UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

ONE-E-WAY, INC.,
Patent Owner.

Case: IPR2025-01516
U.S. Patent No. 10,468,047

DECLARATION OF MICHAEL ALLAN MARTIN DAVIES IN SUPPORT OF *INTER PARTES REVIEW* OF CLAIMS 1-20 OF U.S. PATENT NO. 10,468,047

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I, Michael Allan Martin Davies, do hereby declare as follows:

I. INTRODUCTION

1. I make this declaration based upon my own personal knowledge and, if called upon to testify, would testify competently to the matters stated herein.

2. I have been asked to provide my expert opinion in connection with the Petition for *Inter Partes Review* of U.S. Patent No. 10,468,047 ("the '047 patent") to Woolfork concerning whether the '047 patent is unpatentable over certain prior art. This declaration is a statement of my opinions on issues relating to the patentability of claims 1-20 (the "Challenged Claims") of the '047 patent. As I explain more fully below, it is my opinion that all of the Challenged Claims would have been obvious to a person of ordinary skill in the art ("POSA") at the time of the alleged invention.

3. I have been retained on behalf of Samsung Electronics Co., Ltd. ("Petitioner"). I am being compensated for my work in this matter at my standard hourly rate. I am also being reimbursed for reasonable and customary expenses associated with my work and testimony in this investigation. My compensation is not contingent on the outcome of this matter or the specifics of my testimony.

4. I have reviewed and considered the following documents in connection with my analysis of the '047 patent:

Exhibit	Description
1001	U.S. Patent No. 10,468,047 to Woolfork ("'047 patent")
1002	File history of U.S. Application No. 16/185,786, filed on November 9, 2018 ("the 2018 application")
1003	File history of U.S. Application No. 10/027,391, filed December 21, 2001 ("the 2001 application"), as originally filed in *Sony Corp. v. One-E-Way, Inc., IPR2016-01638* as Exhibit 1003
1004	U.S. Publication No. 2003/0118196 ("the '196 publication") , as originally filed in *Sony Corp. v. One-E-Way, Inc., IPR2016-01638* as Exhibit 1004
1005	File history of U.S. Application No. 10/648,012, filed August 26, 2003 ("the 2003 application"), as originally filed in *Sony Corp. v. One-E-Way, Inc., IPR2016-01638* as Exhibit 1005
1006	U.S. Patent No. 7,412,294, as originally filed in *Sony Corp. v. One-E-Way, Inc., IPR2016-01638* as Exhibit 1006
1007	Excerpts from file history of U.S. Application No. 12/144,729, filed July 12, 2008 ("the 2008 application"), as originally filed in *Sony Corp. v. One-E-Way, Inc., IPR2016-01638* as Exhibit 1007
1008	Comparison of the 2003 application as-filed with the 2001 application as-filed, as originally filed in *Sony Corp. v. One-E-Way, Inc., IPR2016-01638* as Exhibit 1008
1009	Comparison of figures from the 2003 and 2001 applications as-filed, as originally filed in *Sony Corp. v. One-E-Way, Inc., IPR2016-01638* as Exhibit 1009
1010	Comparison of the '294 patent with the as-filed 2003 application, as originally filed in *Sony Corp. v. One-E-Way, Inc., IPR2016-01638* as Exhibit 1010
1011	Comparison of the 2008 application as-filed with the 2018 application as-filed
1013	*One-E-Way, Inc. v. Apple Inc.*, No. 2:20-cv-06339, Dkt. 86 (C.D. Cal. Mar. 9, 2022) ("Apple *Markman* order")
1014	*In the Matter of Certain Consumer Elecs. And Display Devices with Graphics Processing and Graphics Processing Units Therein,* 337-TA-943, Order 12 (ITC July 24, 2015) ("ITC *Markman* order")
1015	U.S. Patent No. 6,744,808 ("Walley")
1016	U.S. Patent No. 5,546,424 ("Miyake")

Exhibit	Description
1017	Reserved
1018	"Wireless Communications: Principles & Practice" by Theodore S. Rappaport (1996) ("Rappaport")
1019	Reserved
1020	Reserved
1021	U.S. Patent No. 6,256,303 ("Drakoulis")
1022	"The Communications Handbook" (1997) by Jerry D. Gibson ("Gibson")
1023	One-E-Way's Opening Claim Construction Brief *One-E-Way, Inc. v. Apple Inc.*, 2:20-cv-6339-JSK-PD (D.I. 65) (C.D. Cal. Dec. 6 2021)
1024	Order Re Motion For Summary Judgment of Non-Infringement ("*Apple* Summary Judgment Order") *One-E-Way, Inc. v. Apple Inc.*, 2:20-cv-6339-JSK-PD (D.I. 102) (C.D. Cal. June 15, 2022)
1025	Library of Congress Record for "Wireless Communications: Principles & Practice" by Theodore S. Rappaport (1996)
1026	U.S. Patent No. 5,933,421
1027	Library of Congress Record for "The Communications Handbook" (1997)
1028	U.S. Patent No. 5,953,669
1029	Opinion Affirming *Apple* Summary Judgment Order *One-E-Way, Inc. v. Apple Inc.*, 2022-2020 (D.I. 32) (Aug. 14, 2023)
1030	*Curriculum Vitae*, Michael Allan Martin Davies

5. In forming the opinions expressed below, I have considered:

a) the documents listed above;

b) the relevant legal standards, including the standard for obviousness, and any additional authoritative documents as cited in the body of this declaration; and

c) my own knowledge and experience based upon my work in the field of wireless communications as described below, as well as the following materials.

6. Unless otherwise noted, all emphasis in any quoted material has been added.

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

7. My complete qualifications and professional experience are described in my *Curriculum Vitae*, a copy of which can be found in Exhibit 1030. The following is a brief summary of my relevant qualifications and professional experience.

8. I received a Bachelor of Arts and a Master of Arts in Engineering and in Electrical Sciences from St. Catharine's College at the University of Cambridge; a Master of Engineering in Cybernetics, Robotics, and Microelectronics from the University of Durham; and a Master of Business Administration from London Business School (with Distinction). My educational work focused on engineering, physics, computer science and mathematics; cybernetics and robotics; microelectronics including the design of microchips; and management science with particular focus on technology, innovation, and business strategy.

9. I am the Founder and Chairman of Endeavour Partners, LLC, a boutique strategy consulting and expert advisory firm. I also serve as a Senior Lecturer and Principal Investigator at the Sloan School of Management and the School of Engineering at the Massachusetts Institute of Technology ("MIT") and teach in the Integrated Design and Management and Professional Education programs. I also serve as a Guest Lecturer at London Business School for programs involving strategy, entrepreneurship, technology, and innovation and am the creator and director of the Business of AI program.

10. For approximately the last 35 years, I have worked in wireless and broadband communications, mobile computing, consumer electronics, and related industries, and with businesses harnessing these technologies. I worked first for approximately a decade as an engineer in high-tech manufacturing, then for approximately a decade as a manager and executive, focusing on the wireless, mobile, telecommunications and internet sectors, and for the last twenty-five years or so as an expert consultant and advisor, educator and entrepreneur.

11. I have worked for a wide variety of technology and manufacturing companies on issues relating to research and development, product development, manufacturing, logistics, supply chain management, technology, strategy, and innovation. My work primarily involves the connections amongst technology, innovation, research and development, new product adoption and diffusion,

consumer choice and behavior, business models, and the emergence and evolution of business ecosystems.

12. I have experience working throughout the digital and mobile sectors, including at the convergence of mobile, broadband Internet, consumer electronics, software, semiconductors, and other digital technologies. My work in this area extends to mobile devices including cellphones, smartphones, and tablets, communication services and networks (wireless and broadband Internet), computers (components, hardware, and software), electronic hardware (semiconductors and integrated circuits, printed circuit board design, and manufacturing), consumer electronics, the Internet of Things ("IoT"), artificial intelligence (AI), robotics, and the related areas of content (video, audio, applications and software), electronic commerce, software (from embedded systems to cloud services, and artificial intelligence.

13. I began my work in the manufacturing sector on the design, development, and deployment of mechanical, electrical, and high-tech products. For example, in the mid 1990s as Chief of Strategy for BellSouth NZ (now One NZ), I collaborated with Apple and Nokia on digital connectivity for the Apple Newton and then worked with Nokia on the development and testing of the Nokia Communicator 9000, the first smartphone that used digital connectivity. During my time in that role between 1992 and 1998 I also served as New Zealand's representative to the ITU-R

Task Group 8/1 on Future Public Land Mobile Telecommunications Systems (FPLMTS), chaired the New Zealand Working Party on Personal Communications Services (PCS) technologies spectrum and, and was elected a Vice Chairman of the GSM MoU (the largest global group of mobile network operators) and founded and led its 3rd Generation Interest Group (3GIG). I continued to work on these particular and related issues involving short-range wireless communications such as IEEE 802.11, Bluetooth and 802.15.4 and Zigbee intensively over the next several years through the early 2000s.

14. Since then, I have focused on mobile-, communications-, and computing-related issues, including developing effective business strategies. In particular, I have done extensive work on what is involved in designing, developing, and bringing to market complex consumer electronics, including smartphones, tablets, and personal computers; building new business models; the challenge of incorporating high-end technologies; and supply chain management.

15. I have significant experience serving as an expert consultant in this field. I served as an industry expert for the Department of Justice in 2011 in the anti-trust investigation of the proposed AT&T and T-Mobile merger. In this role, I analyzed the impact of the proposed merger, in particular as it related to the technology and economics of mobile networks and wireless services, and to consumer choice.

16. I also served as the DoJ's industry expert for its antitrust investigation into the proposed T-Mobile and Sprint merger, for a criminal trade secrets case against Chinese device vendor Huawei, and for the civil antitrust case against Google and on a number of other non-public matters involving telecommunications and mobile communications.

17. I have served as an expert witness in several International Trade Commission ("ITC" or the "Commission") investigations related to the information and communications technology industry and public interest matters. A full list of those investigations is attached in my C.V.

18. I have also served as a technical expert in recent United States District Court Patent Infringement cases helping establish invalidity and noninfringement in U.S. District Court Cases. A full list of these cases can also be found attached in my C.V.

19. My curriculum vitae, provided as Exhibit 1030 to this report, includes additional details about my education, professional background, and prior testifying experience.

III. LEVEL OF ORDINARY SKILL IN THE ART

20. I understand there are multiple factors relevant to determining the level of ordinary skill in the pertinent art, including (1) the levels of education and experience of persons working in the field at the time of the invention; (2) the

sophistication of the technology; (3) the types of problems encountered in the field; and (4) the prior art solutions to those problems.

21. I understand that the ’047 patent was filed on November 9, 2018.

22. My analysis reflects the views of a POSA in the field of the ’047 patent. A POSA would have had a Bachelor of Science (or equivalent) degree in electrical engineering or a related field, and approximately two years of experience in the design or implementation of wireless communications systems, or the equivalent. Alternatively, a person of ordinary skill in the art has approximately six years of experience in the design or implementation of wireless communications systems, or the equivalent.

23. For purposes of this Declaration, my statements and opinions, such as those regarding my experience and the understanding of a POSA generally (and specifically related to the references I consulted herein), are rendered from the perspective of a POSA as of the December 21, 2001 date.

IV. RELEVANT LEGAL STANDARDS

24. I am not an attorney. In preparing and expressing my opinions and considering the subject matter of the ’047 patent, I am relying on certain basic legal principles that counsel have explained to me. These principles are discussed below.

25. I have been informed that the claims of the ’047 patent are to be given their ordinary and customary meaning as understood by a person of ordinary skill in

the art. I have been asked to apply this claim construction standard when I render my opinions on patentability set forth in this declaration.

26. I understand that prior art to the ’047 patent includes patents and printed publications in the relevant art that predate the proper priority date of the alleged invention recited in the ’047 patent.

27. I have been informed that a claimed invention is unpatentable under 35 U.S.C. § 103 if the differences between the invention 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 the subject matter pertains. I have also been informed by counsel that the obviousness analysis takes into account factual inquiries including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the claimed subject matter.

28. I have been informed by counsel that the Supreme Court has recognized several rationales for combining references or modifying a reference to show obviousness of claimed subject matter. Some of these rationales include the following: (a) combining prior art elements according to known methods to yield predictable results; (b) simple substitution of one known element for another to obtain predictable results; (c) use of a known technique to improve a similar device (method, or product) in the same way; (d) applying a known technique to a known

device (method, or product) ready for improvement to yield predictable results; (e) choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and (f) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

29. I further understand that certain factors may support or rebut the obviousness of a claim. I understand that such secondary considerations include, among other things, commercial success of the patented invention, skepticism of those having ordinary skill in the art at the time of invention, unexpected results of the invention, any long-felt but unsolved need in the art that was satisfied by the alleged invention, the failure of others to make the alleged invention, praise of the alleged invention by those having ordinary skill in the art, and copying of the alleged invention by others in the field. I understand that there must be a nexus—a connection—between any such secondary considerations and the alleged invention. I also understand that contemporaneous and independent invention by others is a secondary consideration tending to show obviousness.

30. I am not aware of any evidence of secondary considerations.

V. SUMMARY OF THE ’047 PATENT

A. General background regarding the claims and specification

31. The ’047 patent has twenty claims. Claims 1, 8 and 17 are independent

claims. The ’047 patent was filed on November 9, 2018.

32. The ’047 patent generally relates to a wireless digital audio system which includes a portable audio source with a wireless digital audio transmitter and a wireless audio receiver coupled to a headphone set, which is configured for digital wireless communication with the audio transmitter. (EX1001 at Abstract).

33. An embodiment of the alleged invention is depicted in FIG. 1, which is reproduced below:

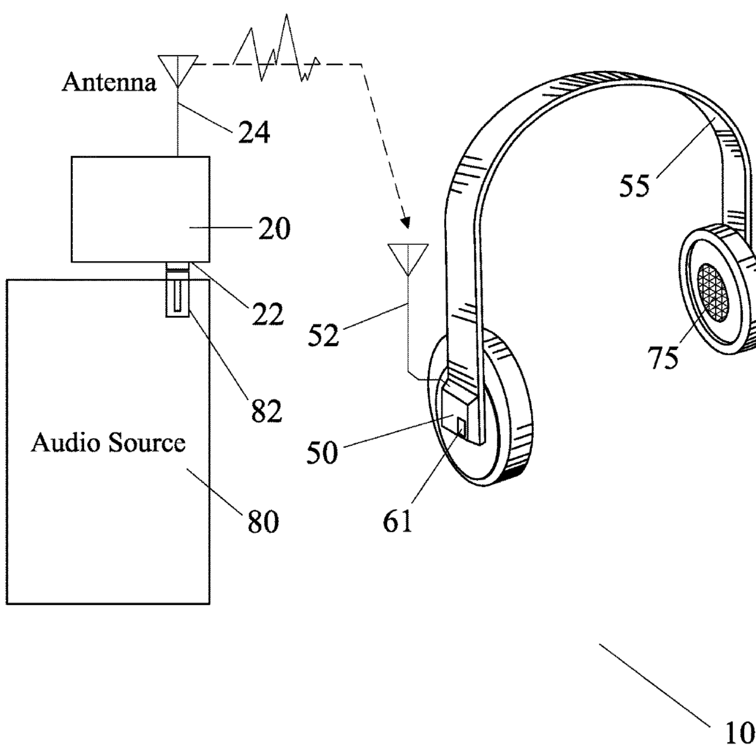


FIG. 1

(EX1001 at FIG. 1).

34. FIG. 1 depicts an exemplary embodiment of the invention. The audio source 80 is connected to a wireless transmitter 20, which transmits audio wirelessly

using a transmitting antenna 24 to a receiving antenna 52 of a battery powered headphone receiver 50.

35. The speakers 75 in headphones 55 are used for listening to the spread spectrum-demodulated and decoded communication signal. (EX1001 at 2:36-3:2).

36. FIGS. 2 reproduced below, depicts a block diagram of an audio transmitter of the wireless digital audio system of FIG. 1:

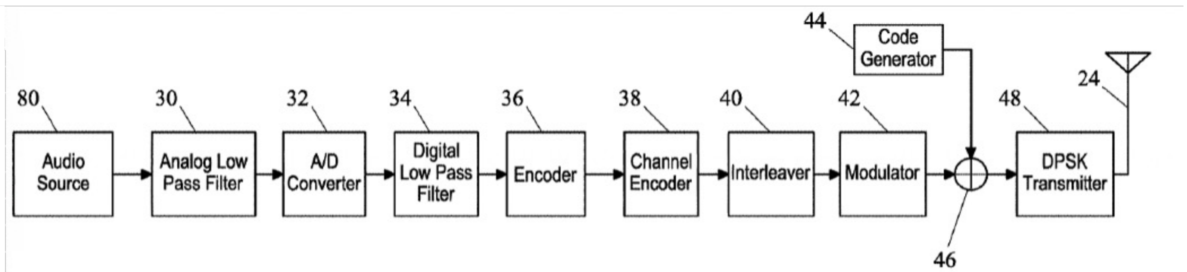


FIG. 2

(EX1001 at FIGS. 2).

37. In the transmitter 20 depicted in FIG. 2, the audio source 80 is filtered by an analog low pass filter 30. This filtered audio signal is then digitized using an analog to digital converter (ADC) 32.

38. This digitized signal is then **filtered** by the digital low pass filter 34, and **encoded**, by the encoder 36.

39. This digitized and encoded signal is then **processed by the channel encoder** 38 to reduce the effect of channel noise and processed by the interleaver 42 to reduce the effect of inter-symbol interference.

40. This signal is then **modulated**, by the modulator 42. The code generator 44 generates a **unique code that is specifically associated with one user** of the wireless digital audio system. EX1001, 2:51-3:2. A spread spectrum differential phase shift key (DPSK) transmitter module 48 that uses this unique user code to improve noise immunity then transmits the signal through the transmit antenna 24.

41. This transmission is **code division multiple access in which the unique code associated with one user makes the transmission independent of any central control and ensures that other signals** that utilize other code words appear as noise. As a result, the user may enjoy private listening without interference from other users.

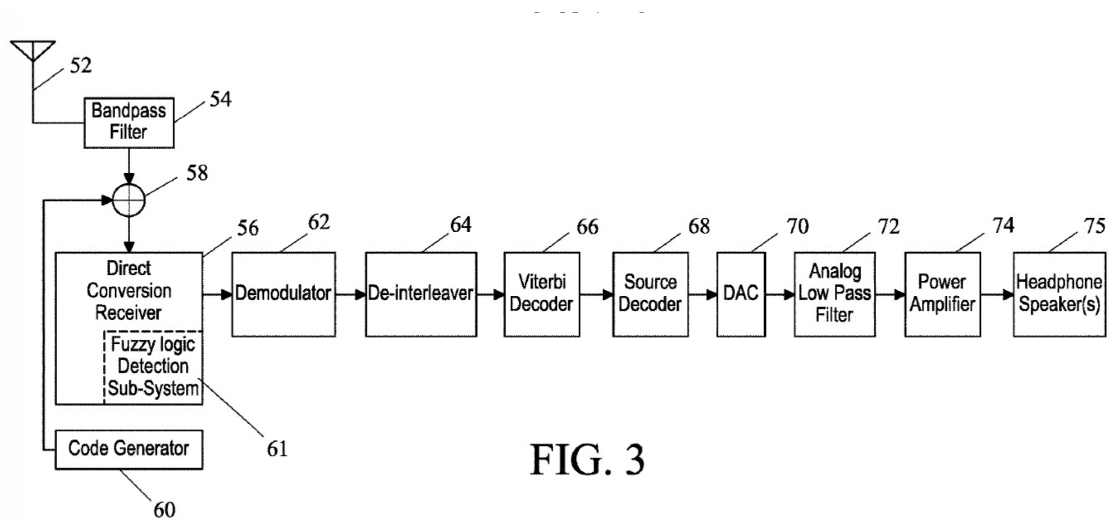


FIG. 3

(EX1001 at FIGS. 2).

42. The spread spectrum modulated signal transmitted by the antenna 24 is received by the antenna 52 shown in Figure 3.

43. This received signal is then processed by spread spectrum direct conversion receiver or module 56 in conjunction with a receiver code generator 60 that provides **the same unique code that is specifically associated with one user of the digital audio system.** This is the only code that is recognized by the receiver.

44. This makes this code division multiple access reception in which the unique code is associated with one user and is independent of central control and so that other signals with different code words appear as noise and the system provides its one user with private listening without interference.

