filed on 27 December 2016, 20 pages
20	"Sonos Multi-Room Music System User Guide," Version 090401, Sonos, Inc. 1 April 2009, 256 pages
21	Pre-Brief Conference Decision mailed on 11 May 2017, issued in connection with U.S. Patent Application No. 14/504812, filed on 2 October 2014, 2 pages
22	Reexam Non-Final Office Action mailed on 09 November 2016, issued in connection with U.S. Patent Application No. 90/013774, filed on 29 June 2016, 35 pages

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	Attorney Docket Number	13-0402

23	Renewed Request for Ex Parte Re-Examination, U.S. Application No. 90/013959 filed 16 June 2017, 126 pages.
24	Request for Ex Parte Reexamination submitted in U.S. Patent 9213357 on May 22, 2017, 85 pages
25	Sonos System Overview, Version 1.0, July 2011, 12 pages
26	"Symantec pcAnywhere User's Guide," v 10.5.1, 1995-2002, 154 pages.

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	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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.

☒ A certification statement is not submitted herewith.

SIGNATURE

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	/Kerry T. Creeron/	Date (YYYY-MM-DD)	2017-11-10
Name/Print	Kerry T. Creeron	Registration Number	70,004

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Electronic Acknowledgement Receipt	
EFS ID:	30913778
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	John Gerrard Tolomei/Kerry Creeron
Filer Authorized By:	John Gerrard Tolomei
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	10-NOV-2017
Filing Date:	17-APR-2013
Time Stamp:	19:06:12
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	Non Patent Literature	14290493_NOTICE_OF_ALLOWANCE_14-0314_6-1-17_12PAGES.PDF	544371 8fbfad90d733dcbe74b973376b8fcd2bcaa98909	no	12

Warnings:

Information:					
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24	Non Patent Literature	SONOS_SYSTEM_OVERVIEW. PDF	964534	no	12
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26	Information Disclosure Statement (IDS) Form (SB08)	13-0402_IDS1_10_Nov_2017_1 0_00_59.pdf	1054819	no	6
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A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
27	Non Patent Literature	90013959- NOTICEOFINCOMPLETEREEXA MREQUEST-05-25-17_10PAGES. PDF	517179	no	10
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Warnings:					
Information:					
Total Files Size (in bytes):			55393070		

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

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

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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.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL (Submitted Only via EFS-Web)							
Application Number	13864249	Filing Date	2013-04-17	Docket Number (if applicable)	13-0402 (15-518-CON)	Art Unit	2442
First Named Inventor	Millington			Examiner Name	Survillo		
This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application. Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV							
SUBMISSION REQUIRED UNDER 37 CFR 1.114							
Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).							
☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.							
☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____							
☐ Other _____							
☒ Enclosed							
☒ Amendment/Reply							
☐ Information Disclosure Statement (IDS)							
☐ Affidavit(s)/ Declaration(s)							
☒ Other _____ PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)							
MISCELLANEOUS							
☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(l) required)							
☐ Other _____							
FEES							
☒ The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed. The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No <u>132490</u>							
SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED							
☒ Patent Practitioner Signature							
☐ Applicant Signature							

Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)

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

U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

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Signature of Registered U.S. Patent Practitioner			
Signature	/Jeffrey P. Armstrong/	Date (YYYY-MM-DD)	2017-10-05
Name	Jeffrey P. Armstrong	Registration Number	54967

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No. 13-0402
(MBHB 15-518-CON)

In the Application of:	)	
Nicholas A. J. Millington	)	Examiner: SURVILLO, Oleg
	)	
Application No.: 13/864,249	)	Group Art Unit: 2442
	)	
Filed: April 17, 2013	)	Confirmation No. 9806
	)	
Title: Concurrent Transmission and	)	
Playback of Audio Information	)	
	)	
	)	

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

**RESPONSE TO THE FINAL OFFICE ACTION MAILED MAY 16, 2017 AND
ADVISORY ACTION MAILED AUGUST 22, 2017**

Please consider the following Amendments and Remarks submitted with a Request for Continued Examination in response to the Final Office Action mailed on May 16, 2017, and the Advisory Action mailed August 22, 2017, in the above-captioned application.

Amendments begin on page 2.

Remarks begin on page 10.

Please charge any fee due or credit any overpayment to Deposit Account 13-2490.

AMENDMENTS TO THE CLAIMS

1-20. (Canceled)

21. (Currently Amended) In a network comprising a first zone player, a second zone player, and a ~~second-third~~ zone player, a method comprising:

transmitting first audio information and timing information to the first zone player and the third zone player via the second zone player over the network, wherein the network comprises at least one of a local area network and a wide area network;

synchronously playing the first audio information via the first zone player and the third zone player based on the timing information; and

~~transmitting the first audio information to the first zone player via the second zone player over at least one of a local and a wide area network; and~~

playing [[the]] second audio information via the second zone player while (i) the first zone player and the third zone player [[is]] are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information.

22. (Currently Amended) The method of claim 21 wherein the second audio information comprises an audio track, ~~further comprising transmitting the first audio information to a third zone player, by while the second zone player is: playing the second audio information; and transmitting the first audio information to the first zone player.~~

23. (Currently Amended) The method of claim 21 wherein the timing information comprises first timing information, and wherein playing the second audio information comprises

playing the second audio information based on second timing information, wherein the second timing information is different from the first timing information, further comprising:

~~transmitting timing information to the first zone player via the second zone player while the second zone player is playing the second audio information.~~

24. (Currently Amended) The method of claim 21 wherein the timing information comprises first timing information, and wherein playing the second audio information comprises playing the second audio information based on second timing information, wherein the second timing information comprises clock timing information, and wherein the first timing information comprises the clock timing information~~second audio information comprises timing information.~~

25. (Currently Amended) The method of claim ~~[[24]]~~ 21 wherein the timing information comprises at least one of playback timing information and clock timing information.

26. (Currently Amended) The method of claim 21 wherein the timing information comprises clock timing information, ~~further comprising: transmitting the first audio information to a third zone player via the second zone player while the second zone player is (i) playing the second audio information and (ii) transmitting the first audio information to the first zone player; and transmitting timing information associated with the first audio information to the first and third zone players.~~

27. (Currently Amended) The method of claim 21 wherein the method further comprises:

receiving audio information from an audio information source that is connected to the second zone player; and

converting the audio information received from the audio information source into the first audio information via the second zone player prior to the transmission of the first audio information and the timing information to the first zone player and the third zone player. 28,
further comprising receiving the analog audio information from an audio information source that is directly connected to the first zone player.

28. (Currently Amended) The method of claim 27, wherein the audio information source is directly connected to the second zone player, wherein the audio information received from the audio information source comprises analog audio information, and wherein the converting comprising converting the analog audio information into digital audio information,
~~wherein the first audio information comprises digital audio information, and wherein the method further comprises converting analog audio information into the digital audio information via the second zone player prior to the transmission of the first audio information to the first zone player.~~

29. (Currently Amended) A system comprising a first zone player, a second zone player, and a ~~second~~ third zone player, wherein:

each of the first zone player and the third zone player comprises ~~includes~~ at least one processor and tangible non-transitory computer-readable memory comprising instructions that, when executed, cause the first zone player and the third zone player to ~~perform first operations,~~
~~the first operations comprising synchronously playing play~~ first audio information based on timing information; and

the second zone player includes at least one processor and tangible non-transitory computer-readable memory comprising instructions that, when executed, cause the second zone player to perform second operations, the second operations comprising:

transmitting the first audio information and the timing information over at least one of a local area network and a wide area network to the first zone player and the second zone player, and

playing [[the]] second audio information while (i) the first zone player and the third zone player [[is]] are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information.

30. (Currently Amended) The system of claim 29 wherein the second audio information comprises an audio track. ~~operations further comprise transmitting the first audio information to a third zone player while the second zone player is: playing the second audio information; and transmitting the first audio information to the first zone player.~~

31. (Currently Amended) The system of claim 29 wherein the timing information comprises first timing information, and wherein playing the second audio information comprises playing the second audio information based on second timing information, wherein the second timing information is different from the first timing information. ~~second operations further comprise transmitting timing information to the first zone player while the second zone player is playing the second audio information.~~

32. (Currently Amended) The system of claim 29 wherein the timing information comprises first timing information, wherein playing the second audio information comprises playing the second audio information based on second timing information, wherein the second timing information comprises clock timing information, and wherein the first timing information comprises the clock timing information~~second audio information comprises timing information.~~

33. (Currently Amended) The system of claim ~~[[32]]~~ 29 wherein the timing information comprises at least one of playback timing and clock timing information.

34. (Currently Amended) The ~~method~~ system of claim 29 wherein the timing information comprises clock timing information. ~~second operations further comprise:~~

~~transmitting the first audio information to a third zone player while the second zone player is (i) playing the second audio information and (ii) transmitting the first audio information to the first zone player; and~~

~~transmitting timing information associated with the first audio information to the first and third zone players.~~

35. (Currently Amended) The system of claim 29 wherein the second operations further comprise:

receiving audio information from an audio information source that is connected to the second zone player; and

converting the audio information received from the audio information source into the first audio information via the second zone player prior to the transmission of the first audio information and the timing information to the first zone player and the third zone player. 36

~~wherein the second operations further comprise receiving the analog audio information from an audio information source that is directly connected to the second zone player.~~

36. (Currently Amended) The system of claim 35, wherein the audio information source is directly connected to the second zone player, wherein the audio information received from the audio information source comprises analog audio information, and wherein the converting comprising converting the analog audio information into digital audio information.
~~29 wherein:~~

~~the first audio information further comprises digital audio information; and~~

~~the second operations further comprise converting analog audio information into the digital audio information prior to the transmission of the first audio information to the first zone player.~~

37. (Currently Amended) A tangible, non-transitory computer-readable ~~memory~~ medium having instructions stored thereon that when executed cause a first zone player to:

transmit first audio information and timing information to each of a second zone player and a third zone player over at least one of a local area network and a wide area network;

causing the second zone player and the third zone player to synchronously play the first audio information based on the timing information;

playing second audio information while (i) the second zone player and the third zone player ~~[[is]]~~ are synchronously playing the first audio information and (ii) the first zone player is transmitting the first audio information and the timing information to the second zone player and the third zone player, wherein the second audio information is different from the first audio information. ~~;~~ and;

~~transmit the first audio information to a third zone player while the first zone player is (i) playing the second audio information and (ii) transmitting the first audio information to the second zone player.~~

38. (Currently Amended) The tangible, non-transitory computer readable medium of claim 37 wherein the second audio information comprises an audio track, ~~further comprising instructions that when executed cause the first zone player to: transmit playback timing information to the second and third zone players while the first zone player is playing the second audio information.~~

39. (Currently Amended) The tangible, non-transitory computer readable medium of claim 37 wherein the timing information comprises first timing information, and wherein playing the second audio information comprises playing the second audio information based on second timing information, wherein the second timing information is different from the first timing information, ~~further comprising instructions that when executed cause the first zone player to: receive the first audio information from an audio information source, wherein the audio information source is directly connected to the first zone player.~~

40. (Currently Amended) The tangible, non-transitory computer readable medium of claim 37 wherein the timing information comprises first timing information, wherein playing the second audio information comprises playing the second audio information based on second timing information, wherein the second timing information comprises clock timing information, and wherein the first timing information comprises the clock timing information, ~~further comprising instructions that when executed cause the first zone player to: convert the first audio~~

~~information from analog to digital prior to transmitting the first audio information to the first and third zone players.~~

REMARKS**I. Status of the Claims**

Claims 21-40 are pending; claims 21, 29, and 37 are independent. Without conceding the merits of the rejections, and solely to advance prosecution, Applicant has amended claims 21-40 to further clarify the claim language and to generally put the claims in better condition for allowance and issue. Applicant reserves the right to pursue the originally-filed and/or previously-pending claims in one or more continuation applications.

II. Summary of the Final Office Action

In the Final Office Action mailed May 16, 2017, the Examiner: (i) rejected claims 21, 22, 27-30, 35-37, 39, and 40 under § 102 over U.S. Pat. 8,131,389 (Hardwick); (ii) rejected claims 23-26, 31-34, and 38 under § 103 over Hardwick in view of U.S. Pub. 2007/0142944 (Goldberg); (iii) rejected claim 27 under § 112 as allegedly indefinite; and (iv) rejected claims 27 and 25 under 35 U.S.C. § 112, fourth paragraph for improper dependency.

III. Summary of the Advisory Action

The Advisory Action mailed on August 22, 2017, states that the amendments presented in the After Final Response filed on August 13, 2017, if entered, would overcome (i) the § 112 rejections of claims 27 and 35, and (ii) the § 102 rejections of claims 21-40 based on Hardwick. And with reference to claims 23 and 24, the Advisory Action further (i) requested that Applicant cite passages in the specification that describe “the first and second timing information used to play different audio information” and (ii) commented that “it appears that the first timing information and the second timing information are the same clock timing information, which renders ‘first’ and ‘second’ ambiguous because it suggests distinct information when it is not.”

IV. Response to the Requests in the Advisory Action

The Advisory Action requests that Applicant cite passages in the specification that describe “the first and second timing information used to play different audio information.” Advisory Action p. 2.

This aspect of the claims is supported generally throughout Applicant’s originally-filed specification, including but not limited to ¶¶ 19-20 of Applicant’s published application U.S. Pub. 2013/0238108, which describes an example scenario where: (i) “zone players 11(1) and 11(2) comprise one synchrony group,” that is playing [first] audio information from a first “audio information source 14(1)(1)”; and (ii) “contemporaneously...zone player 11(1)...provide[s] [second] audio information from...[a second] audio information source 14(1)(2), to...zone player 11(6) for playback.” In operation, “zone players that are playing different audio programs may do so with unrelated timings[,],...for example, the timing with which zone players 11(1) and 11(s) play [the first] audio program may have no relationship to the timing with which...zone player 11(6) play[s] [the second] audio program.” U.S. Pub. 2013/0238108, ¶¶ 19-20.

The Advisory Action also states, “it appears that the first timing information and the second timing information are the same clock timing information, which renders ‘first’ and ‘second’ ambiguous because it suggests distinct information when it is not.” Advisory Action, p. 2. Applicant disagrees that the first and second timing information terms are ambiguous.

