

COPY

1 Brandon C. Fernald (CA Bar 222429)
2 Rachel D. Stanger (CA Bar 200733)
3 **FERNALD LAW GROUP, LLP**
4 510 W 6th Street, Suite 700
5 Los Angeles, California 90014
6 Tel: (323) 410-0300
7 Fax: (323) 410-0330
8 Email: brandon.fernald@fernaldlawgroup.com

9 Edward E. Casto, Jr. (*pro hac vice*)
10 Jaime K. Olin (CA Bar 243139)
11 **NELSON BUMGARDNER CASTO, P.C.**
12 3131 West 7th Street, Suite 300
13 Fort Worth, Texas 76107
14 Tel: (817) 377-9111
15 Fax: (817) 377-3485
16 Email: ecasto@nbclaw.net
17 jolin@nbclaw.net

18 Attorneys for Plaintiff One-E-Way, Inc.

19
20
21 **UNITED STATES DISTRICT COURT**
22
23 **CENTRAL DISTRICT OF CALIFORNIA**

24 ONE-E-WAY, INC.,

25 Plaintiff,

26 vs.

27 PLANTRONICS, INC.; AUDIOVOX
CORPORATION d/b/a ACOUSTIC
RESEARCH; IMATION CORPORATION;
HARMAN INTERNATIONAL INDUSTRIES,
INC. d/b/a AKG; and JAYBIRD GEAR, LLC,

28 Defendants.

CASE NO. 2:11-06673-PA (FMO)

**FIRST AMENDED COMPLAINT
FOR PATENT INFRINGEMENT**

DEMAND FOR JURY TRIAL

FILED
2011 AUG 25 PM 12:45
CLERK U.S. DISTRICT COURT
CENTRAL DIST. OF CALIF.
LOS ANGELES

1 Plaintiff One-E-Way, Inc. brings the following complaint for patent infringement
2 against Plantronics, Inc.; Audiovox Corporation d/b/a Acoustic Research; Imation
3 Corp.; Harman International Industries, Inc. d/b/a AKG; and JayBird Gear, LLC.

4 **PARTIES**

5 1. Plaintiff One-E-Way, Inc. (“One-E-Way”) is a Delaware corporation with a
6 principal place of business at 500 Santa Paula Avenue, Pasadena, California 91107.

7 2. On information and belief, Defendant Plantronics, Inc. (“Plantronics”) is a
8 corporation organized under the laws of Delaware, having its principal place of business
9 located at 345 Encinal Street, Santa Cruz, California 95060. Defendant Plantronics can
10 be served with process by serving its registered agent for service of process, Richard R.
11 Pickard, at 345 Encinal Street, Santa Cruz, California 95060.

12 3. On information and belief, Defendant Audiovox Corporation d/b/a
13 Acoustic Research (“Acoustic Research”) is a corporation organized under the laws of
14 Delaware, having its principal place of business located at 180 Marcus Blvd., P.O. Box
15 18000, Hauppauge, New York 11788. Defendant Acoustic Research can be served with
16 process by serving its registered agent for service of process, Robert S. Levy, Esq., c/o
17 Levy, Stopol & Camelo, LLP, 1425 RXR Plaza, Uniondale, New York 11556-1425.

18 4. On information and belief, Defendant Imation Corporation (“Imation”) is a
19 corporation organized under the laws of Delaware, having its principal place of business
20 located at 1 Imation Way, Oakdale, Minnesota 55138. Defendant Imation can be served
21 with process by serving its general counsel, John Breedlove, Esq.

22 5. On information and belief, Defendant Harman International Industries, Inc.
23 d/b/a AKG (“AKG”) is a corporation organized under the laws of Delaware, having its
24 principal place of business located at 400 Atlantic Street, Suite 1500, Stamford,
25 Connecticut. Defendant AKG can be served with process by serving its registered agent
26 for service of process, The Corporation Trust Company, Corporation Trust Center, 1209
27 Orange Street, Wilmington, Delaware 19801.

1 6. On information and belief, Defendant JayBird Gear, LLC is a limited
2 liability company organized under the laws of Utah, having its principal place of
3 business located at 9980 S 300 W, Suite 200, Sandy, Utah 84070. Defendant JayBird
4 can be served with process by serving its registered agent for service of process, Tana
5 Davis, at 9980 S 300 W, Suite 200, Sandy, Utah 84070.

6 **JURISDICTION AND VENUE**

7 7. This is an action for patent infringement arising under the patent laws of
8 the United States, 35 U.S.C. §§ 101 *et seq.*

9 8. Subject matter jurisdiction is conferred upon this Court pursuant to 28
10 U.S.C. §§ 1331 and 1338(a).

11 9. The Court has general and specific personal jurisdiction over each
12 Defendant, and venue is proper pursuant to 28 U.S.C. §§ 1391(b), (c), and 1400(b).
13 Each Defendant has substantial contacts with the forum as a result of pervasive business
14 activities conducted within the State of California and within this District. Each
15 Defendant regularly solicits business in, and derives substantial revenue from products
16 and/or services provided to individuals residing in California and, particularly, the
17 Central District of California.

18 **OPERATIVE FACTS**

19 10. On January 4, 2011, United States Patent No. 7,865,258 (“the ’258
20 patent”) was duly and legally issued by the United States Patent and Trademark Office
21 to C. Earl Woolfork for an invention entitled “Wireless Digital Audio System,” a true
22 and correct copy of which is attached hereto as Exhibit A, and incorporated herein by
23 reference.

24 11. Mr. Woolfork is a resident of Pasadena, California.

25 12. One-E-Way owns the entire right, title, and interest in and to the ’258
26 patent and all rights to enforce this action and recover damages for the past, present and
27 future infringements by Defendants complained of herein.

1 13. The '258 patent is a continuation of application No. 12/144,729, filed on
2 July 12, 2008, now Patent No. 7,684,885, which is a continuation of application No.
3 10/648,012, filed on August 26, 2003, now Patent No. 7,412,294, which is a
4 continuation-in-part of application No. 10/027,391, filed on December 21, 2001, now
5 abandoned.