45. The direct conversion receiver 56, which is an element of the receiver 50, may utilize fuzzy logic detection in the fuzzy logic detection sub-system 61 to enhance bit detection and thereby optimize reception of the received unique user code.

46. A block de-interleaver 64 decodes the bits of the digital signal encoded in the block interleaver 40, a Viterbi decoder 66 is used to decode the bits encoded by the channel encoder 38, and a source decoder 68 decodes the coding applied by the encoder 36.

47. A digital-to-analog converter (DAC) 70 is then used to transform the digital signal to an analog audio signal, which is then filtered by an analog low pass filter 72 and then processed by a power amplifier 74 optimized for powering the headphone speakers 75 to provide high quality low distortion music. EX1001, 3:3-

37, 4:24-35.

B. Simplified explanation of the elements of the transmitter and receiver of the '047 Patent

1. Transmitter

48. I understand that the claim term "transmitter," as recited in Challenged Claims of the '047 patent, was construed by the Court in the *Apple* Action to mean "a device that can be connected into an analog headphone jack to wirelessly transmit an audio signal" with respect to the '047 patent. See §VII. In Fig. 2 below, a transmission starts with an analog audio source, which is then filtered, converted to digital, encoded, modulated, and finally transmitted over the air leveraging a unique spreading code. Each of these steps are explained in more detail below.

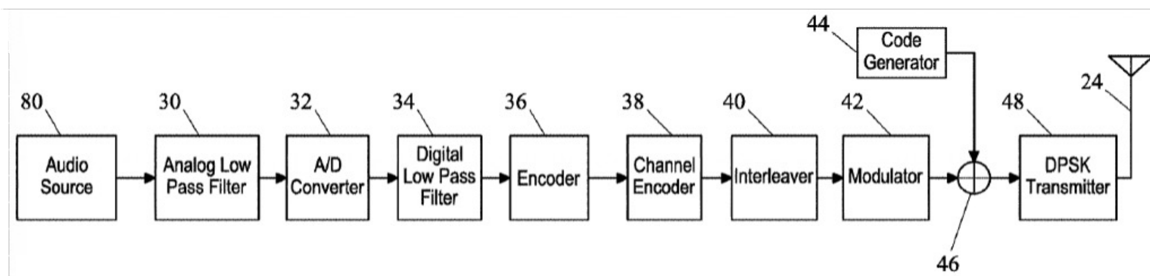


FIG. 2

(EX1001 at FIGS. 2).

a. Analog low pass filter

49. The **analog low pass filter** receives an analog audio signal from an audio source (for example, from a radio, cassette player, CD player, or computer). That signal is then filtered to remove higher frequency noise or unwanted signals,

by blocking frequencies above a desired level. EX1018, 373. This creates a cleaner analog audio signal that can flow to the next step, without interference or unwanted elements.

b. AD converter

50. An **AD converter**, or Analog-to-Digital converter, takes an analog audio signal such as music, and converts it into a digital signal. This conversion is performed by sampling the original signal (through the sampling process) and turning it into binary digits or bits ("1s" and "0s") (through the quantization process) that can be transmitted through and processed by a digital system, such as a computer. EX1022, 107, 110, 111, 121, 122.

c. Digital low pass filter

51. In a similar way to the analog low pass filter, the **digital low pass filter** rejects higher, unwanted frequencies or noise in the digital domain, thus creating a cleaner signal.

d. Encoder

52. The **encoder** takes the now cleaner, though still raw, digital signal and reduces the transmit bit rate during silent periods (pauses and gaps in speech) thereby compressing the digital signal and minimizing its average transmit bit rate. EX1018 p. 387, 388, Figure 7.10, 516, Figure 10.11, 522, 530

53. Music specific encoders that have a greater passband are generally used

for music.

e. Channel encoder

54. The **channel encoder** takes the compressed digital signal from the encoder and adds redundancy to it in the form of error detection and correction codes. EX1022, 166, 167, 1254, FIGURE 88.5. The channel encoder introduces this redundancy to ensure that any errors caused by extraneous noise during transmission can be corrected by the receiver.

55. The channel encoder may use one of two methods for adding error correction: forward error control ("FEC") EX1022, 166, 1343 or automatic repeat request ("ARQ") EX1022, 181, 182. In FEC, extra redundant bits (error correction codes, "ECCs") are added to the compressed digital signal and are used by the Viterbi decoder to determine where errors have occurred in the bitstream and how to correct them. EX1022, 166, 1343. In ARQ, extra redundant bits are added to the compressed digital signal and used by the receiver to detect errors. EX1022, 181, 182. When the receiver detects an error it sends the transmitter a request for a repeat transmission. EX1022, 181, 182.

f. Interleaver

56. While the channel encoder provides error correction, in the form of error correcting codes (ECCs), in an attempt to avoid errors and maintain the data fidelity of a transmission, this method is not effective in maintaining quality when

dealing with burst errors. Burst errors occur when several consecutive bits or blocks of data are transmitted with errors.

57. The **interleaver** reorders the bits or blocks of the digital signal from the channel encoder, with the goal of avoiding or mitigating the impact of "burst errors" which might affect a block of contiguous data. Such errors can result from a burst of interference or a short period of low signal strength. EX1022, 177, 179, 1254, Figure 88.5. The interleaver functions to distribute the errors over multiple blocks of data so that error correction methods (employed by the channel encoder and Viterbi decoder) are able to work more effectively, in particular in the event of "burst errors". *Id*. Essentially, it is easier to fix one error in a sequence of good data rather than to correct multiple contiguous errors (burst errors) in a block of good data.

g. Modulator

58. A **modulator** receives an information or modulating signal (the digital signal from the output of the channel encoder containing the data to be transmitted) and a carrier signal (a high-frequency, simple periodic waveform that does not carry any information) and uses the information signal to alter the carrier signal's amplitude (height), frequency (the number of waves that pass through in a given second), or phase (whether the wave is at a peak or trough). EX1018, 220-222. EX1022, 273. In digital modulation these alterations are known as amplitude-shift keying (ASK), frequency-shift keying (FSK), and phase-shift keying (PSK).

EX1018, 267. EX1022, 279, 281, 287. The resulting modulated wave is capable of transmitting the data of interest with more bandwidth efficiency. EX1018, 267.

h. Code generator

59. In code division multiple access ("CDMA") multiple users transmit on the same frequency band, with each user's transmission separated from another's by a dedicated spreading code. EX1022, 94, 105. EX1018 6, 275, 336, 405, 527. The dedicated spreading code spreads the data to be transmitted over a wide bandwidth. The dedicated spreading code may be referred to as Pseudo Noise ("PN") code, Pseudo Random ("PR") code, spreading codes, despreading codes, or orthogonal codes. EX1022, 94, 105. EX1018, 275, 336, 408, 527. The **code generator** creates these distinct spreading codes for each user and correlates the code to the modulated signal for each user (by multiplying the modulated signal, bit-by-bit, with the spreading code and summing the result). EX1018, Figure 5.49, 276, 277. By correlating the modulated signal with a distinct spreading code for each user, users are able to transmit over the same frequency spectrum without other users being able to receive their signal. *Id.* By spreading the modulated signal across a larger bandwidth, it can be transmitted with lower power and tolerate a greater interference. EX1018, 278.

i. Differential Phase Shift Keying (DPSK) module

60. DPSK (Differential Phase Shift Keying) is a type of phase modulation

where the carrier wave's phase is altered with the information signal to be transmitted. EX1018, 242, 243. The differentially encoded sequence {dk} is generated from the input binary sequence $\{m_k\}$ by complementing the modulo-2-sum of m_k and d_{k-1}. The effect is to leave the binary symbol d_k unchanged from the previous symbol if the incoming binary symbol m_k is 1, and toggle to d_k if m_k is 0. EX1018, 242, 243, Table 5.1.

Table 5.1 Illustration of the Differential Encoding Process

$\{m_k\}$		1	0	0	1	0	1	1	0
$\{d_{k-1}\}$		1	1	0	1	1	0	0	0
$\{d_k\}$	1	1	0	1	1	0	0	0	1

DPSK Modulation: EX1018, 242, 243, Table 5.1.

61. In DPSK the phase of the signal tracks the peak (1) or valley (0) state of the earlier element, obviating the need for a synchronous carrier at the demodulator. EX1018, 242, 243, Table 5.1. The **DPSK module** amplifies the DPSK modulated signal to increase its power and range and sends it on to an antenna where it is transmitted over the air to the receiver.

2. Receiver

62. The **receiver** performs the reverse steps to those that were performed by the transmitter. It receives the signal that has been transmitted over the air from the antenna of the transmitter, and goes through a series of steps to produce a usable audio signal that can be ultimately heard by a user through their headphone or

speaker.

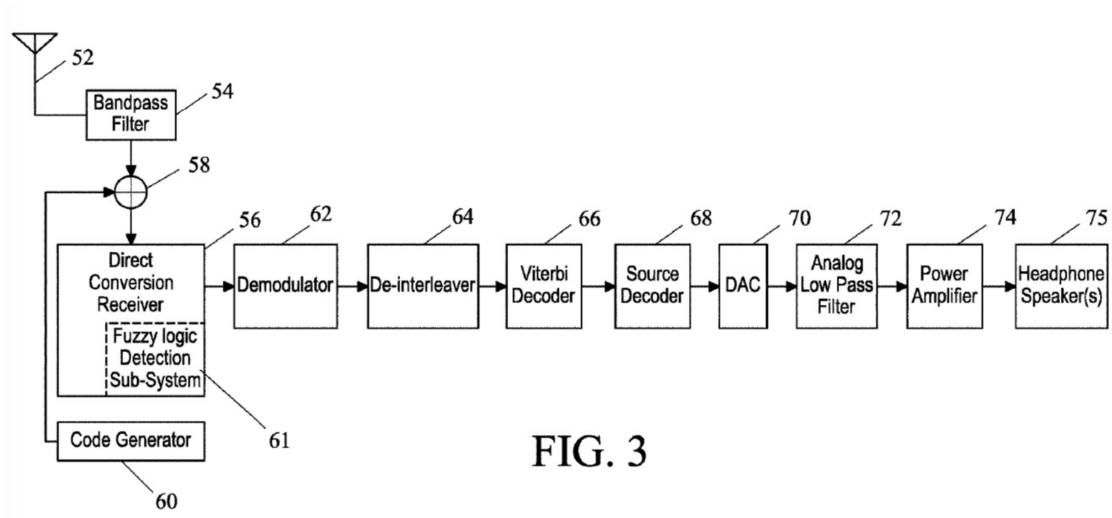


FIG. 3

(EX1001 at FIGS. 2).

a. Direct conversion receiver

63. The RF signal comes in through the antenna and into the **direct conversion receiver** ("DCR"). The DCR is also known as a Zero-Intermediate Frequency ("Zero-IF") receiver as it functions to convert the signal received by the antenna directly from RF to baseband using an intermediate frequency nominally at zero frequency. EX1022, 1323.

b. Receiver code generator

64. The baseband output of the direct conversion receiver is summed with the receiver code generator signal by the receiver summing element. The **receiver code generator** contains the same distinct spreading code that was transmitted by the transmitter that is specific to a particular user. EX1018, Figure 5.49, 276, 277,

336, 405 Any wireless transmission signals without the distinct spreading code specific to the particular user will be appear as noise to the receiver and be ignored. As a result, the output of the receiver summing element is a “despread” baseband representing only baseband that is associated with the distinct user specific spreading code. EX1022, 200.

c. Demodulator

65. The **demodulator** takes the despread baseband signal from the receiver summing element and extracts the original information signal from the modulated carrier wave, in the reverse process from modulation. EX1018, 278, Figure 5.50 and Figure 5.49.

d. De-interleaver

66. The **de-interleaver** similarly reverses the transmitter’s interleaver process, returning the bits of the original signal back into the proper order. EX1018, 338.

e. Viterbi decoder

67. The **Viterbi decoder** performs the reciprocal function to the channel encoder in the transmitter, it conducts error correction (using FEC or ARQ) and removes the redundancy that was put in place by the channel encoder in the process. EX1018, 315, 316, 354. The Viterbi decoder is a simple decoder for convolutional codes which uses the Viterbi algorithm (a maximum likelihood detector) to

reconstruct the transmitted data sequence from the received data in the face of noise and other interference. EX1018, 315, 316, 354. EX1022, 174.

f. Source decoder

68. The **source decoder** performs the reciprocal function to the encoder in the transmitter, it decompresses the output of the Viterbi decoder and restores the data to the original digital form of the audio source, prior to its encoding. EX1022, 169. EX1018, 387, 388, Figure 7.11.

g. DAC

69. The **Digital-to-Audio Converter ("DAC")** takes the digital stream from the source decoder and turns it back into an accurate reconstruction of the original analog signal that can be sent, for example, to headphones or speakers as sound waves. EX1022, 107, 108, 110, 140.

h. Analog low pass filter

70. Similar to the **analog low pass filter** in the transmitter, the receiver's **analog low pass filter** removes any unwanted higher frequencies or noise from the newly converted signal that may have crept in during the transmission or the conversion processes. EX1018, 241, 252.

i. Power amplifier

71. The **power amplifier** increases the power of the analog audio signal so that it is strong enough to travel over-the-air from the headphone speaker to the

ultimate recipient. EX1018, 199. EX1022, 1199

j. Headphone speaker

72. The **headphone speakers** are final step in the chain, the physical device that produces the high quality, low distortion audible sound that can be heard by the end user.

C. High-level summary of the prosecution history

73. I understand that an overview of the prosecution history is provided in the Petition. I have reviewed the prosecution history relating to the '047 patent, and the overview provided in the Petition, which I adopt here, but as stated above I am not a lawyer and thus do not offer opinions on the overall process.

1. The 2001 Application

74. It is my understanding that the earliest application to which the '047 patent claims priority, entitled "Wireless Digital Audio System," was filed on December 21, 2001 and assigned U.S. Application No. 10/027,391 ("the 2001 application"). EX1003, p.3. As filed, the 2001 application included a 5-page specification, 7 claims, an abstract, and 3 figures (shown below). *Id.*, pp.4-22:

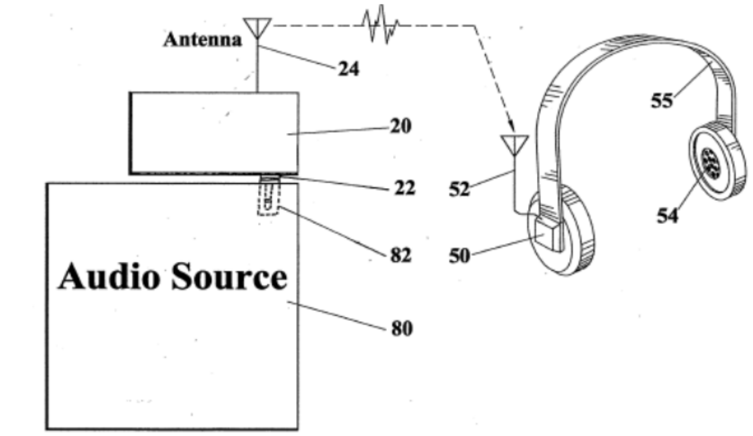


FIG.1

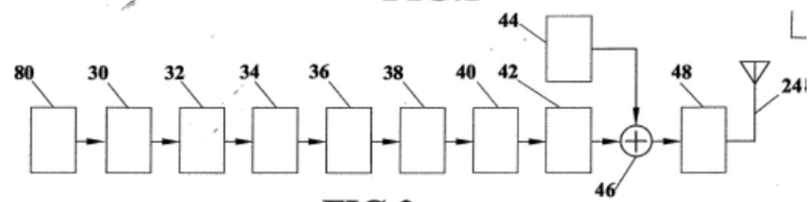


FIG.2

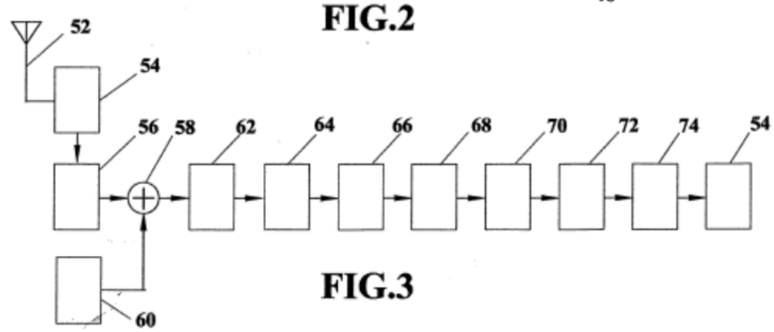


FIG.3

75. The 2001 application states that "[t]he present invention is directed to wireless digital audio systems for transmission of a signal from an audio player device to a headphone." *Id.*, p.6. The 2001 application describes various details of the wireless digital audio system, including that "encoder 36 may be used to reduce intersymbol interference (ISI) by using a transform code to encode the digital signal"; "differential phase shift key (DPSK) transmitter 48 [] modulates the digital signal to be transmitted"; and "direct conversion receiver 56 may provide a method

for down converting the received signal." *Id.*, pp.8-9. Figures 2 and 3 include functional block diagrams showing the components, including the encoder 36, DPSK transmitter 48, and direct conversion receiver 56, and operational flow of the audio transmitter and audio receiver, respectively. *Id.*, p.22.

76. On September 6, 2002, the examiner rejected all claims in the 2001 application as obvious under 35 U.S.C. § 103 in view of certain prior art. *Id.*, pp.26-36. On December 3, 2002, the applicant cancelled claims 1 and 2 in attempting to argue against the rejection. On February 26, 2003, the examiner again rejected the remaining claims as obvious in view of the prior art. *Id.*, pp.49-57. On August 27, 2003, the applicant expressly abandoned the 2001 application in favor of a continuation in part (CIP) application. *Id.*, p.60.

77. On June 26, 2003, shortly before abandonment, the 2001 application published as U.S. Publication 2003/0118196 ("the '196 publication"). EX1004.

2. The 2003 Application

78. On August 26, 2003, the applicant filed a CIP application directed to a different invention, entitled "Fuzzy Audio Wireless Music System," assigned U.S. Application No. 10/648,012 ("the 2003 application"). EX1005. As filed, the 2003 application included a 6-page specification, 5 claims, an abstract, and 2 figures (shown below). EX1005, pp.1-20.

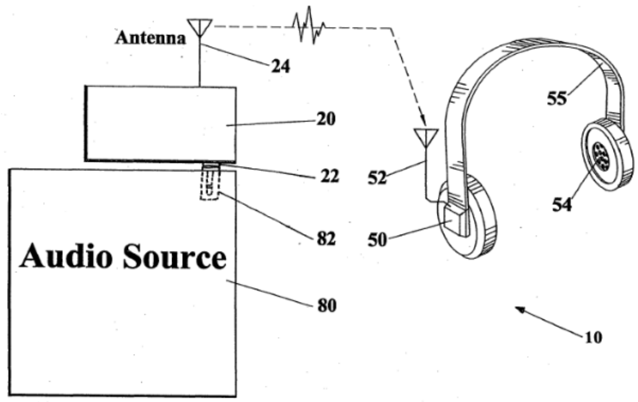


FIG 1

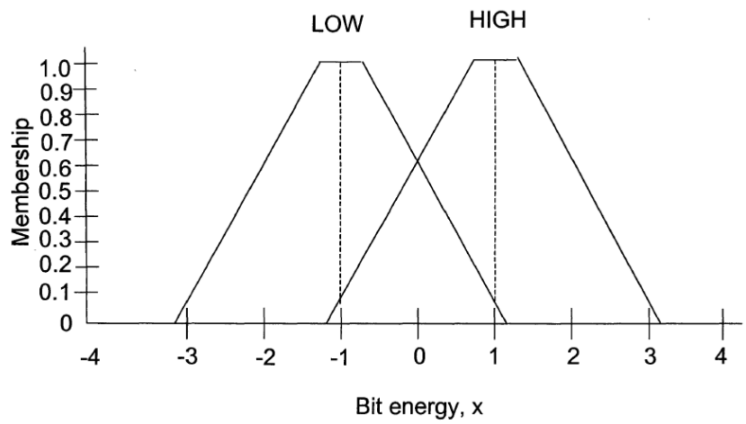


Figure 2

79. The 2003 application as filed did **not** incorporate by reference the 2001 application. The 2003 application as filed also differs substantially from the 2001 application. While figures 1 of both applications are nearly identical, figure 2 of the 2003 application differs from figures 2 and 3 of the 2001 application, which are not included in the 2003 application. *See* EX1009. In addition, the wireless audio system described in the 2003 application specification differs significantly from that described in the 2001 application. *See* EX1008.