The specification describes at least two types of “timing information” used for playing media content. In some example embodiments, “audio information channel device 23 obtains the audio information for the audio program from an audio information source, adds *playback timing information*, and transmits the combined audio and playback timing information to the

master device 21 and slave devices 22(g) over the network 12 for playback. The *playback timing information* that is provided with the audio information, together with *clock timing information provided by the audio information channel device 23* to the various devices 21 and 22(g)...enables the master device 21 and slave devices 22(g) of the synchrony group 20 to play the audio information simultaneously.” U.S. Pub. 2013/0238108, ¶ 28 (emphasis added).

Regarding the above-described example scenario where zone player 11(1) is both playing first audio from audio information source 14(1)(1) and providing second audio from audio information source 14(1)(2) to zone player 11(6) for playback, (i) zone player 11(1) plays back the first audio based on first timing information that includes *playback timing information for the first audio* and *clock timing information from audio information channel device 13* and (ii) zone player 11(6) plays back the second audio based on second timing information that includes *playback timing information for the second audio* and *clock timing information from zone player 11(6)*. Regarding the first audio in this example embodiment, zone player 11(1) “will determine a time differential value that is the difference between the [zone player 11(1)’s] current clock time, as indicated by its digital to analog converter 34, and the audio information channel device’s [13] time as indicated by the audio information channel device’s [13] clock timing information.” U.S. Pub. 2013/0238108, ¶ 84. Thus, in this example scenario, zone player 11(1) plays the first audio based on its own device clock timing, and zone player 11(6) plays the second audio based on zone player 11(1)’s device clock timing, too.

Accordingly, claim 23 would cover, among other example embodiments, a scenario where “the second zone player is transmitting the first audio information and timing information to the first zone player and the third zone player,” where “the timing information compris[es] first timing information” (e.g., playback timing for the first audio information), and the second

zone player “play[s] the second audio information based on second timing” (e.g., playback timing for the second audio information) where “the second timing information is different from the first timing information.”

And claim 24 would cover, among other example embodiments, a scenario where “the second zone player is transmitting the first audio information and timing information to the first zone player and the third zone player,” where “the timing information compris[es] first timing information” (e.g., device clock timing of the second zone player), and the second zone player “play[s] the second audio information based on second timing information, wherein the second timing information comprises clock timing information” (e.g., device clock timing of the second zone player), “and wherein the first timing information comprises the clock timing information” (e.g., device clock timing of the second zone player).

Claims 23 and 24 may cover other scenarios with other timing information, too. But in view of the foregoing, the first and second timing information is supported by the specification and is not ambiguous in view of example embodiments disclosed in the specification.

V. Conclusion

Applicant submits that the pending claims are patentable, and Applicant requests a Notice of Allowance. If further discussion would advance the application to allowance and issue, the Examiner is invited to telephone the undersigned at 312-913-0001.

Respectfully submitted,
McDonnell Boehnen Hulbert & Berghoff LLP

Date: October 5, 2017

By: /Jeffrey P. Armstrong/
Jeffrey P. Armstrong
Reg. No. 54,967

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)		Docket Number (Optional) 13-0402 (15-518-CON)																																		
Application Number 13/864,249	Filed April 17, 2013																																			
For Concurrent Transmission and Playback of Audio Information																																				
Art Unit 2442	Examiner Survillo																																			
<p>This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.</p> <p>The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):</p> <table style="width: 100%; border-collapse: collapse;"><thead><tr><th></th><th style="text-align: center;"><u>Fee</u></th><th style="text-align: center;"><u>Small Entity Fee</u></th><th style="text-align: center;"><u>Micro Entity Fee</u></th><th></th></tr></thead><tbody><tr><td>☐ One month (37 CFR 1.17(a)(1))</td><td style="text-align: center;">\$200</td><td style="text-align: center;">\$100</td><td style="text-align: center;">\$50</td><td>\$ _____</td></tr><tr><td>☒ Two months (37 CFR 1.17(a)(2))</td><td style="text-align: center;">\$600</td><td style="text-align: center;">\$300</td><td style="text-align: center;">\$150</td><td>\$ 600.00</td></tr><tr><td>☐ Three months (37 CFR 1.17(a)(3))</td><td style="text-align: center;">\$1,400</td><td style="text-align: center;">\$700</td><td style="text-align: center;">\$350</td><td>\$ _____</td></tr><tr><td>☐ Four months (37 CFR 1.17(a)(4))</td><td style="text-align: center;">\$2,200</td><td style="text-align: center;">\$1,100</td><td style="text-align: center;">\$550</td><td>\$ _____</td></tr><tr><td>☐ Five months (37 CFR 1.17(a)(5))</td><td style="text-align: center;">\$3,000</td><td style="text-align: center;">\$1,500</td><td style="text-align: center;">\$750</td><td>\$ _____</td></tr></tbody></table> <p>☐ Applicant asserts small entity status. See 37 CFR 1.27.</p> <p>☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.</p> <p>☐ A check in the amount of the fee is enclosed.</p> <p>☐ Payment by credit card. Form PTO-2038 is attached.</p> <p>☒ The Director has already been authorized to charge fees in this application to a Deposit Account.</p> <p>☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number <u>13-2490</u>.</p> <p>☒ Payment made via EFS-Web.</p> <p>WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.</p> <p>I am the</p> <p>☐ applicant/inventor.</p> <p>☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).</p> <p>☒ attorney or agent of record. Registration number <u>54,967</u></p> <p>☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.</p> <table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 50%; padding: 5px;"><u>/Jeffrey P. Armstrong/</u> Signature</td><td style="width: 50%; padding: 5px;"><u>October 5, 2017</u> Date</td></tr><tr><td style="padding: 5px;"><u>Jeffrey P. Armstrong</u> Typed or printed name</td><td style="padding: 5px;"><u>312-913-0001</u> Telephone Number</td></tr></table> <p>NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.</p> <p>☒ * Total of <u>1</u> forms are submitted.</p>				<u>Fee</u>	<u>Small Entity Fee</u>	<u>Micro Entity Fee</u>		☐ One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ _____	☒ Two months (37 CFR 1.17(a)(2))	\$600	\$300	\$150	\$ 600.00	☐ Three months (37 CFR 1.17(a)(3))	\$1,400	\$700	\$350	\$ _____	☐ Four months (37 CFR 1.17(a)(4))	\$2,200	\$1,100	\$550	\$ _____	☐ Five months (37 CFR 1.17(a)(5))	\$3,000	\$1,500	\$750	\$ _____	<u>/Jeffrey P. Armstrong/</u> Signature	<u>October 5, 2017</u> Date	<u>Jeffrey P. Armstrong</u> Typed or printed name	<u>312-913-0001</u> Telephone Number
	<u>Fee</u>	<u>Small Entity Fee</u>	<u>Micro Entity Fee</u>																																	
☐ One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ _____																																
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<u>/Jeffrey P. Armstrong/</u> Signature	<u>October 5, 2017</u> Date																																			
<u>Jeffrey P. Armstrong</u> Typed or printed name	<u>312-913-0001</u> Telephone Number																																			

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

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

Electronic Patent Application Fee Transmittal				
Application Number:		13864249		
Filing Date:		17-Apr-2013		
Title of Invention:		CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION		
First Named Inventor/Applicant Name:		Nicholas A. J. Millington		
Filer:		Jeffrey Armstrong		
Attorney Docket Number:		13-0402 (MBHB 15-518-CON)		
Filed as Large 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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 2 months with \$0 paid	1252	1	600	600
Miscellaneous:				
RCE- 1st Request	1801	1	1200	1200
Total in USD (\$)				1800

Electronic Acknowledgement Receipt	
EFS ID:	30580432
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Jeffrey Armstrong
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	05-OCT-2017
Filing Date:	17-APR-2013
Time Stamp:	17:27:53
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1800
RAM confirmation Number	100617INTEFSW17282400
Deposit Account	132490
Authorized User	Jeffrey Armstrong
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)					
37 CFR 1.20 (Post Issuance fees)					
37 CFR 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	13-0402_RCE.pdf	76489	no	2
			fdaf8259febe7264c040a1181361a35a6abc4ef0		
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
2		13-0402_Response.pdf	140284	yes	13
			418a95e96c713150f9e2be3321f11b41917f1121		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Amendment Submitted/Entered with Filing of CPA/RCE		1	1	
	Claims		2	9	
	Applicant Arguments/Remarks Made in an Amendment		10	13	
Warnings:					
Information:					
3	Extension of Time	13-0402_EOT.pdf	139084	no	1
			1982257c172c2eb3e5ad85884dfcb3a40de1ed4f		
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	32809	no	2
			1c6b6f45390ebdb4c5d63ce30cfe6adfa60534d4		
Warnings:					
Information:					
Total Files Size (in bytes):			388666		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 13/864,249		Filing Date 04/17/2013		☐ To be Mailed	
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO									
APPLICATION AS FILED – PART I									
(Column 1)		(Column 2)							
FOR		NUMBER FILED		NUMBER EXTRA		RATE (\$)		FEE (\$)	
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A		N/A		N/A			
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A		N/A		N/A			
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A		N/A		N/A			
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 =		*		X \$		=	
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =		*		X \$		=	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$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).							
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
						TOTAL			
* If the difference in column 1 is less than zero, enter "0" in column 2.									
APPLICATION AS AMENDED – PART II									
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT	10/05/2017	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	x \$80 =		0	
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	x \$420 =		0	
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						TOTAL ADD'L FEE		0	
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	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			
<p>* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.</p>									

LIE
BRENDA TURNER

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806
107361 7590 08/22/2017 McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606			EXAMINER SURVILLO, OLEG	
			ART UNIT 2442	PAPER NUMBER
			MAIL DATE 08/22/2017	DELIVERY MODE PAPER

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

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

Advisory Action Before the Filing of an Appeal Brief	Application No. 13/864,249	Applicant(s) MILLINGTON, NICHOLAS A. J.	
	Examiner OLEG SURVILLO	Art Unit 2442	AIA (First Inventor to File) Status No

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

THE REPLY FILED 13 August 2017 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.
NO NOTICE OF APPEAL FILED

1. ☒ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance;
 (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:

a) ☒ The period for reply expires 3 months from the mailing date of the final rejection.

b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires _____ months from the mailing date of the prior Advisory Action or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.

Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANT'S FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because

a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);

b) ☐ They raise the issue of new matter (see NOTE below);

c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or

d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: See Continuation Sheet. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).

5. ☐ Applicant's reply has overcome the following rejection(s): _____.

6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

7. ☒ For purposes of appeal, the proposed amendment(s): (a) ☒ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).

10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).

11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.

13. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____

14. ☒ Other: attached to this correspondence is form PTO-2323.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:

Claim(s) allowed: _____.

Claim(s) objected to: _____.

Claim(s) rejected: 21-40.

Claim(s) withdrawn from consideration: _____.

	/OLEG SURVILLO/ Primary Examiner, Art Unit 2442
--	--

Continuation of 3. NOTE: It is noted that since Applicant-initiated interview has already been conducted after Final, no additional interview as part of the AFCP2.0 is deemed necessary.

Regarding the rejection of claim 27 under 35 U.S.C. 112, second paragraph, Applicant's proposed amendment has been fully considered and is sufficient. Therefore, if amendment was entered the rejection would have been withdrawn.

Regarding the rejection of claims 27 and 35 under 35 U.S.C. 112, fourth paragraph, Applicant's proposed amendment has been fully considered and is sufficient. Therefore, if amendment was entered, the rejection would have been withdrawn.

Regarding the rejection of claims 21-40 under 35 U.S.C. 102(b), Applicant's proposed amendment has been fully considered. As to claims 21, 29, and 37, Examiner agrees that Hardwick fails to teach "synchronously playing the first audio information via the first zone player and the third zone player based on the timing information". Therefore, if amendment was entered, the rejection would have been withdrawn. However, further search and consideration is necessary beyond the time allotted for this Pilot program before decision on allowability can be made.

As to any arguments not specifically addressed, they are the same as those discussed above.

As to claims 23 and 24, Applicants are requested to provide support in the specification for the first and second timing information used to play different audio information.

As to claim 24, it appears that the first timing information and the second timing information are the same clock timing information, which renders "first" and "second" ambiguous because it suggests distinct information when it is not.

<p style="text-align: center;">AFCP 2.0 Decision</p>	<p>Application No.</p> <p>13/864,249</p>	<p>Applicant(s)</p> <p>MILLINGTON, NICHOLAS A. J.</p>
	<p>Examiner</p> <p>OLEG SURVILLO</p>	<p>Art Unit</p> <p>2442</p>

This is in response to the After Final Consideration Pilot request filed 13 August 2017.

1. **Improper Request** – The AFCP 2.0 request is improper for the following reason(s) and the after final amendment submitted with the request will be treated under pre-pilot procedure.

- ☐ An AFCP 2.0 request form PTO/SB/434 (or equivalent document) was not submitted.
- ☐ A non-broadening amendment to at least one independent claim was not submitted.
- ☐ A proper AFCP 2.0 request was submitted in response to the most recent final rejection.
- ☐ Other:

2. **Proper Request**

- A. After final amendment submitted with the request will not be treated under AFCP 2.0.

The after final amendment cannot be reviewed and a search conducted within the guidelines of the pilot program.

- ☐ The after final amendment will be treated under pre-pilot procedure.

- B. Updated search and/or completed additional consideration.

The examiner performed an updated search and/or completed additional consideration of the after final amendment within the time authorized for the pilot program. The result(s) of the updated search and/or completed additional consideration are:

- ☐ 1. All of the rejections in the most recent final Office action are overcome and a Notice of Allowance is issued herewith.
- ☐ 2. The after final amendment would not overcome all of the rejections in the most recent final Office action. See attached interview summary for further details.
- ☐ 3. The after final amendment was reviewed, and it raises a new issue(s). See attached interview summary for further details.
- ☒ 4. The after final amendment raises new issues, but would overcome all of the rejections in the most recent final Office action. A decision on determining allowability could not be made within the guidelines of the pilot. See attached interview summary for further details, including any newly discovered prior art.
- ☐ 5. Other:

Examiner Note: Please attach an interview summary when necessary as described above.

