

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LINKPLAY TECHNOLOGY INC.,
Petitioner

v.

SONOS, INC.,
Patent Owner

IPR2025-00511
U.S. Patent No. 9,213,357

**DECLARATION OF DR. BRUCE HARTPENCE IN SUPPORT OF
PETITION FOR *INTER PARTES REVIEW* OF U.S. PATENT NO. 9,213,357**

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I, Bruce Hartpence, Ph.D., of Rochester, New York, declare that:

I. Introduction

1. My name is Bruce Hartpence, and I have been retained by counsel for Petitioner Linkplay Technology, Inc. (“Linkplay” or “Petitioner”) as an expert witness to provide assistance regarding U.S. Patent No. 9,213,357 (also referred to herein as “the ’357 Patent”). Specifically, I have been asked to consider the validity of claims 1-20 of the ’357 Patent (the “Challenged Claims”) in view of prior art, anticipation, and obviousness considerations, and understanding of a person of ordinary skill in the art (“POSITA”) at the time of the invention as it relates to the ’357 Patent. I have personal knowledge of the facts and opinions set forth in this declaration and believe them to be true. If called upon to do so, I would testify competently thereto.

2. I am being compensated for my time at my standard consulting rate. I am also being reimbursed for expenses that I incur during the course of this work. My compensation is not contingent upon the results of my study, the substance of my opinions, or the outcome of any proceeding involving the challenged claims. I have no financial interest in the outcome of this matter.

3. My analysis here is based on my years of education, research, and experience, as well as my investigation and study of relevant materials, including those cited herein.

4. I may rely upon these materials, my knowledge and experience, and/or additional materials to rebut arguments raised by the Patent Owner. Further, I may also consider additional documents and information in forming any necessary opinions, including documents that may not yet have been provided to me.

5. My analysis of the materials produced in this proceeding is ongoing, and I will continue to review any new material as it is provided. This declaration represents only those opinions I have formed to date. I reserve the right to revise, supplement, and/or amend my opinions stated herein based on new information and on my continuing analysis of the materials already provided.

II. Background and Qualifications

6. I summarize some of my relevant qualifications, work experience, and educational background below. A more detailed recitation of my qualifications and background is provided in my Curriculum Vitae, attached as Appendix A.

7. I earned my B.S. (1996) and M.S. (1998) degrees in Information Technology from the Rochester Institute of Technology. I then continued my formal education, earning a Ph.D. degree in Computing and Information Science from the Rochester Institute of Technology in 2020.

8. Following my Masters degree in 1998, I was an Assistant Professor at the Rochester Institute of Technology, where I taught Network Security Situation Assessment (NSSA) and Information Services & Technology. In 2007, I was

promoted to Associate Professor. I then earned a promotion to Professor in 2016, which is my current role.

9. In the decades I have spent teaching, I have taught many classes relevant to the subject matter of this case. For example, I have taught the following courses:

- Network Services
- Large Scale Networking
- Data Communication & Networks
- Internetworking
- Computer Concepts
- Introduction to Routing and Switching
- Networking for Developers
- Wireless Networking
- Network Fundamentals
- Design and Deployment of Wireless Networks
- Advanced Switching
- Computer Platform Fundamentals Lab
- Data Communications
- OS Scripting
- Wireless Concepts
- Sys Admin I
- Wireless Security
- Network Security Lab
- Advanced Switching
- Network Programming Lab
- Network Design and Performance
- Troubleshooting
- Intro to VoIP
- VoIP QoS and Security
- Wireless Networking
- Virtualization
- Voice over IP

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- Advanced Routing and Switching
 - Software Defined Networks Seminar
 - Enterprise Computing
 - Graduate Advanced Wired Networking
 - Wireless Design
 - Graduate Data Communication and Networks
 - Graduate Introduction to Programming with Data
 - Python for ML and AI

10. Over the course of the last three decades of scholarship, I have authored numerous publications relevant to the subject matter of this case. These include eleven books that I have written all of, or chapters of. They are:

- Hartpence, Bruce. Packet Guide to Routing and Switching. 1st ed. Sebastopol, CA: O'Reilly Media, 2011. Print;
- Hartpence, Bruce. Packet Guide to Core Network Protocols. 1st ed. Sebastopol, CA: O'Reilly Media, 2011. Print;
- Hartpence, Bruce. "Basic Device and Protocol Security." Network Security, Administration and Management. Ed. Dulal Kar and Mahbubur Syed. Hershey, PA: IGI Global, 2010. 1-19. Print;
- Hartpence, Bruce. The Packet Guide to Voice over IP Protocols. first ed. Sebastopol, Ca: O'Reilly, 2012. Print;
- Hartpence, Bruce. Packet Guide to Core Network Protocols. 1st ed. Sebastopol, CA: O'Reilly Media, 2011. Print;
- Hartpence, Bruce. "Internet Protocol Version 6." The Packet Guide to Core Network Protocols. Sebastopol, Ca: O'Reilly, 2012. 30. Print;
- Hartpence, Bruce. The Packet Guide to Voice over IP Protocols. first ed. Sebastopol, Ca: O'Reilly, 2012. Print;
- Hartpence, Bruce. "Transmission Control Protocol." The Packet Guide to Core Network Protocols. Sebastopol, Ca: O'Reilly, 2014. 200-230. Print;
- Hartpence, Bruce. "User Datagram Protocol." The Packet Guide to Core Network Protocols. Sebastopol, Ca: O'Reilly, 2014. 230-255. Print;
- Hartpence, Bruce. "Network Address Translation." The Packet Guide to Routing and Switching. Sebastopol, California: O'Reilly, 2016. 30.

Print; and

- Hartpence, Bruce. "Multicast." The Packet Guide to Routing and Switching. Sebastopol, California: O'Reilly, 2016. 35. Print.

11. These publications further include the following relevant scholarly articles. They are:

- Hartpence, Bruce, and Andres Kwasinski. CNN and MLP Neural Network Ensembles for Packet Classification and Adversary Defense. 2021 Intelligent and Converged Networks, IEEE, 2021.
- Hartpence, Bruce. Neural Network Architectures and Ensembles for Packet Classification: Addressing Visibility, Security and Quality of Service Challenges in Communication Networks. Rochester Institute of Technology, 2020.
- Hartpence, Bruce, and Andres Kwasinski. A Convolutional Neural Network Approach to Improving Network Visibility. 2020 29th Wireless and Optical Communications Conference (WOCC). IEEE, 2020.
- Hartpence, Bruce, Andres Kwasinski, "Combating TCP Port Scan Attacks Using Sequential Neural Networks", IEEE ICNC, 2020;
- Hartpence, Bruce, Kwasinski, A., "Fast Internet Packet and Flow Classification Based on Artificial Neural Networks", IEEE Southeastcon, 2019;
- Hartpence, Bruce, and Rossi Rosario. "Software Defined Networking for Systems and Network Administration Programs." The USENIX Journal of Education in System Administration (2016): 12;
- Hartpence, Bruce, "Performance Evaluation of Networks with Physical and Virtual Links", IEEE Global Information Infrastructure and Networking Symposium (GIIS), 2015;
- Hartpence, Bruce, Curricular and Performance Measurement Challenges in Cloud Environments, SIGITE 2014;
- Sharma et al., Performance of Meshed Tree Protocols for Loop Avoidance in Switched Networks, ICNS 2014;
- Sharma, K, et al, "Meshed Tree Protocol for Faster Convergence in Switched Networks", IARIA, 2014;
- Ghosh A., Hartpence B., Johnson D., Shenoy N., "A practical study of the problems of current Internet Routing Tables", SAM, 2013;