6 14. The '258 patent claims inventions that allow private audio enjoyment
7 without interference from other users of independent wireless digital transmitters and
8 receivers sharing the same space.

9 **FIRST CAUSE OF ACTION**

10 **(Infringement of U.S. Patent No. 7,865,258)**

11 15. The allegations of paragraphs 1-14 are repeated and realleged as if fully
12 set forth herein.

13 16. On information and belief, the Defendants are directly infringing, actively
14 inducing the infringement of, and/or contributing to the infringement of one or more
15 claims of the '258 patent by importing, making, using, selling, and/or offering to sell
16 products incorporating the technology covered by the '258 patent. Upon further
17 information and belief, Defendants will continue infringing the '258 patent.

18 17. Defendant Plantronics has infringed and is continuing to directly infringe,
19 contribute to the infringement of, and/or induce the infringement of at least claims 3, 4,
20 8, 10 and 11 of the '258 Patent without One-E-Way's consent or authorization. Such
21 acts of infringement include, but are not limited to, Plantronics' use, sale, provision, and
22 operation of its BackBeat 906 and .Audio 995 products.

23 18. Defendant Acoustic Research has infringed and is continuing to directly
24 infringe, contribute to the infringement of, and/or induce the infringement of at least
25 claims 3, 4, 8, 10 and 11 of the '258 Patent without One-E-Way's consent or
26 authorization. Such acts of infringement include, but are not limited to, Acoustic
27 Research's use, sale, provision, and operation of its AWD 205, 209, 210 and 510
28

1 products.

2 19. Defendant Imation has infringed and is continuing to directly infringe,
3 contribute to the infringement of, and/or induce the infringement of at least claims 3, 8
4 and 10 of the '258 Patent without One-E-Way's consent or authorization. Such acts of
5 infringement include, but are not limited to, Imation's use, sale, provision, and operation
6 of its WR700 product.

7 20. Defendant AKG has infringed and is continuing to directly infringe,
8 contribute to the infringement of, and/or induce the infringement of at least claims 3, 8
9 and 10 of the '258 Patent without One-E-Way's consent or authorization. Such acts of
10 infringement include, but are not limited to, AKG's use, sale, provision, and operation
11 of its K 840 KL product.

12 21. Defendant JayBird has infringed and is continuing to directly infringe,
13 contribute to the infringement of, and/or induce the infringement of at least claims 3, 4,
14 8, 10 and 11 of the '258 Patent without One-E-Way's consent or authorization. Such
15 acts of infringement include, but are not limited to, JayBird's use, sale, provision, and
16 operation of its SB2 and JB200 products bundled with iSport and/or uSport products.

17 22. Defendants Plantronics, AKG, JayBird and Acoustic Research were
18 notified of their respective infringing activities with respect to the '258 patent by letter
19 dated October 13, 2010.

20 23. The filing of this complaint constitutes further notice to all Defendants of
21 the '258 patent in accordance with 35 U.S.C. § 287.

22 24. Defendants' continued infringement of the '258 patent has damaged and
23 continues to damage One-E-Way. Defendants are thus liable to One-E-Way in an
24 amount that adequately compensates One-E-Way for their respective infringements
25 which, by law, cannot be less than a reasonable royalty, together with interest and costs
26 as fixed by this Court under 35 U.S.C. § 284.

27 25. Upon information and belief, Defendants Plantronics, AKG, JayBird, and
28

1 Acoustic Research's infringement of the '258 patent has been willful and deliberate
2 since the date they were put on notice of the patent.

3 26. In addition, all Defendants' continued infringement of the '258 patent after
4 the filing of this Complaint is willful and deliberate.

5 **PRAYER FOR RELIEF**

6 WHEREFORE, One-E-Way respectfully requests this Court to enter judgment:

7 A. Declaring that Defendants have been and are infringing one or more claims
8 of the '258 patent;

9 B. Declaring that Defendants' infringements are willful;

10 C. Awarding to One-E-Way damages adequate to compensate One-E-Way for
11 each Defendants' infringement of the '258 patent, with interest as fixed by the Court;

12 D. Declaring that such damages be trebled in accordance with 35 U.S.C. § 284
13 as a consequence of Defendants' willful infringement;

14 E. Declaring this case exceptional under 35 U.S.C. § 285 and awarding One-
15 E-Way its costs and attorney's fees; and

16 F. Awarding One-E-Way such other and further relief as this Court deems just
17 and proper.

18
19 **DEMAND FOR JURY TRIAL**

20 Plaintiff respectfully demands a jury trial on all issues so triable pursuant to Fed.
21 R. Civ. P. 38(b) and L.R. 38-1.

1 Dated: August 26, 2011

BRANDON C. FERNALD
RACHEL D. STANGER
FERNALD LAW GROUP LLP

By: /s/ Brandon C. Fernald
Brandon C. Fernald

Edward E. Casto, Jr. (*pro hac vice*)
Jaime K. Olin (CA Bar 243139)
NELSON BUMGARDNER CASTO, P.C.
3131 West 7th Street, Suite 300
Fort Worth, Texas 76107
Tel: (817) 377-9111
Fax: (817) 377-3485
Email: ecasto@nbclaw.net
jolin@nbclaw.net

Attorneys for Plaintiff One-E-Way, Inc.

EXHIBIT A

US007865258B2

(12) **United States Patent**
Woolfork

(10) **Patent No.:** **US 7,865,258 B2**
(45) **Date of Patent:** ***Jan. 4, 2011**

(54) **WIRELESS DIGITAL AUDIO SYSTEM**

(76) Inventor: **C. Earl Woolfork**, 500 Santa Paula Ave.,
Pasadena, CA (US) 91107

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

This patent is subject to a terminal dis-
claimer.