08/17/2017

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No. 13-0402
(MBHB 15-518-CON)

In the Application of:	)	
Nicholas A. J. Millington	)	Examiner: SURVILLO, Oleg
	)	
Application No.: 13/864,249	)	Group Art Unit: 2442
	)	
Filed: April 17, 2013	)	Confirmation No. 9806
	)	
Title: Concurrent Transmission and	)	
Playback of Audio Information	)	
	)	
	)	

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

**RESPONSE TO THE FINAL OFFICE ACTION
MAILED MAY 16, 2017**

Pursuant to 37 C.F.R. § 1.116 and the After Final Consideration Pilot Program 2.0, please consider the following Amendments and Remarks in response to the Final Office Action mailed on May 16, 2017, in the above-captioned application.

Amendments begin on page 2.

Remarks begin on page 10.

Please charge any fee due or credit any overpayment to Deposit Account 13-2490.

CERTIFICATION AND REQUEST FOR CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0		
Practitioner Docket No.: 13-0402 (15-518-CON)	Application No.: 13/864,249	Filing Date: April 17, 2013
First Named Inventor: Millington	Title: Concurrent Transmission and Playback of Audio Information	
<p>APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0 (AFCP 2.0) OF THE ACCOMPANYING RESPONSE UNDER 37 CFR 1.116.</p> <ol style="list-style-type: none"> The above-identified application is (i) an original utility, plant, or design nonprovisional application filed under 35 U.S.C. 111(a) [a continuing application (e.g., a continuation or divisional application) is filed under 35 U.S.C. 111(a) and is eligible under (i)], or (ii) an international application that has entered the national stage in compliance with 35 U.S.C. 371(c). The above-identified application contains an outstanding final rejection. Submitted herewith is a response under 37 CFR 1.116 to the outstanding final rejection. The response includes an amendment to at least one independent claim, and the amendment does not broaden the scope of the independent claim in any aspect. This certification and request for consideration under AFCP 2.0 is the only AFCP 2.0 certification and request filed in response to the outstanding final rejection. Applicant is willing and available to participate in any interview requested by the examiner concerning the present response. This certification and request is being filed electronically using the Office's electronic filing system (EFS-Web). Any fees that would be necessary consistent with current practice concerning responses after final rejection under 37 CFR 1.116, e.g., extension of time fees, are being concurrently filed herewith. [There is no additional fee required to request consideration under AFCP 2.0.] By filing this certification and request, applicant acknowledges the following: <ul style="list-style-type: none"> Reissue applications and reexamination proceedings are not eligible to participate in AFCP 2.0. The examiner will verify that the AFCP 2.0 submission is compliant, i.e., that the requirements of the program have been met (see items 1 to 7 above). For compliant submissions: <ul style="list-style-type: none"> The examiner will review the response under 37 CFR 1.116 to determine if additional search and/or consideration (i) is necessitated by the amendment and (ii) could be completed within the time allotted under AFCP 2.0. If additional search and/or consideration is required but cannot be completed within the allotted time, the examiner will process the submission consistent with current practice concerning responses after final rejection under 37 CFR 1.116, e.g., by mailing an advisory action. If the examiner determines that the amendment does not necessitate additional search and/or consideration, or if the examiner determines that additional search and/or consideration is required and could be completed within the allotted time, then the examiner will consider whether the amendment places the application in condition for allowance (after completing the additional search and/or consideration, if required). If the examiner determines that the amendment does not place the application in condition for allowance, then the examiner will contact the applicant and request an interview. <ul style="list-style-type: none"> The interview will be conducted by the examiner, and if the examiner does not have negotiation authority, a primary examiner and/or supervisory patent examiner will also participate. If the applicant declines the interview, or if the interview cannot be scheduled within ten (10) calendar days from the date that the examiner first contacts the applicant, then the examiner will proceed consistent with current practice concerning responses after final rejection under 37 CFR 1.116. 		
Signature /Jeffrey P. Armstrong/		Date August 13, 2017
Name (Print/Typed) Jeffrey P. Armstrong		Practitioner Registration No. 54,967
<p>Note: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.</p>		
☒ * Total of <u>1</u> forms are submitted.		

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No. 13-0402
(MBHB 15-518-CON)

In the Application of:	)	
Nicholas A. J. Millington	)	Examiner: SURVILLO, Oleg
	)	
Application No.: 13/864,249	)	Group Art Unit: 2442
	)	
Filed: April 17, 2013	)	Confirmation No. 9806
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Title: Concurrent Transmission and	)	
Playback of Audio Information	)	
	)	
	)	

Mail Stop Amendment
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P.O. Box 1450
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**RESPONSE TO THE FINAL OFFICE ACTION
MAILED MAY 16, 2017**

Pursuant to 37 C.F.R. § 1.116 and the After Final Consideration Pilot Program 2.0, please consider the following Amendments and Remarks in response to the Final Office Action mailed on May 16, 2017, in the above-captioned application.

Amendments begin on page 2.

Remarks begin on page 10.

Please charge any fee due or credit any overpayment to Deposit Account 13-2490.

AMENDMENTS TO THE CLAIMS

Please amend claims 21-40. Following is a completing listing of the claims, as amended.

1-20. (Canceled)

21. (Currently Amended) In a network comprising a first zone player, a second zone player, and a ~~second-third~~ zone player, a method comprising:

transmitting first audio information and timing information to the first zone player and the third zone player via the second zone player over the network, wherein the network comprises at least one of a local area network and a wide area network;

synchronously playing the first audio information via the first zone player and the third zone player based on the timing information; and

~~transmitting the first audio information to the first zone player via the second zone player over at least one of a local and a wide area network; and~~

playing [[the]] second audio information via the second zone player while (i) the first zone player and the third zone player [[is]] are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information.

22. (Currently Amended) The method of claim 21 wherein the second audio information comprises an audio track, ~~further comprising transmitting the first audio information to a third zone player, by while the second zone player is: playing the second audio information; and transmitting the first audio information to the first zone player.~~

23. (Currently Amended) The method of claim 21 wherein the timing information comprises first timing information, and wherein playing the second audio information comprises playing the second audio information based on second timing information, wherein the second timing information is different from the first timing information, ~~further comprising:~~

~~transmitting timing information to the first zone player via the second zone player while the second zone player is playing the second audio information.~~

24. (Currently Amended) The method of claim 21 wherein the timing information comprises first timing information, and wherein playing the second audio information comprises playing the second audio information based on second timing information, wherein the second timing information comprises clock timing information, and wherein the first timing information comprises the clock timing information~~second audio information comprises timing information.~~

25. (Currently Amended) The method of claim ~~[[24]]~~ 21 wherein the timing information comprises at least one of playback timing information and clock timing information.

26. (Currently Amended) The method of claim 21 wherein the timing information comprises clock timing information, ~~further comprising: transmitting the first audio information to a third zone player via the second zone player while the second zone player is (i) playing the second audio information and (ii) transmitting the first audio information to the first zone player; and transmitting timing information associated with the first audio information to the first and third zone players.~~

27. (Currently Amended) The method of claim 21 wherein the method further comprises:

receiving audio information from an audio information source that is connected to the second zone player; and

converting the audio information received from the audio information source into the first audio information via the second zone player prior to the transmission of the first audio information and the timing information to the first zone player and the third zone player. 28;
~~further comprising receiving the analog audio information from an audio information source that is directly connected to the first zone player.~~

28. (Currently Amended) The method of claim 27, wherein the audio information source is directly connected to the second zone player, wherein the audio information received from the audio information source comprises analog audio information, and wherein the converting comprising converting the analog audio information into digital audio information.
~~wherein the first audio information comprises digital audio information, and wherein the method further comprises converting analog audio information into the digital audio information via the second zone player prior to the transmission of the first audio information to the first zone player.~~

29. (Currently Amended) A system comprising a first zone player, a second zone player, and a ~~second~~ third zone player, wherein:

each of the first zone player and the third zone player comprises ~~includes~~ at least one processor and tangible non-transitory computer-readable memory comprising instructions that, when executed, cause the first zone player and the third zone player to ~~perform first operations;~~
~~the first operations comprising synchronously playing play first audio information based on timing information;~~ and

the second zone player includes at least one processor and tangible non-transitory computer-readable memory comprising instructions that, when executed, cause the second zone player to perform second operations, the second operations comprising:

transmitting the first audio information and the timing information over at least one of a local area network and a wide area network to the first zone player and the second zone player, and

playing [[the]] second audio information while (i) the first zone player and the third zone player [[is]] are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information.

30. (Currently Amended) The system of claim 29 wherein the second audio information comprises an audio track. ~~operations further comprise transmitting the first audio information to a third zone player while the second zone player is: playing the second audio information; and transmitting the first audio information to the first zone player.~~

31. (Currently Amended) The system of claim 29 wherein the timing information comprises first timing information, and wherein playing the second audio information comprises playing the second audio information based on second timing information, wherein the second timing information is different from the first timing information. ~~second operations further comprise transmitting timing information to the first zone player while the second zone player is playing the second audio information.~~

32. (Currently Amended) The system of claim 29 wherein the timing information comprises first timing information, wherein playing the second audio information comprises playing the second audio information based on second timing information, wherein the second timing information comprises clock timing information, and wherein the first timing information comprises the clock timing information~~second audio information comprises timing information.~~

33. (Currently Amended) The system of claim ~~[[32]]~~ 29 wherein the timing information comprises at least one of playback timing and clock timing information.

34. (Currently Amended) The ~~method~~ system of claim 29 wherein the timing information comprises clock timing information. ~~second operations further comprise:~~

~~transmitting the first audio information to a third zone player while the second zone player is (i) playing the second audio information and (ii) transmitting the first audio information to the first zone player; and~~

~~transmitting timing information associated with the first audio information to the first and third zone players.~~

35. (Currently Amended) The system of claim 29 wherein the second operations further comprise:

receiving audio information from an audio information source that is connected to the second zone player; and

converting the audio information received from the audio information source into the first audio information via the second zone player prior to the transmission of the first audio information and the timing information to the first zone player and the third zone player. ~~36~~

~~wherein the second operations further comprise receiving the analog audio information from an audio information source that is directly connected to the second zone player.~~

36. (Currently Amended) The system of claim 35, wherein the audio information source is directly connected to the second zone player, wherein the audio information received from the audio information source comprises analog audio information, and wherein the ~~converting comprising converting the analog audio information into digital audio information.~~
~~29 wherein:~~

~~the first audio information further comprises digital audio information; and~~

~~the second operations further comprise converting analog audio information into the digital audio information prior to the transmission of the first audio information to the first zone player.~~

37. (Currently Amended) A tangible, non-transitory computer-readable ~~memory~~ medium having instructions stored thereon that when executed cause a first zone player to:

transmit first audio information and timing information to each of a second zone player and a third zone player over at least one of a local area network and a wide area network;

causing the second zone player and the third zone player to synchronously play the first audio information based on the timing information;

playing second audio information while (i) the second zone player and the third zone player ~~[[is]]~~ are synchronously playing the first audio information and (ii) the first zone player is transmitting the first audio information and the timing information to the second zone player and the third zone player, wherein the second audio information is different from the first audio information. ~~;~~ and;

~~transmit the first audio information to a third zone player while the first zone player is (i) playing the second audio information and (ii) transmitting the first audio information to the second zone player.~~

38. (Currently Amended) The tangible, non-transitory computer readable medium of claim 37 wherein the second audio information comprises an audio track, ~~further comprising instructions that when executed cause the first zone player to: transmit playback timing information to the second and third zone players while the first zone player is playing the second audio information.~~

39. (Currently Amended) The tangible, non-transitory computer readable medium of claim 37 wherein the timing information comprises first timing information, and wherein playing the second audio information comprises playing the second audio information based on second timing information, wherein the second timing information is different from the first timing information, ~~further comprising instructions that when executed cause the first zone player to: receive the first audio information from an audio information source, wherein the audio information source is directly connected to the first zone player.~~

40. (Currently Amended) The tangible, non-transitory computer readable medium of claim 37 wherein the timing information comprises first timing information, wherein playing the second audio information comprises playing the second audio information based on second timing information, wherein the second timing information comprises clock timing information, and wherein the first timing information comprises the clock timing information, ~~further comprising instructions that when executed cause the first zone player to: convert the first audio~~

~~information from analog to digital prior to transmitting the first audio information to the first and third zone players.~~

REMARKS

Claims 21-40 are pending; claims 21, 29, and 37 are independent. Without conceding the merits of the rejections, and solely to advance prosecution, Applicant has amended claims 21-40 to further clarify the claim language and to generally put the claims in better condition for allowance and issue. Applicant reserves to right to pursue the originally-filed and/or previously-pending claims in one or more continuation applications.

In the Final Office Action dated May 16, 2017: (i) claims 21, 22, 27-30, 35-37, 39, and 40 were rejected under 35 U.S.C. § 102 over U.S. Pat. 8,131,389 (Hardwick); (ii) claims 23-26, 31-34, and 38 were rejected under 35 U.S.C. § 103 over Hardwick in view of U.S. Pub. No. US2007/0142944 (Goldberg); (iii) Claim 27 was rejected under 35 U.S.C. § 112, second paragraph, for allegedly being indefinite; and (iv) claims 27 and 25 were rejected under 35 U.S.C. § 112, fourth paragraph for improper dependency. Applicant has amended claims 27 and 35 have been amended to address the § 112 rejections and requests that the §112 rejections be withdrawn.

As a preliminary matter, the undersigned attorney thanks the Examiner for engaging in a telephone conference with the undersigned and his colleague, John Tolomei, on July 19, 2017, to discuss the present Office Action, the §102 rejection, the Hardwick reference, and independent claim 21. The following remarks reflect that Applicant understands that the Examiner agreed that Hardwick fails to disclose or suggest all the features of independent claim 21, as amended above. Applicant requests that this paper constitute the Applicant's Interview Summary. If the Examiner notices any deficiencies with this paper in this regard, he is encouraged to contact the undersigned attorney to correct such deficiencies.

Applicant submits that the claims are patentable over the cited references for at least the reason that Hardwick and the other cited references fail to teach or suggest all the elements recited in the claims. For example, with reference to claim 21, the cited references fail to teach or suggest at least, “playing second audio information via the second zone player while (i) the first zone player and the third zone player are synchronously playing the first audio information and (ii) the second zone player is transmitting the first audio information and the timing information to the first zone player and the third zone player, wherein the second audio information is different from the first audio information,” in combination with the other elements recited in the claims as agreed during the July 19th interview.