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- Hartpence B, et al, “Global Crossing Whitepaper: Strengthening BGP and User Data Security Using Flow Analysis”, 2010;
 - Hartpence, B., Troell, L., Simmons, S., “Study of the Performance of Safenet Ethernet Encryptors and a Comparison to IPSec Encryption Data”, Safenet and RIT whitepaper 2006;
 - Bischof, H.P., Hartpence, B., Hui, F., Shenoy, N., “LAC Technical Report: A Robust Framework for Secure Connectivity and Roaming Over Serverless, Wireless Networks”, 2003; and
 - A Networking and System Administration Laboratory Infrastructure To Support High Traffic Environments, CITC3, Leone, Weber, Hartpence, 2002.

12. In addition to organizing communication conferences at RIT from 2005-2007, my work has been highlighted at the following conferences:

- Wireless and Optical Communications Conference (WOCC), 2020;
- International Conference on Computing, Networking and Communication (ICNC), 2020;
- IEEE Big Data, 2019;
- IEEE Southeastcon, 2019;
- IEEE Global Information Infrastructure and Networking Symposium (GIIS), 2015;
- Global Environment for Network Innovation, 2014, 2015;
- Education and Information Systems, Technologies and Applications (EISTA), 2011, 2013;
- Security and Management Conference, 2010, 2013;
- Consortium for Computing Sciences in Colleges — Northeastern Region, 2007;
- Special Interest Group for Information Technology Education (SIGITE) Conference, 2005, 2007, 2009, 2014; and
- Computer Information Technology Conference (CITC3) Conference, 2002.

13. In addition to my scholarly publications, I have also produced over 400 videos on my YouTube channel teaching material relevant to the subject matter of

this case. These videos have totaled over half a million views. Some specific examples of relevant videos include:

- iperf Testing - How does it work with TCP and UDP?
- RFC 768 User Datagram Protocol
- The Packet Guide to VoIP Chapter 4 – RTP and RTCP
- Transmission Control Protocol (TCP) part 1
- Packet Guide to Voice over IP: Intro to VoIP Chapter 1 part 1
- RFC 791 Internet Protocol
- Packet Guide to VoIP Chapter 3 part 1 - Session Initiation Protocol (SIP)
- Packet Guide to VoIP Chapter 2 part 1 - Traditional Telephony
- SIP and H.323 VoIP Signaling Overview
- Domain Name System (DNS)

14. Prior to my time in this field, I served in the U.S. Navy for 6 years aboard the U.S.S. Enterprise (CVN-65). Following this experience, I then worked as an electrical technician for Mobil Chemical in Macedon, New York for four years.

III. Level of Ordinary Skill in the Art

15. In rendering the opinions set forth in this declaration, I was asked to consider the patent claims and the prior art through the eyes of a person of ordinary skill in the art (“POSITA”) at the time of the alleged invention. I understand the ’357 Patent was first filed October 17, 2014, but it also claims the benefit of priority to several earlier non-provisional applications and an earlier provisional application filed July 28, 2003. I also understand that Patent Owner has alleged that the invention was conceived even earlier, by April 25, 2003. I have used the Patent Owner claimed conception date of April 25, 2003 for my analysis related to a POSITA in this

declaration. I understand, however, the Patent Owner has to prove such date, which it has not in the proceeding.

16. I understand that the factors considered in determining the ordinary level of skill in a field of art include the level of education and experience of persons working in the field, the types of problems encountered in the field, the teachings of the prior art, and the sophistication of the technology at the time of the alleged invention. I understand that a POSITA is not a specific real individual, but rather is a hypothetical individual having the qualities reflected by the factors above. I understand that a POSITA would also have knowledge from the teachings of the prior art, including the art cited below.

17. Taking these factors into consideration, on or before the invention date of the '357 Patent, a POSITA of the '357 Patent would have had a Bachelor's degree in electrical engineering, computer engineering, computer science, information technology, or a related field, along with at least two years of experience in the design or development of connected consumer electronics, networked engineering or the equivalent. Additional graduate education could substitute for professional experience, or significant experience in the field could substitute for formal education.

18. Before the invention date, my level of skill in the art was at least that of a POSITA. I also had extensive experience working with people having level of skill

of a POSITA at the time of the invention. I am qualified to provide opinions concerning what a POSITA would have known and understood at that time, and my analysis and conclusions herein are from the perspective of a POSITA as of the invention date.

IV. Materials Considered and Relied Upon

19. In reaching the conclusions described in this declaration, I have relied on the documents and materials cited herein as well as those identified in this Declaration, including but not limited to, the '357 Patent, the prosecution history and reexamination of the '357 Patent, and prior art references cited herein. These materials include patents, related documents, and printed publications. Each of these materials is a type of document that experts in my field would have reasonably relied upon when forming their opinions.

20. In the cited references, all emphasis is added unless otherwise noted.

21. I have also relied on my education, training, research, knowledge, and personal and professional experience in the relevant technologies and systems that were already in use prior to, and within the timeframe of the assumed invention date of the claimed subject matter in the '357 Patent, which is alleged to be April 25, 2003.

- EX1001: U.S. Patent No. 9,213,357 to Millington *et al.* (“the '357 Patent”)
- EX1002: Prosecution History of the '357 Patent

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- EX1004: *Ex Parte* Reexamination (Control No. 90/013,959) History of Claims 9-12 and 19 of the '357 Patent
 - EX1005: U.S. Patent App. Pub. No. US 2003/0083024 A1 to Richenstein *et al.* ("Richenstein")
 - EX1006: Claim Construction Decision from Sonos, Inc. v. D&M Holdings
 - EX1008: MOST Specification Rev. 2.0 ("MOST")
 - EX1009: U.S. Patent No. 7,116,894 to Chatterton *et al.* ("Chatterton")
 - EX1010: RFC 1889

22. In support of my knowledge of the art and explanations below, I have further provided some exemplary references demonstrating aspects of the state of the art, which have been included as Exhibits 1011-1035 and 1042-1044. These references do not contain the full scope of my experience, knowledge, and understanding of the art and how it has developed, but they do provide some exemplary information regarding the state of the art during the relevant time frame. Unless otherwise stated, the exhibits I reference in my report represent the sources as I reviewed or retrieved them during my analysis.

V. Legal Standards

23. I am not a lawyer and do not provide any legal opinions, but I have been advised that certain legal standards are to be applied by technical experts in forming opinions regarding the meaning and validity of patent claims. I have applied the legal standards described below, which were provided to me by counsel for the Petitioner.