(21) Appl. No.: **12/570,343**

(22) Filed: **Sep. 30, 2009**

(65) **Prior Publication Data**

US 2010/0014698 A1 Jan. 21, 2010

Related U.S. Application Data

(63) Continuation of application No. 12/144,729, filed on
Jul. 12, 2008, now Pat. No. 7,684,885, which is a
continuation of application No. 10/648,012, filed on
Aug. 26, 2003, now Pat. No. 7,412,294.

(51) **Int. Cl.**
G06F 17/00 (2006.01)

(52) **U.S. Cl.** **700/94**

(58) **Field of Classification Search** None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,491,839 A	2/1996	Schotz	
5,668,880 A	9/1997	Alajajian	
5,721,783 A	2/1998	Anderson	
5,771,441 A *	6/1998	Altstatt	455/66.1
5,781,542 A	7/1998	Tanaka	
5,790,595 A	8/1998	Benthin	
5,946,343 A	8/1999	Schotz	
6,115,478 A	9/2000	Schneider	
6,236,862 B1	5/2001	Erten et al.	
6,342,844 B1	1/2002	Rozin	
6,418,558 B1	7/2002	Roberts	

6,678,892 B1	1/2004	Lavelle et al.	
6,781,977 B1 *	8/2004	Li	370/335
6,982,132 B1	1/2006	Goldner	
7,505,823 B1	3/2009	Bartlett et al.	

(Continued)

FOREIGN PATENT DOCUMENTS

GB 2252013 A 7/1992

(Continued)

OTHER PUBLICATIONS

Microsoft Computer Dictionary definition for Code Division Multi-
plex Access, copyright 2002.*

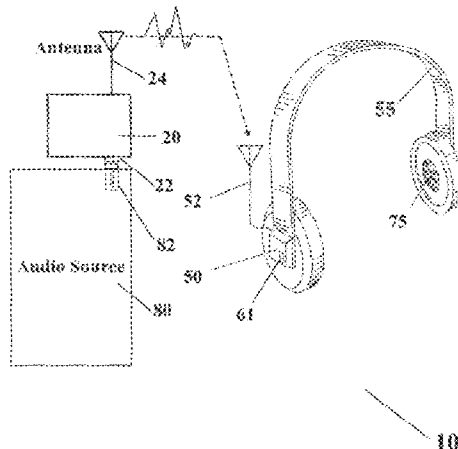
(Continued)

Primary Examiner—Andrew C Flanders
(74) *Attorney, Agent, or Firm*—Megan E. Lyman

(57) **ABSTRACT**

A wireless digital audio system includes a portable audio source with a digital audio transmitter operatively coupled thereto and an audio receiver operatively coupled to a head-phone set. The audio receiver is configured for digital wire-
less communication with the audio transmitter. The digital audio receiver utilizes fuzzy logic to optimize digital signal processing. Each of the digital audio transmitter and receiver is configured for code division multiple access (CDMA) communication. The wireless digital audio system allows private audio enjoyment without interference from other users of independent wireless digital transmitters and receivers sharing the same space.

13 Claims, 3 Drawing Sheets



US 7,865,258 B2

Page 2

U.S. PATENT DOCUMENTS

2003/0045235 A1 3/2003 Mooney
2004/0223622 A1 11/2004 Lindemann

FOREIGN PATENT DOCUMENTS

WO WO0076272 A1 12/2000
WO WO0133836 A1 5/2001

OTHER PUBLICATIONS

American National Standard for Methods of Measurement of Compatibility Between Wireless Communication Devices and Hearing Aids—ANSI C63. 19-2001.

A Conferencing Spread Spectrum Radio, KM Lye, TT Tjhung, KC Chua, TC Pek, WH Yung, WP Goh, YP Chia, WK Loh, FL Ma, KM Low, 1994.

Specification of the Bluetooth System, Version 1.0 B, pp. 17-27, 4144, 81-86, 143-147, Nov. 20, 1999.