Hardwick is directed to digital audio servers (DASs). Hardwick, Abstract. “[A] DAS allows a standard stereo component, such as a CD player, a DVD player, a receiver, a tuner, or a tape recorder, to be connected to an Ethernet network.” Hardwick, 10:10-13. Hardwick’s Figure 4 shows a system with two DASs, each in its own room. “In room #1, a first DAS 405 is connected to a stereo system that includes a CD changer 415 and a pair of amplified speakers 420.” Hardwick, 14:31-38. “In room #2, a second DAS 410 is connected to a second stereo system that includes an amplifier 425, speakers 430, and a tape player/recorder 435 Hardwick, 14:39-45. “The DAS 405 and the DAS 410 are connected in a star configuration via an Ethernet network wired through a standard router or hub 445. This configuration allows music stored on either DAS to be played by both stereo systems.” Hardwick, 14:50-53.

In contrast to claim 21, Hardwick at most discloses playing audio in two separate rooms by stereo systems that share DASs. However, neither of these stereo systems synchronously plays audio information in the manner recited in claim 21. For example, even if the DASs in Hardwick could reasonably be construed as zone players, Hardwick does not disclose or suggest

transmitting first audio information and timing information via one DAS to the other DAS for synchronous playback. Thus, it follows that Hardwick also fails to disclose or suggest playing second audio information via the DAS that is transmitting first audio and timing information, nor does Hardwick disclose these features in combination with other features of claim 21. Accordingly, Applicant requests that the Office withdraw the § 102 rejections of claim 21.

Further, and without conceding the merits of the other assertions in the Office Action, Applicant requests that the Office (i) withdraw the rejections of 29 and 37 for at least the reason that claims 29 and 37 recite elements similar to those in claim 21 that are not disclosed or suggested in Hardwick or the other cited references; and (ii) withdraw the rejections of the dependent claims for at least the reason that the dependent claims depend from patentable independent claims.

Applicant submits that the pending claims are patentable, and Applicant requests a Notice of Allowance. If further discussion would advance the application to allowance and issue, the Examiner is invited to telephone the undersigned at 312-913-0001.

Respectfully submitted,
McDonnell Boehnen Hulbert & Berghoff LLP

Date: August 13, 2017

By: /Jeffrey P. Armstrong/
Jeffrey P. Armstrong
Reg. No. 54,967

Electronic Acknowledgement Receipt	
EFS ID:	30063323
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Jeffrey Armstrong
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	13-AUG-2017
Filing Date:	17-APR-2013
Time Stamp:	19:55:18
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	After Final Consideration Program Request	13-0402_AFCP_Request.pdf	134587 f4dbfc3c6dc0d39f207873206e72150d11f09740	no	1

Warnings:

Information:					
2		13-0402_Response.pdf	120916	yes	12
			ec87c11ddae724b1e6c008b7fffb86eff5d5b558		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Response After Final Action		1	1	
	Claims		2	9	
	Applicant Arguments/Remarks Made in an Amendment		10	12	
Warnings:					
Information:					
Total Files Size (in bytes):			255503		
<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>					



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806
107361 7590 07/24/2017 McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606			EXAMINER SURVILLO, OLEG	
			ART UNIT 2442	PAPER NUMBER
			MAIL DATE 07/24/2017	DELIVERY MODE PAPER

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

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

<i>Applicant-Initiated Interview Summary</i>	Application No.	Applicant(s)		
	13/864,249	MILLINGTON, NICHOLAS A. J.		
	Examiner	Art Unit	AIA (First Inventor to File) Status	Page
	OLEG SURVILLO	2442	No	1 of 1

All participants (applicant, applicant's representative, PTO personnel):

1. OLEG SURVILLO (Primary Examiner); Telephonic
2. Jeffrey Armstrong (Attorney); Telephonic
3. John Tolomei (Attorney); Telephonic

Date of Interview: 19 July 2017

Claim(s) discussed: discussed claim 21

Identification of prior art discussed: Hardwick

Amendment Proposed: proposed amendments attached with the Agenda

Issues Discussed:

Item(s) under 35 U.S.C. 103:

discussed proposed amendments. Agreed that Hardwick fails to teach all of the claim features of claim 21, as amended. Examiner advised that unless next Office action is a Notice of Allowance, reliance on Hardwick to teach some of the features of claim 21 might be maintained in the next response. No agreement on allowability has been reached since update search is necessary.

Attachment(s): Agenda, Proposed Amendments, Proposed Arguments

/OLEG SURVILLO/ Primary Examiner, Art Unit 2442	
<p>Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable time limit of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.</p> <p>Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.</p> <p>Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicant's responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04</p> <p>Please further see:</p> <p>MPEP 713.04 Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b) 37 CFR § 1.2 Business to be transacted in writing</p>	



McDonnell Boehnen Hulbert & Berghoff
Law Offices

300 South Wacker Drive
Chicago, Illinois 60606-6709
www.mbhb.com

312-913-0001 phone
312-913-0002 fax

July 18, 2017

Via email: oleg.survillo@uspto.gov

Examiner Oleg Survillo
U.S. Patent & Trademark Office
P.O. Box 1450
Arlington, VA 22313-1450

RE: Interview Agenda for App. 13/864,249 (Sonos 13-0402; MBHB 15-518-CON)

Examiner Survillo:

Thank you for agreeing to interview the above-referenced application. An agenda of topics is outlined below:

Agenda for the Examiner Interview:

- Proposed amendments to claim 21
- Section 102 rejection of claim 21
 - U.S. Pat. 8,131,389 ("Hardwick")

Proposed Amendment:

21. (Proposed) In a network comprising a first zone player, ~~and a second zone player,~~
and a third player, a method comprising:

transmitting first audio information and associated timing information to the first and third zone players via the second zone player over the network, wherein the network comprises at least one of a local area network and a wide area network

based on the timing information transmitted to the first and third zone players,
synchronously playing the first audio information via the first and third zone players; and

~~transmitting the first audio information to the first zone player via the second zone player~~
~~over at least one of a local and a wide area network; and~~

playing second audio information via the second zone player while (i) the first and third
zone player ~~[[is]]~~ are synchronously playing the first audio information and (ii) the second zone

player is transmitting the first audio information and the timing information to the first and third zone players, wherein the second audio information is different from the first audio information..

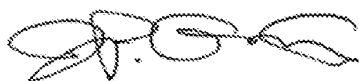
Comments

Hardwick is directed to digital audio servers (DASs). Hardwick, Abstract. “[A] DAS allows a standard stereo component, such as a CD player, a DVD player, a receiver, a tuner, or a tape recorder, to be connected to an Ethernet network.” Hardwick, col. 10, lines 10-13. Hardwick’s Figure 4 shows a system with two DASs, each in its own room. “In room #1, a first DAS 405 is connected to a stereo system that includes a CD changer 415 and a pair of amplified speakers 420.” Hardwick, col. 14, lines 31-38. “In room #2, a second DAS 410 is connected to a second stereo system that includes an amplifier 425, speakers 430, and a tape player/recorder 435.” Hardwick, col. 14, lines 39-45. “The DAS 405 and the DAS 410 are connected in a star configuration via an Ethernet network wired through a standard router or hub 445. This configuration allows music stored on either DAS to be played by both stereo systems.” Hardwick, col. 14, lines 50-53.

Hardwick fails to disclose or suggest all the features of proposed claim 21. Rather, Hardwick at most discloses playing audio in separate rooms by stereo systems that share DASs. None of these stereo systems, however, synchronously play audio information in the manner required by claim 21. For example, even if the DASs in Hardwick could reasonably be construed as zone players, Hardwick does not disclose or suggest transmitting first audio information and associated timing information via one DAS to other DASs for synchronous playback. As such, it follows that Hardwick also fails to disclose or suggest playing second audio information via the DAS that is transmitting the first audio and timing information, nor does Hardwick disclose these features in combination with other features of claim 21.

If you have questions, or if you would like additional information to prepare for the interview, please feel free to call me.

Best regards,



Jeff Armstrong
312-913-2104 (office)



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/864,249	04/17/2013	Nicholas A. J. Millington	13-0402 (MBHB 15-518-CON)	9806
107361 7590 05/16/2017 McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606			EXAMINER SURVILLO, OLEG	
			ART UNIT 2442	PAPER NUMBER
			MAIL DATE 05/16/2017	DELIVERY MODE PAPER

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

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

Office Action Summary	Application No. 13/864,249	Applicant(s) MILLINGTON, NICHOLAS A. J.	
	Examiner OLEG SURVILLO	Art Unit 2442	AIA (First Inventor to File) Status No

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1) ☒ Responsive to communication(s) filed on 12/30/16 and 01/24/17.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.

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

3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.

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

Disposition of Claims*

5) ☒ Claim(s) 21-40 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.

6) ☐ Claim(s) ____ is/are allowed.

7) ☒ Claim(s) 21-40 is/are rejected.

8) ☐ Claim(s) ____ is/are objected to.

9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, 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.

Application Papers

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

11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

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

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)).

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

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date See Continuation Sheet.

3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.

4) ☐ Other: ____.

Continuation of Attachment(s) 2). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :10/13/16; 10/13/16; 10/13/16; 10/13/16; 10/13/16; 11/22/16; 02/14/17; 02/14/17; 02/14/17; 04/14/17.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Response to Amendment

1. Claims 21-40 are pending in the application. Claims 21-40 are currently amended. Claims 1-20 have been canceled. No new claims are currently added.

Response to Arguments

2. With regard to Applicant's remarks dated December 30, 2016 and January 24, 2017:

Amendment to the title of the invention has been fully considered and is entered.

Regarding claim objection, Applicant's amendment has been fully considered and is sufficient. Therefore, the objection has been withdrawn.

Regarding the rejection of claims 29-36 under 35 U.S.C. 101, Applicant's amendment and arguments have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.

Regarding the rejection of claims 21-40 under 35 U.S.C. 103(a), Applicant's amendment and arguments have been fully considered.

Applicants argue that none of the units 710 and 770 of Goldberg play audio that is different than the audio that they are broadcasting. Examiner agrees. Applicants further argue that Giaino's computing device does not play one audio stream while transmitting another over a local or wide area network, much less playing the audio

stream while a separate zone player is playing the transmitted audio stream. Examiner agrees. Therefore, the rejection has been withdrawn. However, new grounds of rejection are made in view of the newly discovered prior art.

As to any arguments not specifically addressed they are the same as those discussed above.

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 27 is rejected under 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

As to claim 27, it is unclear why the analog audio information would be received when dependent claim 28 from which claim 27 appears to depend specifically converts analog to digital before transmission to the first zone player.

The following is a quotation of pre-AIA 35 U.S.C. 112, fourth paragraph:

Subject to the following paragraph [i.e., the fifth paragraph of pre-AIA 35 U.S.C. 112], a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

4. Claims 27 and 35 are rejected under pre-AIA 35 U.S.C. 112, 4th paragraph, as being of improper dependent form for failing to further limit the subject matter of the claim upon which it depends, or for failing to include all the limitations of the claim upon which it depends.

As to claim 27, the statute requires a dependent claim "shall contain a reference to a claim previously set forth". However, a reference is made to a claim subsequently set forth (claim 28 is not previously set forth), thus, not complying with requirement of pre-AIA 35 U.S.C. 112, fourth paragraph.

Claim 35 is rejected for the same reasons as discussed per claim 27 above.

Claim Rejections - 35 USC § 102

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

A person shall be entitled to a patent unless –

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

5. Claims 21, 22, 27-30, 35-37, 39, and 40 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Hardwick et al. (US Patent 8,131,389 B1).

As to claim 21, Hardwick teaches in a network comprising a first zone player [DAS#2 410 with connected amplifier 425 and speakers 430] and a second zone player [DAS#1 405 with connected amplified speakers 420 and CD changer 415], a method comprising:

playing first audio information via the first zone player [DAS 410 performs read and playback of the music stored in the main server DAS 405] (col. 14 lines 50-60);

transmitting the first audio information to the first zone player via the second zone player over at least one of a local and wide area network [DAS 405 and DAS 410 are connected via an Ethernet network] (col. 14 lines 39-60, Fig. 4); and

playing second audio information via the second zone player while (i) the first zone player is playing the first audio information and (ii) the second zone player is transmitting the first audio information to the first zone player, wherein the second audio information is different from the first audio information [multi-zone feature that allows different music selections to be simultaneously played in different rooms] (col. 11 lines 44-63, col. 12 line 63 to col. 13 line 6).

As to claim 22, Hardwick teaches transmitting the first audio information to a third zone player while the second zone player is playing the second audio information and transmitting the first audio information to the first zone player [Hardwick anticipates multiple zones each having DAS that plays the music in respective zone] (col. 11 lines 44-63, col. 12 line 63 to col. 13 line 6).

As to claim 27, Hardwick teaches receiving the analog audio information from an audio information source that is directly connected to the first zone player (col. 14 lines 39-49).

As to claim 28, Hardwick teaches that the first audio information comprises digital audio information, and wherein the method further comprises converting analog audio

information into the digital audio information via the second zone player prior to transmission of the first audio information to the first zone player (col. 10 line 64 to col. 11 line 16).

As to claim 29, Hardwick teaches a system comprising a first zone player and a second zone player, each comprising at least one processor and tangible non-transitory computer-readable memory comprising instructions (Figs. 3 and 4) that, when executed, cause the corresponding first and second zone players to perform operations as discussed per claim 21 above.

As to claims 30, 35, and 36, Hardwick teaches all the elements as discussed per corresponding claims 22, 27, and 28 above.

As to claim 37, Hardwick teaches a tangible, non-transitory computer-readable medium having instructions stored thereon [invention of Hardwick is computer implemented] that when executed cause a first zone player [DAS#1 405] to perform the method steps as discussed per claims 21 and 22 above.

As to claim 39, Hardwick teaches the first zone player receives the first audio information from an audio information source [CD changer 415] that is directly connected to the first zone player (col. 18 lines 15-30).

As to claim 40, Hardwick teaches all the elements as discussed per claim 28 above.

Claim Rejections - 35 USC § 103

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

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

6. Claims 23-26, 31-34, and 38 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Hardwick et al. in view of Goldberg et al. (US 2007/0142944 A1).

As to claim 23, Hardwick teaches all the elements except for transmitting timing information to the first zone player via the second zone player while the second zone player is playing the second audio information.

Goldberg teaches transmitting timing information to the first zone player via the second zone player while the second zone player is playing the second audio information (step 1902, Fig. 34A, par. [0200]-[0202]).