80. For example, the 2003 application's "Summary of the Invention" states,

"[t]he present invention is directed to FAWM (Fuzzy Audio Wireless Music) systems for coded digital transmission of an audio signal from any audio player device with a headphone jack to a receiver headphone using fuzzy logic technology." EX1005, p.2.

81. Unlike the 2001 application, the 2003 application does not disclose or describe a direct conversion receiver, differential phase shift keying, intersymbol interference, or an encoder or interleaver to reduce intersymbol interference. *Id.*, pp.3-6 (describing the fuzzy logic operations in detail and stating that "[t]he fuzzy logic detector is the key component to the FAWM system 10," but not describing any of the aforementioned components).

82. The figures of the 2003 application also contain no functional block diagrams showing the components or operation of the fuzzy audio wireless music system of the invention. *Id.*, pp.16-17.

83. The '047 patent claims recite, among other things, reduced "intersymbol interference" (cls. 1-20) and "a direct conversion module" (cls. 1-8). EX1001. In addition, independents claim 1, 8, and 17 recite "differential phase shift keying (DPSK)." *Id.* The 2003 application as filed does not disclose "intersymbol interference," "a direct conversion module," or "differential phase shift keying (DPSK)."

84. In October 2004, the applicant began amending the specification and

figures of the 2003 application, to both add and to remove material. A summary of the amendments is listed below:

a. Adding an incorporation by reference of the 2001 application (EX1005, 0375);

b. Adding description that the FAWM system utilized Bluetooth technology, including that the transmitter and the receiver are a Bluetooth compliant transmitter and receiver (EX1005, 0025-34);

c. Broadening the disclosure by removing specifics, including removing the statement that "[t]he fuzzy logic detector is the key component to the FAWM system 10." (EX1005, 0029);

d. Changing the application title from "Fuzzy Audio Wireless Music System" to "Wireless Digital Audio Music System" (EX1005, 0076);

e. Removing all references to "FAWM" and replacing them with "wireless digital audio music" (EX1005, 0076-84);

f. Adding new figures 2 and 3 and heavily editing the original figure 2 from the 2003 application into new figure 4 (EX1005, 0086, 0093-95);

g. Adding a description of a "direct conversion receiver 56" to the specification (EX1005, 0287);

h. Adding a "direct conversion receiver 56" to figure 3 (EX1005, 0296, 0307); and

i. Adding a description of a "DPSK (differential phase shift key) transmitter" to the specification (EX1005, 0377).

85. I understand that the examiner objected to many of these amendments as introducing new matter in the disclosure, but allowed others. By the time the 2003 application issued as U.S. Patent No. 7,412,294 (EX1006) on August 12, 2008, the specification and figures were almost completely different from the as-filed 2003 application. EX1010.

3. The 2008 Application

86. The as-filed specification of the '047 patent is substantially the same as the as-filed specification of the 2008 application. EX1011.

VI. TECHNOLOGY BACKGROUND

87. Below I provide a brief overview of the prior art references I discuss in the Grounds.

A. '196 Publication (EX1004)

88. The '196 Publication is U.S. Patent Appl Pub. 2003/0118196, published June 26, 2003. I have been informed that the '196 Publication is prior art. The '196 Publication is in the same field of endeavor as the '047 patent are both are directed to "wireless digital audio systems for transmission of a signal from an audio player device to a headphone." (EX1004, Abstract; see also EX1001, 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 headphone set.")

89. The '196 Publication is generally directed to "wireless digital audio systems for transmission of a signal from an audio player device to a headphone":

> **The present invention is directed to wireless digital audio systems for transmission of a signal from an audio player device to a headphone.** An audio transmitter may include a headphone plug in communication with an analog low pass filter wherein the headphone plug may be connectable to a headphone jack of an audio source. The low pass filter output signal may be in communication with an A/D converter whose output may be in communication with a digital low pass filter that outputs a signal to an encoder. The encoder output may be in communication with a channel encoder the output of which may be in communication with a block interleaver. The block interleaver output may be in communication with a modulator the output of which may be summed with a transmitter code generator output in a summating element. The modulator may be a 64 Ary modulator. The summating element output may be in communication with a differential phase shift key transmitter the output of which may be in communication with a transmit antenna for wireless transmission of a signal. The transmitted signal may be transmitted to an audio receiver for processing to power a headphone speaker. It is emphasized that this abstract is provided to comply with the rules requiring an abstract that will allow a searcher or other reader to quickly ascertain the subject matter of the technical disclosure. It is submitted with the understanding

that it will not be used to interpret or limit the scope or meaning of the claims.

EX1004, Abstract.

B. Rappaport (EX1018)

90. Rappaport is a book titled "Wireless Communications: Principles & Practice" by Theodore S. Rappaport, which published in 1996. A POSA would have understood that Rappaport was publicly available prior to the filing date of the earliest application to which the '047 patent claims priority to (December 21, 2001), as evidenced by the following: (1) Rappaport's copyright page indicates it was copyrighted in 1996, with corrections in 1999, and bears the ISBN number 0-13-375536-3 (EX1018); (2) the Library of Congress includes an entry for Rappaport with the same ISBN number (0-13-375536-3), which confirms that Rappaport was originally "Published: Prentice Hall PTR, Upper Saddle River, N.J., **c1996**" (EX1025, 1); and (3) Rappaport was referenced in U.S. Patent No. 5,933,421, which was filed on February 6, 1997 and issued on August 3, 1998 (EX1026, 1:51-54 ("The technical foundations of these multiple access protocols are discussed in the recent book by Rappaport entitled "Wireless Communications Principles and Practice", Prentice Hall, **1996**."). I have been informed that Rappaport is prior art.

91. The "purpose" of Rappaport "is to initiate the newcomer to cellular radio and wireless personal communications." EX1018, xiii. Rappaport "has been

designed for the student or practicing engineer who is already familiar with technical concepts such as probability, communication theory, and basic electromagnetics." *Id*. Rappaport "provides extensive coverage of the most common analog and digital modulation techniques used in mobile communications." *Id*., xiv. Rappaport is in the same field of endeavor as the '047 patent because both are directed to wireless personal communication devices.

C. Walley (EX1015)

92. Walley is U.S. Patent No. 6,744,808, which was filed June 3, 1999 and issued June 1, 2004. I have been informed that Walley is prior art. Walley is in the same field of endeavor as the '047 patent because both are directed to wireless communication devices using spread spectrum techniques which transmit audio, including music.

93. Walley is directed to "generic type spread spectrum controllers which can be used in a variety of applications." EX1015, Abstract. These controllers address "Problems With the Current Art" relating to the "different requirements" of "wireless communications electronics, such as cordless and cellular telephones, wireless units to transmit music to speakers or headphones, programmable digital assistants and computers with wireless links, pagers, and wireless tracking devices." EX1015, 2:33-39, 2:66-3:1, 12:15-25. Walley discloses a spread spectrum system (e.g., a CDMA system) that uses a "spreading code[]," which Walley discloses as a

"a dedicated code that is used to separate that system's transmissions from all others." EX1015, 1:27-59. Walley also discloses that the "spreading codes" are "commonly referred to as Pseudo Noise (PN) codes." EX1015, 1:34-35. Walley teaches that this code can be lengthened to "increase the noise immunity and the transmission range of the signal." Id., 4:23-25.

D. Miyake (EX1017)

94. Miyake is U.S. Patent No. 5,546,424, which was filed June 27, 1994 and issued August 13, 1996. I have been informed that Miyake is prior art. Miyake is in the same field of endeavor as the '047 patent because both are directed to spread-spectrum, wireless communication devices.

95. Miyake teaches a "spread spectrum communication system which can simplify the management of users and services." EX1016, 2:23-26. Miyake describes a "spreading code" based on the output of two different spreading code generators:

> [A] spreading code supplied to the mixer 31 is what is obtained by mixing **a spreading code from the first spreading code generator 32, which produces spreading codes specific to individual users**, with **a spreading code output from the second spreading code generator 33, which produces spreading codes assigned according to the attributes**.

EX1016, 5:49-56; *see also id.*, 8:12-60.

E. Gibson (EX1022)

96. Gibson is a book titled "The Communications Handbook" by Jerry D. Gibson. This book published in 1997. A POSA would have understood that Gibson was publicly available prior to the filing date of the earliest application to which the '047 patent claims priority to (December 21, 2001), as evidenced by the following: (1) Gibson's copyright page indicates it was copyrighted in 1997 and bears the ISBN number 0-8493-8349-8 (EX1022); (2) the Library of Congress includes an entry for Gibson with the same ISBN number (0-8493-8349-8), which confirms that Gibson was "Published: CRC Press ; IEEE Press, Boca Raton, Fla. ; [New York, N.Y.], **c1997**" (EX1027, 1); and (3) Gibson was referenced in U.S. Patent No. 5,953,669, which was filed on December 11, 1997 and issued on September 14, 1999 (EX1028, 4:60-65 ("General considerations involved in designing a wireless communication system such as a cellular radiotelephone network are described in "The Communications Handbook," Jerry D. Gibson, Editor-in-Chief, CRC Press (**1997**), Chapter 81, pp. 1146-1159, incorporated herein by reference."). I have been informed that Gibson is prior art.

97. Gibson is directed to design of communication systems, including wireless systems, and thus is in the same field of endeavor as the '047 patent. Specifically, Gibson is a handbook which includes "articles or chapters" that are

"written as tutorials or overviews, so that once the reader locates the broader topic, it is easy to find an answer to a specific question." EX1022, iii. Gibson includes chapters which outline the "Basic Principles" of a communication system, such as Chapter 16: Spread Spectrum Communications and Chaper 21: Digital Modulation Techniques.

F. Drakoulis (EX1021)

98. Drakoulis is U.S. Patent No. 6,256,303, which was filed October 15, 1999 and issued July 3, 2001. I have been informed that Drakoulis is prior art.

99. Drakoulis is directed to an apparatus which "includes a base unit 22 containing a high frequency transmitter and a remote unit 24 which is capable of receiving the high frequency transmitted signal." EX1021, 5:27-5:33. "[T]he base unit 22 is adapted to be coupled via jacks or connectors and electrical conductors to the signal source 10." EX1021, 5:34-37; see also id., FIG. 1. Drakoulis teaches that "suitable" "audio sources 10" include "a CD player, AM/FM tuner, tape deck, turntable, etc." (EX1015, 5:21-25.) Drakoulis further teaches "Although not shown, a stereo mini-input jack and stereo mini-output jack may also be mounted on the housing of the base unit 22 for receiving mini plug connectors attached to cables." Drakoulis is in the same field of endeavor as the '047 patent because both are directed to devices for wirelessly transmitting audio from a separate audio device.

VII. CLAIM CONSTRUCTION

100. I understand that, in the Apple Litigation, the district court construed numerous claim terms of the ’047 patent. (EX1013 (Apple *Markman* Order)). I further understand that the District Court subsequently applied these claim constructions in granting defendant’s motion for summary judgment of noninfringement. (*See, e.g.,* EX1024 at 8 (Apple MSJ Order)). I also understand that the Federal Circuit appellate court affirmed the district court’s ruling of summary judgment of non-infringement. (EX1029 at 2, 7(Apple Affirmance)).

101. The relevant Apple Litigation claim constructions are summarized in the table below:

Term	**Construction**
“[reduce/reduction of] intersymbol interference coding”	“coding that reduces intersymbol (inter-symbol) interference”
The term “independent” in the context of “independent” CDMA communication	“performed independent of any central control”
“unique user code”	“fixed code (bit sequence) specifically associated with one user of a device(s)”
“audio source”	“a device for providing audio that has an analog headphone jack”
“transmitter”	“a device that can be connected into an analog headphone jack to wirelessly transmit an audio signal”
“direct conversion module”	“module for converting radio frequency to baseband or very near baseband in a single frequency conversion without an intermediate frequency.”

102. I have adopted the above claim constructions for purposes of my analysis here, and note certain issues that relate to my technical analysis.

VIII. CLAIMS 1-20 ARE UNPATENTABLE

103. I have been asked to provide my opinion as to whether the Challenged Claims of the ’047 patent would have been anticipated or obvious in view of the prior art. The discussion below provides a detailed analysis of how the prior art references identified below teach the limitations of the Challenged Claims of the ’047 patent.

104. As part of my analysis, I have considered the scope and content of the prior art and any differences between the alleged invention and the prior art. I describe in detail below the scope and content of the prior art, as well as any differences between the alleged invention and the prior art, on an element-by-element basis for each Challenged Claims of the ’047 patent.

105. As described in detail below, the alleged invention of the Challenged Claims would have been obvious in view of the teachings of the identified prior art references as well as the knowledge of a POSA.

Grounds	**Claim(s)**	**Basis**
1	1-4, 6-13, 15-19	Rendered obvious by ’196 publication (EX1004)
2	5, 14, 20	Rendered obvious by ’196 publication (EX1004) in view of Rappaport (EX1018)

Grounds	Claim(s)	Basis
3	1-5, 8-14, 17-20	Rendered obvious by Walley (EX1015) in view of Miyake (EX1016), Gibson (EX1022), and Rappaport (EX1018)
4	6-7, 15-16	Rendered obvious by Walley (EX1015) in view of Miyake (EX1016), Gibson (EX1022), Rappaport (EX1018), and Drakoulis (EX1021)
5	1-20	Rendered obvious by Walley (EX1015) in view of Miyake (EX1016), Gibson (EX1022), Rappaport (EX1018), and Drakoulis (EX1021)

A. Ground 1: The ’196 Publication Renders Obvious Claims 1-4, 6-13 and 15-19

Challenged Claims

1. Claim 1

[1p] A portable spread spectrum audio receiver configured to receive and store a unique user code, said portable spread spectrum receiver configured to receive wireless modulation transmissions from a spread spectrum transmitter coupled to a music audio source, said wireless modulation transmissions representative of an audio signal representation, said portable spread spectrum audio receiver comprising:

106. I understand that this part of the claim is called the preamble. I also understand that there are special rules that apply to whether a preamble of a claim is a limitation or not. I have not been asked to apply those rules in my analysis. Instead, I have been asked to presume that this is a limitation of the claims. I have done so.

107. It is my opinion that ’196 Publication renders obvious the preamble.

(1) The ’196 Publication teaches a “portable . . . audio receiver.”

108. For example, the ’196 Publication teaches headphones which receive a

wireless transmission from an audio player device:

> **The present invention is directed to wireless digital audio systems for transmission of a signal from an audio player device to a headphone.** An audio transmitter may include a headphone plug in communication with an analog low pass filter wherein the headphone plug may be connectable to a headphone jack of an audio source. The low pass filter output signal may be in communication with an A/D converter whose output may be in communication with a digital low pass filter that outputs a signal to an encoder. The encoder output may be in communication with a channel encoder the output of which may be in communication with a block interleaver. The block interleaver output may be in communication with a modulator the output of which may be summed with a transmitter code generator output in a summating element. The modulator may be a 64 Ary modulator. The summating element output may be in communication with a differential phase shift key transmitter the output of which may be in communication with a transmit antenna for wireless transmission of a signal. **The transmitted signal may be transmitted to an audio receiver for processing to power a headphone speaker.** It is emphasized that this abstract is provided to comply with the rules requiring an abstract that will allow a searcher or other reader to quickly ascertain the subject matter of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims.

EX1004, Abstract.

109. The ’196 Publication explains that “audio receiver 50 … may be a headphone receiver” (“*portable . . . audio receiver*”):

> Referring to FIG. 1, a wireless digital audio system 10 may include an audio transmitter 20 connected to an audio player or audio source 80. The audio transmitter 20 may be connected to the audio source 80 headphone jack 82 using a headphone plug 22. The audio transmitter 20 may have a transmitting antenna 24 that may be omni-directional for transmitting an electromagnetic signal to a receiving antenna 52 of **an audio receiver** 50 **that may be a headphone receiver**. **The audio receiver** 50 **may have headphone speakers** 54 **in headphones** 55 **for listening to the audio signal.** The audio system 10 may digitize the audio signal and may transmit an electromagnetic signal at 2.4 GHz using approximately 100 milliwatts or less of power.

EX1004, ¶[0011].

110. Thus, the ’196 Publication teaches a “*portable . . . audio receiver*” (“audio receiver 50”).

(2) The ’196 Publication teaches a “spread spectrum … receiver configured to receive and store a unique user code and to receive wireless modulation transmissions from a spread spectrum transmitter coupled to a music audio source.”

111. The Apple Litigation construed “transmitter” to mean “a device that can be connected into an analog headphone jack to wirelessly transmit an audio signal.” (*See* §VII). The Apple Litigation further construed “audio source” to mean “a device for providing audio that has an analog headphone jack.” As I explain

below, the '196 Publication teaches a "*transmitter*" ("audio transmitter 20") "*coupled to a music audio source*" ("audio player or audio source 80").

112. For example, the '196 Publication explains that "audio transmitter 20 may be connected to the audio source 80 headphone jack 82 using a headphone plug 22":

> Referring to FIG. 1, a wireless digital audio system 10 may include **an audio transmitter** 20 **connected to an audio player or audio source** 80**. The audio transmitter** 20 **may be connected to the audio source** 80 **headphone jack** 82 **using a headphone plug** 22**.** The audio transmitter 20 may have a transmitting antenna 24 that may be omni-directional for transmitting an electromagnetic signal to a receiving antenna 52 of an audio receiver 50 that may be a headphone receiver. The audio receiver 50 may have headphone speakers 54 in headphones 55 for listening to the audio signal. The audio system 10 may digitize the audio signal and may transmit an electromagnetic signal at 2.4 GHz using approximately 100 milliwatts or less of power.

EX1004, ¶[0011].

113. As explained above and depicted below, "audio transmitter 20" includes a "headphone plug 22" which is connected into the "headphone jack 82" of "audio source 80":

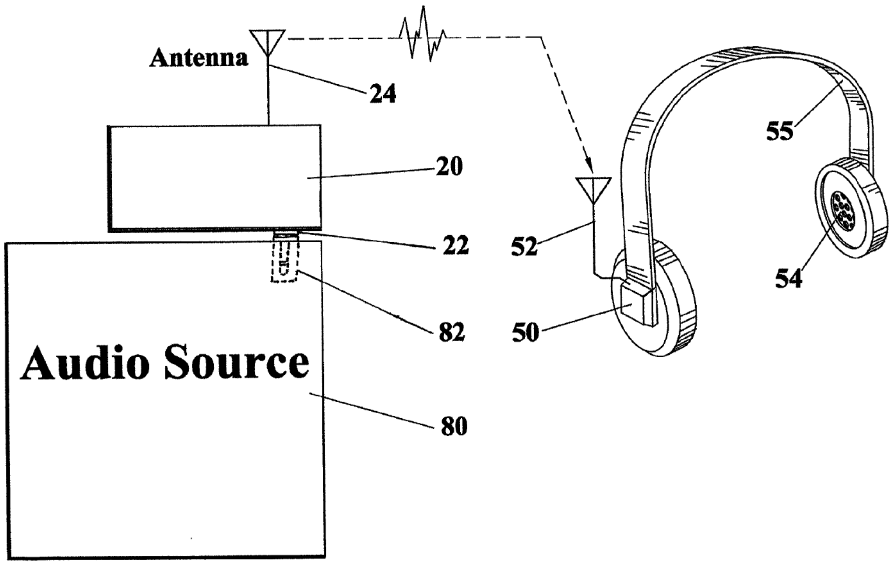


FIG.1

EX1004, FIG. 1.

114. The "headphone jack 82" is an "<u>analog</u> headphone jack" because the '196 Publication explains that the "headphone plug" is "in communication with an <u>analog</u> low pass filter wherein the headphone plug may be connectable to a headphone jack of an audio source" and "audio source 80 normally provides an <u>analog</u> output signal":

> The present invention is directed to wireless digital audio systems for transmission of a signal from an audio player device to a headphone. **An audio transmitter may include a headphone plug in communication with an <u>analog</u> low pass filter wherein the headphone plug may be connectable to a headphone jack of an audio source.** The **low pass filter output signal may be in communication with an <u>A/D</u> converter** whose output may be in

> communication with a digital low pass filter that outputs a signal to an encoder.

EX1004, Abstract.