* cited by examiner

U.S. Patent

Jan. 4, 2011

Sheet 1 of 3

US 7,865,258 B2

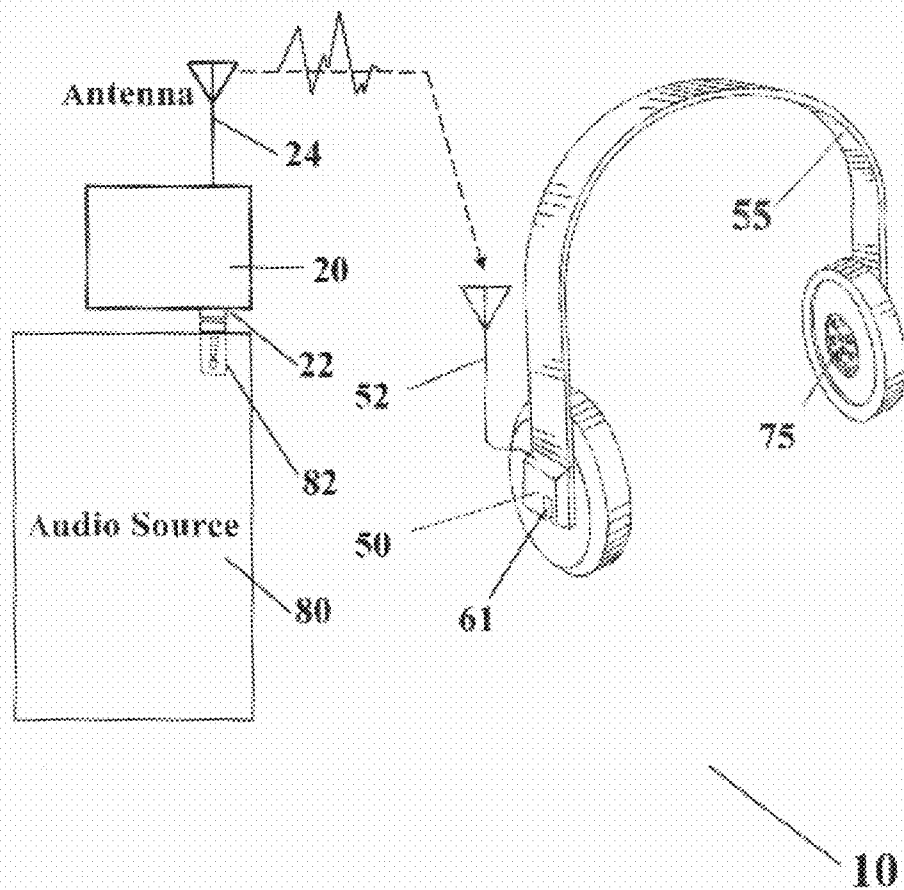


FIG.1

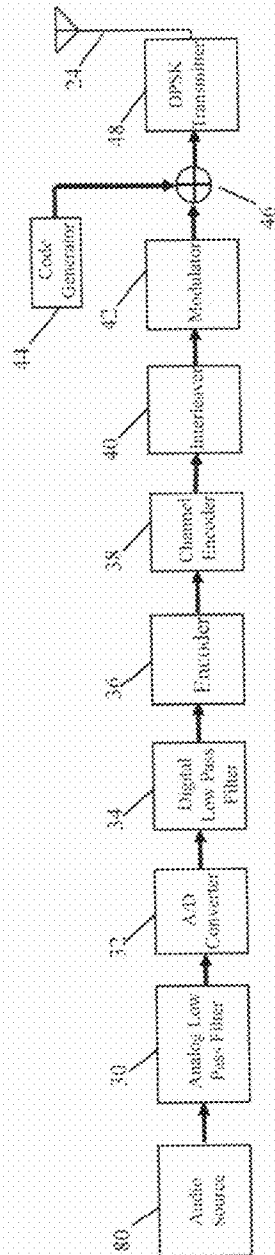


FIG. 2

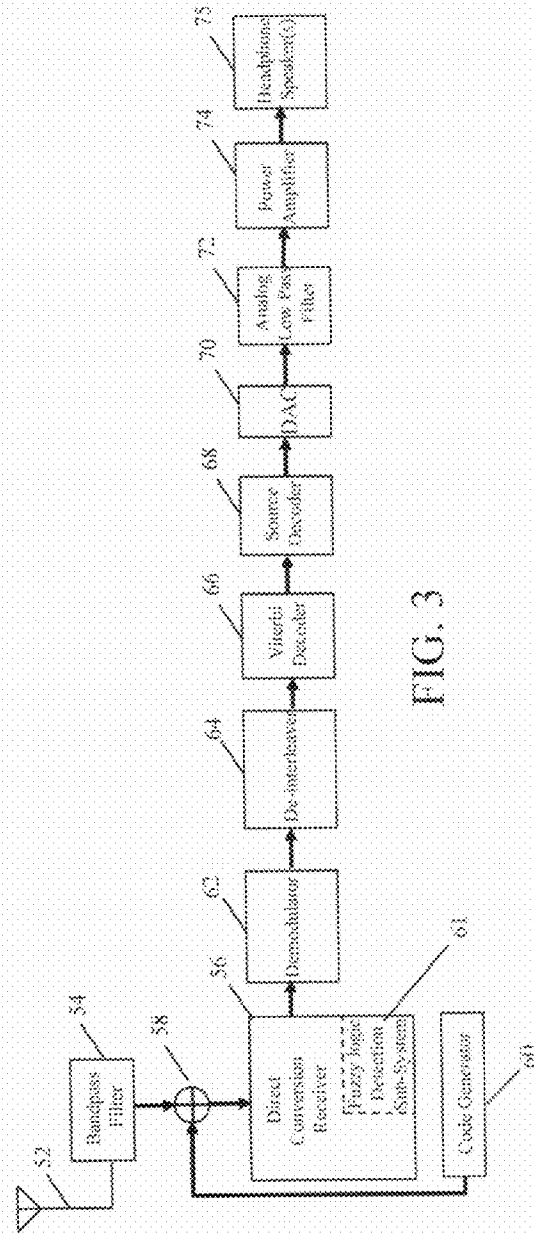


FIG. 3

U.S. Patent

Jan. 4, 2011

Sheet 3 of 3

US 7,865,258 B2

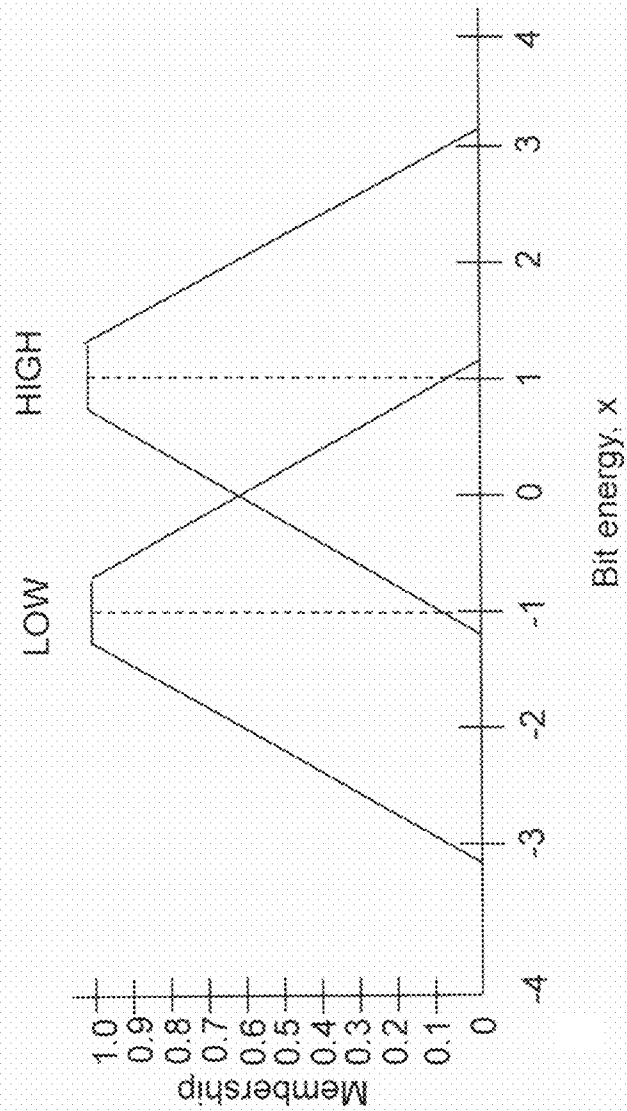


Fig. 4

US 7,865,258 B2

1

WIRELESS DIGITAL AUDIO SYSTEM

This continuation application claims the benefit of U.S. patent application Ser. No. 12/144,729 filed Jul. 12, 2008, which claimed benefit of U.S. patent application Ser. No. 10/648,012 filed Aug. 26, 2003, which claimed benefit from U.S. patent application Ser. No. 10/027,391, filed Dec. 21, 2001, for "Wireless Digital Audio System," published under US 2003/0118196 A1 on Jun. 26, 2003, now abandoned, both of which are incorporated herein in their entirety by reference.

BACKGROUND OF THE INVENTION

This invention relates to audio player devices and more particularly to systems that include headphone listening devices. The new audio system uses an existing headphone jack (i.e., this is the standard analog headphone jack that connects to wired headphones) of a music audio player (i.e., portable CD player, portable cassette player, portable A.M./F.M. radio, laptop/desktop computer, portable MP3 player, and the like) to connect a battery powered transmitter for wireless transmission of a signal to a set of battery powered receiving headphones.

Use of audio headphones with audio player devices such as portable CD players, portable cassette players, portable A.M./F.M. radios, laptop/desktop computers, portable MP3 players and the like have been in use for many years. These systems incorporate an audio source having an analog headphone jack to which headphones may be connected by wire.

There are also known wireless headphones that may receive A.M. and F.M. radio transmissions. However, they do not allow use of a simple plug in (i.e., plug in to the existing analog audio headphone jack) battery powered transmitter for connection to any music audio player device jack, such as the above mentioned music audio player devices, for coded wireless transmission and reception by headphones of audio music for private listening without interference where multiple users occupying the same space are operating wireless transmission devices. Existing audio systems make use of electrical wire connections between the audio source and the headphones to accomplish private listening to multiple users.

There is a need for a battery powered simple connection system for existing music audio player devices (i.e., the previously mentioned music devices), to allow coded digital wireless transmission (using a battery powered transmitter) to a headphone receiver (using a battery powered receiver headphones) that accomplishes private listening to multiple users occupying the same space without the use of wires.

SUMMARY OF THE INVENTION

The present invention is generally directed to a wireless digital audio system for coded digital transmission of an audio signal from any audio player with an analog headphone jack to a receiver headphone located away from the audio player. Fuzzy logic technology may be utilized by the system to enhance bit detection. A battery-powered digital transmitter may include a headphone plug in communication with any suitable music audio source. For reception, a battery-powered headphone receiver may use embedded fuzzy logic to enhance user code bit detection. Fuzzy logic detection may be used to enhance user code bit detection during decoding of the transmitted audio signal. The wireless digital audio music system provides private listening without interference from other users or wireless devices and without the use of conventional cable connections.