Since the concept of transmitting timing information between playback devices was known in the art at the time of the invention and the claims do not specify a particular purpose of timing information and transmission thereof, one of ordinary skill in

the art would have recognized the ability of DAS devices of Hardwick to transmit the timing information for any purpose that there might be.

As to claim 24, Hardwick teaches all the elements except for the second audio information comprises timing information.

Goldberg teaches that the second audio information comprises timing information (step 1902, Fig. 34A, par. [0200]-[0202]).

Since the concept of transmitting timing information between playback devices was known in the art at the time of the invention and the claims do not specify a particular purpose of timing information and transmission thereof, one of ordinary skill in the art would have recognized the ability of DAS devices of Hardwick to transmit the timing information for any purpose that there might be.

As to claim 25, Hardwick in view of Goldberg teaches that the timing information comprises playback timing information (step 1902, Fig. 34A, par. [0200]-[0202] in Goldberg).

As to claim 26, Hardwick teaches transmitting the first audio information to a third zone player via the second zone player while the second zone player is (i) playing the second audio information and (ii) transmitting the first audio information to the first zone player [Hardwick anticipates multiple zones each having DAS that plays the music in respective zone] (col. 11 lines 44-63, col. 12 line 63 to col. 13 line 6).

Hardwick fails to teach transmitting timing information associated with the first audio information to the first and third players.

Goldberg teaches transmitting timing information to the first and third zone players (step 1902, Fig. 34A, par. [0200]-[0202] in Goldberg).

Since the concept of transmitting timing information between playback devices was known in the art at the time of the invention and the claims do not specify a particular purpose of timing information and transmission thereof, one of ordinary skill in the art would have recognized the ability of DAS devices of Hardwick to transmit the timing information for any purpose that there might be.

As to claims 31-34, Hardwick in view of Goldberg teaches all the elements as discussed per corresponding method claims 23-26.

As to claim 38, Hardwick in view of Goldberg teaches all the elements as discussed per corresponding method claims 23-26.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to OLEG SURVILLO whose telephone number is (571)272-9691. The examiner can normally be reached on Mon-Thu 10:00am - 7:30pm; Fri 10:00am - 6:30pm EST.

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, Glenton B. Burgess can be reached on 571-272-3949. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/OLEG SURVILLO/
Primary Examiner, Art Unit 2442

Notice of References Cited	Application/Control No. 13/864,249	Applicant(s)/Patent Under Reexamination MILLINGTON, NICHOLAS A.	
	Examiner OLEG SURVILLO	Art Unit 2442	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-8,131,389 B1	03-2012	Hardwick; John C.	G11B27/002	700/94
	B	US-				
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
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NON-PATENT DOCUMENTS

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

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

dated 04/14/2017

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)

Approved for use through 07/31/2016. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13864249
	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON, NICHOLAS A.J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, OLEG	
	Attorney Docket Number	13-0402	

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	5633871		1997-05-27	BLOKS; Rudolf H. J.	
	2	5661728		1997-08-26	FINOTELLO; Andrea et al.	
	3	5917830		1999-06-29	CHEN; David et al.	
	4	6154772		2000-11-28	DUNN; Bryan W. et al.	
	5	7188353		2007-03-06	CRINON; Regis J.	
	6	7391791		2008-06-24	BALASSANIAN; Edward et al.	
	7	8942252		2015-01-27	BALASSANIAN; Edward et al.	
	8	9456243		2016-09-27	HUGHES; Gary et al.	

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	Attorney Docket Number	13-0402	

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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	20020124182		2002-09-05	BACSO; Stephen R. et al.			
	2	20040117840		2004-06-17	BOUDREAU; Paul A. et al.			
	3	20040117858		2004-06-17	BOUDREAU; Paul A. et al.			
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	1	Implicit, LLC v. Sonos, Inc. (No. 14-1330-RGA), Defendant's Original Complaint (Mar. 3, 2017) (15 pages)						
	2	Notice of Allowance mailed on 03 April 2017, issued in connection with U.S. Patent Application No. 15088678, filed on 01 April 2016, 8 pages.						

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

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	Examiner Name	SURVILLO, OLEG
	Attorney Docket Number	13-0402

3	Sonos, Inc. v. D&M Holdings, Inc. (No. 14-1330-RGA), Defendants' Final Invalidity Contentions (Jan. 18, 2017) (106 pages)
4	Notice of Allowance mailed on 09 March 2017, issued in connection with U.S. Patent Application No. 15/080591, filed on 25 March 2016, 7 pages
5	Notice of Allowance mailed on 10 February 2017, issued in connection with U.S. Application No. 14/290493, filed on 29 May 2014, 13 pages
6	Notice of Allowance mailed on 15 March 2017, issued in connection with U.S. Patent Application No. 15/080716, filed on 25 March 2016, 7 pages.
7	Notice of Allowance mailed on 27 March 2017, issued in connection with U.S. Patent Application No. 15089758, filed on 04 April 2016, 7 pages.
8	Notice of Allowance mailed on 30 March 2017, issued in connection with U.S. Patent Application No. 15088532, filed on 01 April 2017, 7 pages.
9	Notice of Allowance mailed on 28 March 2017, issued in connection with U.S. Patent Application No. 15088906, filed on 01 April 2016, 7 pages.
10	Notice of Allowance mailed on 28 March 2017, issued in connection with U.S. Patent Application No. 15155149, filed on 16 May 2016, 7 pages.
11	ROTHERMEL et al., "Clock Hierarchies- An Abstraction for Grouping and Controlling Media Streams," University of Stuttgart Institute of Parallel and Distributed High-Performance Systems, January 1996, 23 pages
12	ROTHERMEL, Kurt, "State-of-the-Art and Future Research in Stream Synchronization," University of Stuttgart, 3 pages
13	Sonos, Inc. v D&M Holdings, D&M Supp Opposition Brief including Exhibits, 17 March 2017, 23 pages

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	Art Unit	2442
	Examiner Name	SURVILLO, OLEG
	Attorney Docket Number	13-0402

14	Sonos, Inc. v. D&M Holdings, Expert Report of Jay P. Kesan including Appendices A-P, Feb. 20, 2017, 776 pages.
15	Sonos, Inc. v. D&M Holdings (No. 14-1330-RGA), DI 226, Opinion Denying Inequitable Conduct Defenses, Feb. 6, 2017, updated, 5 pages.
16	Sonos, Inc. v. D&M Holdings (No. 14-1330-RGA), DI 242, US District Judge Andrews 101 Opinion, Mar. 13, 2017, 16 pages.
17	Sonos, Inc. v D&M Holdings, Sonos Supp Opening Markman Brief including Exhibits, 3 March 2017, 17 pages
18	Sonos, Inc. v. D&M Holdings, Sonos Supp Reply Markman Brief including Exhibits, 29 March 2017, 36 pages

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EXAMINER SIGNATURE

Examiner Signature	/OLEG SURVILLO/	Date Considered	05/08/2017
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

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	Art Unit	2442
	Examiner Name	SURVILLO, OLEG
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
<p>That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).</p>			
OR			
<p>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).</p>			
☒			
<p>See attached certification statement.</p> <p>The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.</p> <p>A certification statement is not submitted herewith.</p>			
SIGNATURE			
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	/Neilesh R. Patel/	Date (YYYY-MM-DD)	2017-04-13
Name/Print	Neilesh R. Patel	Registration Number	50918
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402 (MBHB 15-518-CON)

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2	20030123853	2003-07-03	IWAHARA; Yuji et al.
3	20060161742	2006-07-20	SUGIMOTO; Kayo et al.

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	1	1389853	EP	A1	2004-02-18	SONY INT EUROPE GMBH.		
	2	2009075540	JP	A	2009-04-09	TOUCHTUNES MUSIC CORP.	English Translation of Abstract Only	×
	3	2003093950	WO	A2	2003-11-13	GOLDBERG, BENJAMIN, M. et al.		☐

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	1	Advisory Action mailed on 28 December 2016, issued in connection with U.S. Patent Application No. 13/705176, filed on 05 December 2012, 4 pages	
	2	CHINESE OFFICE ACTION, Office Action mailed on 20 December 2016, issued in connection with Chinese Application No. 201380044446.8, 16 pages.	

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3	DHIR, Amit, "Wireless Home Networks - DECT, Bluetooth, Home RF, and Wirelss LANs," XILINX, wp135 (v1.0), March 21, 2001, 18 pages
4	EUROPEAN PATENT OFFICE, Office Action mailed 25 November 2016, issued in connection with EP Application No. 13810340.3, 5 pages.
5	Final Office Action mailed on 12 January 2017, issued in connection with U.S. Patent Application No. 14/504812, filed on 02 October 2014, 25 pages
6	Final Office Action mailed on 13 December 2016, issued in connection with U.S. Patent Application No. 13/871795, filed on 26 April 2013, 41 pages
7	FOUT, Tom, "Universal Plug and Play (UPnP) Client Support," Microsoft, August 2001, 18 pages
8	JAPANESE PATENT OFFICE, Final Office Action mailed on 08 November 2016, issued in connection with Japanese Patent Application No. 2015-520286, 5 pages.
9	JAPANESE PATENT OFFICE, Office Action mailed on 22 November 2016, issued in connection with Japanese Application No. 2015-520288, 6 pages.
10	JAPANESE PATENT OFFICE, Office Action mailed on 29 November 2016, issued in connection with Japanese Application No. 2015-516169, 4 pages.
11	KOU et al., "RenderingControl:1 Service Template Verion 1.01," Contributing Members of the UPnP Forum, June 25, 2002, 63 pages
12	"Linux SDK for UPnP Devices v1.2," Intel Corporation, January 17, 2003, 102 pages
13	Non-Final Office Action mailed on 03 January 2017, issued in connection with U.S. Patent Application No. 14/808875, filed on 24 July 2015, 10 pages

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14	Non-Final Office Action mailed on 10 November 2016, issued in connection with U.S. Patent Application No. 15/243355, filed on 22 August 2016, 11 pages
15	Non-Final Office Action mailed on 12 January 2017, issued in connection with U.S. Patent Application No. 13/895076, filed on 15 May 2013, 10 pages
16	Non-Final Office Action mailed on 16 November 2016, issued in connection with U.S. Patent Application No. 15/228639, filed on 04 August 2016, 15 pages
17	Non-Final Office Action mailed on 29 November 2016, issued in connection with U.S. Patent Application No. 13/894179, filed on 14 May 2013, 14 pages
18	Non-Final Office Action mailed on 30 November 2016, issued in connection with U.S. Patent Application No. 15/243186, filed on 22 August 2016, 12 pages
19	Notice of Allowance mailed on 01 December 2016, issued in connection with U.S. Patent Application No. 15/088283, filed on 01 April 2016, 9 pages
20	Notice of Allowance mailed on 02 December 2016, issued in connection with U.S. Patent Application No. 15/088532, filed on 01 April 2016, 9 pages
21	Notice of Allowance mailed on 02 December 2016, issued in connection with U.S. Patent Application No. 15/088678, filed on 01 April 2016, 9 pages
22	Notice of Allowance mailed on 02 December 2016, issued in connection with U.S. Patent Application No. 15/089758, filed on 04 April 2016, 9 pages
23	Notice of Allowance mailed on 02 December 2016, issued in connection with U.S. Patent Application No. 15/155149, filed on 16 May 2016, 9 pages
24	Notice of Allowance mailed on 07 December 2016, issued in connection with U.S. Patent Application No. 15/156392, filed on 17 May 2016, 9 pages

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25	Notice of Allowance mailed on 13 December 2016, issued in connection with U.S. Patent Application No. 15/080591, filed on 25 March 2016, 9 pages.
26	Notice of Allowance mailed on 14 December 2016, issued in connection with U.S. Patent Application No. 15/088906, filed on 01 April 2016, 9 pages.
27	Notice of Allowance mailed on 22 December 2016, issued in connection with U.S. Patent Application No. 15/080716, filed on 25 March 2016, 9 pages.
28	PASCOE, Bob, "Salutation Architectures and the newly defined service discovery protocols from Microsoft® and Sun®," Salutation Consortium, White Paper, June6, 1999, 5 pages
29	RITCHIE et al., "MediaServer:1 Device Template Version 1.01," Contributing Members of the UPnP Forum, June 25, 2002, 12 pages
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31	RITCHIE, John, "MediaRenderer:1 Device Template Version 1.01," Contributing Members of the UPnP Forum, June 25, 2002, 12 pages
32	SCHULZRINNE et al., "RTP: A Transport Protocol for Real-Time Applications," Network Working Group, January 1996, pp. 1-75
33	UNITED STATES PATENT AND TRADEMARK OFFICE, U.S. Provisional Application No. 60/490,768 filed on 28 July 2003, entitled "Method for synchronizing audio playback between multiple networked devices," 13 pages.
34	UNITED STATES PATENT AND TRADEMARK OFFICE, U.S. Provisional Application No. 60/825,407 filed on 12 September 2003, entitled "Controlling and manipulating groupings in a multi-zone music or media system," 82 pages.
35	"UPnP and Sonos Questions," Sonos Community, December 2006, 5 pages

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36	Yamaha DME 64 Owner's Manual; copyright 2004, 80 pages
37	Yamaha DME Designer 3.5 setup manual guide; copyright 2004, 16 pages
38	Yamaha DME Designer 3.5 User Manual; Copyright 2004, 507 pages
39	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidity Contentions Exhibit 1: Defendants' Invalidity Contentions for U.S. Patent No. 7,571,014 filed September 16, 2016, 270 pages.
40	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidity Contentions Exhibit 10: Defendants' Invalidity Contentions for U.S. Patent No. 9,219,959 filed September 27, 2016, 236 pages.
41	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidity Contentions Exhibit 11: Defendants' Invalidity Contentions for U.S. Design Patent No. D559,197 filed September 27, 2016, 52 pages.
42	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidity Contentions Exhibit 2: Defendants' Invalidity Contentions for U.S. Patent No. 8,588,949 filed September 27, 2016, 224 pages.
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45	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidity Contentions Exhibit 5: Defendants' Invalidity Contentions for U.S. Patent No. 8,938,637 filed September 27, 2016, 213 pages.
46	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidity Contentions Exhibit 6: Defendants' Invalidity Contentions for U.S. Patent No. 9,042,556 filed September 27, 2016, 162 pages.