24. It is my understanding that assessing the validity of a U.S. patent based on a prior art analysis requires two steps. First, one must construe the terms of the patent claims to understand what meaning a POSITA would have given the terms. Second, after the claim terms have been construed, one may then assess validity by comparing a patent claim to the “prior art.” I understand that the teaching of the prior art is viewed through the eyes of a POSITA at the time the invention was made. My analysis as to what constitutes a POSITA is set forth above.

A. Legal Standard for Priority Date

25. I understand that the “priority date” or “effective filing date” of a patent is the date on which it is filed, or the date on which an earlier-filed U.S. or international patent application was filed if the patentee claims the benefit of priority to that earlier-filed U.S. or international patent application. I further understand that in order for the patent to be entitled to the priority date of the earlier filing, at least one claim in the application of the patent, upon filing, must be supported by the written description of the earlier-filed U.S. or international patent application.

B. Legal Standard for Anticipation

26. I have been informed that a patent claim may be “anticipated” if each element of that claim is present either explicitly or inherently in a single prior art reference, and that the elements should be arranged in the reference as in the claim. I understand that for a claimed limitation to be inherently present, the prior art need

not expressly disclose the limitation, so long as the claimed limitation necessarily flows from the disclosure of the prior art. I understand there is no requirement that a person of ordinary skill in the art would have recognized the inherent disclosure at the relevant time, but only that the subject matter is in fact inherent in the prior art reference. I also understand that in order for a prior art reference to anticipate a claim of a patent, the reference must enable one of ordinary skill in the art at the time of the filing to practice the claim without undue experimentation.

C. Legal Standard for Obviousness

27. I have been informed that a patent claim can be considered to have been obvious to a person of ordinary skill in the art at the time the application was filed. This means that, even if all of the requirements of a claim are not found in a single prior art reference, the claim is not patentable if the differences between the subject matter in the prior art and the subject matter in the claim would have been obvious to a person of ordinary skill in the art at the time the application was filed.

28. I have been informed that a determination of whether a claim would have been obvious should be based upon several factors, including, among others:

- the scope and content of the prior art;
- what differences, if any, existed between the claimed invention and the prior art; and
- the level of ordinary skill in the art at the time.

29. I have been informed that a single reference can render a patent claim obvious if any differences between that reference and the claims would have been obvious to a person of ordinary skill in the art. Alternatively, the teachings of two or more references may be combined in the same way as disclosed in the claims, if such a combination would have been obvious to one having ordinary skill in the art. In determining whether a combination based on either a single reference or multiple references would have been obvious, it is appropriate to consider, among other factors:

- whether the teachings of the prior art references disclose known concepts combined in familiar ways, and when combined, would yield predictable results;
- whether a person of ordinary skill in the art could implement a predictable variation, and would see the benefit of doing so;
- whether the claimed elements represent one of a limited number of known design choices, and would have a reasonable expectation of success by those skilled in the art; whether a person of ordinary skill would have recognized a reason to combine known elements in the manner described in the claim;
- whether there is some teaching or suggestion in the prior art to make the modification or combination of elements claimed in the patent; and

- whether the innovation applies a known technique that had been used to improve a similar device or method in a similar way.

30. I understand that one of ordinary skill in the art has ordinary creativity and is not an automaton. I also understand that in considering obviousness, it is important not to determine obviousness using the benefit of hindsight derived from the patent being considered.

31. I understand that various objective or “real world” factors may be indicative of non-obviousness. I understand that such factors are known as “secondary considerations” and they may include:

- the commercial success of the claimed invention;
- the existence of a long-felt, unresolved need for a solution to the problem solved by the claimed invention;
- failed attempts to solve the problem solved by the claimed invention;
- copying of the claimed invention;
- unexpected results of the claimed invention;
- praise for the claimed invention by others in the relevant field; and
- willingness of others to accept a license under the patent because of the merits of the claimed invention.

32. I understand that, for a secondary consideration to be relevant to the

inquiry of obviousness, the evidence must demonstrate a nexus between that secondary consideration and the claimed invention. I understand that the nexus must be to some aspect of the claim not already in the prior art, and if the secondary consideration is actually directed to what was not known in the prior art, including patents and publications, there is no nexus.

VI. Technology Background

A. Introduction to Computer Networking

33. In order for two or more electronic devices to communicate with each other, share resources or data, or interact in any way there must be a connection between them. Any time that two or more electronic devices are connected for these purposes, it creates a computer network, i.e., a set of connections with a shared medium, interface, and communication format. There are countless different ways to build a network depending on its specific purpose, including different device components, different connection types or communication paths, and different network architectures or “topologies.” Each design choice made in building the network will come with different pros and cons, and accounting for these in the design is a critical role for one skilled in the art.

34. To help those in the field track the norms and common approaches to different technical problems, multiple groups and organizations have worked to define and publish industry standards as reference materials. The two leading

organizations are the Institute of Electrical and Electronics Engineers (“IEEE”), founded in 1884,¹ and Internet Engineering Task Force (“IETF”), founded in 1986,² but there have been countless different standards in the field. Standards provide useful reference tools for those in the field on how to design functional systems and devices to be compatible with each other. Some standards are made available for free, while others are made available for a fee.

B. Networks

35. Networks are commonly described as either Wide Area Networks (“WANs”) or Local Area Networks (“LANs”) depending on their geographic coverage. While a WAN may extend to different parts of a single country or even the world, a LAN is isolated to a specific building or campus.³

36. By at least the early 2000’s, both LANs and WANs could be built using wired or wireless connections to transmit electrical, optical, or radio signals. For example, by the early 2000’s there were multiple options for wired or “twisted pair” standards including IEEE 802.3 (known as “ethernet”), Universal Serial Bus

¹ EX1042 ([IEEE - History of IEEE](https://www.ieee.org/about/ieee-history.html?utm_source=linklist_text&utm_medium=lp-about&utm_campaign=history)) (available at https://www.ieee.org/about/ieee-history.html?utm_source=linklist_text&utm_medium=lp-about&utm_campaign=history)

² EX1043 ([IETF | Introduction](https://www.ietf.org/about/introduction/)) (available at <https://www.ietf.org/about/introduction/>)

³ EX1011 ([Functional Requirements Ver. 6.8](#)) at 2.

(“USB”), and Media-Oriented Systems Transport (“MOST”).⁴ Similarly, by the early 2000’s IEEE had provided 802.11, which standardized both RF and IR transmissions as Wireless Local Area Networking (“WLAN”).

37. In designing a network, the transmission speed and range of physical media must be accounted for, for which I’ve summarized some exemplary measurements below:⁵

Medium	Data Rate (Mbps)	Range (ft)
IEEE 802.3	100	-
USB ⁶	480	-
MOST ⁷	24.8	-
WLAN ⁸	11	250-300
Bluetooth ⁹	0.8-1.0	30

C. Network Devices

38. Any device that can connect to another device can be a part of a network. Computers, phones, and satellites were among the first computer network devices,

⁴ EX1017 (IEEE 802.3); EX1013 (USB Specification Rev. 2.0); EX1008 (MOST Specification Rev. 2.0).