2

These and other features, aspects and advantages of the present invention will become better understood with reference to the following drawings, description and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Some aspects of the present invention are generally shown by way of reference to the accompanying drawings in which:

FIG. 1 schematically illustrates a wireless digital audio system in accordance with the present invention;

FIG. 2 is a block diagram of an audio transmitter portion of the wireless digital audio system of FIG. 1;

FIG. 3 is a block diagram of an audio receiver portion of the wireless digital audio system of FIG. 1; and

FIG. 4 is an exemplary graph showing the utilization of an embedded fuzzy logic coding algorithm according to one embodiment of the present invention.

DETAILED DESCRIPTION

The following detailed description is the best currently contemplated modes for carrying out the invention. The description is not to be taken in a limiting sense, but is made merely for the purpose of illustrating the general principles of the invention.

Referring to FIGS. 1 through 3, a wireless digital audio music system 10 may include a battery powered transmitter 20 connected to a portable music audio player or music audio source 80. The battery powered wireless digital audio music transmitter 20 utilizes an analog to digital converter or ADC 32 and may be connected to the music audio source 80 analog headphone jack 82 using a headphone plug 22. The battery powered transmitter 20 may have a transmitting antenna 24 that may be omni-directional for transmitting a spread spectrum modulated signal to a receiving antenna 52 of a battery powered headphone receiver 50. The battery powered receiver 50 may have headphone speakers 75 in headphones 55 for listening to the spread spectrum demodulated and decoded communication signal. In the headphone receiver 50, fuzzy logic detection may be used to optimize reception of the received user code. The transmitter 20 may digitize the audio signal using ADC 32. The digitized signal may be processed downstream by an encoder 36. After digital conversion, the digital signal may be processed by a digital low pass filter. To reduce the effects of channel noise, the battery powered transmitter 20 may use a channel encoder 38. A modulator 42 modulates the digital signal to be transmitted. For further noise immunity, a spread spectrum DPSK (differential phase shift key) transmitter or module 48, is utilized. The battery powered transmitter 20 may contain a code generator 44 that may be used to create a unique user code. The unique user code generated is specifically associated with one wireless digital audio system user, and it is the only code recognized by the battery powered headphone receiver 50 operated by a particular user. The radio frequency (RF) spectrum utilized (as taken from the Industrial, Scientific and Medical (ISM) band) may be approximately 2.4 GHz. The power radiated by the transmitter adheres to the ISM standard.