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47	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidity Contentions Exhibit 7: Defendants' Invalidity Contentions for U.S. Patent No. 9,195,258 filed September 27, 2016, 418 pages.
48	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidity Contentions Exhibit 8: Defendants' Invalidity Contentions for U.S. Patent No. 9,202,509 filed September 27, 2016, 331 pages.
49	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidity Contentions Exhibit 9: Defendants' Invalidity Contentions for U.S. Patent No. 9,213,357 filed September 27, 2016, 251 pages.
50	Sonos, Inc. v. D&M Holdings Inc. et al., Defendants' Brief in Support of their Motion for Leave to Amend their Answer to Add the Defense of Inequitable Conduct, provided October 12, 2016, 24 pages.

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	Attorney Docket Number	13-0402 (MBHB 15-518-CON)

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
<p>That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).</p>			
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<p>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).</p>			
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<p>A certification statement is not submitted herewith.</p>			
SIGNATURE			
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	/Benjamin M. Urban/	Date (YYYY-MM-DD)	2017-02-14
Name/Print	Benjamin M. Urban	Registration Number	71591
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1	Sonos, Inc. v. D&M Holdings Inc. et al., Redlined Exhibit B: Defendants' First Amended Answer to Plaintiffs' Third Amended Complaint, provided August 1, 2016, 27 pages.
2	Sonos, Inc. v. D&M Holdings Inc. et al., Reply Brief in Support of Defendants' Motion for Leave to Amend their Answer to Add the Defense of Inequitable Conduct, provided November 10, 2016, 16 pages.
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	First Named Inventor	MILLINGTON; Nicholas A. J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402 (MBHB 15-518-CON)

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
<p>That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).</p>			
OR			
<p>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).</p>			
<p>☐ See attached certification statement.</p>			
<p>☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.</p>			
<p>A certification statement is not submitted herewith.</p>			
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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	/Benjamin M. Urban/	Date (YYYY-MM-DD)	2017-02-14
Name/Print	Benjamin M. Urban	Registration Number	71591
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

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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.
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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.
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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	Sonos, Inc. v. D&M Holdings (No. 14-1330-RGA), DI 206-1, Transcript of 101 Hearing (Nov. 28, 2016) (28 pages)	
	2	Sonos, Inc. v. D&M Holdings (No. 14-1330-RGA), DI 207, PUBLIC Joint Claim Construction Brief (Nov. 30, 2016) (88 pages)	
	3	Sonos, Inc. v. D&M Holdings (No. 14-1330-RGA), Markman Hearing Transcript (Dec. 14, 2016) (69 pages)	
	4	Sonos, Inc. v. D&M Holdings (No. 14-1330-RGA), DI 214, D&M Post-Markman Letter (Dec. 22, 2016) (13 pages)	
	5	Sonos, Inc. v. D&M Holdings (No. 14-1330-RGA), DI 215, Sonos Post-Markman Letter (Dec. 22, 2016) (15 pages)	
	6	Sonos, Inc. v. D&M Holdings (No. 14-1330-RGA), DI 219, Claim Construction Opinion (Jan. 12, 2017) (24 pages)	
	7	Sonos, Inc. v. D&M Holdings (No. 14-1330-RGA), DI 221, Claim Construction Order (Jan. 18 2017) (2 pages)	
	8	Universal Plug and Play ("UPnP") AV Architecture:1 For UPnP, Version 1.0, (June 25, 2002) (D+M_0298151-72) (22 pages)	
	9	UPnP AV Architecture:0.83 (June 12, 2002) (SONDM000115483-504) (22 pages)	
	10	RenderingControl:1 Service Template Version 1.01 For UPnP, Version 1.0, (June 25, 2002) (SONDM000115187-249) (63 pages).	

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11	MediaServer:1 Device Template Version 1.01 For UPnP, Version 1.0 (June 25, 2002) (12 pages)
12	Universal Plug and Play Device Architecture V. 1.0, (June 8, 2000) (54 pages)
13	MediaRenderer:1 Device Template Version 1.01 For UPnP, Version 1.0 (June 25, 2002) (12 pages)
14	AVTransport:1 Service Template Version 1.01 For UPnP, Version 1.0 (June 25, 2002) (66 pages)
15	Connection Manager: 1 Service Template Version 1.01 For UPnP, Version 1.0 (June 25, 2002) (25 pages)
16	ContentDirectory:1 Service Template Version 1.01 For UPnP, Version 1.0 (June 25, 2002) (89 pages)
17	WANCommonInterfaceConfig:1 Service Template Version 1.01 For UPnP, Ver. 1.0 (November 12, 2001) (D+M_0401820-43) (24 pages)
18	WANIPConnection:1 Service Template Version 1.01 For UPnP Ver. 1.0 (November 12, 2001) (D+M_0401844-917) (74 pages)
19	WANPPPConnection:1 Service Template Version 1.01 For UPnP, Version 1.0 (November 12, 2001) (D+M_0401918-2006) (89 pages)
20	Intel Media Renderer Device Interface ("Intel Media Renderer") (September 6, 2002) (62 pages)
21	Intel Designing a UPnP AV Media Renderer, v. 1.0 ("Intel AV Media Renderer") (May 20, 2003) (SONDM000115117-62) (46 pages)

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	22	Windows Media Connect Device Compatibility Specification (April 12, 2004) (16 pages)	
	23	Universal Plug and Play Vendor's Implementation Guide (January 5, 2000) (7 pages)	
	24	Intel SDK for UPnP Devices Programming Guide, Version 1.2.1, (November 2002) (30 pages)	
	25	Linux SDK for UPnP Devices v. 1.2 (Sep. 6, 2002) (101 pages)	
	26	Designing a UPnP AV MediaServer, Nelson Kidd (2003) (SONDM000115062-116) (55 pages)	
	27	Simple Service Discovery Protocol/1.0 Operating without an Arbiter (Oct. 28, 1999) (24 pages)	
	28	General Event Notification Architecture Base: Client to Arbiter (April 2000) (23 pages)	
	29	Microsoft, Universal Plug and Play (UPnP) Client Support ("Microsoft UPnP") (August 2001) (D+M_0402007-24) (18 pages)	
	30	Home Networking with Universal Plug and Play, IEEE Communications Magazine, Vol. 39 No. 12 (December 2001) (D+M_0402025-40) (16 pages)	
	31	Universal Plug and Play in Windows XP, Tom Fout. Microsoft Corporation (July 2001) (D+M_0402041-73) (33 pages)	
	32	Understanding Universal Plug and Play, Microsoft White Paper (June 2000) (D+M_0402074-118) (45 pages)	

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33	Microsoft Window's XP Reviewer's Guide (August 2001) (D+M_0402225-85) (61 pages)
34	Simple Network Time Protocol (SNTP), RFC 1361 (August 1992) (D+M_0397537-46) (10 pages)
35	Simple Network Time Protocol (SNTP), RFC 1769 (March 1995) (D+M_0397663-76) (14 pages)
36	Realtime Transport Protocol (RTP), RFC 3550 (July 2003) (D+M_0398235-323) (89 pages)
37	Real Time Control Protocol (RTCP) and Realtime Transfer Protocol (RTP), RFC 1889 (Jan. 1996) (D+M_0397810-84) (75 pages)
38	Realtime Streaming Protocol (RTSP), RFC 2326 (Apr. 1998) (D+M_0397945-8036) (92 pages)
39	Network Time Protocol (NTP), RFC 1305 (Mar. 1992) (D+M_0397417-536) (120 pages)
40	UPnP Design by Example, A Software Developers Guide to Universal Plug and Play Michael Jeronimo and Jack Weast, Intel Press (D+M_0401307-818) (April 2003) (511 pages)
41	Sonos, Inc. v. D&M Holdings (No. 14-1330-RGA), DI 226, Opinion Denying Inequitable Conduct Defenses (Feb. 6, 2017) (5 pages)
42	Sonos, Inc. v. D&M Holdings (No. 14-1330-RGA), DI 227, Order Denying Inequitable Conduct Defenses (Feb. 6, 2017) (1 page)
43	Sonos, Inc. v. D&M Holdings Inc. et al., Defendants' Opposition to Sonos's Motion to Strike Defendants' New Amended Answer Submitted with their Reply, provided October 3, 2016, 15 pages.

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44	Sonos, Inc. v. D&M Holdings Inc. et al., Exhibit A: Defendants' First Amended Answer to Plaintiffs' Third Amended Complaint, provided August 1, 2016, 26 pages.
45	Sonos, Inc. v. D&M Holdings Inc. et al., Exhibit A: Defendants' Second Amended Answer to Plaintiffs' Third Amended Complaint, provided October 12, 2016, 43 pages.
46	Sonos, Inc. v. D&M Holdings Inc. et al., Exhibit A: Defendants' Second Amended Answer to Plaintiffs' Third Amended Complaint, provided September 9, 2016, 88 pages.
47	Sonos, Inc. v. D&M Holdings Inc. et al., Exhibit B: Defendants' Second Amended Answer to Plaintiffs' Third Amended Complaint, provided October 12, 2016, 43 pages.
48	Sonos, Inc. v. D&M Holdings Inc. et al., Opening Brief in Support of Defendants' Motion for Leave to Amend Their Answer to Add the Defense of Inequitable Conduct, provided August 1, 2016, 11 pages.
49	Sonos, Inc. v. D&M Holdings Inc. et al., Order, provided October 7, 2016, 2 pages.
50	Sonos, Inc. v. D&M Holdings Inc. et al., Plaintiff's Opposition to Defendants' Motion for Leave to Amend Their Answer to Add the Defense of Inequitable Conduct, provided August 26, 2016, 25 pages.

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	2	6917592		2005-07-12	RAMANKUTTY; Rajesh et al.	
	3	7257398		2007-08-14	UKITA; Yoshitaka et al.	
	4	7286652		2007-10-23	AZRIEL; Gad et al.	
	5	7400644		2008-07-15	SAKAMOTO; Ichiro et al.	
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	1	20020131398		2002-09-19	TAYLOR; James L.	
	2	20030172123		2003-09-11	POLAN; Jeffrey S. et al.	
	3	20040032421		2004-02-19	WILLIAMSON; Charles G. et al.	

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	1	2001034951	JP		2001-02-09	SANYO ELECTRIC CO.	English Translation of Abstract Only	×

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	1	EUROPEAN PATENT OFFICE, Examination Report mailed on 24 October 2016, issued in connection with European Patent Application No. 13808623.6, 4 pages.	
	2	"Final Office Action mailed on 19 October 2016, issued in connection with U.S. Patent Application No. 13/848921, filed on 22 March 2013, 14 pages".	
	3	Non-Final Office Action mailed on 03 November 2016, issued in connection with U.S. Patent Application No. 14/184528, filed on 19 February 2014, 17 pages.	

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4	Non-Final Office Action mailed on 04 October 2016, issued in connection with U.S. Patent Application No. 15/089758, filed on 04 April 2016, 9 pages.
5	Non-Final Office Action mailed on 05 October 2016, issued in connection with U.S. Patent Application No. 13/864250, filed on 17 April 2013, 10 pages.
6	Non-Final Office Action mailed on 05 October 2016, issued in connection with U.S. Patent Application No. 13/864252, filed on 17 April 2013, 11 pages.
7	Non-Final Office Action mailed on 06 October 2016, issued in connection with U.S. Patent Application No. 15/088678, filed on 01 April 2016, 9 pages.
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	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402 (MBHB 15-518-CON)	

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33	ROTHERMEL et al., "Synchronization in Joint-Viewing Environments," University of Stuttgart Institute of Parallel and Distributed High-Performance Systems, 1992, 13 pages.
34	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 1: Defendants' Invalidation Contentions for U.S. Patent No. 7,571,014 filed April 15, 2016, 161 pages.
35	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 10: Defendants' Invalidation Contentions for U.S. Patent No. 9,213,357 filed April 15, 2016, 244 pages.
36	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 2: Defendants' Invalidation Contentions for U.S. Patent No. 8,588,949 filed April 15, 2016, 112 pages.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

37	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidity Contentions Exhibit 5: Defendants' Invalidity Contentions for U.S. Patent No. 8,938,637 filed April 15, 2016, 177 pages.
38	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidity Contentions Exhibit 8: Defendants' Invalidity Contentions for U.S. Patent No. 9,195,258 filed April 15, 2016, 400 pages.
39	TAYLOR, Marilou, "Long Island Sound," Audio Video Interiors, April 2000, 8 pages.

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/OLEG SURVILLO/	Date Considered	05/08/2017
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
<p>That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).</p>			
OR			
<p>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).</p>			
<p>☐ See attached certification statement.</p>			
<p>☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.</p>			
<p>A certification statement is not submitted herewith.</p>			
SIGNATURE			
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	/Benjamin M. Urban/	Date (YYYY-MM-DD)	2016-10-13
Name/Print	Benjamin M. Urban	Registration Number	71,591
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
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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.
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Docket No. 13-0402)

In re the Application of:	)	
	)	
MILLINGTON, Nicholas A.J.	)	
	)	
Application No.: 13/864,249	)	Group Art Unit: 2442
	)	
Filed: April 17, 2013	)	
	)	Examiner: Survillo, Oleg
Confirmation No.: 9806	)	
	)	
For: Method and Apparatus for Playing and	)	
Providing Audio Content in a Synchrony	)	
Group	)	

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

INFORMATION DISCLOSURE STATEMENT TRANSMITTAL LETTER

In view of the provisions set forth in 37 C.F.R. §§ 1.56, 1.97, and 1.98, Applicant submits herewith on Forms PTO/SB/08 a listing of documents that Applicant wishes to make of record in the above-identified application, along with copies of non-patent literature documents and foreign patent documents.

Documents listed in the attached Appendix and submitted herewith on Forms PTO/SB/08 arise from a patent infringement action involving Applicant that is captioned as *Sonos Inc. v. D&M Holding Inc. d/b/a the D+M Group, D&M Holdings U.S. Inc., and Denon Electronics (USA), LLC*, Civil Action No. 14-1330-RGA (D. Del. 2014). Applicant's submission of these documents in the present application is not intended as an admission that any such document constitutes prior art to the claims of the present application¹, that any such document is considered material to patentability as defined in 37 C.F.R. § 1.56(b), or that the aforementioned patent infringement action is related to the present application.

¹ For certain non-patent literature documents, the dates specified in Form PTO/SB/08 are based on allegations made by an opposing party in litigation. For the purpose of examination, Applicant respectfully requests the Office consider these documents to be available as of the specified dates. However, Applicant does not admit that the documents were available as of these dates and expressly reserves the right to challenge the availability of these documents at a later time.