⁵ EX1019 (A Technology Comparison, Memson Corp.) at 5.

⁶ USB 2.0 Specification at 1.

⁷ EX1008 (MOST Specification Rev. 2.0.) at 85.

⁸ EX1019 (A Technology Comparison, Memson Corp.) at 5.

⁹ EX1019 (A Technology Comparison, Memson Corp.) at 5.

going as far back as the 1960's with ARPANET.¹⁰ Even as early as the 1980's, Carnegie Melon's CS department had added networking capabilities to a refrigerator so the department could remotely check whether there was cold Coca Cola available.¹¹ And as of the early 2000's, that list had expanded to include a wide array of devices including printers¹², scanners¹³, PDAs¹⁴, projectors¹⁵, and even baby monitors¹⁶, to name a few.

39. Effectively networking of these varied devices requires organizing each group of devices into the right network architecture and using the right kinds of network connections to the needs of the design. In order to structure the way different devices are networked, references models like the OSI model and the more operational TCP/IP model are a helpful tool to keep things straight.

1. The TCP-IP Model

40. The TCP-IP model separates network activity into the following four layers, as also shown below in my exemplary figure: Layer 1 (Physical), Layer 2 (Link), Layer 3 (Internet), Layer 4 (Transport), and Layer 5 (Application).

¹⁰ EX1014 ([Looking back at the ARPANET effort, 34 years later](#)).

¹¹ EX1015 (The "Only" Coke Machine on the Internet).

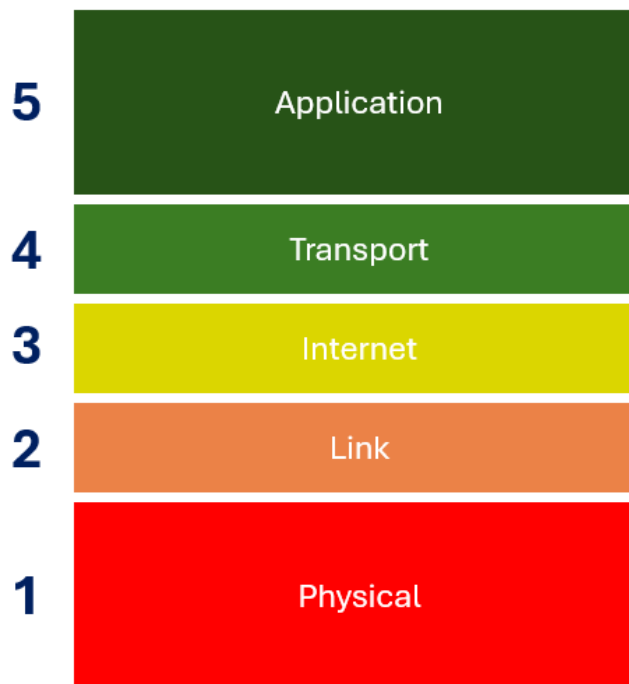
¹² EX1020 ([News release details-News Releases | KONICA MINOLTA](#)).

¹³ EX1021 ([Microtek ArtixScan 1800f with USB 2.0 announced | ePHOTOzine](#)).

¹⁴ EX1022 ([Sony unveils 'PalmPowered' entertainment PDA • The Register](#)).

¹⁵ EX1023([NEC MT1065: Network- Ready Wireless Projector](#)).

¹⁶ EX1024 ([Introduction to Industrial Networking](#)).



41. Each layer of the stack occurs within a single device or system, and defines with how that device connects to other devices over a network. There are many different types of network connection, but at the lowest level, each network is defined by signal transmissions. The lowest layer, Layer 1 in the TCP-IP stack is the Physical Layer, and it defines the electrical and mechanical specifications; how the device sends and receives network signals over a given transmission medium.

42. As part of its responsibility to send and receive the transmission signals over the network, i.e., networking interfacing, the Physical Layer is also responsible for encoding and decoding the bits (as frames for example, for Ethernet connections).

43. The next layer, Layer 2, is the “Link Layer,” which is responsible for translating the bits and frames from Layer 1 into “frames,” managing the access

method, error control and Layer 2 addressing.

44. The next layer, Layer 3 is the “Internet Layer.” The Internet Layer is responsible for the construction of the IP packet. This includes the IP addressing, Layer 3 header checksum, quality of service bits and the encapsulation of the Layer 4 header and application data. Layer 3 is also responsible for routing of IP packets

45. At Layer 4, the “Transport Layer,” TCP-IP ensures reliable data transmission across networks using transport protocols, including TCP and UDP, based on error prevention means including retransmissions, ack receipts, etc.¹⁷

46. Finally, at the Application Layer, the TCP-IP model provides data translation and organization for application specific requirement and end-user activity.

D. Electronic Timekeeping

47. Accurate timekeeping requires a means for measuring/controlling both the rate at which time is passing and current value at any given instant. This is true regardless of whether the timekeeping is analog, digital, or even solar. For electronics, the rate of time comes from a process called “clocking,” while the current value could be a counter or a real-time or “time-of-day” clock. Each of these can be determined internally by the device itself, or externally by a received signal

¹⁷ EX1026 (RFC 793 (TCP)); EX1027 (RFC 768 (UDP)).

or command over a network

1. Crystal Oscillator Clocking

48. Many electronics use crystal oscillators to generate an internal pulse or rhythm to use for timekeeping. By applying a current to the crystal, the crystal produces a wave with a specific frequency. There are many types of oscillators and many ways to control the frequency including shape and type of crystal, applied voltage, etc., allowing flexibility with respect to the frequency used. When left alone to run consistently over time, crystal oscillators provide highly regular waves and frequencies to measure the passage of time.¹⁸ Processors then use the oscillator's frequency output for higher order timekeeping purposes including event coordination, tracking counters, and creating clocks.

2. Counters

49. Most electronic devices track oscillator output in ticks, where each cycle increments by one tick. By counting the number of ticks, processors can execute sequential actions and programming without performing any subsequent steps to translate a tick total change into another time unit.

3. Real-Time Clocks

50. At the operating system level, counters are insufficient for many types of programming and applications. Instead, additional processors take the oscillator

¹⁸ EX1028 (RTC Oscillator Guide) at 1.

clocking and using it to build a real-time clock with a “time of day” reading using the human interpretable seconds, minutes, hours, days, etc. values. Real-time clocks are often corrected using external sources to provide consistent readings across devices. For example, the National Institute of Standards and Technology provides a “Coordinated Universal Time” (“UTC”) for computers around the globe to synchronize to.¹⁹ As explained further below, UTC is distributed from global reference clock servers as an external source of time for networked computers.

E. Network Synchronization

51. By connecting devices together on a network, there are unlimited options for ways to use those devices. However, for some purposes, timing is critical which requires synchronization between devices. Since at least the 1980’s, there have been known challenges to achieving synchronization, including how to measure the current time at any given clock, how to maintain the same pace of time on each clock, and how to eliminate the impact of transmission time when communicating about the first two items. There have been multiple protocols and proposals addressing issues with synchronization, but some of the most common ones in the early 2000’s were IETF’s NTP and IEEE’s PTP.