> Referring to FIG. 2, **an audio transmitter** 20 **may receive an audio signal from an audio source** 80**.** The audio transmitter 20 may be a compact device that may be connected to the audio source 80 to remain therewith for transmitting a signal to an audio receiver. **An audio source 80 normally provides an <u>analog</u> output signal** in the approximate range of 20 Hz to 20 kHz. This **signal may then be processed through an <u>analog</u> low pass filter** 30 **to then be digitized by a 4 bit <u>analog</u>-to-digital (A/D) converter** 32. After digital conversion of the **<u>analog</u> audio signal**, the digital signal may be processed by a digital low pass filter 34 to reduce unwanted out of band noise that may have been produced by the A/D converter 32.

EX1004, ¶[0012].

115. Thus, "audio transmitter 20" is a device that can be connected into an analog headphone jack (using "headphone plug 22") to wireless transmit an audio signal. Additionally, "audio source 80" is a device for providing audio that has an analog headphone jack ("headphone jack 82"). Accordingly, the '196 Publication teaches a "*transmitter*" ("audio transmitter 20") "*coupled to a … audio source*" ("audio source 80").

116. The '196 Publication discloses a "connection system for existing audio

player devices," "such as radio, tape players, [and] CD players." EX1004, ¶¶[0002], [0004] and explains that "cassette tape players … may be used during exercising":

> Use of audio headphones with **audio player devices such as radio, tape players, CD players**, computers, television audio and the like **have been in use for may [sic] years. Such use includes the portable player systems such as cassette tape players that may be used during exercising as for example running.** These systems usually incorporate an audio source having a headphone jack to which a headphone is connected by wire and connector.

EX1004, ¶[0002].

> As can be seen, there is a need for a simple **connection system for existing audio player devices** to allow wireless transmission to a headphone receiver.

EX1004, ¶[0004].

117. A POSA would have understood that radio, cassette players and CD players are generally used to play music. A POSA would have further understood that cassette players used while exercising, such as when running, are typically used to play music. A POSA would thus have understood that the '196 Publication teaches or suggests that "audio source 80" is a *music audio source*.

118. The '196 Publication teaches *a spread spectrum transmitter* and *a spread spectrum … receiver configured to receive and store a unique user code.*

Specifically, the ’196 Publication teaches that “audio transmitter 20” includes “a transmitter code generator 44 signal to produce…a unique codeword that spreads the signal spectrum” of the transmission to audio receiver:

> Modulation of the digital signal may be performed using direct sequence spread spectrum communication technology. A 64- Ary modulator 42 may be used for summation at summation element 46 with **a transmitter code generator** 44 **signal to produce** a high symbol rate, and **a unique codeword that spreads the signal spectrum**. The output of the summation element 46 may then be communicated to a differential phase shift key (DPSK) transmitter 48 that modulates the digital signal to be transmitted by an omni-directional transmitting antenna 24 at approximately 2.4 GHz. The transmit power may be limited to 100 milliwatts.

Id., ¶[0014].

119. The ’196 Publication explains that audio receiver 50 receives the transmission and includes “receiver code generator 60 [that] may contain the same unique code word that was transmitted by the audio transmitter 20 specific to a particular a user” to demodulate the transmission:

> The down converted output signal of the direct conversion receiver 56 may be summed in receiver summing element 58 with a receiver code generator 60 signal. The **receiver code generator** 60 **may contain the same unique code word that was transmitted by the audio transmitter** 20 <u>**specific to a particular a user**</u>. Other code words from

> wireless digital audio systems 10 may appear as noise to a particular audio receiver 50. This may also be true for other device transmitted signals operating in the wireless digital audio system 10 spectrum. This code division multiple access (CDMA) may be used to provide each user independent operation.

Id., ¶[0016].

120. A POSA would have understood that audio receiver 50 further comprises "demodulator 62 to demodulate the signal elements modulated in the audio transmitter 20":

> The resulting summed digital signal from receiving summary element 58 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 the audio transmitter 20. A source decoder 68 may further decode the coding applied by the encoder 36. The resultant processed digital signal may thereby be condition to represent the original signal processed and transmitted by the audio transmitter 20.

Id., ¶[0017]; *see also id.,* ¶[0014].

121. For these reasons, it is my opinion that the '196 Publication renders obvious a *portable spread spectrum audio receiver* ("audio receiver 50") *configured to receive and store a unique user code* ("unique codeword"). Furthermore, the '196

Publication teaches *portable spread spectrum audio receiver* ("audio receiver 50") *configured to receive wireless modulation transmissions from a spread spectrum transmitter* (modulated transmissions from "audio transmitter 20") *coupled to a music audio source* ("audio source 80," which can be a "radio, tape players, [or] CD players").

[1A] a direct conversion module configured to receive wireless modulation transmissions representative of said audio signal representation and which have been processed to reduce intersymbol interference, and wherein said portable spread spectrum audio receiver further processes said received wireless modulation transmissions for reduction of intersymbol interference;

122. It is my opinion that the '196 Publication renders obvious this limitation.

(1) The '196 Publication teaches "a direct conversion module configured to receive wireless modulation transmissions representative of said audio signal representation"

123. As I explain in Section VII above, the term "direct conversion module" was construed to mean a "module for converting radio frequency to baseband or very near baseband in a single frequency conversion without an intermediate frequency."

124. The '196 Publication discloses that "audio receiver 50" includes a "direct conversion receiver 56" ("*direct conversion module*") which receives an audio signal from "audio transmitter 20". I understand that, in another proceeding, PO argued that "a POSITA would understand that a 'direct conversion' receiver includes near-zero intermediate frequency (NZIF) receivers that convert to very near

baseband in a single frequency conversion without an intermediate frequency." EX1023, 18. I agree that a 'direct conversion' receiver converts a signal to baseband in a single frequency conversion without an intermediate frequency. (See, e.g., EX1022, 1322-24.) Thus, the '196 Publication teaches a *direct conversion module* ("direct conversion receiver 56").

> FIG. 3 illustrates a functional block diagram of the **audio receiver** according to an embodiment of the invention.

EX1004, ¶0009.

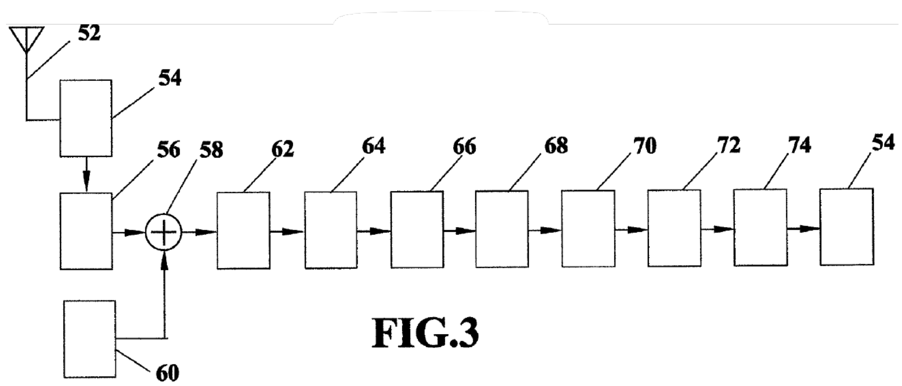


FIG.3

EX1004, FIG. 3.

> **The** transmitted **signal** from transmit antenna 24 **may be received by receiving antenna** 52 **and communicated to a wideband band pass filter** (BPF) 54. The **received spread spectrum signal may then be communicated to a** 2.4 GHz **direct conversion receiver 56**. The direct conversion receiver 56 may provide a method for down converting the received signal while utilizing timing and synchronization to capture the correct bit sequence embedded in the received spread spectrum

> signal. The audio receiver 50 may utilize fuzzy logic (or continuous logic) to optimize performance of the audio receiver 50.

EX1004, ¶[0015].

125. The received signal was "modulated in the audio transmitter 20":

> The resulting summed digital signal from receiving summary element 58 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 the audio transmitter 20. A source decoder 68 may further decode the coding applied by the encoder 36. The resultant processed digital signal may thereby be condition to represent the original signal processed and transmitted by the audio transmitter 20.

EX1004., ¶[0017].

> **Modulation of the digital signal may be performed using direct sequence spread spectrum communication technology. A 64- Ary modulator 42 may be used for** summation at summation element 46 with a transmitter code generator 44 signal to produce a high symbol rate, and a unique codeword that spreads the signal spectrum. The output of the summation element 46 may then be communicated to **a differential phase shift key (DPSK) transmitter 48 that modulates the digital signal to be transmitted by an omni-directional**

> **transmitting antenna 24** at approximately 2.4 GHz. The transmit power may be limited to 100 milliwatts.

EX1004, ¶[0014].

126. Thus, the ’196 Publication teaches *a direct conversion module* (56) *configured to receive wireless modulation transmissions representative of said audio signal representation* (the received modulated signal).

(2) The ’196 Publication teaches “wireless modulation transmissions … which have been processed to reduce intersymbol interference, and wherein said portable spread spectrum audio receiver further processes said received wireless modulation transmissions for reduction of intersymbol interference”

127. The ’196 Publication discloses that audio transmitter 20 includes “encoder 36…to reduce intersymbol interference (ISI) by using a transform code to encode the digital signal” and thus teaches *wireless modulation transmissions … which have been processed to reduce intersymbol interference*:

> **An encoder 36 may be used to reduce intersymbol interference (ISI) by using a transform code to encode the digital signal.** The reduction of ISI may lower the probability of a signal detection error in the audio receiver. The digital signal may next be processed by a channel encoder 38 and a block interleaver 40 to produce encoded redundancies in the transmitted signal to reduce errors that may occur during transmission.

EX1004, ¶[0013].

128. The ’196 Publication discloses that audio receiver 50 comprises “source decoder 68” to “decode the coding applied by the encoder 36” and thus teaches *portable spread spectrum audio receiver further processes said received wireless modulation transmissions for reduction of intersymbol interference*:

> The resulting summed digital signal from receiving summary element 58 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 the audio transmitter 20. **A source decoder** 68 **may further decode the coding applied by the encoder** 36**. The resultant processed digital signal may thereby be condition to represent the original signal processed and transmitted by the audio transmitter** 20.

EX1004., ¶[0017].

129. Accordingly, the ’196 Publication discloses that its “audio receiver 50” (claimed “*portable spread spectrum audio receiver*”) processes the “received spread spectrum signal” (claimed “*wireless modulation transmissions*”) to “reduce intersymbol interference (ISI)” (claimed “*reduction of intersymbol interference.*”) EX1004, ¶¶[0013]-[0015], [0017].[11.B] communicating data to the wireless communication device over [t]he Internet through the Internet access facility.

[1B] a digital-to-analog converter (DAC) configured to provide an analog audio output signal corresponding to said audio signal representation;

130. It is my opinion that the ’196 Publication renders obvious this limitation.

131. Audio receiver 50 includes “[a] digital-to-analog converter 70 (DAC) [that] may be used to transform the digital signal to an analog audio signal.” EX1004, ¶[0018].

132. Accordingly, the ’196 Publication teaches *a digital-to-analog converter (DAC)* (“digital-to-analog converter 70”) *configured to provide an analog audio output signal corresponding to said audio signal representation.*

[1C] a speaker configured to generate an audio signal corresponding to said analog audio output signal, wherein said generated audio signal does not include audible audio content originating from any audio signals transmitted in a spectrum used by said spread spectrum transmitter that do not originate from said spread spectrum transmitter;

133. It is my opinion that the ’196 Publication renders obvious this limitation.

134. The ’196 Publication indicates that the use of “code division multiple access (CDMA) may be used to provide each user independent operation.” *Id.*, ¶[0016]. The ’196 Publication explains that the unique user code allows a receiver to identify transmissions intended for “a particular … user” while “[o]ther code words from wireless digital audio systems 10 may appear as noise”:

> The receiver code generator 60 may contain **the same unique code word that was transmitted by the audio transmitter** 20 **specific to a particular a user. Other code words from wireless digital audio systems 10 may appear as noise to a particular audio receiver 50**. This may also be true for other device transmitted signals operating in the wireless digital audio system 10 spectrum. This code division multiple access (CDMA) may be used to provide each user independent operation.

EX1004, ¶[0016].

135. A POSA would thus understand that audio receiver 50 would selectively receive transmissions from transmitter 20 (*"said spread spectrum transmitter"*) and *do[] not include audible audio content originating from any audio signals transmitted in a spectrum used by said spread spectrum transmitter that do not originate from said spread spectrum transmitter.* The '196 Publication explains that these transmissions are then demodulated and processed to "return the signal to analog or base band format for use in powering a speaker 54" (*speaker configured to generate an audio signal corresponding to said analog audio output signal*). EX1004, ¶[0017-18].

[1D] wherein said portable spread spectrum audio receiver is configured to use independent code division multiple access communication and to use said unique user code to communicate with only said spread spectrum transmitter during a wireless connection;

136. It is my opinion that the '196 Publication renders obvious this

limitation.

137. The ’196 Publication teaches the use of independent CDMA, including the use of a unique user code, so that the receiver is configured to only communicate with a particular transmitter:

> The receiver code generator 60 may contain **the same unique code word that was transmitted by the audio transmitter** 20 **specific to a particular a user**. Other code words from wireless digital audio systems 10 may appear as noise to a particular audio receiver 50. This may also be true for other device transmitted signals operating in the wireless digital audio system 10 spectrum. **This code division multiple access (CDMA) may be used to provide each user independent operation.**

EX1004, ¶[0016].

138. I understand during previous claim construction that the term “Independent CDMA” was taken to mean “performed independent of any central control.” The one-to-one relationship between the ’196 Publication’s receiver and transmitter teaches “Independent CDMA” as it does not require any centralized control.

[1E] wherein said portable spread spectrum audio receiver is further configured to perform at least one of a plurality of demodulations on at least one of said received wireless modulation transmissions, wherein said plurality of demodulations includes a differential phase shift keying (DPSK) demodulation and a non-DPSK demodulation; and

139. It is my opinion that the ’196 Publication renders obvious this limitation.

140. The ’196 Publication teaches that the transmitter can modulate the transmission in at least two ways: by using a “64-Ary modulator 42”—a non-DPSK modulation—and by using a “differential phase shift key (DPSK) transmitter 48 that modulates the digital signal to be transmitted.” EX1004, ¶[0014].

141. The ’196 Publication teaches an audio receiver which receives and processes the transmitted signal through a wideband band pass filter 54, direct conversion receiver 56 and a receiver summing element 58. *Id.*, ¶[0015]-[0016]. The ’196 Publication then explains that “[t]he resulting summed digital signal from receiving summary element 58 may be processed by a 64-Ary demodulator 62 to demodulate the signal elements modulated in the audio transmitter.” *Id.*, [0017]. The ’196 Publication further teaches that the receiver can process the received transmission “to represent <u>the original signal</u> processed and transmitted by the audio transmitter.” *Id.*, ¶[0017]. A POSA would have understood that to restore “the original signal,” the modulations performed prior to transmission (64-Ary and DPSK) by the transmitter must be demodulated by the audio receiver.

142. Accordingly, the ’196 Publication teaches that the receiver performs a plurality of demodulations (64-Ary and DPSK) on the received wireless modulation transmissions.

[1F] wherein said further processing for reduction of intersymbol interference is separate from said performance of at least one of said plurality of demodulations.

143. It is my opinion that the ’196 Publication renders obvious this limitation.

144. The ’196 Publication teaches separate components for decoding the received signal after demodulation, including a source decoder 68 which “may further decode the coding applied by the encoder 36.” EX1004, ¶[0018], Fig. 3. As discussed above, the coding applied by encoder 36 is used to “reduce intersymbol interference.” *Id.*, ¶[0013].

145. Accordingly, the ’196 Publication renders obvious claim 1.

Claim 2. The portable spread spectrum audio receiver of claim 1, wherein the portable spread spectrum audio receiver is further configured to perform said plurality of demodulations on the at least one of said received wireless modulation transmissions.

146. It is my opinion that the ’196 Publication renders claim 2 obvious.

147. As I explained above with respect to limitation [1E], the ’196 Publication teaches a transmitter which first modulates a signal a “64-Ary modulator” and then modulates the resulting signal with a “differential phase shift

key (DPSK) transmitter 48 that modulates the digital signal to be transmitted." EX1004, ¶[0014]. A POSA would have understood that to restore "the original signal," 64-Ary and DPSK demodulations must be performed by the audio receiver. *See* [1E].

148. Accordingly, the '196 Publication teaches that the receiver performs a plurality of demodulations on the received wireless modulation transmissions.

Claim 3. The portable spread spectrum audio receiver of claim 1, wherein the audio signal representation represents music.

149. It is my opinion that the '196 Publication renders claim 3 obvious.

150. The '196 Publication states the "invention relates to audio player devices and more particularly to systems that include headphone listening devices." EX1004, ¶[0001]. It further teaches that the headphones are used "with audio player devices such as radio, tape players, CD players, computers, television audio and the like" and provides an example of "cassette tape players that may be used during exercising as for example running. *Id.*, ¶[0002]. A POSA would have understood that radio, tape players, and CD players provide audio signal representations that represent music.

Claim 4. The portable spread spectrum audio receiver of claim 1, wherein said analog audio output signal is capable of representing audio signals below 40 Hz and also capable of representing audio signals above 5 kHz.

151. It is my opinion that the '196 Publication renders claim 4 obvious.

152. The ’196 Publication teaches “[a]n analog low pass filter 72 may be used to filter the analog audio signal to pass a signal in the approximate *20 Hz to 20 kHz frequency range* and filter other frequencies.” EX1004, ¶[0018]. 20 Hz is below 40 Hz so that the output signal includes audio signals that are between 20Hz and 40Hz, hence below 40Hz, and 20 kHz so that the output signal includes audio signals that are in the range between 5kHZ and 20kHZ, and hence above 5 kHz, the ’196 Publication teaches this limitation.

Claim 6. The portable spread spectrum radio receiver of claim 1, further comprising a headphone unit, wherein the headphone unit is configured to integrate the speaker and wherein the headphone unit enables a user to secure the speaker on to a head of the user.

153. It is my opinion that the ’196 Publication renders claim 6 obvious.

154. The ’196 Publication states “[t]he audio receiver 50 may have headphone speakers 54 in headphones 55 for listening to the audio signal” and illustrates a headphone unit that enables a user to secure the speaker on to the head of a user in Figure 1:

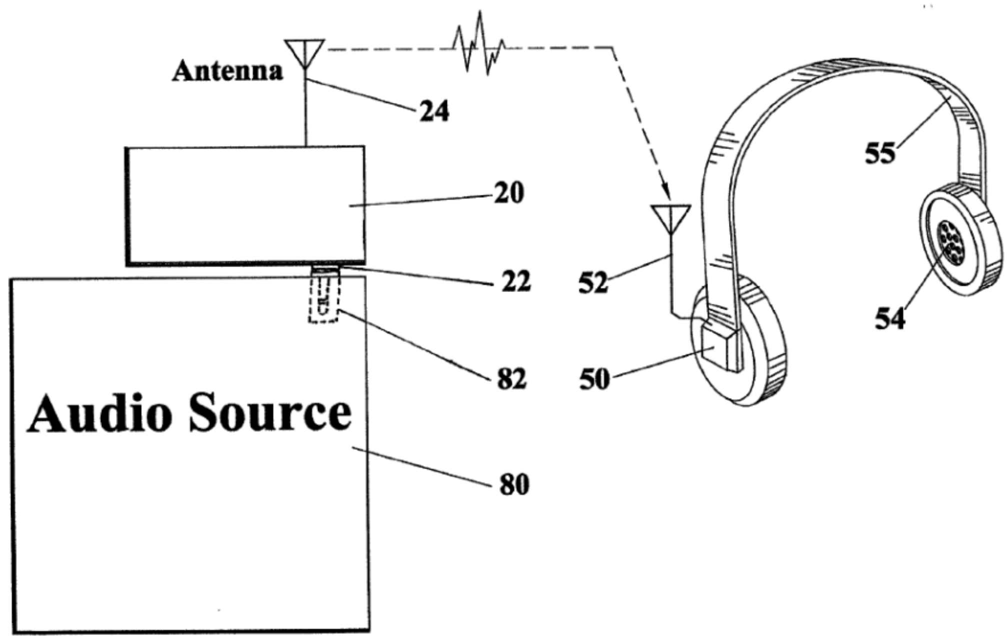


FIG.1

EX1004, ¶[0011], Fig. 1.

Claim 7. The portable spread spectrum radio receiving of claim 6, wherein the headphone unit comprises a headphone strap that connects the speaker with another speaker for opposite ear.