Applicant respectfully requests that the listed documents be considered by the Examiner and be made of record in the present application, and that a copy of Form PTO/SB/08 be returned in accordance with M.P.E.P. §609.

Respectfully submitted,

Dated: October 13, 2016

By: /Benjamin M. Urban/
Benjamin M. Urban

McDonnell Boehnen Hulbert & Berghoff LLP
300 South Wacker Drive
Chicago, IL 60606
312 913 0001

Appendix

Patent/Pub. No.	Title	Filing Date
WO2007135581A2	A DEVICE FOR AND A METHOD OF PROCESSING AUDIO DATA	5/2/2007
WO0019693A1	METHOD AND SYSTEM OF TELECONFERENCING	9/24/1999
USD431552S	Remote control	3/3/2000
USD432525S	Handheld remote control	12/23/1999
USD412337S	Controller for a monitor camera	8/27/1998
USD416021S	Remote controller	7/27/1998
USD415496S	Remote control	3/12/1998
USD407071S	4-in-1 remote control unit	3/9/1998
USD430143S	Remote control	3/5/1998
USD410927S	Remote controller	1/27/1998
USD404741S	Control panel for an automotive audio system and climate control	1/20/1998
USD405071S	Cursor control--data entry device	10/17/1997
USD429246S	Arm support with control panel	10/8/1997
USD420006S	Remote control unit	4/16/1997
USD395889S	Remote control	3/25/1997
USD406847S	Two sided remote control	3/25/1997
USD392641S	Remote control	11/15/1996
USD397996S	Remote control with charger	9/30/1996
USD393628S	Hand-held remote control unit	8/19/1996
USD401587S	Satellite receiver remote control	4/1/1996
USD388792S	Television remote control	6/24/1996
USD389143S	Interactive display controller and telephone handset unit	4/25/1996
USD384940S	Remote controller	6/3/1996
USD380752S	Combined telephone and remote control	5/28/1996
USD382271S	Luminous remote control	5/15/1996
USD387352S	Remote control	3/19/1996
USD394659S	Remote controller	3/11/1996
USD372716S	Remote control	4/24/1995
USD379816S	Multimedia remote control	2/8/1995
USD377651S	Remote controller	10/26/1994
USD366044S	Remote controller for television receiver	9/16/1994
USD364878S	Control panel for a combined vehicular radio receiver, cassette player and digital clock	8/30/1994
USD363933S	Remote control	8/2/1994
USD362446S	Front panel for a combined radio receiver, cassette tape player and CD changer control	7/29/1994
USD364877S	Control head for a mobile radio	3/21/1994
USD356312S	Remote control unit	12/27/1993
USD350531S	Remote control for a ceiling fan	10/29/1993
USD356093S	Control Panel for a combined vehicular radio receiver, cassette player, compact disc player and digital clock	7/26/1993
USD365102S	Universal remote control unit	6/1/1993
USD357024S	Mobile radio control head	3/15/1993

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

USD354751S	TV remote control for the manually handicapped	12/31/1992
USD350962S	Hand held television controller	12/4/1992
USD354059S	Remote control unit	12/3/1992
US20150365987	Wireless Speaker For Receiving From A Mobile Phone Directions To Receive And Render A Playlist From A Content Server On The Internet	8/26/2015
US20110316768	SYSTEM, METHOD AND APPARATUS FOR SPEAKER CONFIGURATION	6/28/2010
US20100087089	Wall Mounted Docking Station	10/2/2009
US20110001632	Method and System for Changing an Input Source for an Electronic Device	7/1/2009
US8411883	LOUDSPEAKER APPARATUS AND SPEAKER SYSTEM	6/19/2009
US8374595	HANDHELD ELECTRONIC DEVICE AND OPERATING METHOD THEREOF	4/30/2009
US7945708	Apparatus and method of receiving data from audio/video equipment	1/9/2009
US8565455	Multiple Display Systems with Enhanced Acoustics Experience	12/31/2008
US20090124289	Audio apparatus and external adapter used for the audio apparatus	11/10/2008
US8861739	Apparatus and method for generating a multichannel signal	11/10/2008
US20090070434	SYSTEM AND METHOD FOR EFFICIENTLY ACCESSING INTERNET RESOURCES	6/6/2008
US8170222	AUGMENTED REALITY ENHANCED AUDIO	4/18/2008
US8311226	METHOD FOR ASSIGNING A PLURALITY OF AUDIO CHANNELS TO A PLURALITY OF SPEAKERS, CORRESPONDING COMPUTER PROGRAM PRODUCT, STORAGE MEANS AND MANAGER NODE	3/25/2008
US20080205070	CRADLE	1/28/2008
US7987294	UNIFICATION OF MULTIMEDIA DEVICES	10/16/2007
US7995732	Managing Audio in a Multi-Source Audio Environment	10/4/2007
US7721032	METHOD AND APPARATUS FOR MEDIATING AMONG MEDIA APPLICATIONS	8/20/2007
US8654995	Audio control system for a vehicle	4/19/2007
US8942395	Pointing element enhanced speaker system	2/12/2007
US20090011798	MOBILE PHONE	3/8/2007
US8233029	Reproduction Apparatus and System	7/14/2006
US8041062	Personal Sound System Including Multi-Mode Ear Level Module with Priority Logic	3/28/2006
US20080075295	Media playing from a docked handheld media device	8/31/2006
US7746906	DATA COMMUNICATIONS SYSTEM	7/10/2006
US20060227985	Information processing apparatus, information processing method, recording medium, and program	3/27/2006
US20060259649	INTERFACE SWITCHING APPARATUS AND METHOD	4/27/2006
US20080303947	Audio Processing Apparatus and Display Apparatus with Same	8/25/2006
US7933418	Sound reproducing apparatus and method of identifying positions of speakers	2/16/2005
US7882234	Wireless communication system, wireless communication device, and control method for establishing a one-to-one relationship	9/29/2005
US8050203	Multi-channel digital wireless audio system	12/20/2005
US8150079	Personal digital assistant and stereo reproduction method	12/14/2005
US20070087686	Audio playback device and method of its operation	10/18/2005
US7831054	Volume control	6/28/2005
US20060270395	Personal shared playback	5/25/2005
US20060222186	Multi-channel audio switch	4/5/2005
US20050197725	Music management system	2/18/2005
US7653344	Wireless digital audio/video playback system	1/5/2005

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

US7761176	Promotional portable music players	11/23/2004
US7688306	Methods and apparatuses for operating a portable device based on an accelerometer	11/12/2004
US8600084	Methods and systems for altering the speaker orientation of a portable system	11/9/2004
US7305694	Method and apparatus for remotely controlling a receiver according to content and user selection	9/7/2004
US7472058	AUTOMATIC AUDIO SOURCE DETECTION FOR CAPTURE DEVICES	12/28/2004
US7630501	System and method for calibration of an acoustic system	5/14/2004
US20040249490	Multichannel audio system, and head unit and slave unit used for the same	4/28/2004
US7853341	Wired, wireless, infrared, and powerline audio entertainment systems	2/20/2004
US20040171346	Method of Adding Wireless Remote Control to Audio Playback Devices Equipped for Wired Remote Control	1/5/2004
US7492912	Multi-channel speaker system and a connection system thereof	3/18/2004
US20060173844	Automatic configuration of client terminal in public hot spot	3/12/2004
US20050131558	Audio network distribution system	11/4/2004
US20050160270	Localized audio networks and associated digital accessories	11/8/2004
US7627825	Control device and method, information processing device and method, recording medium, and program	9/29/2004
USD524296	Remote controller for television set	6/14/2004
USD515072	Remote control unit	5/27/2004
USD506463	Remote control unit	4/8/2004
USD499718	Remote control	2/2/2004
USD496005	Remote control	1/21/2004
USD495333	Liquid crystal display	1/13/2004
USD499395	Remote control	1/5/2004
US20050154766	Multimedia processing system capable of auto-detecting multimedia signals to facilitate selecting and method of the same	12/23/2004
US7676044	Multi-speaker audio system and automatic control method	12/10/2004
US7548744	WIFI authentication method	12/19/2003
US7428310	Audio output adjusting device of home theater system and method thereof	12/22/2003
US7046677	Method and apparatus for time-multiplexed processing of multiple digital video programs	11/26/2003
US7430181	Method and apparatus for automatically configuring devices on a wireless network	11/26/2003
US6919771	Digital amplifier	9/25/2003
US20050060435	Middleware filter agent between server and PDA	9/17/2003
US7263110	Synchronizing clock signals of server and client devices in a network system based on power source synchronous pulse signal	9/10/2003
US7675943	Synchronous play-out of media data packets	9/4/2003
US7558224	Management of packet-based audio devices within acoustic spaces	7/29/2003
US7289631	Encryption key setting system, access point, encryption key setting method, and authentication code setting system	7/7/2003
US8442239	Audio system with balance setting based on information addresses	1/23/2003
US20030231208	Multimode interface	6/13/2003
US7676142	Systems and methods for multimedia time stretching	6/9/2003
US20040253969	Technique for discovery using a wireless network	6/6/2003
US20040185773	Mobile transceiver and electronic module for controlling the transceiver	3/18/2003
US20040183827	Methods and apparatus for implementing a remote application over a network	3/17/2003
US20040177167	Network audio systems	3/4/2003

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

US20030167335	System and method for network-based communication	3/3/2003
US20040168081	Apparatus and method simplifying an encrypted network	2/20/2003
US20030185400	Sound processing unit, sound processing system, audio output unit and display device	1/15/2003
US7366206	Multi-media jitter removal in an asynchronous digital home network	1/16/2003
US20040019807	System And Methodology For Providing Community-Based Security Policies	5/14/2003
USD496003	Hand-held remote control	12/16/2003
USD499086	Inline control module for communications headset adapter	12/10/2003
USD518475	Remote controller	12/2/2003
USD504872	Remote controller	11/24/2003
USD496335	Remote control	11/10/2003
USD527375	Remote control device	9/30/2003
USD497363	Liquid crystal display	9/22/2003
USD500015	Remote control device	9/19/2003
USD515557	Remote control	9/16/2003
USD501477	Keyboard control device	8/11/2003
USD491925	Remote control	7/2/2003
USD504885	Remote control	6/11/2003
USD493148	Remote controller for air conditioner	3/28/2003
USD486145	Remote control keypad	2/28/2003
US7356011	Simplified configuration and security for networked wireless devices	12/18/2002
US20040117462	Client device configuration with user entry of configuration parameters	12/12/2002
US7505889	Transcoding media system	12/5/2002
US7295548	Method and system for disaggregating audio/visual components	11/27/2002
US20030103088	User interface for a remote control application	11/6/2002
US7277547	Method for automated security configuration in a wireless network	10/23/2002
US7308188	Audio reproducing apparatus	9/30/2002
US20040059842	Network device installation	9/19/2002
US20040203590	Set-up of wireless consumer electronics device using a learning remote control	9/11/2002
US7197148	System for controlling remote speakers using centralized amplifiers, centralized monitoring and master/slave communication protocol	9/9/2002
US20030063755	System for controlling remote speakers using centralized amplifiers, centralized monitoring and master/slave communication protocol	9/9/2002
US20040042629	Automatic earpiece sensing	8/30/2002
US20040014426	Portable audio playback device with bass enhancement	7/19/2002
US20030043856	Method and apparatus for reducing synchronization delay in packet-based voice terminals by resynchronizing during talk spurts	7/2/2002
US20040001591	Robust method for achieving audio/video synchronization in MPEG decoders in personal video recording applications	6/27/2002
US7092694	Wireless communication system having a guest transmitter and a host receiver	6/19/2002
US7139981	Media management system	6/13/2002
USD477310	Remote control	10/7/2002
USD481056	Control panel for projector	9/12/2002
USD478051	Remote controller for household electric/electronic appliances	7/11/2002
USD478896	Remote control	6/28/2002
USD476643	Remote controller	6/11/2002

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

USD474763	Handheld remote control	5/30/2002
USD475993	TV remote control	3/21/2002
US20030219007	Reusable multi-protocol meta-architecture for Voice-over-IP playback	5/23/2002
US7096169	Virtual speaker demonstration system and virtual noise simulation	5/16/2002
US7945636	Providing a multi-tier enterprise level application	5/15/2002
US20030212802	Proximity network encryption and setup	5/9/2002
US20030198257	Method of manually fine tuning audio synchronization of a home network	4/23/2002
US20020165921	Method of multiple computers synchronization and control for guiding spatially dispersed live music/multimedia performances and guiding simultaneous multi-content presentations and system therefor	4/24/2002
US7324857	Method to synchronize playback of multicast audio streams on a local network	4/19/2002
US20030179780	Method of detecting drift between two clocks	3/20/2002
US20040037433	Multi-channel wireless professional audio system	8/21/2002
US20020131761	Information recording medium, apparatus and method for recording/reproducing information to/from the medium	1/16/2002
US7206618	Removable customizable inserts and faceplate for electronic devices	1/11/2002
US20020101357	System for transmitting control commands to electronic devices	1/4/2002
US7092528	Apparatus and methods for reducing noise audible from a speaker	11/6/2001
US7120168	System and method for effectively performing an audio/video synchronization procedure	11/20/2001
US20020078293	Method and system for selecting and controlling devices in a home network	10/12/2001
US20060072489	Home network using wireless module	10/11/2001
US7260616	Communication hub with automatic device registration	8/13/2001
US6937988	Methods and systems for prefilling a buffer in streaming data applications	8/10/2001
US6873862	Wireless headphones with selective connection to auxiliary audio devices and a cellular telephone	7/24/2001
US20030014486	Distributed audio network using networked computing devices	7/16/2001
US7161939	Method and system for switching among independent packetized audio streams	6/29/2001
US6987767	Multiplexer, multimedia communication apparatus and time stamp generation method	6/28/2001
US6778073	Method and apparatus for managing audio devices	6/26/2001
US7136934	Multimedia synchronization method and device	6/19/2001
US6653899	Audio amplifier power and temperature controller having network detecting and associated methods	6/15/2001
US20020137505	Audio detection for hands-free wireless	5/24/2001
US20010050991	Portable audio devices	5/18/2001
US7146260	Method and apparatus for dynamic configuration of multiprocessor system	4/24/2001
US7130316	System for frame based audio synchronization and method thereof	4/11/2001
US6741961	Low power audio processor that multiplexes component distribution signals	3/14/2001
US20010043456	Portable computer with low power audio CD-player	3/8/2001
US8477958	Networked sound masking system	2/26/2001
US6456783	Data structure of stream data, and recording and playback method thereof	1/8/2001
US20040223622	Digital wireless loudspeaker system	4/6/2001
USD462945	Volume control for a communications headset	11/13/2001
USD479520	Audiovisual control device	9/15/2001
USD468297	Karaoke controller with microphone	7/27/2001
USD466108	Remote control	6/15/2001