¹⁹ EX1029 (NIST Computer Time Services-May 2002) at 1.

1. Phase-Locked Loop

52. Due to its fundamental role in electronic timekeeping, controlling the oscillator's wave output is a key piece. When the oscillator's output and the target output fully align, the oscillator is described as "in phase." Adjusting the voltage higher or lower to adjust the oscillator output allows oscillators that are out of phase to move into phase.

53. A common application of this is called the "Phase-Locked Loop" or ("PLL"). In a PLL, the oscillator's output is compared to its target output, and the voltage is adjusted based on the difference between the two in a loop. With repeated loops, the oscillator's output and the target output align, and the oscillator becomes "Phase-Locked." PLL circuits commonly feed an external signal to define the target output, allowing the oscillator's output to be controlled by the external source. These signals can be provided as isolated transmission or as a preamble to another transmission.

2. NTP

54. In 1985, David Mills authored the IETF standard for "Network Time Protocol" or "NTP."²⁰ As explained, NTP measures absolute real-world time using from a fixed point (0000 UT January 1, 1900) using a 64 bit (32 for integers and 32 for fractions).

²⁰ EX1030 (RFC 958).

55. At a high level, NTP is a top-down method with a fixed or “absolute” time value measurement (UT). NTP is designed to distribute this time as widely as possible, while losing as little accuracy as possible. To do so, NTP relies on a small number of “NTP servers” or “primary reference clocks” each tasked with maintaining its own absolute time, precision, error, and drift rate information based on inputs and feedback from national standards (atomic clocks) and its peer NTP servers.²¹ With the NTP servers in place, NTP clients request the same information from the servers or intermediates to calibrate their own NTP time measurements, gaining accuracy and precision over time as more datapoints inform its local measurements.²² NTP requests rely on UDP (Layer 3 Transport) to provide time synchronization at the Application Layer 4 of TCP-IP.

56. Based on this same original premise from 1985, NTP has been the leading synchronization means for decades, including by the early 2000’s when NTP version 2.0 had established a more expansive multilevel hierarchy of master and slave servers to provide NTP service worldwide.²³ Implementing NTP, devices around the globe were able to achieve synchronized time readings with accuracy to the low millisecond level.²⁴

²¹ EX1030 (RFC 958, §3).

²² EX1030 (RFC 958, §2).

²³ EX1031(RFC 1305).

²⁴ EX1032 (RFC 2030, §1).

3. *SNTP*

57. “Simple Network Time Protocol” or “SNTP” was introduced as a less architecturally intensive version of NTP, which implements synchronization than the standard NTP, relying on the same messaging with clients to synchronize each device’s time measurements.²⁵

58. Instead of relying on the NTP servers and expansive hierarchy and algorithms to obtain a reliable time, RFC 4330 explains that SNTP servers should just be connected to another reliable source like a radio clock or a telephone modem.²⁶ In SNTP implementations, the accuracy can be achieved to a few milliseconds, slightly worse but generally on the same level as standard NTP.

4. *PTP*

59. In contrast to NTP’s top-down methodology, IEEE published a “Precision Time Protocol” as IEEE1588-2002, where the primary goal was precision coordination for “measurement and control systems” between different devices.²⁷

60. Rather than focusing on an absolute time value, PTP’s methodology focuses on measuring the delays in transmission as precisely as possible. To that end, PTP includes ports with the sole purpose of timestamping PTP measuring.²⁸ The

²⁵ EX1032 (RFC 2030, §6).

²⁶ EX1032 (RFC 2030, §6).

²⁷ EX1033 (IEEE 1588-2002) at 1.

²⁸ EX1033 (IEEE 1588-2002) at 118.

PTP standard then identifies the key sources of inaccuracy between sending and receiving a timestamp between devices.

The achievable accuracy of a PTP system is limited by the following:

- The delay fluctuation in the protocol stacks of PTP clocks
- The delay fluctuation in network components
- Timestamping accuracy
- Stability issues²⁹

61. Among other recommendations, PTP advises placing the PTP port as close to the physical layer as possible, reducing as much of the stay delay as possible. PTP further provides that if stamping cannot be achieved close enough to the physical layer, the PTP timestamp for a given message can be included as a separately transmitted timestamp following up on the previous message, i.e., a “Follow-up” message.³⁰ Additionally, PTP is provided to be best suited for local systems, where there is less component delay or fluctuation. As a result of this design and intended purpose, PTP systems can achieve synchronization to the sub-microsecond level.

F. Media Networking

62. Throughout the 1990’s, networking was leveraged to create more flexible and powerful media playback systems including home theatres and sound systems. How each network was designed varied based on the needs of the media

²⁹ EX1033 (IEEE1588-2002) at 118.

³⁰ EX1033 (IEEE1588-2002) at 118.

and the networking capabilities. Some of the distinguishing features for a media network include whether it is analog or digital and how the media is shared between devices.

G. Digital/Analog Convertors

63. Signals are analog, where media and transmissions are encoded into individual bits grouped together in samples. For many of the systems and networks, this means including a way to convert between digital and analog formats, i.e., Digital-to-analog Convertors or “DACs,” and Analog-to-digital Converts or “ADCs.”³¹ ADCs are tasked with taking the continuous analog waveform and breaking it down into discrete blocks or “samples,” where each sample accounts for a specific period of time. The number of samples taken per second of content is its “Sampling Rate” measured in kHz.³² The converted digital content can then be stored, i.e., burnt to a CD or DVD, saved as a file, etc., or transferred over a network as a digital signal. For playback, the DAC reverses the conversion, producing the analog signal based on the sampling rate for the stored data.

H. Data Transmission

64. There is a connection between the sampling rate desired for rendering quality and the rate of data transmission across the physical medium. Multiplying

³¹ EX1016 (Aspects of Data Acquisition System Design) at 1.

³² EX1016 (Aspects of Data Acquisition System Design) at 1.

the sampling rate by the bits per sample provides the corresponding data rate for that audio. As explained above regarding network transmission media, different network connections transfer data at different speeds. In the table below, I provide a comparison between the speed that different types of audio are sampled (kHz) and the corresponding data transmission rate (Mbps).³³

Audio Quality	Sampling Rate (kHz)	Bits/Sample	Data Rate
DVD-A	96	24	2.304Mbps
DVD-A	48	24	1.152Mbps
CD-A	44.1	16	706Kbps
Telephone quality	8	8	64Kbps

VII. Overview of the '357 Patent

A. The '357 Patent

65. The '357 Patent is titled "Obtaining content from remote source for playback." The '357 Patent issued on December 12, 2015, from U.S. Patent Application No. 14/516,867, filed on October 17, 2014, and claiming to be a continuation of Application No. 13/297,000, filed on Nov. 15, 2011, which claims to be a continuation of Application No. 10/816,217, filed on Apr. 1, 2004, now Pat.