155. It is my opinion that the ’196 Publication renders claim 7 obvious.

156. The ’196 Publication states “[t]he audio receiver 50 may have headphone speakers 54 in headphones 55 for listening to the audio signal” and illustrates a headphone strap that connects the speaker with another speaker for the opposite ear in Figure 1:

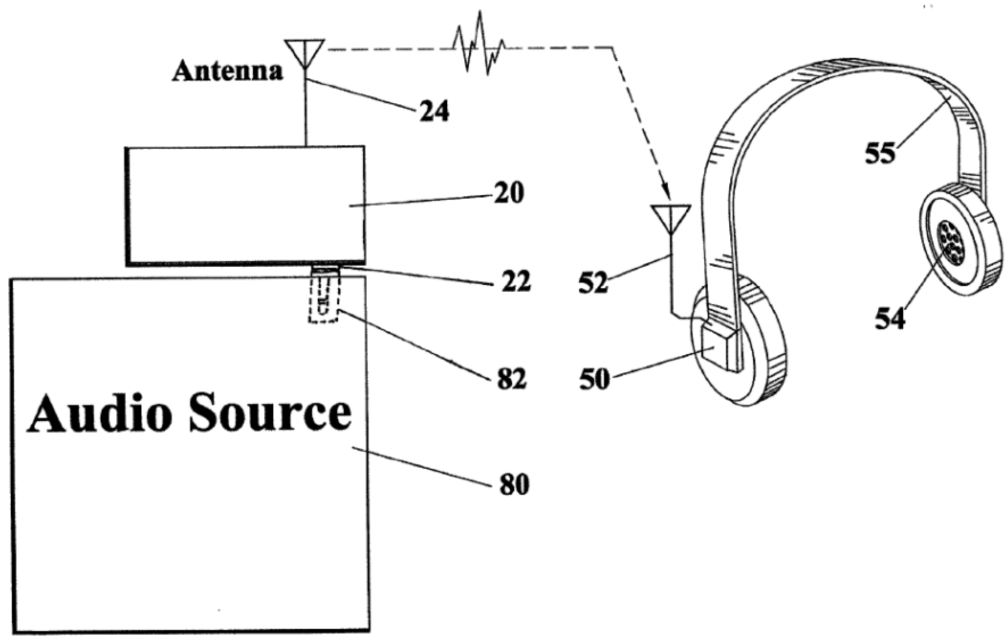


FIG.1

EX1004, ¶[0011], Fig. 1.

Claims 8-13, 15-16

157. Claim 8 and its dependent claims, 9-13 and 15-16, correspond to Claim 1 and its dependent claims as indicated in the below table, and claims 8-13 and 15-16 are rendered obvious for the same reasons that I provided above in Ground 1 for their matching claims or claim limitations.

Limitation	Corresponding Limitation
[8P]	[1P]
[8A]	[1D]
[8B]	[1A]

[8C]	[1A]
[8D]	[1E]
[8E]	[1B]
[8F]	[1C]
[9]	Claim 2
[10]	Limitation [1A]
[11]	Claim 4
[12]	Limitation [1C]
[13]	Limitation [1F]
[14]	Claim 5

Claim 17

[17P] A portable spread spectrum audio transmitter coupled to a music audio source, said transmitter configured to transmit a unique user code and wireless modulation transmissions representative of an audio signal representation, said portable spread spectrum audio transmitter configured to:

158. It is my opinion that the ’196 Publication renders obvious this limitation.

159. The ’196 Publication states “audio transmitter 20 may be a compact device that may be connected to the audio source 80 to remain therewith for transmitting a signal to an audio receiver” (EX1004, ¶[0012]) and thus teaches an

audio transmitter coupled to a music audio source. A POSA would have understood that the transmitter is *portable* since it is "compact" and configured for "wireless transmission of a signal to a receiving headphone." EX1004, ¶¶[0001], [0012].

160. The '196 Publication further teaches a *spread spectrum audio transmitter… configured to transmit a unique user code and wireless modulation transmissions representative of an audio signal representation*. It states that "[m]odulation of the digital signal may be performed using direct sequence *spread spectrum* communication technology." EX1004, ¶[0014]. In particular, the transmitter includes "a transmitter code generator 44 signal to produce a high symbol rate, and a unique codeword that spreads the signal spectrum." *Id.* The *transmitter [is] configured to transmit a unique user code*: "The receiver code generator 60 may contain the same **unique code word that was transmitted by the audio transmitter** 20 **specific to a particular a user**." *Id*, ¶[0016].

161. Additionally, "audio transmitter 20" is *configured to transmit … wireless modulation transmissions representative of an audio signal representation* as it includes "a differential phase shift key (DPSK) transmitter 48 that modulates the digital signal to be transmitted by an omni-directional transmitting antenna 24 at approximately 2.4 GHz." *Id.*, ¶[0014].

[17A] encode a first representation of an audio signal to reduce intersymbol interference associated with a transmitted representation of the audio signal;

162. It is my opinion that the ’196 Publication renders obvious this limitation.

163. The ’196 Publication teaches that the audio transmitter includes “encoder 36…to reduce intersymbol interference (ISI) by using a transform code to encode the digital signal” and thus provides transmissions representative of an audio signal that have been processed to reduce intersymbol interference. EX1004, ¶[0013].

[17B] perform at least one of a plurality of modulations on the first representation of the audio signal;

164. It is my opinion that the ’196 Publication renders obvious this limitation.

165. The ’196 Publication teaches that the transmitter can modulate the transmission in at least two ways by using a “64-Ary modulator 42”—a non-DPSK modulation—and by using a “differential phase shift key (DPSK) transmitter 48 that modulates the digital signal to be transmitted.” EX1004, ¶[0014].

[17C] generate a modulated signal based on the performance of at least one of the plurality of modulations, wherein the plurality of modulations includes a differential phase shift keying (DPSK) modulation and a non-DPSK modulation; and

166. It is my opinion that the ’196 Publication renders obvious this

limitation.

167. The ’196 Publication teaches that the transmitter can modulate the transmission in at least two ways by using a “64-Ary modulator 42”—a non-DPSK modulation—and by using a “differential phase shift key (DPSK) transmitter 48 that modulates the digital signal to be transmitted.” EX1004, ¶[0014].

[17D] use the modulated signal and independent code division multiple access communication to wirelessly transmit a transmitted representation of the audio signal.

168. It is my opinion that the ’196 Publication renders obvious this limitation.

169. The ’196 Publication teaches the use of independent CDMA, including the use of a unique user code, so that the receiver is configured to only communicate with a particular transmitter. Specifically, the transmitter includes “a transmitter code generator 44 signal to produce a high symbol rate, and a unique codeword that spreads the signal spectrum” and a “differential phase shift key (DPSK) transmitter 48 that modulates the digital signal to be transmitted by an omni-directional transmitting antenna 24.” *Id.*, ¶[0014].

170. The receiver includes “receiver code generator 60 [that] may contain the same unique code word that was transmitted by the audio transmitter 20 specific to a particular a user.” *Id.*, ¶[0016]. The ’196 Publication states “[t]his code division multiple access (CDMA) may be used to provide each user independent operation.”

Id.

Claim 18. The portable spread spectrum audio transmitter of claim 17, wherein said plurality of modulations are separate from the encoding and processing by the encoder.

171. It is my opinion that the ’196 Publication renders obvious the limitation of claim 18.

172. The ’196 Publication renders obvious *said plurality of modulations are separate from the encoding and processing by the encoder*.

173. The ’196 Publication discloses separate components for modulation and encoding the audio signal. Specifically, “encoder 36 may be used to reduce intersymbol interference (ISI) by using a transform code to encode the digital signal.” EX1004, ¶[0013], Fig. 2. Following encoding, modulators 42 and 46 separately process the signal

> A 64-Ary modulator 42 may be used for summation at summation element 46 with a transmitter code generator 44 signal to produce a high symbol rate, and a unique codeword that spreads the signal spectrum. The output of the summation element 46 may then be communicated to a differential phase shift key (DPSK) transmitter 48 that modulates the digital signal to be transmitted by an omni-directional transmitting antenna 24 at approximately 2.4 GHz.

Id., ¶[0014].

Claim 19. The portable spread spectrum audio transmitter of claim 17, wherein the transmitted unique user code distinguishes the transmitted representation of the audio signal from other transmitted audio signals in the spread spectrum transmitter spectrum, said other transmitted audio signals not originating from said wireless digital coded audio spread spectrum transmitter.

174. It is my opinion that the ’196 Publication renders obvious the limitation of claim 19.

175. The ’196 Publication teaches “a transmitter code generator 44 signal to produce a high symbol rate, and a unique codeword that spreads the signal spectrum.” *Id.*, ¶[0014]. It further teaches that the “receiver code generator 60 may contain the same unique code word that was transmitted by the audio transmitter 20 specific to a particular a user.” *Id.*, ¶[0016]. Because the transmitter and receiver use the same unique user code, “[o]ther code words from wireless digital audio systems 10 may appear as noise to a particular audio receiver 50. This may also be true for other device transmitted signals operating in the wireless digital audio system 10 spectrum. This code division multiple access (CDMA) may be used to provide each user independent operation.” Thus, the ‘’196 Publication indicates the headphones provide “a high quality, low distortion signal for hearing by a user wearing the headphones 55.” EX1004, ¶[0018].

B. Ground 2: The ’196 Publication In View of Rappaport Renders Obvious Claims 5, 14 and 20

1. Overview of the combination; motivation to combine; expectation of success

176. Ground 2 relies on the ’196 Publication in view of Rappaport.

177. The ’196 Publication is directed to “wireless digital audio systems for transmission of a signal from an audio player device to a headphone.”

178. The ’196 Publication does not explicitly state how the audio player device or headphone receives power.

179. Nevertheless, a POSA would have understood that the audio player device and headphones of the ’196 Publication would have needed to receive power from a power supply, such as a battery.

180. For example, Rappaport is a textbook whose purpose “to initiate the newcomer to cellular radio and wireless personal communications.” EX1018, xiii.

181. Rappaport explains that the “power supply requirements” would vary for different devices, and it teaches and suggests that portable wireless communication devices include a battery to supply power to the device. EX1018, 22-23, 43, 199, 317.

182. A POSA would have thus understood that the ’196 Publication’s audio player device and headphones would include a power supply, such as a battery.

183. A POSA would have had a reasonable expectation of success in

including a *power supply* with the *portable spread spectrum audio receiver* because it was well known in the art that an electronic device requires a power supply, and it was well known to use a battery as a power supply for a portable device. EX1018, 22-23, 43, 199, 317; EX1021, 5:63-6:2.

Claim 5. The portable spread spectrum audio receiver of claim 1, wherein the portable spread spectrum audio receiver includes a power supply.

184. The ’196 Publication in view of Rappaport renders obvious this limitation.

185. The ’196 Publication renders obvious the portable spread spectrum audio receiver of claim 1.

186. The ’196 Publication teaches the use of a power amplifier that powers the headphone speaker: “[t]he analog audio signal may then be processed by a **power amplifier 74** that may be optimized **for powering a headphone speaker 54** to optimize a high quality, low distortion signal for hearing by a user wearing the headphones 55.” EX1004, ¶[0018].

187. POSA would have understood that: (1) portable devices have “power supply requirements” (EX1018, 22); and (2) a “power amplifier” requires a *power supply* to … “power[] a headphone speaker.”

188. A POSA would have been motivated to include a power supply, such as a battery, as disclosed in Rappaport, in order to provide power to the wireless

component.

Claim 14. The portable spread spectrum audio receiver of claim 8, wherein the portable spread spectrum audio receiver includes a power supply.

189. The '196 Publication in view of Rapport renders obvious this limitation. *See* claim 5.

Claim 20. The portable spread spectrum audio transmitter of claim 17, wherein the portable spread spectrum audio transmitter includes a power supply.

190. The '196 Publication in view of Rappaport renders obvious this limitation.

191. The '196 Publication renders obvious the portable spread spectrum audio transmitter of claim 17.

192. The '196 Publication teaches that the portable transmitter includes a power supply by indicating it "may transmit an electromagnetic signal at 2.4 GHz using approximately 100 milliwatts or less of power." EX1004, ¶[0011]; *see also id.*, ¶[0014] ("The transmit power may be limited to 100 milliwatts."). A POSA would have understood that the portable transmitter must require a power supply to transmit the signal with 100 milliwatts or less of power.

C. Ground 3: Walley in view of Miyake, Gibson, and Rappaport Renders Obvious Claims 1-5, 8-14 and 17-20

1. Overview of the combination; motivation to combine; expectation of success

193. Ground 3 relies on Walley in view of Miyake, Gibson, and Rappaport.

194. I understand that, in another proceeding, PO argued proposed claims constructions for the terms "transmitter" and "audio source" (i.e., plain and ordinary meaning). E1023, 4-9. I understand that Petitioner disagrees with those proposed constructions. However, for the purposes of Grounds 3 and 4 herein, I apply PO's constructions for these terms to illustrate that, even under PO's proposed constructions, the challenged claims are obvious in view of the cited prior art.

195. Walley is directed to "generic type spread spectrum controllers" which address "Problems With the Current Art" relating to the "different requirements" of "wireless communications electronics, such as <u>cordless and cellular telephones, wireless units to transmit music to speakers or headphones</u>, programmable digital assistants and computers with wireless links, pagers, and wireless tracking devices." EX1015, Abstract, 2:33-39, 2:66-3:1, 12:15-25. Walley discloses a "variable length [Pseudo Noise (]PN[)] code controller" which "can supply PN codes of varying lengths to the transmit controller." EX1015, 9:4-8. Walley explains that "the PN code length might be increased" to "increase the transmit range or to overcome interference or jamming." EX1015, 8:39-43.

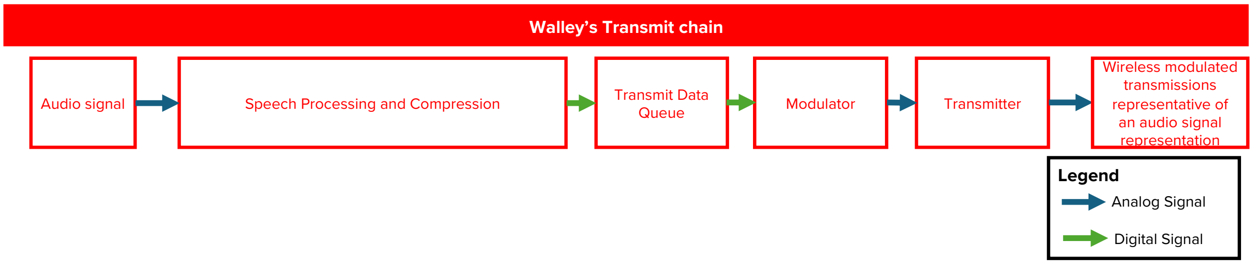
196. Miyake describes a "spread spectrum communication system which can simplify the management of users and services" by assigning "user-specific" spreading codes. EX1016, 2:23-26, 5:49-56, 8:12-60.

197. A POSA would be motivated to combine the spreading process of Walley with Miyake's spreading process because it would combine Walley's adjustable system PN code (which can be lengthened to reduce interference) with Miyake's user-specific spreading code to provide a spreading process which creates user-specific spreading codes that can be lengthened to reduce interference.

198. This combination would involve the use of Miyake's known spreading process to improve Walley's similar spread spectrum system to provide user-specific spreading codes to tailor transmissions based on user preferences. For example, Walley explains that "the clarity and fidelity of sound in a portable phone may be an important consideration but, as the signal starts to fade, a user <u>may willingly</u> accept a somewhat lower fidelity in order to have an increased range." EX1015, 3:22-26. A POSA would understand that user-specific spreading codes would allow the system to identify users that are willing to accept a lower fidelity in exchange for an increased range (or vice versa). In addition, this combination would be a simple substitution of one known element (Walley's system-based spreading code) for another (Miyake's user-specific spreading code) to obtain predictable results (a user-specific spreading code).

199. A POSA would have reasonably expected to succeed in using Miyake's user-specific spreading code in Walley's system because Miyake describes using such spreading codes in the context of a spread spectrum system like Walley's and a POSA would have understood that implementing spreading codes on a user-basis (Miyake) instead of on a system-basis (Walley) would have only required routine knowledge as user accounts and user-specific systems were well-known, and Miyake describes its spread spectrum system as something "which can be designed easily." EX1016, 2:23-26.

200. Walley describes at a high level a CDMA spread spectrum controller suitable for a range of devices, forgoing unnecessary details of the physical structure of the devices or certain technical details about the individual steps in the processing of the audio signal. Rather Walley combines the steps of audio signal processing (such as analog low pass filtering, AD converting, digital low pass filtering, encoding, channel encoding, interleaving) into a "speech processing and compression" and indicates that the signal is modulated, then the modulated signal is multiplied by a PN code prior to transmission. Walley does not constrain the specific form of modulation that is used.

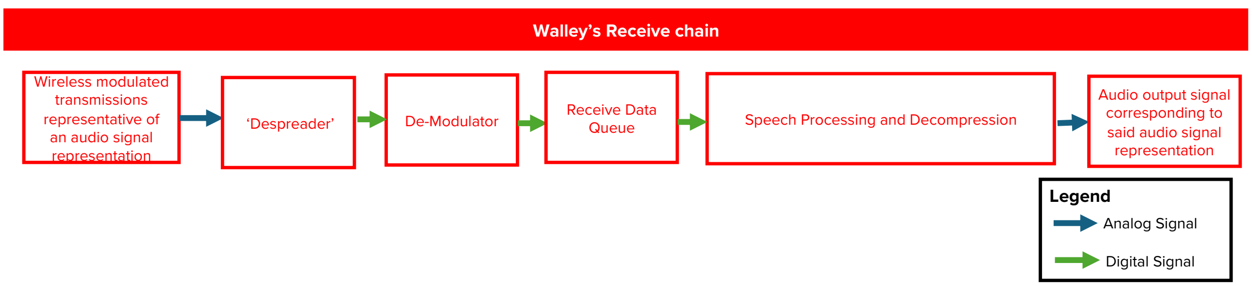


Depiction of Walley's transmit chain[1]

201. Walley also forgoes unnecessary details of how the reciprocal process is carried out at the receiver. Rather Walley specifies that the "despreader" is responsible for performing conversion of the received wireless modulated transmission signal to separate out the original data encoded with the unique user code, as for example a direct conversion receiver does. Walley describes the sequence of steps that takes place in the transmit chain, and the receiver performs the reciprocal steps in the receive chain. In Walley's receive chain, the wireless modulated transmissions representative of an audio signal representation is received

[1] Speech Processing and Compression in Walley encompasses all the following functions from the '047 Patent: analog low pass filter, AD converter, digital low pass filter, encoder, channel encoder, and interleaver (which are described in V.B.1.a.-f.). Walley's Modulator has the same function as the Modulator of the '047 Patent (which is described in V.B.1.g.). The transmitter in Walley conducts the same functions as the code generator and the DPSK transmitter in the '047 Patent (which is described in V.B.1.h. and i.).

and undergoes 'despreading' and demodulation, then the demodulated, digitized signal is sent to a receive data queue prior to undergoing the processes included in speech processing and decompression (such as de-interleaving, Viterbi decoding, source decoding, DAC, analog low pass filtering, and power amplifying) after which it is transmitted as an audio output signal corresponding to said audio signal representation.



Depiction of Walley's receive chain[2]

[2] The "Despreader" in Walley conducts the same functions as the code generator and the Direct Conversion Receiver in the '047 Patent (which is described in V.B.2.a. and b.). Walley's Demodulator has the same function as the Demodulator of the '047 Patent (which is described in V.B.2.c.). Speech Processing and Decompression in Walley encompasses all the following functions from the '047 Patent: de-interleaver, Viterbi decoder, source decoder, DAC, analog low pass filter, power amplifier, headphone speaker (which are described in V.B.2.d.-j.).

202. Rappaport is a textbook whose purpose is "to initiate the newcomer to cellular radio and wireless personal communications." EX1018, xiii. Gibson is a communications handbook which includes "articles or chapters" that are "written as tutorials or overviews, so that once the reader locates the broader topic, it is easy to find an answer to a specific question." EX1022, iii, title. A POSA would have been motivated to use the teachings of Rappaport and Gibson to provide the implementation details required to create a transmitter and receiver based on Gibson's teachings, and would have had a reasonable expectation that applying Gibson's teachings to Walley would be successful.