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

USD452520	Remote control for a vertical digital projector	3/13/2001
USD462340	Remote control	1/18/2001
US20020124097	Methods, systems and computer program products for zone based distribution of audio signals	12/29/2000
US20020072817	System and method for request, delivery and use of multimedia files for audiovisual entertainment in the home environment	12/11/2000
US6915347	Associating multiple display units in a grouped server environment	12/6/2000
US20020072816	Audio system	12/7/2000
US7548851	Digital multimedia jukebox	10/11/2000
US7457948	Automated authentication handling system	9/29/2000
US6826283	Method and system for allowing multiple nodes in a small environment to play audio signals independent of other nodes	7/27/2000
US6859460	System and method for providing multimedia jitter buffer adjustment for packet-switched networks	5/31/2000
US6654720	Method and system for voice control enabling device in a service discovery network	5/9/2000
US6684060	Digital wireless premises audio system and method of operation thereof	4/11/2000
US6654956	Method, apparatus and computer program product for synchronizing presentation of digital video data with serving of digital video data	4/10/2000
US6535121	Fire department station zoned alerting control system	4/6/2000
US6816510	Method for clock synchronization between nodes in a packet network	2/9/2000
US6901439	Method of adding a device to a network	1/20/2000
USD462339	Remote control	12/22/2000
USD478069	Communication interface with external controls	11/1/2000
US7558635	Control device and control method for fixing an information output order for several information sources, especially audio sources	9/5/2000
US7966388	Network management system and graphical user interface	12/21/1999
US6636269	Video timing system and method	8/18/1999
US6463474	Local authentication of a client at a network device	7/2/1999
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dated 10/13/2016

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)

Approved for use through 07/31/2016. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

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	Filing Date		2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402	

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	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
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<p>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).</p>			
<p>☐ See attached certification statement.</p>			
<p>☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.</p>			
<p>A certification statement is not submitted herewith.</p>			
SIGNATURE			
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	/Benjamin M. Urban/	Date (YYYY-MM-DD)	2016-10-13
Name/Print	Benjamin M. Urban	Registration Number	71,591
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

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<i>Index of Claims</i> 	Application/Control No. 13864249	Applicant(s)/Patent Under Reexamination MILLINGTON, NICHOLAS A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant			☐ CPA			☐ T.D.			☐ R.1.47		
CLAIM		DATE									
Final	Original	05/03/2017									
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<p align="center"><i>Index of Claims</i></p> 	Application/Control No. 13864249	Applicant(s)/Patent Under Reexamination MILLINGTON, NICHOLAS A. J.
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CLAIM		DATE								
Final	Original	05/03/2017								
	37	✓								
	38	✓								
	39	✓								
	40	✓								

EAST Search History**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S490	56589341	@ad<"20040401" or @rlad<"20040401"	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/08 19:28
S491	337	S490 and play\$3 near4 different with zone	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/08 19:29
S492	294	S490 and play\$3 near4 different with zone not sonos.as.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/08 19:37
S493	266	S490 and play\$3 near4 different with zone not sonos.as. not millington.in.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/08 19:38
S494	99	S490 and play\$3 near4 different with zone not sonos.as. not millington.in. and (song or music or audio)	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/08 19:40
S495	90	S490 and play\$3 near4 different with (zone or area) with (music or song or audio) not sonos.as. not millington.in.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/08 19:52
S496	0	S490 and concurrent with play\$4 near4 different with (zone or area) with (music or song or audio) not sonos.as. not millington.in.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/08 19:56
S497	106	S490 and play\$4 near4 different with (zone or area) with (music or song or audio) not sonos.as. not millington.in.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/08 19:56
S498	16	S497 not S495	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/08 19:57

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SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.		
13/864,249	04/17/2013 RULE	709	2442	13-0402 (MBHB 15-518-CON)		
APPLICANTS SONOS, INC., Santa Barbara, CA INVENTORS Nicholas A. J. Millington, Santa Barbara, CA; ** CONTINUING DATA ***** This application is a CON of 13/297,000 11/15/2011 PAT 9182777 which is a CON of 10/816,217 04/01/2004 PAT 8234395 which claims benefit of 60/490,768 07/28/2003 ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 05/21/2013						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and /OLEG SURVILLO/ Acknowledged Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY CA	SHEETS DRAWINGS 5	TOTAL CLAIMS 20	INDEPENDENT CLAIMS 3
ADDRESS McDonnell Boehnen Hulbert & Berghoff LLP Sonos, Inc. 300 South Wacker Drive Chicago, IL 60606 UNITED STATES						
TITLE CONCURRENT TRANSMISSION AND PLAYBACK OF AUDIO INFORMATION						
FILING FEE RECEIVED 1600	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit		

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	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
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	6	20070087686		2007-04-19	HOLM; Jukka et al.	
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	2	63269633	JP		1988-11-07	UNKNOWN		
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27	Sonos, Inc. v. D&M Holdings Inc. et al., Declaration of Steven C. Visser, executed September 9, 2016, 40 pages.
28	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidity Contentions, filed September 14, 2016, 100 pages.
29	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidity Contentions Exhibit 1: Defendants' Invalidity Contentions for U.S. Patent No. 7,571,014 filed April 15, 2016, 161 pages.
30	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidity Contentions Exhibit 10: Defendants' Invalidity Contentions for U.S. Patent No. 9,213,357 filed April 15, 2016, 244 pages.
31	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidity Contentions Exhibit 11: Defendants' Invalidity Contentions for U.S. Patent No. 9,219,959 filed April 15, 2016, 172 pages.
32	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidity Contentions Exhibit 12: Defendants' Invalidity Contentions for U.S. Design Patent No. D559,197 filed April 15, 2016, 36 pages.
33	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidity Contentions Exhibit 2: Defendants' Invalidity Contentions for U.S. Patent No. 8,588,949 filed April 15, 2016, 112 pages.

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34	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidity Contentions Exhibit 3: Defendants' Invalidity Contentions for U.S. Patent No. 8,843,224 filed April 15, 2016, 118 pages.
35	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidity Contentions Exhibit 4: Defendants' Invalidity Contentions for U.S. Patent No. 8,938,312 filed April 15, 2016, 217 pages.
36	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidity Contentions Exhibit 5: Defendants' Invalidity Contentions for U.S. Patent No. 8,938,637 filed April 15, 2016, 177 pages.
37	Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidity Contentions Exhibit 6: Defendants' Invalidity Contentions for U.S. Patent No. 9,042,556 filed April 15, 2016, 86 pages.
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48	Sonos, Inc. v. D&M Holdings Inc. et al., Exhibit A: Defendants' Second Amended Answer to Plaintiffs' Third Amended Complaint, filed September 9, 2016, 43 pages.
49	Sonos, Inc. v. D&M Holdings Inc. et al., First Amended Complaint for Patent Infringement, filed December 17, 2014, 26 pages.
50	Sonos, Inc. v. D&M Holdings Inc. et al., Joint Claim Construction Chart, Volume 1 of 3 with Exhibits A-O, filed August 17, 2016, 30 pages.

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¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.S/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13864249
	Filing Date	2013-04-17
	First Named Inventor	MILLINGTON; Nicholas A.J.
	Art Unit	2442
	Examiner Name	SURVILLO, Oleg
	Attorney Docket Number	13-0402

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
<p>That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).</p>			
OR			
<p>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).</p>			
<p>☐ See attached certification statement.</p>			
<p>☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.</p>			
<p>A certification statement is not submitted herewith.</p>			
SIGNATURE			
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	/Benjamin M. Urban/	Date (YYYY-MM-DD)	2016-10-13
Name/Print	Benjamin M. Urban	Registration Number	71,591
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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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.
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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.

Search Notes 	Application/Control No. 13864249	Applicant(s)/Patent Under Reexamination MILLINGTON, NICHOLAS A. J.
	Examiner OLEG SURVILLO	Art Unit 2442

CPC- SEARCHED		
Symbol	Date	Examiner
G06F 3/167, 17/00, 17/3074, 3/048, 3/0482, 3/0484, 3/126, 3/16	5/3/2017	OS
H04L 65/60, 12/2812	5/3/2017	OS

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
709	219, 220, 231	5/3/2017	OS

SEARCH NOTES		
Search Notes	Date	Examiner
Updated Inventor search	5/3/2017	OS
Updated Assignee search	5/3/2017	OS
Updated EAST search in USPAT, US-PGPUB, EPO, JPO, and FPRS databases	5/3/2017	OS

INTERFERENCE SEARCH			
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	/OLEG SURVILLO/ Primary Examiner. Art Unit 2442
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	Attorney Docket Number	13-0402

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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	5633871		1997-05-27	BLOKS; Rudolf H. J.	
	2	5661728		1997-08-26	FINOTELLO; Andrea et al.	
	3	5917830		1999-06-29	CHEN; David et al.	
	4	6154772		2000-11-28	DUNN; Bryan W. et al.	
	5	7188353		2007-03-06	CRINON; Regis J.	
	6	7391791		2008-06-24	BALASSANIAN; Edward et al.	
	7	8942252		2015-01-27	BALASSANIAN; Edward et al.	
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	1	20020124182		2002-09-05	BACSO; Stephen R. et al.			
	2	20040117840		2004-06-17	BOUDREAU; Paul A. et al.			
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	1	Implicit, LLC v. Sonos, Inc. (No. 14-1330-RGA), Defendant's Original Complaint (Mar. 3, 2017) (15 pages)						
	2	Notice of Allowance mailed on 03 April 2017, issued in connection with U.S. Patent Application No. 15088678, filed on 01 April 2016, 8 pages.						

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3	Sonos, Inc. v. D&M Holdings, Inc. (No. 14-1330-RGA), Defendants' Final Invalidity Contentions (Jan. 18, 2017) (106 pages)
4	Notice of Allowance mailed on 09 March 2017, issued in connection with U.S. Patent Application No. 15/080591, filed on 25 March 2016, 7 pages
5	Notice of Allowance mailed on 10 February 2017, issued in connection with U.S. Application No. 14/290493, filed on 29 May 2014, 13 pages
6	Notice of Allowance mailed on 15 March 2017, issued in connection with U.S. Patent Application No. 15/080716, filed on 25 March 2016, 7 pages.
7	Notice of Allowance mailed on 27 March 2017, issued in connection with U.S. Patent Application No. 15089758, filed on 04 April 2016, 7 pages.
8	Notice of Allowance mailed on 30 March 2017, issued in connection with U.S. Patent Application No. 15088532, filed on 01 April 2017, 7 pages.
9	Notice of Allowance mailed on 28 March 2017, issued in connection with U.S. Patent Application No. 15088906, filed on 01 April 2016, 7 pages.
10	Notice of Allowance mailed on 28 March 2017, issued in connection with U.S. Patent Application No. 15155149, filed on 16 May 2016, 7 pages.
11	ROTHERMEL et al., "Clock Hierarchies- An Abstraction for Grouping and Controlling Media Streams," University of Stuttgart Institute of Parallel and Distributed High-Performance Systems, January 1996, 23 pages
12	ROTHERMEL, Kurt, "State-of-the-Art and Future Research in Stream Synchronization," University of Stuttgart, 3 pages
13	Sonos, Inc. v D&M Holdings, D&M Supp Opposition Brief including Exhibits, 17 March 2017, 23 pages

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14	Sonos, Inc. v. D&M Holdings, Expert Report of Jay P. Kesan including Appendices A-P, Feb. 20, 2017, 776 pages.
15	Sonos, Inc. v. D&M Holdings (No. 14-1330-RGA), DI 226, Opinion Denying Inequitable Conduct Defenses, Feb. 6, 2017, updated, 5 pages.
16	Sonos, Inc. v. D&M Holdings (No. 14-1330-RGA), DI 242, US District Judge Andrews 101 Opinion, Mar. 13, 2017, 16 pages.
17	Sonos, Inc. v D&M Holdings, Sonos Supp Opening Markman Brief including Exhibits, 3 March 2017, 17 pages
18	Sonos, Inc. v. D&M Holdings, Sonos Supp Reply Markman Brief including Exhibits, 29 March 2017, 36 pages

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SIGNATURE			
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	/Neilesh R. Patel/	Date (YYYY-MM-DD)	2017-04-13
Name/Print	Neilesh R. Patel	Registration Number	50918
<p>This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.</p>			

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Electronic Acknowledgement Receipt	
EFS ID:	28922645
Application Number:	13864249
International Application Number:	
Confirmation Number:	9806
Title of Invention:	METHOD AND APPARATUS FOR PLAYING AND PROVIDING AUDIO CONTENT IN A SYNCHRONY GROUP
First Named Inventor/Applicant Name:	Nicholas A. J. Millington
Customer Number:	107361
Filer:	Betty E. Lee
Filer Authorized By:	
Attorney Docket Number:	13-0402 (MBHB 15-518-CON)
Receipt Date:	14-APR-2017
Filing Date:	17-APR-2013
Time Stamp:	13:28:54
Application Type:	Utility under 35 USC 111(a)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	ImplicitLLC_SonosInc_NPL1.pdf	1866770 94840942d20c1fe454f3084c794b7b2463dd5e3	no	15

Warnings:

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Information:					
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U.S.PATENTS						Remove
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	1	5198603		1993-03-30	NISHIKAWA; Masashi et al.	
	2	6032202		2000-02-29	LEA; Rodger J. et al.	
	3	7945143		2011-05-17	YAHATA; Hiroshi et al.	
	4	8483853		2013-07-09	LAMBOURNE; Robert A.	
	5	9507780		2016-11-29	ROTHKOPF; Fletcher R. et al.	
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	First Named Inventor	MILLINGTON; Nicholas A.J.	
	Art Unit	2442	
	Examiner Name	SURVILLO, Oleg	
	Attorney Docket Number	13-0402 (MBHB 15-518-CON)	

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