Particularly, the received spread spectrum signal may be communicated to a 2.4 GHz direct conversion receiver or module 56. Referring to FIGS. 1 through 4, the spread spectrum modulated signal from transmit antenna 24 may be received by receiving antenna 52 and then processed by spread spectrum direct conversion receiver or module 56 with a receiver code generator 60 that contains the same transmitted unique code, in the battery powered receiver 50 head-

US 7,865,258 B2

3

phones. The transmitted signal from antenna 24 may be received by receiving antenna 52 and communicated to a wideband bandpass filter (BPF). The battery powered receiver 50 may utilize embedded fuzzy logic 61 (as graphically depicted in FIGS. 1, 4) to optimize the bit detection of the received user code. The down converted output signal of direct conversion receiver or module 56 may be summed by receiver summing element 58 with a receiver code generator 60 signal. The receiver code generator 60 may contain the same unique wireless transmission of a signal code word that was transmitted by audio transmitter 20 specific to a particular user. Other code words from wireless digital audio systems 10 may appear as noise to audio receiver 50. This may also be true for other device transmitted wireless signals operating in the wireless digital audio spectrum of digital audio system 10. This code division multiple access (CDMA) may be used to provide each user independent audible enjoyment. The resulting summed digital signal from receiving summary element 58 and direct conversion receiver or module 56 may be processed by a 64-Ary demodulator 62 to demodulate the signal elements modulated in the audio transmitter 20. A block de-interleaver 64 may then decode the bits of the digital signal encoded in the block interleaver 40. Following such, a Viterbi decoder 66 may be used to decode the bits encoded by the channel encoder 38 in audio transmitter 20. A source decoder 68 may further decode the coding applied by encoder 36.

Each receiver headphone 50 user may be able to listen (privately) to high fidelity audio music, using any of the audio devices listed previously, without the use of wires, and without interference from any other receiver headphone 50 user, even when operated within a shared space. The fuzzy logic detection technique 61 used in the receiver 50 could provide greater user separation through optimizing code division in the headphone receiver.

The battery powered transmitter 20 sends the audio music information to the battery powered receiver 50 in digital packet format. These packets may flow to create a digital bit stream rate less than or equal to 1.0 Mbps.

The user code bits in each packet may be received and detected by a fuzzy logic detection sub-system 61 (as an option) embedded in the headphone receiver 50 to optimize audio receiver performance. For each consecutive packet received, the fuzzy logic detection sub-system 61 may compute a conditional density with respect to the context and fuzziness of the user code vector, i.e., the received code bits in each packet. Fuzziness may describe the ambiguity of the high (1)/low (0 or -1) event in the received user code within the packet. The fuzzy logic detection sub-system 61 may measure the degree to which a high/low bit occurs in the user code vector, which produces a low probability of bit error in the presence of noise. The fuzzy logic detection sub-system 61 may use a set of if-then rules to map the user code bit inputs to validation outputs. These rules may be developed as if-then statements.

Fuzzy logic detection sub-system 61 in battery-powered headphone receiver 50 utilizes the if-then fuzzy set to map the received user code bits into two values: a low (0 or -1) and a high (1). Thus, as the user code bits are received, the "if" rules map the signal bit energy to the fuzzy set low value to some degree and to the fuzzy set high value to some degree. FIG. 4 graphically shows that x-value -1 equals the maximum low bit energy representation and x-value 1 equals the maximum high bit energy representation. Due to additive noise, the user code bit energy may have some membership to a low and high as represented in FIG. 4. The if-part fuzzy set may determine if each bit in the user code, for every received packet, has a

4

greater membership to a high bit representation or a low bit representation. The more a user code bit energy fits into the high or low representation, the closer its subsethood, i.e., a measure of the membership degree to which a set may be a subset of another set, may be to one.

The if-then rule parts that make up the fuzzy logic detection sub-system 61 must be followed by a defuzzifying operation. This operation reduces the aforementioned fuzzy set to a bit energy representation (i.e., -1 or 1) that is received by the transmitted packet. Fuzzy logic detection sub-system 61 may be used in battery-powered headphone receiver 50 to enhance overall system performance.

The next step may process the digital signal to return the signal to analog or base band format for use in powering speaker(s) 75. A digital-to-analog converter 70 (DAC) may be used to transform the digital signal to an analog audio signal. An analog low pass filter 72 may be used to filter the analog audio music signal to pass a signal in the approximate 20 Hz to 20 kHz frequency range and filter other frequencies. The analog audio music signal may then be processed by a power amplifier 74 that may be optimized for powering headphone speakers 75 to provide a high quality, low distortion audio music for audible enjoyment by a user wearing headphones 55. A person skilled in the art would appreciate that some of the embodiments described hereinabove are merely illustrative of the general principles of the present invention. Other modifications or variations may be employed that are within the scope of the invention. Thus, by way of example, but not of limitation, alternative configurations may be utilized in accordance with the teachings herein. Accordingly, the drawings and description are illustrative and not meant to be a limitation thereof.

Moreover, all terms should be interpreted in the broadest possible manner consistent with the context. In particular, the terms "comprises" and "comprising" should be interpreted as referring to elements, components, or steps in a non-exclusive manner, indicating that the referenced elements, components, or steps may be present, or utilized, or combined with other elements, components, or steps that are not expressly referenced. Thus, it is intended that the invention cover all embodiments and variations thereof as long as such embodiments and variations come within the scope of the appended claims and their equivalents.

I claim:

1. A portable wireless digital audio system for digital transmission of an original audio signal representation from a portable audio source to a portable digital audio headphone receiver, said portable wireless digital audio system comprising:

a digital audio transmitter, capable of mobile operation, transmitting a unique user code with said original audio signal representation in packet format, wherein said digital audio transmitter is operatively coupled to said portable audio source, said digital audio transmitter comprising:

a digital modulator configured for independent code division multiple access (CDMA) communication operation;

said digital audio transmitter configured for direct digital wireless communication with said portable digital audio headphone receiver, wherein said headphone receiver is configured to receive said unique user code with said original audio signal representation in packet format, said portable digital audio headphone receiver comprising:

US 7,865,258 B2

5

an embedded fuzzy logic detector wherein the fuzzy logic detector activates fuzzy logic rules and performs a defuzzification operation to enhance detection of the unique user code;

a digital demodulator configured for independent CDMA communication operation;

a digital-to-analog converter (DAC) generating an audio output of said original audio signal representation; and

a module adapted to reproduce said generated audio output.