2. Challenged Claims

Claim 1

[1p] A portable spread spectrum audio receiver configured to receive and store a unique user code, said portable spread spectrum receiver configured to receive wireless modulation transmissions from a spread spectrum transmitter coupled to a music audio source, said wireless modulation transmissions representative of an audio signal representation, said portable spread spectrum audio receiver comprising:

203. I understand that this part of the claim is called the preamble. I also understand that there are special rules that apply to whether a preamble of a claim is a limitation or not. I have not been asked to apply those rules in my analysis. Instead, I have been asked to presume that this is a limitation of the claims. I have done so.

204. It is my opinion that Walley in view of Miyake renders obvious the

preamble.

(1) Walley teaches a "portable spread spectrum audio receiver configured … to receive wireless modulation transmissions from a spread spectrum transmitter coupled to a music audio source."

205. It is my opinion that Walley teaches a *portable spread spectrum audio receiver* (e.g., telephones, headphones, speakers) *configured to receive wireless modulation transmissions from a spread spectrum transmitter* (e.g., telephone base unit; wireless units). For example, Walley teaches "generic type **spread spectrum** controllers which can be used in a variety of applications" which are intended to address "Problems With the Current Art" relating to the "different requirements" of "wireless communications electronics, such as **cordless and cellular telephones, wireless units to transmit music to speakers or headphones**, programmable digital assistants and computers with wireless links, pagers, and wireless tracking devices:"

> **Spread spectrum technology is being used in more and more wireless applications**. Generally applications of spread spectrum include a fixed spread spectrum code size. In addition in applications that employ time domain duplex, some may employ a fixed duty cycle, for example 50% broadcast and 50% receive, for broadcast and receive functions. Many applications, such as cordless phones, also feature a fixed sampling rate for an input signal. **By building systems in which these variables are not fixed but variable manufacturers can make generic type spread spectrum controllers which can be used in a**

> **variety of applications. These same circuits can also be controlled to give current devices enhanced characteristics by adjusting data rate for changing conditions, thereby enhancing their performance.** By allowing the spreading code to be reduced in length, the data rate of the transmitted signal can be increased without adjusting the bandwidth of the amplifiers used to amplify the transmitted signal. Similarly, more data can be transmitted or spreading code size increased by increasing the transmit duty cycle or the number of timeslices allotted to transmit the signal. The spreading code size can also be increased by using techniques, such as reduced sampling rate, which reduce the amount of data input into the system. Conversely the spreading code length can be increased in order to achieve more range, greater interference tolerance etc. by reducing the data rate or increasing the amount of time allotted to broadcast the signal.

EX1015, Abstract.

> **Problems Within the Current Art**
>
> As popularity increases for wireless communications electronics, such as **cordless and cellular telephones, wireless units to transmit music to speakers or headphones**, programmable digital assistants and computers with wireless links, pagers, and wireless tracking devices, the demand for cheaper, higher performance devices also increases.

EX1015, 2:33-39.

> One of the difficulties of providing a circuit that can serve in many applications is that different applications **can have different requirements**.

EX1015, 2:66-3:1.

> **Another embodiment of the system comprises a set of wireless speakers.** In the case of wireless speakers, there would be transmission in only one direction so the transmit (from the base unit) duty cycle would be maximized. Also, the maximum frequency that would be delivered to the speaker would be known. The maximum spreading code size could then be chosen that was consistent with the data rate to be delivered to the speaker. This code might change size depending whether the speaker system was monophonic, stereo, or a surround sound system.

EX1015, 12:15-25.

206. It is my opinion that Walley teaches *receive wireless modulation transmissions from a spread spectrum transmitter coupled to a music audio source*.

207. Walley teaches "**wireless units to transmit music** to speakers or headphones." EX1015, 2:33-39. Walley additionally teaches a "representative example of a portable telephone," which includes "mobile hand unit" and "a base unit." *Id.*, 6:48-66. The "base unit" can "**broadcast a high fidelity music signal** to the hand unit" when a person "was placed on hold":

> For example, **if a base unit were to broadcast a high fidelity music signal to the hand unit, such as when a person was placed on hold**, the data requirement for transmission might be increased from the base station to the hand unit.

Id., 7:36-40.

208. Walley explains that, although FIG. 4 depicts an embodiment in which the transmitter receives "continuous speech input," Walley's disclosures could be adapted to substitute the "continuous speech input" with "any manner of data":

> Continuous speech 401 is provided to the system via a microphone 403. **Those skilled in the art will realize that** instead of a continuous speech input and a continuous speech output, **any manner of data could be substituted and the method described would be equally viable**.

EX1015, 6:52-56.

209. Walley additionally explains that the "audio signal" is based on an "input signal":

> The fidelity of the **audio signal** will decrease as the sampling rate of the **input signal** decreases.

Id., 11:49-51.

210. A POSA thus would have understood that the transmission of music to a speakers, headphones, or a portable phone's "hand unit" would require the music

transmitter ("wireless units" or a "base unit") be *coupled to a music audio source* to provide music input signal (*wireless modulation transmission/audio signal representation*). EX1015, 6:52-56, 11:49-51.

211. Thus, it is my opinion that Walley teaches a *portable spread spectrum audio receiver* (e.g., telephones, headphones, speakers) *configured to receive wireless modulation transmissions* (input signals) *from a spread spectrum transmitter* (e.g., telephone base unit; wireless units) *coupled to a music audio source*.

(2) Walley in view of Miyake renders obvious a "spread spectrum … receiver configured to receive and store a unique user code."

212. As I explain in Section VII above, the term "unique user code" was construed to mean a "fixed code (bit sequence) specifically associated with one user of a device(s)."

213. As I explain below, Walley teaches a *spread spectrum audio receiver* (telephone, speaker or headphones) *configured to receive and store a ... code* (spreading code).

214. Walley discloses a spread spectrum system (e.g., a CDMA system) that uses a "spreading code[]," which Walley discloses as a "a dedicated code that is used to separate that system's transmissions from all others." EX1015, 1:27-59. Walley also discloses that the "spreading codes" are "commonly referred to as Pseudo Noise

(PN) codes." EX1015, 1:34-35. Walley teaches that this code can be lengthened to "increase the noise immunity and the transmission range of the signal." *Id.*, 4:23-25.

215. Miyake discloses "spreading codes specific to individual users," which is consistent with the '047 patent's explanation that a "unique user code is specifically associated with one wireless digital audio system user." EX1001, 2:60-66. Specifically, Miyake teaches a "spread spectrum communication system which can simplify the management of users and services." (EX1016, 2:23-26.)

216. Miyake describes a "spreading code" based on the output of two different spreading code generators (one for user-specific codes and another for attribute-based codes):

> [A] spreading code supplied to the mixer 31 is what is obtained by mixing **a spreading code from the first spreading code generator 32, which produces spreading codes specific to individual users**, with **a spreading code output from the second spreading code generator 33, which produces spreading codes assigned according to the attributes**.

EX1016, 5:49-56; *see also id.*, 8:12-60.

217. Miyaki's spreading code is "set on the transmitter side [and] should coincide with the spreading code set on the receiver side." *Id.*, 7:12-21. Since the transmitter and receiver are using the same code, a POSA would understand that the code is a *fixed code.*

218. A POSA would have understood Miyake's "spreading code" is a *specifically associated with one user of a device(s)* because Miyake repeatedly explains that the "spreading codes [are] specific to individual users." EX1016, 5:49-56; *see also* EX1016, 7:12-21 ("the first spreading code [is] specific to the user").

219. Thus, Miyake teaches a *unique user code* (i.e., a fixed code (bit sequence) specifically associated with one user of a device(s)).

220. A POSA would be motivated to combine the spreading process of Walley with Miyake's spreading process because it would combine Walley's dedicated system PN code (which can be lengthened to reduce interference) with Miyake's spreading code (which is based on a first code assigned to a user and an attribute-based second code) to provide a spreading process which creates user-specific spreading codes that can be lengthened to reduce interference.

221. This combination would involve the use of Miyake's known spreading process to improve Walley's similar spread spectrum process to provide user-specific spreading codes to create a flexible system which takes into account a user's transmission preferences.

222. For example, Walley explains that "the clarity and fidelity of sound in a portable phone may be an important consideration but, as the signal starts to fade, a user <u>may willingly</u> accept a somewhat lower fidelity in order to have an increased range." EX1015, 3:22-26. A POSA would understand that user-specific spreading

codes would allow the system to identify users that are willing to accept a lower fidelity in exchange for an increased range and/or identify users that would prefer higher fidelity with a reduced range.

223. Moreover, it would be a simple substitution of one known element (Walley's system-based spreading code) for another (Miyaki's user-specific spreading code) to obtain predictable results (a user-specific spreading code).

224. For these reasons, it is my opinion that Walley in view of Miyake renders obvious a *portable spread spectrum audio receiver* (Walley's telephones, speaker or headphones) *configured to receive and store a unique user code* (Walley's system spreading code combined with Miyake's "user-specific" spreading code) and *to receive wireless modulation transmissions* (input signals) *from a spread spectrum transmitter* (wireless units or telephone base unit) *coupled to a music audio source*.

[1A] a direct conversion module configured to receive wireless modulation transmissions representative of said audio signal representation and which have been processed to reduce intersymbol interference, and wherein said portable spread spectrum audio receiver further processes said received wireless modulation transmissions for reduction of intersymbol interference;

225. It is my opinion that the Walley in view of Gibson renders obvious this limitation.

(3) Walley in view of Gibson renders obvious "wireless modulation transmissions representative of said audio signal representation and which have been processed to reduce intersymbol interference, wherein said portable spread spectrum audio receiver further processes said received wireless modulation transmissions for reduction of intersymbol interference"

226. Walley describes a system in which an audio signal (such as "continuous speech" or "any manner of data") "is "digitized and compressed," and then "provided to transmit data queue 407, where it is maintained prior to transmission." EX1015, 6:51-7:26; FIG. 4 (depicting wireless transmission of audio between two devices); *see also id.* at 12:15-24 (describing speakers receiving wireless audio transmission). Walley explains that when the system is ready to transmit a "PN code" is "exclusive Exor'ed with each bit of the data code" and the "output of the Exor (Exclusive Or) gate 207 is coupled with the modulator 213, for modulating the carrier frequency 215. The output of the modulator is coupled to a RF power amplifier 217 and the antenna 219 for broadcasting the signal." EX1015, 6:10-34. Walley also explains that the "length of the PN code" can be increased by the "transmit controller" to "overcome interference". EX1015, 8:40-43. One of ordinary skill in the art would understand that increasing the length of the PN code applied to the transmit data to overcome interference is equivalent to the *wireless modulation transmissions…which have been processed to reduce intersymbol interference.* As Walley discloses a *wireless modulation transmission* being

processed to reduce intersymbol interference, given that the receiver performs the reciprocal processes to the transmitter a POSA would understand the audio receiver also performs processes to reduce interference.

227. Gibson teaches that intersymbol interference can be reduced by introducing a "controlled amount of intersymbol" inference to a signal and "precod[ing]" the signal can be used to compensate for (*reduce*) *intersymbol interference*:

> To avoid the problems associated with Nyquist signalling over an ideal bandlimited channel, bandwidth and/or power efficiency must be compromised. Raised cosine pulses compromise bandwidth efficiency to gain robustness with respect to timing errors. **Another possibility is to introduce a controlled amount of intersymbol at the transmitter, which can be removed at the receiver. This approach is called partial-response (PR) signalling.**

EX1022, 329.

> Consider the received signal sample Eq. (25.27) with duobinary signalling. If the receiver has correctly decoded the symbol A_{k-1}, then in the absence of noise A_k can be decoded by subtracting A_{k-1} from the received sample Y_k. If an error occurs, however, then subtracting the preceding symbol estimate from the received sample will cause the error to propagate to successive detected symbols. **To avoid this problem, the transmitted levels can be precoded in such a way as**

> **to compensate for the intersymbol interference introduced by the overall partial response.**

EX1022, 333.

228. Gibson explains that the *receiver* then *further processes said received wireless modulation transmissions for reduction of intersymbol interference*:

> **Precoding the symbols {b_k} in this manner, therefore, enables symbol-by-symbol decisions at the receiver.** In the presence of noise, more sophisticated detection schemes (e.g., maximum likelihood) can be used with PR signalling to obtain improvements in performance.

EX1022, 334; *see also id.*, 333.

229. A POSA would be motivated to combine Gibson's precoding techniques with Walley to mitigate the intersymbol interference in digital data communication systems by encoding/decoding a digitized audio signal using Gibson's precoding techniques to provide a transmitter which creates *wireless modulation transmissions representative of said audio signal representation and which have been processed to reduce intersymbol interference* and a *receiver* which *processes said received wireless modulation transmissions for reduction of intersymbol interference*. A POSA would have understood that the addition of Gibson's precoding techniques to Walley's system is the use of a known technique (precoding) to improve a similar digital data communication system in the same way

(to reduce intersymbol interference).

(4) Walley in view of Gibson renders obvious " a direct conversion module configured to receive wireless modulation transmissions"

230. As I explained in Section VII above, the term "direct conversion module" was construed to mean a "module for converting radio frequency to baseband or very near baseband in a single frequency conversion without an intermediate frequency."

231. Walley discloses a spread spectrum transmitter which includes a "modulator 213, for modulating the carrier frequency 215" which respect to FIG. 2, depicted below:

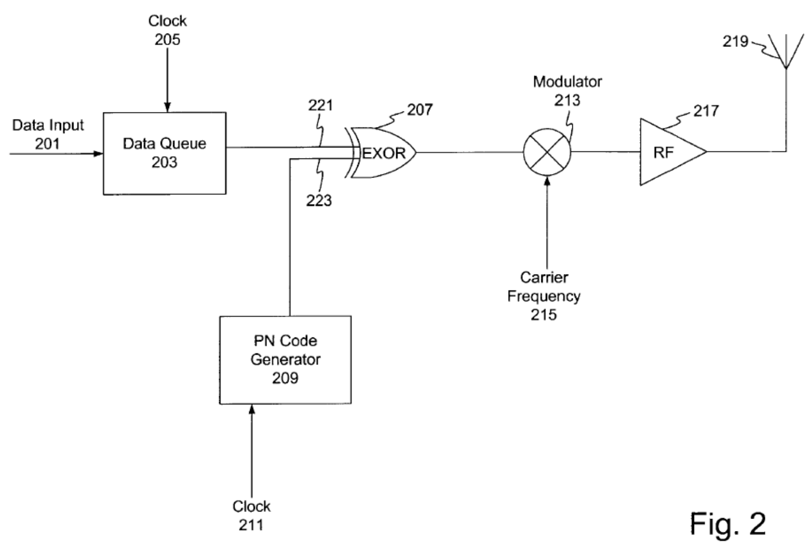


Fig. 2

EX1015, FIG. 2.

232. Walley discloses that the modulator's output is "coupled to a RF power amplifier 217 and the antenna for broadcasting the [analog] signal." EX1015, 6:26-

28.

233. Thus Walley indicates the receiver receives a wireless transmission modulated signal and despreads it: “Despreading the incoming signal with a particular code involves separating the original data, encoded with that particular code, from all other CDMA transmissions, and to recover the original data.” EX1015, 1:47-51. A POSA would have understood that the disclosure of a transmitter which modulates a signal with a carrier frequency would teach or suggest a receiver which receives this transmission and performs the reciprocal steps.

234. Walley teaches conversion of received signal to baseband which can be done indirectly, or directly without an intermediate carrier frequency (which is equivalent to a zero frequency intermediate carrier). Walley does not specify which of these approaches are employed, that is whether it is done directly or indirectly. As such Walley does not disclose whether its receivers directly convert the received signal to baseband without using an intermediate frequency. Gibson discloses a “single conversion receiver/“direct conversion receiver” which converts a received signal to baseband with “zero IF” (i.e., without using an intermediate frequency):

> **We have discussed the need for low power consumption and low cost in designing cordless telephones. These days digital transmitter/single conversion receiver techniques are employed to provide highly accurate quadrature modulation formats and quadrature down conversion schemes that allow a great deal of**

> **flexibility to the baseband section.** Generally, one would have used digital signal processors to perform most of the demodulation functions at the cost of high current consumption. With the advent of application specific signal processing, solutions with these techniques have become more attractive.

EX1022, 1322-23.

> **The direct conversion receiver usually has an intermediate frequency nominally at zero frequency, hence the term zero IF.** The effect of this is to fold the spectrum about zero frequency, which results in the signal occupying only one-half the bandwidth. **The zero IF architecture possesses several advantages over the normal superheterodyne approach.** First, selectivity requirements for the RF filter are greatly reduced due to the fact that the IF is at zero frequency and the image response is coincident with the wanted signal frequency. Second, the choice of zero frequency means that bandwidth for the IF paths is only half the wanted signal bandwidth. Third, channel selectivity can be performed simply by a pair of low-bandwidth low-pass filters.

EX1022, 1323-24.

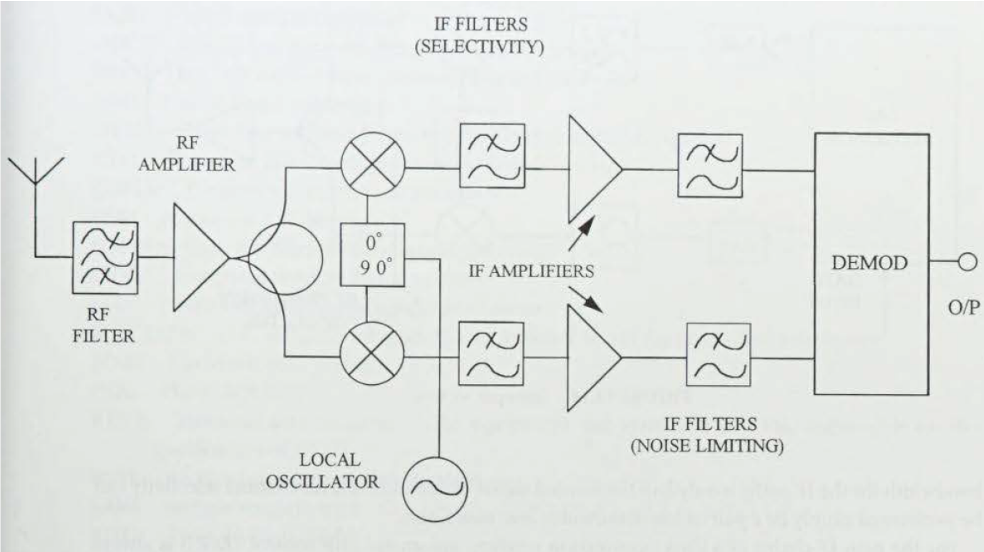


FIGURE 92.13 Direct conversion receiver architecture.

Id., FIG. 92.13.

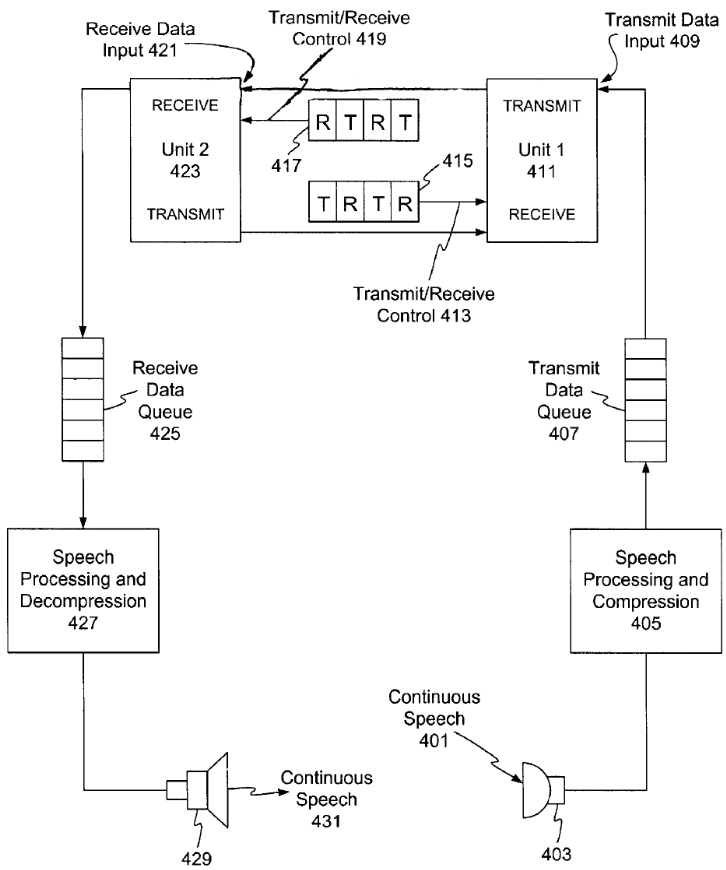
235. It would have been obvious to combine Gibson's direct conversion receiver with the teachings of Walley to provide a receiver including a *direct conversion module configured to receive wireless spread spectrum signal transmissions* in view of Walley's teaching of a "despreader" to perform "separating the original data, encoded with that particular code, from all other CDMA transmissions, and to recover the original data". Gibson is a communications handbook which includes "articles or chapters" that are "written as tutorials or overviews, so that once the reader locates the broader topic, it is easy to find an answer to a specific question." EX1022, iii, title. Gibson explains the benefits of using a "direct conversion receiver" (EX1022, 1322-24), explaining that it is suitable for portable receivers (cordless phones) which need "low power consumption and

low cost" (*id.*, 1322) and provides "several advantages over the normal superheterodyne approach" (*id.* 1323-24), which would use one or more intermediate frequencies. A POSA would have understood that a receiver, such as wireless headphones, would benefit from a component suitable for "low power consumption and low cost" designs. Additionally, a POSA would have understood that the use of Gibson's direct conversion receiver as part of the demodulator suggested by Walley is a simple substitution of one known frequency conversion technique for another to achieve the predictable result of a conversion from a carrier frequency to baseband without the use of an intermediate frequency. Alternatively, a POSA would have understood that the inclusion of Gibson's direct conversion receiver in Walley's receiver is the combination of prior art elements according to known methods to yield predictable results.