³³ See e.g., EX1034 (Chapter 22, The Scientist and Engineer's Guide to Digital Signal Processing, Steven W. Smith, January 1, 1997) (available at <https://www.dspguide.com/>).

No. 8,234,395, which claims priority to Provisional Application No. 60/490,768, filed on Jul. 28, 2003.

66. The '357 Patent describes “a plurality of audio playback devices that receive digital audio information that is to be played back in synchrony.” (EX1001, 3:38-40.) The '357 Patent describes that a first device assigns tasks “associated with a timestamp” for execution by the other devices. (EX1001, 3:53-55.) Then, the first device periodically indicates the current time of its clock, which the other devices use to execute the task at the correct time. (EX1001, 1:56-62.)

67. The '357 Patent applies this to audio playback by assigning different playback devices as at least one of an “audio information channel device 23,” a “master playback device 21,” and one or more “slave playback devices 22.” According to the '357 Patent, the audio information channel device 23 is a centralized hub that coordinates audio information between an audio information source outside the LAN and the playback devices on the LAN. (EX1001, 7:51-17:53, FIG. 2.)

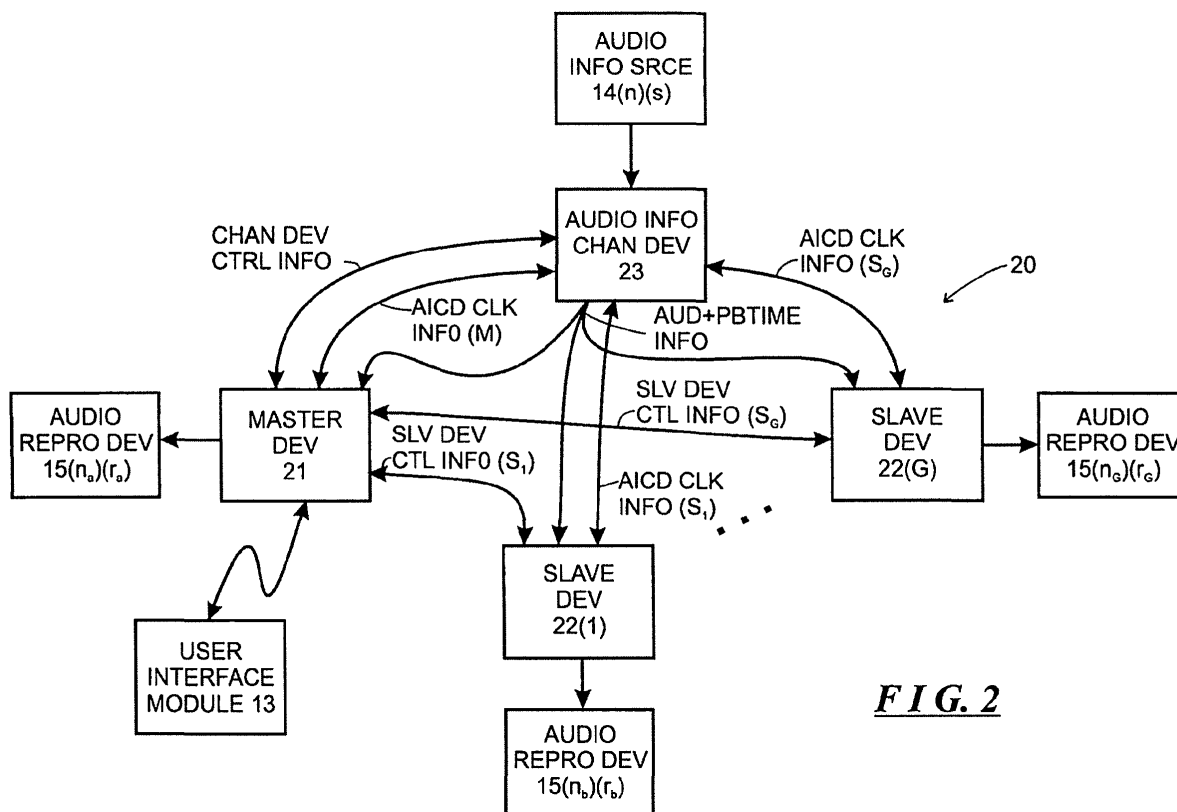


FIG. 2

68. Specifically, the '357 Patent describes audio information channel device 23 to obtain the audio information for the audio program from the audio information source, add playback timing information, and distributes the combined audio and playback timing information to the other playback devices. (EX1001, 7:66-8:4.) The audio information channel device then also transmits “clock timing information” to “enable[] the master device 21 and slave devices 22(g) of the synchrony group 20 to play the audio information simultaneously.” (EX1001, 8:5-11). To achieve the “simultaneous” playback of each timestamp, the '357 Patent explains that the audio information channel sends “clock time information to the

master device 21 and each of the slave devices 22(g) individually over network 12 using a highly accurate clock time information transmission methodology.” (EX1001, 11:25-29) The ’357 Patent then explains that “clock time information” can be distributed using the “well-known SNTP protocol.” (EX1001, 11:35-47, 12:39-45, 16:40-44, 17:34-39, 22:65-23:6, 24:32-38, 25:58-66.) Although the audio information channel device 23 and the master playback device 21 are preferably different devices, the ’357 Patent discloses that, in some implementations, the audio information channel device 23 and the master playback device 21 may be the same device. (EX1001, 8:39-55) (EX1001, 7:60-66.)

B. Priority Date of the ’357 Patent

69. The ’357 Patent has a U.S. filing date of October 17, 2014, and claims to be a continuation of Application No. 13/297,000, filed on Nov. 15, 2011, which claims to be a continuation of Application No. 10/816,217, filed on Apr. 1, 2004, now Pat. No. 8,234,395, which claims priority to Provisional Application No. 60/490,768, filed on Jul. 28, 2003. I further understand that Patent Owner has asserted that the invention date of the ’357 Patent was at least by April 25, 2003.

70. I have not been asked to opine on the ’357 Patent’s entitlement to any date earlier than October 17, 2014, which I can readily do if asked later.

C. File History of the ’357 Patent

71. In the first Office Action on the merits, the Examiner rejected claims 1-

20 as being unpatentable under pre-AIA 35 U.S.C. 103(a) over combinations of U.S. Pat. App. No. 2007/0142944A1 to Goldberg *et al.* (“Goldberg”), U.S. Pat. App. No. 2005/0027821A1 to Alexander *et al.* (“Alexander”), and U.S. Pat. App. No. 2003/0073432A1 to Meade *et al.* (“Meade”). (EX1002, 347-51.) After an interview where agreement could not be reached, Patent Owner responded to the rejections with amendments and arguments, arguing that the prior art lacked control information regarding the second playback device. (EX1002, 321-325.)