2. A wireless digital audio headphone comprising:

a digital audio receiver configured to receive a unique user code bit sequence and a original audio signal representation in the form of packets;

an embedded fuzzy logic detector wherein the fuzzy logic detector activates fuzzy logic rules and performs a defuzzification operation to enhance detection of the unique user code bit sequence;

a digital-to-analog converter (DAC) generating an audio output of the received original audio signal representation; and

a module adapted to reproduce said generated audio output.

3. A portable wireless digital audio transmitter system for digital transmission of an original audio signal representation from a portable audio source to a portable digital audio headphone receiver, said portable wireless digital audio system comprising:

a digital audio transmitter operatively coupled to said portable audio source and transmitting a unique user code bit sequence with said original audio signal representation in packet format, wherein said digital audio transmitter operatively coupled to said audio source is capable of mobile operation, said digital audio transmitter comprising:

an encoder operative to encode said original audio signal representation to reduce intersymbol interference;

a digital modulator module configured for independent CDMA communication operation;

said digital audio transmitter configured for direct digital wireless communication with said portable digital audio headphone receiver, said portable digital audio headphone receiver comprising:

a direct conversion module configured to capture packets embedded in the received spread spectrum signal, the captured packets corresponding to the unique user code bit sequence;

a digital demodulator configured for independent CDMA communication operation;

a decoder operative to decode the applied reduced intersymbol interference coding of said original audio signal representation;

a digital-to-analog converter (DAC) generating an audio output of said original audio signal representation; and

a module adapted to reproduce said generated audio output, said audio having been wirelessly transmitted from said portable audio source and reproduced virtually free from interference.

4. A portable wireless digital audio system for digital transmission of an original audio signal representation from a portable audio source to a portable digital audio headphone receiver, said portable wireless digital audio system comprising:

a digital audio transmitter operatively coupled to said portable audio source and transmitting a unique user code bit sequence with said original audio signal representa-

6

tion in packet format, wherein said digital audio transmitter operatively coupled to said audio source is capable of mobile operation, said digital audio transmitter comprising:

an encoder operative to encode said original audio signal representation to reduce intersymbol interference;

a channel encoder and interleaver to reduce transmission errors;

a differential phase shift keying (DPSK) modulator being configured for independent code division multiple access (CDMA) communication operation;

said digital audio transmitter configured for direct digital wireless communication with said portable digital audio headphone receiver, said portable digital audio headphone receiver comprising:

a direct conversion module configured to capture packets embedded in the received spread spectrum signal, the captured packets corresponding to the unique user code bit sequence;

a digital demodulator configured for independent CDMA communication operation;

a viterbi decoder and de-interleaver generating a corresponding digital output;

a decoder operative to decode the applied reduced intersymbol interference coding of said original audio signal representation;

a digital-to-analog converter (DAC) generating an audio output of said original audio signal representation; and

a module adapted to reproduce said generated audio output, said audio having been wirelessly transmitted from said portable audio source virtually free from interference from device transmitted signals operating in the portable wireless digital audio system spectrum.

5. A portable wireless digital audio system for digital transmission of an original audio signal representation from a portable audio source to a portable digital audio headphone receiver, said portable wireless digital audio system comprising:

a digital audio transmitter operatively coupled to said portable audio source and transmitting a unique user code with said original audio signal representation in packet format, wherein said digital audio transmitter coupled to said audio source is capable of mobile operation, said digital audio transmitter comprising:

a encoder operative to encode said original audio signal representation to reduce intersymbol interference;

a digital modulator configured for independent code division multiple access (CDMA) communication operation said digital audio transmitter configured for direct digital wireless communication with said portable digital audio headphone receiver, said portable digital audio headphone receiver comprising:

an embedded fuzzy logic detector wherein the fuzzy logic detector activates fuzzy logic rules and performs a defuzzification operation to enhance detection of the unique user code;

a direct conversion module configured to capture packets embedded in the received spread spectrum signal, the captured packets corresponding to the detected unique user code;

a digital demodulator configured for independent CDMA communication operation;

a decoder operative to decode the applied reduced intersymbol interference coding of said original audio signal representation;

US 7,865,258 B2

7

a module adapted to reproduce audio of said original audio signal representation.

6. A portable wireless digital audio system for digital transmission of an original audio signal representation from a portable audio source to a digital audio headphone, said portable wireless digital audio system comprising:

a digital audio transmitter operatively coupled to said portable audio source and transmitting a unique user code bit sequence with said original audio signal representation in packet format, wherein said digital audio transmitter coupled to said audio source is capable of mobile operation, said digital audio transmitter comprising:

an encoder operative to encode said original audio signal representation to reduce intersymbol interference;

a differential phase shift keying (DPSK) modulator being configured for independent code division multiple access (CDMA) communication operation; said digital audio transmitter configured for direct digital wireless communication with said portable digital audio headphone receiver, said portable digital audio headphone receiver comprising:

an embedded fuzzy logic detector wherein the fuzzy logic detector activates fuzzy logic rules and performs a defuzzification operation to enhance detection of the unique user code bit sequence;

a direct conversion module configured to capture packets embedded in the received spread spectrum signal, the captured packets corresponding to the detected unique user code bit sequence;

a digital demodulator configured for independent CDMA communication operation;

a decoder operative to decode the applied reduced intersymbol interference coding of said original audio signal representation;

a digital-to-analog converter (DAC) generating an audio output of said original audio signal representation; and a module adapted to reproduce said generated audio output.