[1B] a digital-to-analog converter (DAC) configured to provide an analog audio output signal corresponding to said audio signal representation;

236. It is my opinion that the Walley renders obvious this limitation.

237. Walley describes a system which includes a speech processing and compression block 405 (which digitizes an audio signal before transmission) and a corresponding speech processing and decompression block 427 to reverse that process to provide an audio signal to speaker 429:



EX1015, FIG. 4.

> **The Microphone 403 is coupled to a speech processing and compression block 405 where the continuous speech is digitized and compressed.** The resulting data is provided to the transmit data queue 407, where it is maintained prior to transmission. . . **When the speech processing and decompression module 427 is ready to receive, the data is provided from the receive data queue 425 to the speech processing and decompression module 427 for processing and decompression. The decompressed, processed speech is then provided to an output device, such as the speaker 429, for reproducing it as continuous speech 431.**

EX1015, 6:57-7:26.

> FIG. 2 is a block diagram illustrating a spread spectrum transmitter. Digital data is provided to the system via a digital input 201. The data is then stored in the data queue 203 until it is ready to be transmitted. When the next bit of data is ready to be transmitted, it is clocked out of the data queue via clock line 205 and coupled to the input 221 of the Exor (Exclusive Or) gate 207. The PN Code generator 209 is then clocked via clock signal 211 and the output of the PN code generator 209 is then clocked via clock signal 211 and the output of the PN code generator 209 is coupled to the input 223 of the Exor (Exclusive Or) gate 207. The PN code generator is clocked in a fashion such that each bit of the PN code is exclusive Exor'ed with each bit of the data code. If N is the size of the spreading code used, then clock 211 that clocks the PN code will run at a frequency that is N times faster that the clock 205 which clocks the data. **The output of the Exor (Exclusive Or) gate 207 is coupled to the modulator 213, for modulating the carrier frequency 215. The output of the modulator is coupled to a RF power amplifier 217 and the antenna for broadcasting the signal.**

EX1015, 6:10-34.

> The type of operations that the data input controller can perform are dependent on the data which is input. **If for instance the data is an analog voice waveform, as in the case of a portable phone, the data input controller may perform an analog to digital conversion function.**

EX1015, 9:13-17.

238. A POSA would have understood that a system which receives an *analog signal representation* must convert that input from analog-to-digital before further processing (such as demodulation). A POSA would also have understood, that in order for the receiver to *provide an analog audio output signal corresponding to said audio signal representation* the receiver would take the data from the receive data queue and put it through the speech processing and decompression module which would teach or suggest a digital-to-analog converter to convert the received digital audio signal back to analog form for output through a speaker (i.e., a *digital-to-analog converter configured to provide an analog audio output signal corresponding to said audio signal representation*).

[1C] a speaker configured to generate an audio signal corresponding to said analog audio output signal, wherein said generated audio signal does not include audible audio content originating from any audio signals transmitted in a spectrum used by said spread spectrum transmitter that do not originate from said spread spectrum transmitter;

239. It is my opinion that the Walley renders obvious this limitation.

240. Walley discloses a receiver (portable phone, headphones or a speaker) which includes *a speaker configured to generate an audio signal corresponding to said analog audio output signal*:

> **The decompressed, processed speech is then provided to an output device, such as the speaker 429**, for reproducing it as continuous speech 431**.**

EX1015, 6:57-7:26; *see also id.*, 6:51-56 (explaining that the audio is not limited to continuous speech).

241. Walley's receiver uses a transmitter's unique spreading code to separate the transmitter's audio transmission from other transmissions:

> In a CDMA system, users transmit on the same frequency band. **Each CDMA system has a dedicated code that is used to separate that system's transmission from all others.**

EX1015, 1:27-40; *see also id.*, 1:41-59, 5:33-44.

> Another embodiment of the system comprises a set of wireless speakers. In the case of wireless speakers, there would be transmission in only one direction so the transmit (from the base unit) duty cycle would be maximized.

EX1015, 12:15-24.

242. A POSA would have understood that, by using a transmitter's unique spreading code to receive the transmitter's audio transmission, the speaker would *generate[] audio* which *does not include audible audio content originating from any audio signals transmitted in a spectrum used by said spread spectrum transmitter that do not originate from said spread spectrum transmitter*.

[1D] wherein said portable spread spectrum audio receiver is configured to use independent code division multiple access communication and to use said unique user code to communicate with only said spread spectrum transmitter during a wireless connection;

243. It is my opinion that the Walley in view of Miyake renders obvious this limitation.

244. Walley discloses a receiver which uses a transmitter's unique spreading code to separate the transmitter's transmission from other transmissions:

> In a CDMA system, users transmit on the same frequency band. **Each CDMA system has a dedicated code that is used to separate that system's transmission from all others.**

EX1015, 1:27-40; *see also id.*, 1:41-59 ("Despreading the incoming signal with a particular code involves **separating the original data**, encoded with that particular code, **from all other CDMA transmissions**, and to recover the original data."), 5:33-44 ("[B]y using these different PN codes, spread spectrum signals are **discriminated from all the other spread spectrum transmissions** that may be occurring simultaneously.")

245. Miyake discloses a *receiver is configured… to use unique user code to communicate with only said spread spectrum transmitter* as Miyake teaches that each receiver uses the same spreading code as the transmitter it communicates with, and this spreading code is different from that used by other users:

> To properly carry out communication between the transmitter and the receiver, it is needless to say that the spreading code set on the

> transmitter side should coincide with the spreading code set on the receiver side, and that those spreading codes should differ from those for the other channel users who also use this communication system.

EX1016, 6:63-7:18.

246. A POSA would be motivated to combine the spreading process of Walley with Miyake (which teaches the use of separate, "personal" spreading codes assigned to each user) to provide a spreading process which creates user-specific spreading codes whose code lengths are adjusted to reduce noise/interference in order to allow each user's respective receiver to operate independent of the operation of another user's receiver.

247. Such a combination would involve the use of Miyake's known spreading process to improve Walley's similar spread spectrum system to provide user-specific spreading codes to tailor transmissions based on user preferences. Moreover, it would be a simple substitution of one known element (Walley's system-based spreading code) for another (Miyaki's user-specific spreading code) to obtain predictable results (a user-specific spreading code).

248. CDMA IS-95 is a U.S. digital cellular system based on CDMA and allows users throughout the cellular network to transmit on the same frequency band without interfering with one another by assigning each user a unique code. One of ordinary skill in the art would understand that Walley in combination with Miyake

teaches a CDMA system which is independent as it describes a one to one correlation between a spread spectrum receiver (portable phone) and a spread spectrum transmitter (base station/speaker) where a receiver connects to only one transmitter, rather than a one to many correlation like CDMA IS-95 U.S. digital cellular system where a receiver (portable phone) is configured to roam between multiple different transmitters (base stations/speakers).

249. I understand during previous claim construction that the term "Independent CDMA" was taken to mean "performed independent of any central control". The one-to-one relationship between Miyake's receiver and transmitter teaches this definition as it does not require any centralized control. Additionally, Walley teaches that an orthogonal code is used to separate the transmissions of interest from the rest, so that the receiver only communicates with the transmitter of interest.

[1E] wherein said portable spread spectrum audio receiver is further configured to perform at least one of a plurality of demodulations on at least one of said received wireless modulation transmissions, wherein said plurality of demodulations includes a differential phase shift keying (DPSK) demodulation and a non-DPSK demodulation; and

250. It is my opinion that the Walley in view of Rappaport renders obvious this limitation.

251. Walley discloses the use of a PN code as a specific way to modulate a signal and the use of same PN code to demodulate the signal by a receiver using a

non-DPSK demodulation:

> To decode a spread spectrum transmission at the receiver, it is necessary to "despread" the code. One way to despread the code is to multiply the incoming signal, bit by bit, with the spreading code and sum the result. The process of multiplying the incoming signal bit by bit is commonly known as correlation and upon multiplication, the signal is said to be correlated with the code. Despreading the incoming signal with a particular code involves separating the original data, encoded with that particular code, from all other CDMA transmissions, and to recover the original data.

EX1015, 1:41-51

252. A POSA would have understood that dispreading a spread spectrum transmission to recover the original data would teach or suggest the use of a non-DPSK demodulator on the receiving end to demodulate the modulated signal.

253. Walley discloses a spread spectrum transmitter which includes a "modulator 213, for modulating the carrier frequency 215":

> FIG. 2 is a block diagram illustrating a spread spectrum transmitter. … The output of the Exor (Exclusive Or) gate 207 is coupled to the **modulator 213, for modulating the carrier frequency 215**. The output of the modulator is coupled to a RF power amplifier 217 and the antenna 219 for broadcasting the signal.

EX1015, 6:10-34.

254. A POSA would understand that a receiver receiving the wireless modulated transmissions representative of an audio signal representation from the transmitter would need to demodulate that signal to recover the original signal. Walley does not disclose what type of modulation is performed by modulator 213. A POSA would have understood that this modulator could include, for example a DPSK modulator or an M-ary Quadrature Amplitude Modulation (QAM). For example, Rappaport explains that Differential PSK (DPSK) is a "widely used" modulation technique which advantageously "avoids the need for a coherent reference signal at the receiver" and whose receivers are "easy and cheap to build." EX1018, 242.

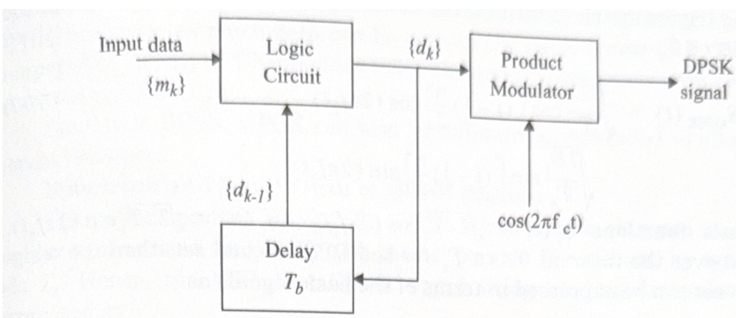


Figure 5.24
Block diagram of a DPSK transmitter.

EX1018, FIG. 5.24.

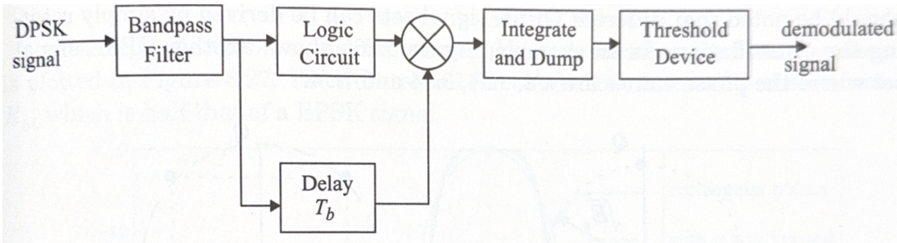


Figure 5.25
Block diagram of DPSK receiver.

EX1018, FIG. 5.25.

255. Rappaport also discloses M-ary QAM, which is a non-DPSK modulation that has "superior" "power efficiency" over M-ary PSK. EX1018, 270-72.

256. A POSA would have understood that the use of either or both Rappaport's DPSK and M-ary QAM modulators and demodulators to perform the modulation and demodulation in Walley's system is the use of a known technique (DSPK and/or 64-ary QAM) to improve a similar wireless system in the same way, that is to modulate a signal. In addition, to the extent the Patent Owner contends that limitation [1E] requires a receiver that is capable of performing *more than one* type of demodulation, any such requirement would still have been obvious. As I explained above, a POSA would have appreciated that DPSK and non-DPSK modulation (and corresponding demodulation) methods each provided different benefits and challenges, and that no single method would always be best for all transmissions and environments. Walley's "generic type spread spectrum controllers

which can be used in a variety of applications" (EX1015, Abstract) would thus benefit from being able to select between a DPSK and a non-DPSK modulation/demodulation to optimize quality/performance for a given wireless application.

[1F] wherein said further processing for reduction of intersymbol interference is separate from said performance of at least one of said plurality of demodulations.

257. It is my opinion that Walley in view of Gibson renders obvious *wherein said further processing for reduction of intersymbol interference is separate from said performance of at least one of said plurality of demodulations* in view of my discussions above with respect to limitations 1a and 1e.

258. For the reasons above, Walley in view of Miyake, Gibson and Rappaport renders obvious claim 1.

Claim 2. The portable spread spectrum audio receiver of claim 1, wherein the portable spread spectrum audio receiver is further configured to perform said plurality of demodulations on the at least one of said received wireless modulation transmissions.

259. It is my opinion that the Walley in view of Rappaport renders obvious the limitation of claim 2.

260. As I explained above with respect to limitation [1E], Walley teaches a transmitter which first modulates a signal with a PN code to "spread" the "signal over a wide bandwidth" and then modulates the signal with modulator 213. I also

explained that Walley did not explain what type of modulation was performed by modulator 213, and explained that Rapport teaches modulation techniques such as DPSK and 64-ary QAM. A POSA would have understood that to restore the original signal, the modulations must be demodulated by the audio receiver. *See* [1E].

261. Thus, Walley in view of Rappaport renders obvious *the portable spread spectrum audio receiver is further configured to perform said plurality of demodulations on the at least one of said received wireless modulation transmissions.*

Claim 3. The portable spread spectrum audio receiver of claim 1, wherein the audio signal representation represents music.

262. It is my opinion that the Walley renders obvious the limitation of claim 3.

263. Walley describes "wireless units to transmit music to speakers or headphones" and "a base unit" which can "broadcast a high fidelity music signal to the hand unit"; it suggests, for example, that this could be done when a person "was placed on hold." *Id.*, 2:33-39, 7:36-40, 12:15-24, 2:67-3:25.

Claim 4. The portable spread spectrum audio receiver of claim 1, wherein said analog audio output signal is capable of representing audio signals below 40 Hz and also capable of representing audio signals above 5 kHz.

264. It is my opinion that the Walley renders obvious the limitation of claim 4.

265. Walley describes a system in which the receiver is capable of processing a high quality audio signal such as high fidelity music and audio having a frequency range of 20 Hz to 20 kHz:

> The type of operations that the data input controller can perform are dependent on the data which is input. … It may also sample the input signal at a given rate. … For example in a portable phone, if the chipping rate of the transmit signal were adequate to **support a sampling rate which would yield a 20 Hz to 20 kHz audio bandwidth,** then the transmit controller 805 might instruct the data input controller to sample at a rate of X samples per second that would yield **a 20 Hz to 20 kHz audio bandwidth**.

EX1015, 8:67-9:35; 2:33-39, 7:36-40, 12:15-24, 2:67-3:25.

Claim 5. The portable spread spectrum audio receiver of claim 1, wherein the portable spread spectrum audio receiver includes a power supply.

266. Walley in view of Gibson renders obvious this limitation.

267. Walley discloses a system which is directed to "wireless communications electronics, such as cordless and cellular telephones, wireless units to transmit music to speakers or headphones, programmable digital assistants and computers with wireless links, pagers, and wireless tracking devices." EX1015, 2:33-39; 2:67-3:25, 11:15-18, 4:48-62, 8:43-47, 8:62-65, 9:13-31, 9:57-60, 10:23-29, 11:23-35.

268. Gibson teaches that "information on the temperature range and **power**

supply" of a system should be collected "to select a [D/A] converter that is accurate over the operating range." EX1022, 114-15. Gibson further teaches that "low power" devices which include "D/A … circuits" may be "battery-operated." EX1022, 107.

269. Thus, Gibson teaches or suggests that devices, such as those including a D/A converter, include a "power supply" such as a battery. EX1021, 107, 114-15. A POSA would have been motivated to combine Walley's receiver (telephone, speaker, headphones) with a "power supply" (such as a "battery") to provide power to the receiver because:

a. Spread spectrum devices such as Walley's receiver require "power" to communicate (EX1015, 5:45-55); and

b. Gibson teaches or suggests that devices which include a D/A converter (such as Walley's receiver (*see* §VIII.C.2.[1B])) use a "power supply" such as a "battery" to provide "power" to the device. (EX1022, 114-15).

270. Accordingly, Walley in view of Gibson renders obvious *wherein the portable spread spectrum audio receiver* (Walley's telephones, speaker or headphones) *includes a power supply* (Gibson's "power supply," such as a "battery").

Claims 8-14

271. Claim 8 and its dependent claims, 9-14, correspond to Claim 1 and its

dependent claims as indicated in the below table, and claims 8-14 are rendered obvious for the same reasons that I provided above with respect to the same elements and claims.

Limitation	Corresponding Limitation
[8P]	[1P]
[8A]	[1D]
[8B]	[1A]
[8C]	[1A]
[8D]	[1E]
[8E]	[1B]
[8F]	[1C]
[9]	Claim 2
[10]	Limitation [1A]
[11]	Claim 4
[12]	Limitation [1C]
[13]	Limitation [1F]
[14]	Claim 5

Claim 17

[17P] A portable spread spectrum audio transmitter coupled to a music audio source, said transmitter configured to transmit a unique user code and wireless modulation transmissions representative of an audio signal representation, said portable spread spectrum audio transmitter configured to:

272. It is my opinion that Walley in view of Miyake renders obvious this limitation.

273. Assuming claim 17's preamble is limiting, Walley in view of Miyake renders obvious *a portable spread spectrum audio transmitter* (Walley's "base unit" or "wireless units") *coupled to a music audio source, said transmitter configured to transmit a unique user code and wireless modulation transmissions representative of an audio signal representation*.

274. As I explained above with respect to the preamble of claim 1 ([1p]), Walley in view of Miyake renders obvious *wireless modulation transmissions from a spread spectrum transmitter coupled to a music audio source* and *wireless modulation transmissions representative of an audio signal representation.* Walley in view of Miyake further renders obvious a transmitter which transmits using a *unique user code. See* [1p].

[17A] encode a first representation of an audio signal to reduce intersymbol interference associated with a transmitted representation of the audio signal;

275. It is my opinion that the Walley in view of Gibson renders obvious this

limitation.

As explained in [1f]: (1) Walley discloses a system in which an audio input signal is digitized and processed prior to transmission, and then processed by the receiver to restore the signal for output; and (2) Gibson discloses the use of precoding a signal to compensate for (i.e., reduce) intersymbol interference in digital communication systems.

276. A POSA would be motivated to combine Gibson's precoding techniques with Walley for the reasons I provided with respect to limitation [1a].

[17B] perform at least one of a plurality of modulations on the first representation of the audio signal;

277. It is my opinion that the Walley in view of Rappaport renders obvious this limitation.

278. Walley discloses the use of a PN code to modulate a signal ("[PN code is] exclusive Exor'ed with each bit of the data code"). *See* [1e] (citing EX1015, 5:13-44.) After modulating the signal with the PN code, Walley discloses that the spread spectrum transmitter uses a "modulator 213, for modulating the carrier frequency 215." *See* [1e] (citing 6:10-34.) As explained in [1e], a POSA would have understood that Walley's modulator 213 could include a DPSK modulator and/or an M-ary QAM, as disclosed in Rappaport. *See* [1e] (citing EX1018, 270-72, FIG. 5.24.).