7. A portable wireless digital audio system for digital transmission of an original audio representation from a portable audio source to a digital audio receiver, said portable wireless digital audio system comprising:

a mobile digital audio transmitter operatively coupled to said portable audio source, said mobile digital audio transmitter configured to transmit a unique user code with the original audio representation;

a mobile digital audio receiver configured for direct digital wireless communication with said mobile digital audio transmitter, said mobile audio receiver comprising:

an embedded fuzzy logic detector wherein the fuzzy logic detector activates fuzzy logic rules and performs a defuzzification operation to enhance detection of the unique user code;

a digital demodulator;

a digital-to-analog converter (DAC) generating an audio output of said original audio representation; and

a module adapted to reproduce said generated audio output.

8. A portable wireless digital audio system for digital transmission of an original audio signal representation from a portable audio source to a digital audio headphone, said portable wireless digital audio system comprising:

a portable digital audio transmitter configured to couple to said portable audio source and transmitting a unique

8

user code bit sequence with said original audio signal representation in packet format, said digital audio transmitter comprising:

an encoder operative to encode said original audio signal representation to reduce intersymbol interference; and

a digital modulator configured for independent code division multiple access (CDMA) communication operation; and said portable digital audio transmitter configured for direct digital wireless communication with said digital audio headphone, said digital audio headphone comprising:

a direct conversion module configured to capture packets embedded in the received spread spectrum signal, the captured packets corresponding to the unique user code bit sequence;

a digital demodulator configured for independent CDMA communication operation;

a decoder operative to decode the applied reduced intersymbol interference coding of said original audio signal representation;

a digital-to-analog converter (DAC) generating an audio output of said original audio signal representation; and

a module adapted to reproduce said generated audio output, said audio having been wirelessly transmitted from said portable audio source virtually free from interference from device transmitted signals operating in the portable wireless digital audio system spectrum.

9. A wireless digital audio receiver comprising:

an embedded fuzzy logic detector wherein the fuzzy logic detector activates fuzzy logic rules and performs a defuzzification operation in response to a received unique user code to enhance detection of the unique user code;

a direct conversion module being configured to capture the correct unique user code bit sequence embedded in a received CDMA signal;

a digital demodulator adapted to process output from said direct conversion module;

a digital-to-analog converter (DAC) generating an audio output wherein if the unique user code bit sequence corresponding to the decoded and converted digital signal is recognized, said audio output having been wirelessly transmitted, said audio output reproduced virtually without interference when operated in a shared space containing at least one other user of a wireless device utilizing code division multiple access (CDMA) communication.

10. A portable wireless digital audio system for digital transmission of an original audio signal representation from a audio source to a digital audio receiver, said portable wireless digital audio system comprising:

a digital audio transmitter operatively coupled to said audio source and transmitting a unique user code with said original audio signal representation in packet format, wherein said digital audio transmitter coupled to said audio source and is capable of being moved in any direction during operation, said digital audio transmitter comprising:

an encoder operative to encode said original audio signal representation to reduce intersymbol interference;

an interleaver to reduce transmission errors;

a digital modulator module configured for independent CDMA communication operation;

said digital audio receiver capable of being moved in any direction during operation, is in direct communication with said digital audio transmitter, said digital audio receiver comprising:

US 7,865,258 B2

9

a direct conversion module configured to capture packets embedded in the received spread spectrum signal, the captured packets corresponding to the unique user code; a digital demodulator configured for independent CDMA communication operation;

an de-interleaver generating a corresponding digital output;

a decoder operative to decode the applied reduced intersymbol interference coding of said original audio signal representation;

a digital-to-analog converter (DAC) generating an audio output of said original audio signal representation; and a module adapted to reproduce said generated audio output, said audio having been wirelessly transmitted from said audio source virtually free from interference from device transmitted signals operating in the portable wireless digital audio system spectrum.

11. A portable wireless digital audio system for digital transmission of an original audio signal representation from a audio source to a digital audio receiver, said portable wireless digital audio system comprising:

a digital audio transmitter operatively coupled to said audio source and transmitting a unique user code with said original audio signal representation in packet format, wherein said digital audio transmitter coupled to said audio source is capable of being moved in any direction during operation, said digital audio transmitter comprising:

an encoder operative to encode said original audio signal representation to reduce intersymbol interference;

a digital modulator module configured for independent code division multiple access (CDMA) communication operation and utilizing differential phase shift keying (DPSK) to modulate said original audio signal representation;

said digital audio receiver capable of being moved in any direction during operation and in direct communication with said digital audio transmitter, said digital audio receiver comprising:

10

a direct conversion module configured to capture packets embedded in the received spread spectrum signal, the captured packets corresponding to the unique user code;

a digital demodulator configured for independent CDMA communication operation;

a decoder operative to decode the applied reduced intersymbol interference coding of said original audio signal representation;

a digital-to-analog converter (DAC) generating an audio output of said original audio signal representation; and a module adapted to reproduce said generated audio output, said audio having been wirelessly transmitted from said audio source virtually free from interference.

12. A portable wireless digital audio system comprising:

a digital audio transmitter operatively coupled to a portable audio source and configured to wirelessly transmit audio output from the portable audio source, the digital audio transmitter further configured to add a unique user code bit sequence to the audio output prior to the transmission;

a wireless digital audio headphone comprising:

a digital audio receiver configured to receive the unique user code bit sequence and the audio output;

an embedded fuzzy logic detector wherein the fuzzy logic detector activates fuzzy logic rules and performs a defuzzification operation to enhance detection of the unique user code bit sequence;

a digital-to-analog converter (DAC) generating an audio signal output of the received audio output; and a module adapted to reproduce said generated audio signal output.

13. The portable wireless digital audio system of claim **12**, wherein said digital demodulator audio transmitter is portable.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,865,258 B2
APPLICATION NO. : 12/570343
DATED : January 4, 2011
INVENTOR(S) : C. Earl Woolfork

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:

Col. 5, ln. 25 reads "A portable wireless digital audio transmitter system" that line should read "A portable wireless digital audio system"

Signed and Sealed this
Twenty-second Day of February, 2011

A handwritten signature in black ink that reads "David J. Kappos". The signature is written in a cursive, flowing style.

David J. Kappos
Director of the United States Patent and Trademark Office