[17C] generate a modulated signal based on the performance of at least one of the plurality of modulations, wherein the plurality of modulations includes a differential phase shift keying (DPSK) modulation and a non-DPSK modulation; and

279. It is my opinion that the Walley in view of Rappaport renders obvious this limitation.

280. Walley discloses the use of a PN code to modulate a signal (*non-DPSK modulation*). *See* [1e] (citing EX1015, 5:13-44.) Walley discloses a spread spectrum transmitter which includes a "modulator 213, for modulating the carrier frequency 215." *See* [1e] (citing 6:10-34.) As explained in [1e], a POSA would have understood that Walley's modulator 213 could include a DPSK modulator (*DPSK modulation*) and/or an M-ary QAM (*non-DPSK modulation*), as disclosed in Rappaport. *See* [1e] (citing EX1018, 270-72, FIG. 5.24.).

[17D] use the modulated signal and independent code division multiple access communication to wirelessly transmit a transmitted representation of the audio signal.

281. It is my opinion that the Walley in combination with Miyake renders obvious this limitation.

282. As I explained above with respect to limitation [1D], Walley discloses a receiver which uses a transmitter's unique spreading code to separate the transmitter's transmission from other transmissions. *See* [1D] (citing EX1015, 1:27-59, 5:33-44). I also explained that Miyake discloses a transmitter which *use[s] the*

modulated signal and independent code division multiple access communication to wirelessly transmit a transmitted representation of the audio signal as Miyake teaches that each receiver uses the same spreading code as the transmitter it communicates with, and this spreading code is different from that used by other users. *See* [1D] (citing EX1016, 6:63-7:18). I understand that the term "Independent CDMA" was previously construed to mean "performed independent of any central control". The one-to-one relationship between Miyake's receiver and transmitter teaches this definition as it does not require any centralized control.

283. A POSA would be motivated to combine the spreading process of Walley with Miyake (which teaches the use of separate, "personal" spreading codes assigned to each user) to provide a spreading process which creates user-specific spreading codes whose code lengths are adjusted to reduce noise/interference in order to allow each user's respective receiver to operate independent of the operation of another user's receiver. *See also* [1D].

284. This combination would involve the use of Miyake's known spreading process to improve Walley's similar spread spectrum system to provide user-specific spreading codes to tailor transmissions based on user preferences.

285. Moreover, it would be a simple substitution of one known element (Walley's system-based spreading code) for another (Miyaki's user-specific spreading code) to obtain predictable results (a user-specific spreading code).

Claim 18. The portable spread spectrum audio transmitter of claim 17, wherein said plurality of modulations are separate from the encoding and processing by the encoder.

286. It is my opinion that Walley in view of Gibson renders obvious the limitation of claim 18 for the same reasons I provided with respect to limitation [1F].

Claim 19. The portable spread spectrum audio transmitter of claim 17, wherein the transmitted unique user code distinguishes the transmitted representation of the audio signal from other transmitted audio signals in the spread spectrum transmitter spectrum, said other transmitted audio signals not originating from said wireless digital coded audio spread spectrum transmitter.

287. It is my opinion that the '196 Publication renders obvious the limitation of claim 19.

288. As explained with respect to limitation [1D]: (1) Walley discloses a receiver which uses a transmitter's unique spreading code to separate the transmitter's transmission from other transmissions; and (2) Miyake discloses a *receiver is configured to use independent code division multiple access communication* as Miyake teaches that each receiver uses the same spreading code as the transmitter it communicates with, and this spreading code is different from that employed by other users.

289. A POSA would be motivated to combine the spreading process of Walley with Miyake (which teaches the use of separate, "personal" spreading codes assigned to each user) to provide a spreading process which creates user-specific

spreading codes whose code lengths are adjusted to reduce noise/interference in order to allow each user's respective receiver to operate independent of the operation of another user's receiver.

290. This combination would involve the use of Miyake's known spreading process to improve Walley's similar spread spectrum system to provide user-specific spreading codes.

291. Moreover, it would be a simple substitution of one known element (Walley's system-based spreading code) for another (Miyaki's user-specific spreading code) to obtain predictable results (a user-specific spreading code).

Claim 20. The portable spread spectrum audio transmitter of claim 17, wherein the portable spread spectrum audio transmitter includes a power supply.

292. As explained in claim 5, Walley discloses "wireless communications electronics, such as cordless and cellular telephones, wireless units to transmit music to speakers or headphones, programmable digital assistants and computers with wireless links, pagers, and wireless tracking devices."

293. Gibson teaches that "information on the temperature range and **power supply**" of a system should be collected "to select [an A/D] converter that is accurate over the operating range." EX1022, 114-15. Gibson further teaches that "low power" devices which include "A/D circuits" may be "battery-operated." EX1022, 107.

294. Thus, Gibson teaches or suggests that devices, such as those including

an A/D converter, include a "power supply" such as a battery. EX1021, 107, 114-15. A POSA would have been motivated to combine Walley's transmitter (base unit or wireless unit) with a "power supply" (such as a "battery") to provide power to the transmitter because:

a. Spread spectrum devices such as Walley's transmitter require "power" to communicate (EX1015, 5:45-55); and

b. Gibson teaches or suggests that devices which include an A/D converter (such as Walley's transmitter (*see, e.g.,* EX1015, 9:14-17) use a "power supply" such as a "battery" to provide "power" to the device. (EX1022, 114-15).

295. Accordingly, Walley in view of Gibson renders obvious *wherein the portable spread spectrum audio transmitter* (Walley's wireless units or telephone base unit) *includes a power supply* (Gibson's "power supply," such as a "battery").

D. Ground 4: Walley in view of Miyake, Gibson, Rappaport and Drakoulis Renders Obvious Claims 6-7 and 15-16.

1. Overview of the combination; motivation to combine; expectation of success

296. Ground 4 relies on Walley in view of Miyake, Gibson, Rappaport and Drakoulis. A POSA would have been motivated to combine the teachings of Walley, Miyake, Gibson and Rappaport for the reasons provided in Ground 3.

297. As I explained above, I understand that, in another proceeding, PO

argued proposed claims constructions for the terms "transmitter" and "audio source" (i.e., plain and ordinary meaning). EX1023, 4-9. I understand that Petitioner disagrees with those proposed constructions. However, for purposes of Grounds 3 and 4 herein, I apply PO's constructions for these terms to illustrate that, even under PO's proposed constructions, the challenged claims are obvious in view of the cited prior art.

298. A POSA would additionally have been motivated to combine these teachings with Drakoulis. As I explained above, Walley teaches a CDMA spread spectrum controller which addresses the "different requirement" of "wireless communication electronics" such as "headphones." Drakoulis discloses a wireless headphone design which depicts the physical structure of the headphones, including a headphone strap which physically connects two ear speakers and secures the ear speakers to a user's head. EX1021, Abstract, FIGS. 1, 6, 10:22-30. A POSA would be motivated to combine, and would have had a reasonable expectation of success at combining, Drakoulis's wireless headphone design with Walley CDMA/spread spectrum receiver to provide headphones which *integrate[s] the speaker* and *enables a user to secure the speaker on to a head of the user* and which provide *a headphone strap that connects the speaker with another speaker for opposite ear* because the use of a headphone strap to secure headphone ear speakers to a user's head is well-known, and Drakoulis teaches the use of this design for wireless headphones.

2. Challenged Claims

Claim 6. The portable spread spectrum radio receiver of claim 1, further comprising a headphone unit, wherein the headphone unit is configured to integrate the speaker and wherein the headphone unit enables a user to secure the speaker on to a head of the user.

299. Walley in view of Miyake, Gibson and Rappaport renders claim 1 obvious. *See* §III.G.1.

300. It is my opinion that the Walley in view of Drakoulis renders obvious the limitation of claim 6.

301. Walley describes wireless headphones:

> As popularity increases for **wireless communications electronics, such as** cordless and cellular telephones, wireless units to transmit music to speakers or **headphones,** programmable digital assistants and computers with wireless links, pagers, and wireless tracking devices, the demand for cheaper, higher performance devices also increases.

EX1015, 2:33-39.

302. Drakoulis discloses a wireless headphones design which *is configured to integrate the speaker and wherein the headphone unit enables a user to secure the speaker on to a head of the user:*

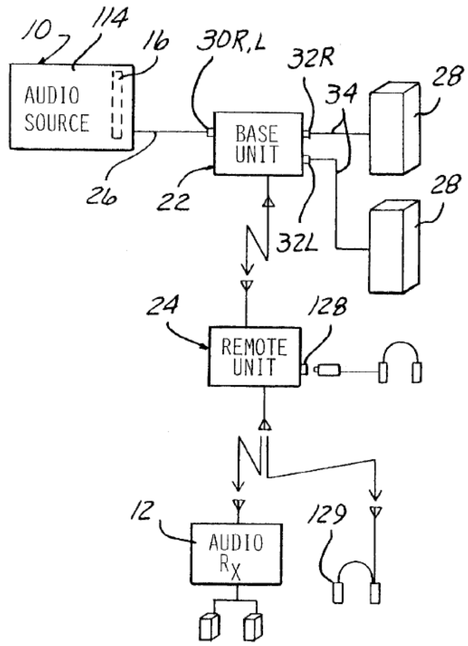


FIG. 1

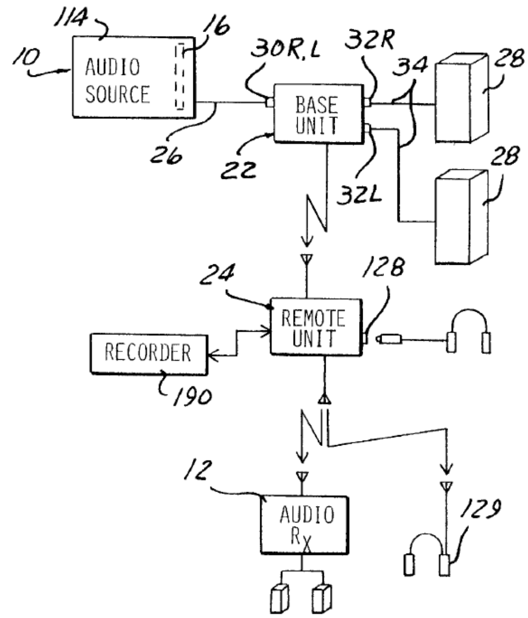


FIG. 6

EX1021, FIGS. 1, 6.

> By way of example, the audio receiver or output device 12, shown in FIG. 1, which is capable of receiving the re-broadcasted transmit signal from the antenna 170 may be a conventional AM/FM stereo receiver, AM/FM radio or even **a wireless headphone having demodulation circuitry mounted therein,** similar to that described above for the stereo decoder 120 and headphone jack 128 mounted on the housing of the remote unit 24.

EX1021, 10:22-30.

303. A POSA would be motivated to combine Drakoulis's headphone design with Walley CDMA/spread spectrum receiver to provide headphones which *integrate[s] the speaker* and *enables a user to secure the speaker on to a head of the*

user as a headphone strap which secures headphone ear speakers to a user's head is well-known, and Drakoulis teaches the use of this design for wireless headphones.

Claim 7. The portable spread spectrum radio receiving of claim 6, wherein the headphone unit comprises a headphone strap that connects the speaker with another speaker for opposite ear.

304. It is my opinion that the Walley in view of Drakoulis renders obvious the limitation of claim 7.

305. Walley discloses headphones which receive wireless transmissions. EX1015, 2:33-39.

306. Drakoulis discloses wireless headphones design which supports include *a headphone strap that connects the speaker with another speaker for opposite ear. See* claim 6 (citing EX1021, FIGS. 1, 6, 10:22-30).

307. A POSA would be motivated to use Drakoulis's headphone design as the use of a strap to connect two ear speakers is well-known, and Drakoulis teaches the use of this design for wireless headphones.

Claims 15-16

308. Claims 15-16, correspond to Claims 6-7, respectively, and thus are rendered obvious by Walley in view of Rappaport for the same reasons.

E. Ground 5: Walley In View of Miyake, Gibson, Rappaport and Drakoulis Renders Obvious Claims 1-20.

1. Overview of the combination; motivation to combine; expectation of success.

309. Ground 5 relies on Walley in view of Miyake, Gibson, Rappaport, and Drakoulis. A POSA would have been motivated to combine, and would have had a reasonable expectation of success at combining, the teachings of Walley, Miyake, Gibson, Rappaport, and Drakoulis for the reasons provided in Ground 4.

310. In contrast to Grounds 3 and 4 above, I apply the constructions set forth in Section VII for the terms "transmitter" and "audio source" for Ground 5.

311. Below, I explain how these terms are met by the combination of Walley and Drakoulis, and I otherwise adopt the arguments I set forth in Grounds 3 and 4 above.

2. Challenged Claims

[1P] A portable spread spectrum audio receiver configured to receive and store a unique user code, said portable spread spectrum receiver configured to receive wireless modulation transmissions from a spread spectrum transmitter coupled to a music audio source, said wireless modulation transmissions representative of an audio signal representation, said portable spread spectrum audio receiver comprising:

312. Assuming claim 1's preamble is limiting, Walley in view of Miyake, Gibson, Rappaport and Drakoulis renders obvious this limitation.

313. As I explained above in Ground 3, Walley in view of Miyake renders

obvious a portable spread spectrum audio receiver configured to receive and store a unique user code, said portable spread spectrum receiver configured to receive wireless modulation transmissions from a spread spectrum transmitter coupled to a music audio source, said wireless modulation transmissions representative of an audio signal representation under the plain and ordinary meanings of "transmitter" and "audio source."

314. As explained in Section VII, the term "transmitter" was previously construed to mean "a device that can be connected into an analog headphone jack to wirelessly transmit an audio signal" and the term "audio source" was previously construed to mean "a device for providing audio that has an analog headphone jack." §II.C. Drakoulis teaches a *transmitter coupled to a music audio source* under these constructions.

315. Drakoulis is directed to an apparatus which "includes **a base unit 22 containing a high frequency transmitter** and a remote unit 24 which is capable of receiving the high frequency transmitted signal." EX1021, 5:27-5:33. **"As shown in FIG. 1, the base unit 22 is adapted to be coupled via jacks or connectors and electrical conductors to the signal source 10.**" EX1021, 5:34-37.

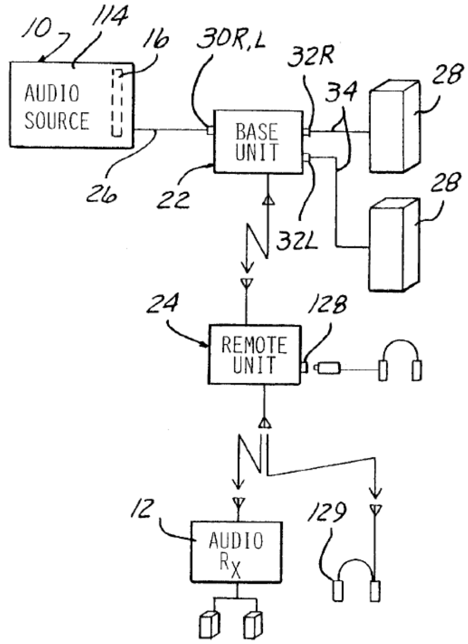


FIG. 1

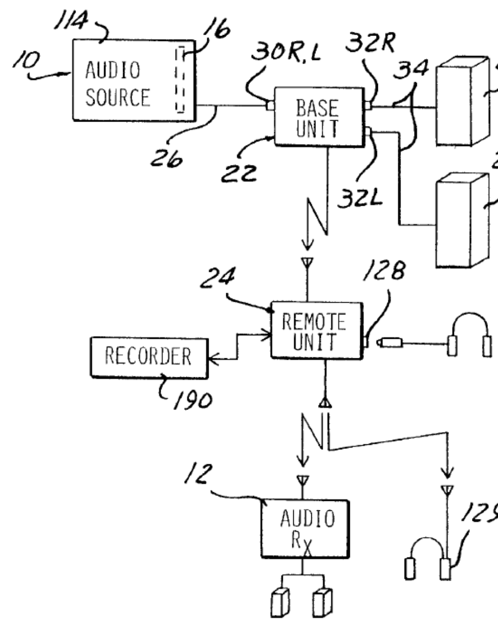


FIG. 6

EX1021, FIGS. 1, 6.

316. Drakoulis teaches that "suitable" "audio sources 10" include "a CD player, AM/FM tuner, tape deck, turntable, etc." EX1015, 5:21-25. Drakoulis further teaches "[a]lthough not shown, a **stereo mini-input jack** and stereo mini-output jack may also be mounted on the housing of the base unit 22 for receiving mini plug connectors attached to cables." EX1015, 5:56-60. Drakoulis thus teaches *a device that can be connected into an analog headphone jack* (base unit 22 through a stereo mini-input jack) *to wirelessly transmit an audio signal.* Drakoulis further teaches *a device for providing audio that has an analog headphone jack* (a CD player, AM/FM tuner, tape deck).

317. A POSA would have been motivated to combine Drakoulis's

transmitter (which can connect to an *audio source* through a headphone jack to wirelessly transmit audio from the *audio source*) with Walley because Walley teaches "generic type spread spectrum controllers which can be used in a variety of applications" and Drakoulis teaches a transmitter which can advantageously add wireless transmission capabilities to an existing, non-wireless audio source.

318. Moreover, it would be a simple substitution of one known element (Walley's transmitter, such as a "wireless unit" or "base unit" capable of transmitting music) for another (Drakoulis's transmitter, which is capable of transmitting music outputted from an audio source's headphone jack) to obtain predictable results (a "wireless unit" or "base unit" capable of transmitting music outputted from an audio source's headphone jack). A POSA would have had a reasonable expectation of success at combining Drakoulis's "stereo mini-input jack" with Walley's transmitters because Walley explains that "any manner of data could be substituted" for the exemplary "continuous speech input" disclosed by Walley, and a stereo mini-input jack is a conventional component that is routinely added to provide audio input to a device.

319. Walley in view of Miyake, Gibson, Rappaport and Drakoulis thus renders obvious a *portable spread spectrum audio receiver* (Walley's phone, speaker or headphones) *configured to receive and store a unique user code* (Walley's spreading code combined with Miyake's user-specific code)*, said*

portable spread spectrum receiver configured to receive wireless modulation transmissions from a spread spectrum transmitter (Walley's wireless unit or base unit modified by Drakous to connect to a headphone jack) *coupled to a music audio source* (e.g., Drakoulis's cd player, radio or tape deck)*, said wireless modulation transmissions representative of an audio signal representation*.

Claims 8-16

As explained in Ground 3, [8P] corresponds to [1P], and [8P] is rendered obvious by the combination of Walley, Miyake, Gibson, Rappaport and Drakoulis for the same reasons set forth above. Elements [8A]-[8F] and claims 9-16 are obvious for the same reasons that I set forth in Grounds 3 and 4 with respect to the same elements and claims.

Claims 17-20

[17P] A portable spread spectrum audio transmitter coupled to a music audio source, said transmitter configured to transmit a unique user code and wireless modulation transmissions representative of an audio signal representation, said portable spread spectrum audio transmitter configured to:

320. As explained in Ground 3, Walley in view of Miyake, Gibson and Rappaport renders obvious *a portable spread spectrum audio transmitter* (Walley's "handsets" or "wireless units") *coupled to a music audio source, said transmitter configured to transmit a unique user code and wireless modulation transmissions representative of an audio signal representation* under the plain and ordinary

meanings of "transmitter" and "audio source."

321. For the reasons explained above with respect to element [1P], under the constructions for "transmitter" and "audio source" set forth in §II.C above, Walley in view of Miyake, Gibson, Rappaport and Drakoulis renders obvious *a portable spread spectrum audio transmitter* (Walley's "base unit" or "wireless units" modified by Drakoulis to connect to a headphone jack) *coupled to a music audio source* (e.g., Drakoulis's cd player, radio or tape deck)*, said transmitter configured to transmit a unique user code* (Walley's spreading code combined with Miyake's user-specific code) *and wireless modulation transmissions representative of an audio signal representation*.

322. Elements [17A]-[17D] and claims 18-20 are obvious for the same reasons that I set forth above in Grounds 3 and 4 with respect to the same elements and claims.

IX. CONCLUSION

323. For the foregoing reasons, it is my opinion that claims 1-20 are invalid in view of Grounds 1-5.

Date: _8 September 2025___

Michael Allan Martin Davies