On March 9, 2015, the Examiner issued a Final Office Action rejecting claims 1-20 over Goldberg in view of Meade alone. (EX1002, 279.) In response, on May 11, 2015, Patent Owner conducted an interview to propose amending the play back element to be “based at least in part on the playback timing information associated with the audio information and the clock information of the first playback device.” (EX1002, 167, 161.) In the interview summary, Patent Owner argued this should place the claims in condition for allowance because “none of the cited references teach that playback is based on the clock information.” (EX1002, 160.) Examiner disagreed and explained that it was essential for the amendment to explain how device clock information was incorporated into play back.

Examiner advised to replace "based at least in part on" with a limitation that would provide specificity as to how playback timing information and clock information are incorporated into play back of the audio information. Examiner stated that providing this information in the claim is **essential for allowability because this is the core of the**

inventive concept. Applicant's Attorneys indicated that such feature would be too specific for the Client to find acceptable. No agreement was reached on allowability of any of the pending claims.³⁴

72. After the interview and on the same date, Patent Owner filed an After Final Consideration Program Request and amended the independent claims to include the first playback device transmitting to the second device “the audio information, playback timing information associated with the audio information, and device clock information of the first playback device” (as appears in the issued claims) and playing back “in synchrony with the second playback device by using the playback timing information associated with the audio information to play back the audio information.” (EX1002, 169-175.)

73. After two more interviews, and a Request For Continued Examination, on November 4, 2015, the Examiner issued a Notice of Allowance noting none of the prior art, alone or in combination disclose or suggested the amended claims’ “playing back, by the first playback device, the audio information in synchrony with the second playback device by using the timing information associated with the audio information and the device clock time information of the first playback device to play back the audio information, wherein the first and second playback devices remain independently clocked during synchronous playback of the audio

³⁴ EX1002, 160 (emphasis added).

information.” (EX1002, 62-78.)

74. After the notice of allowance, Patent Owner then filed another amendment, including amending “device clock time information” to “device clock information,” “clock time information” to “device clock information,” and “clock information” to “clock time information.” Patent Owner specifically asserted that “the amendments are ministerial in nature and/or do not change the scope of the allowed claims.” (EX1002, 40-46.)

D. Reexamination of the ’357 Patent

75. On June 16, 2017, the USPTO issued a Decision Granting *Ex Parte* Reexamination (“Decision”) of claims 9-12 and 19 of the ’357 Patent in Control No. 90/013,959. EX1004, 4062-84. In the Decision, the Examiner construed the terms *independently clocked* to mean “the master does not run the other device’s clocks, the master device merely sets a sync point” and *playback timing information* to be “a type of time stamp.” (EX1004, 4072-73.) After the Decision identified 7 grounds of rejection, the Examiner issued an Office Action including only 6, and then issued a Final Office Action rejection claims 9-12 and 19 over U.S. Pat. App. Pub. No. 2004/0252400 to Blank *et al.* (“Blank”), U.S. Pat. App. Pub. No. 2002/015015003 to Gray *et al.* (“Gray”), and applicant admitted prior art. (EX1004, 501, 505, 370, and 373-74.)

76. In response, Patent Owner argued that Blank teaches the

synchronization of media synch players using a time server and Gray teaches a media server timestamping audio information, but that Blank teaches Gray's timestamp being used to time synchronize the server and player clocks, not for the required synchronized playback.

Because the proposed combination of Blank and Gray requires that Gray's timestamping feature be used to perform a different function than taught by Blank, the Final Office Action's assertions that the proposed combinations and modifications "would yield predictable results," "could be achieved with a reasonable expectation of success," "wouldn't require undue experimentation," "would not be overly complicated," and that Blank incorporates Gray by reference are not sufficient to support the legal conclusion that the claims are obvious in view of Blank and Gray. MPEP 2143(1)(A).³⁵

Patent Owner further cited to litigation documents regarding previous defendant D+M's internal operations in 2011-2013 as evidence of secondary indicia of non-obviousness. (EX1004, 267-79.)

77. In an advisory action issued June 11, 2018, the Examiner affirmed the rejections, leading to Patent Owner's Notice of Appeal July 16, 2018. (EX1004, 222.) On May 31, 2019, the Board reversed the Examiner's rejections based on the conclusions of indicia of non-obviousness. (EX1004, 32.)

E. Interpretation of the '357 Patent Challenged Claims

78. I understand that in this proceeding, the claims should be construed in

³⁵ EX1004, 261-62.

accordance with their ordinary and customary meaning in light of the specification, as understood by one of ordinary skill in the art.

79. I have therefore applied those plain and ordinary meanings in my analysis.

80. I understand that the constructions below were adopted by the District Court of Delaware in a litigation previously brought by Patent Owner against D&M asserting the '357 patent:

Terms	Previous Constructions
clock information	information representing a time value indicated by a device's clock
playback device	data network device configured to process and output audio
network interface	physical component of a device that provides an interconnection with a data network
playback timing information	information indicating when the audio information [content] is to be played back
independently clocked	operating in accordance with their own respective clocks during synchronous playback
audio information	no construction necessary

81. I further understand that the above constructions were adopted by the International Trade Commission in an investigation previously brought by Patent Owner against Google asserting other patents in the same family of the '357 patent.

82. I understand claim constructions have not begun in the pending litigation where Patent Owner asserted the '357 patent against the Petitioner, and that either party may not necessarily agree with the constructions above negotiated by Patent Owner and another party in other litigations. I understand the claim constructions eventually determined in the litigation involving Patent Owner and Petitioner may differ from the above or the plain and ordinary meaning.

83. In my analysis, I thus applied the plain and ordinary meanings, but to the extent a related claim construction was made in the previous litigation, I have also considered and applied it alternatively where applicable, in forming my opinion with respect to each ground. To the extent that the litigation brought against the Petitioner adopt yet different claim constructions, I will supplement my opinions, if necessary.

VIII. Overview of the Cited References

84. General descriptions provided for the following references and combinations thereof are incorporated into each subsection and mapping of the claims that include citations to these references.

A. Richenstein (EX1005)

85. Like the '357 Patent, Richenstein provides devices, methods, and systems for sharing and synchronizing audio playback on a network of audio devices. (EX1005, Abstract.) Richenstein explains that its invention allows multiple sources

of audio to be shared by multiple listeners:

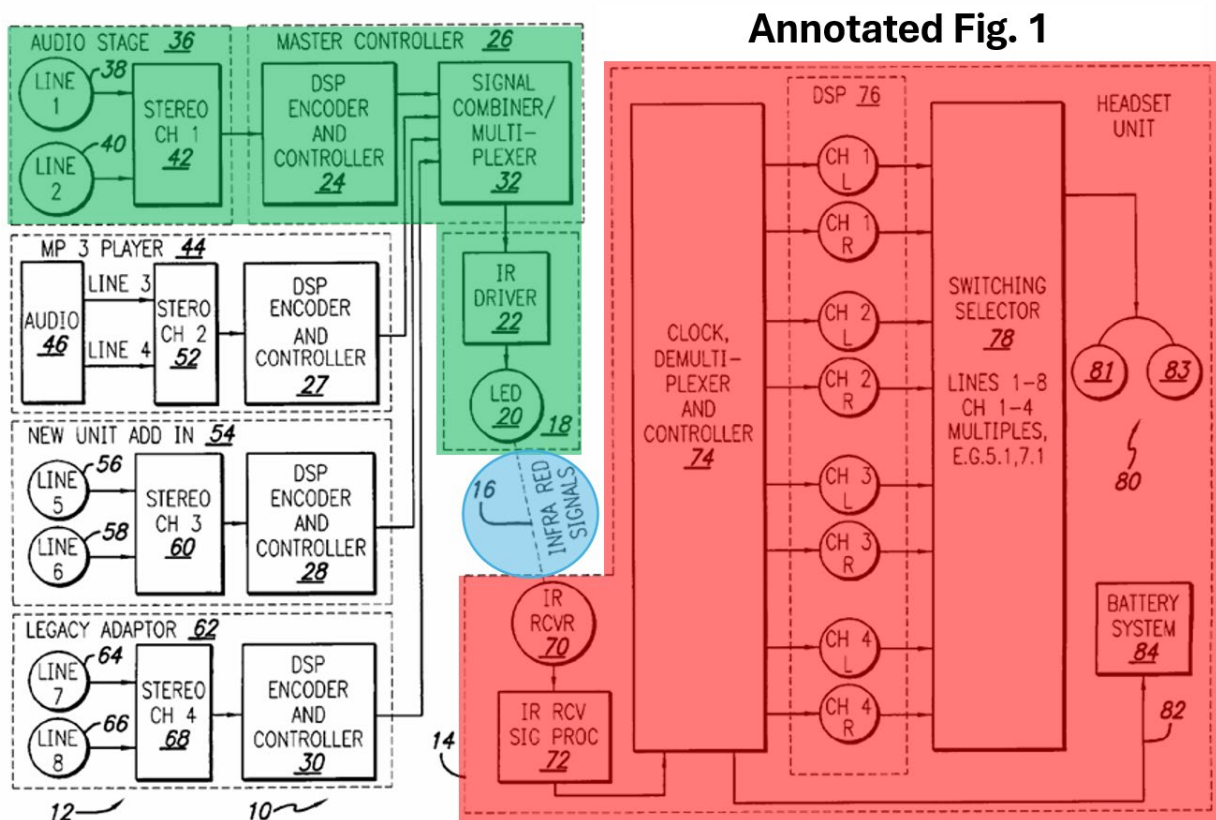
This invention relates to wireless communication systems, and more particularly to wireless audio systems for providing a plurality of selectable audio signals from one or more sources to one or more listeners in an automobile, airplane, or building.³⁶

86. To achieve this, Richenstein discloses a playback system, method, and devices for distributing audio data and control information using networked audio devices, including transmitters, receivers, and “two-way” or *bidirectional* wireless devices. (EX1005, [0007], [0033], [0040]-[0041], [0044], [0049], [0052]-[0056], [0057]-[0058], [0064]-[0069], [0081]-[0082], [0087]-[0088], [0091]-[0094], [0102]-[0105], [0108], [0112]-[0113], [0118]-[0119], [0122], [0124], [0127], [0130]-[0134], [0140]-[0144], [0153]-[0154], & Fig. 1 (transmitters and receivers); [0050], [0034]-[0036], [0051], [0146]-[0149], [0155]-[0156], Figs. 2, 5, 7, & 10 (transmitters); [0039], [0042], [0047]-[0048], [0056], [0062]-[0063], and Figs. 4, 5, & 14-18 (receivers); [0159], [0161], [0165], [0166], [0168], [0175], and Figs. 19-23 (bidirectional devices).)

87. With reference to Fig. 1, Richenstein’s system discloses a network of playback devices that can share audio data and playback audio data in synchrony. These playback devices are connected on a local network (system 10) defined by wireless signals 16. (*See e.g.*, EX1005, [0033]-[0036].) According to Richenstein, a

³⁶ EX1005, [0002].

playback device (exemplary audio device 34) can be connected with various audio sources, and it can transmit digital audio streams to the other playback devices (exemplary headset 14). (EX1005, [0036]-[0041]). As Richenstein explains, audio device 34 includes digital signal processing components to create the digital audio stream (master controller 26 with DSP encoder 24) and a transmitter 18 to transmit the stream as signals 16 to the network (network 10). (EX1005, [0033]-[0036]).



88. Richenstein describes that audio device 34 can be either an audio playback device itself or included as a component of other playback devices:

Audio device 34 thereby represents any audio source including mono and stereo radios, CD and cassette players, mini-disc players, as well as

the audio portions of electronic devices that provide other types of signals such as computers, television sets, DVD players and the like.³⁷

89. Richenstein explains that listeners can remotely control playback devices, such as audio device 34, using other devices on the network. For example, Richenstein describes that audio device 34 can be remotely controlled using remote controller 936 equipped with keypads, joysticks, push buttons, toggle switches, and voice commands.

With continued reference to FIG. 21, remote controller 936 includes IR receiver/transmitter 984 for two-way communication with audio device 34 via IR receiver/transmitter 806 and, optionally, a repeater included in IR receiver/transmitter 926. Remote controller 936 may provide any one or more of a plurality of controls, including but not limited to key pads, joysticks, push buttons, toggles switches, and voice command controls, and may further provide sensory feedback such as audio or tactile/vibrations.³⁸

90. Richenstein further explains that when connected to audio device 34, remote controller 936 may be used to control and access various audio sources connected to audio device 34, including cellular telephone 805, DVD player 803, and video game console 837.

Remote controller 936 may be used for a variety of purposes, including accessing and controlling cellular telephone 805 as previously described. Remote controller 936 may also be used to access and control video game player 922 to play a video game displayed on video display(s) 838, with the game audio track played through headphones 80, 980. Remote controller 936 may further be used to control video

³⁷ EX1005, [0036].

³⁸ EX1005, [0166], [0152].

display 838 and adjust display functions and controls, to control DVD player 803 to display a movie on video display 838 and control its functions (e.g. pause, stop, fast forward), to control trunk-mounted CD changer 950, to request telemetry data from vehicle CPU 924 to display on video display 838, or to control other vehicle 900 functions such as locking/unlocking doors and opening/closing windows. Two or more remote controllers 936 may be provided in vehicle 900 to allow two or more users 933, 935 to play a video game, displayed individually on multiple, respective video displays 838.³⁹

91. As shown in annotated Fig. 1, Richenstein discloses the transmitting playback device (e.g., audio device 34) can transmit audio bitstream signals 16 over the network to the receiving playback device (e.g., head unit 14) for the two devices to playback the audio data synchronous. Richenstein also explains that its playback devices each include clock, including devices on each side of the transmission (transmitting and receiving). As shown in Fig. 1, playback device 14 receiving audio includes a Decoder 74 with clock, multiplexer, and controller. Additionally, Richenstein shows that playback devices connected to various audio sources and with an IR module for transmission include clocks and clock phasing component 628 (shown in green) in Figs. 7 and 8. In Fig. 8, Richenstein further shows the playback device includes both its own base crystal (665) and a master clock 660.

³⁹ EX1005, [0166], [0146], [0152].

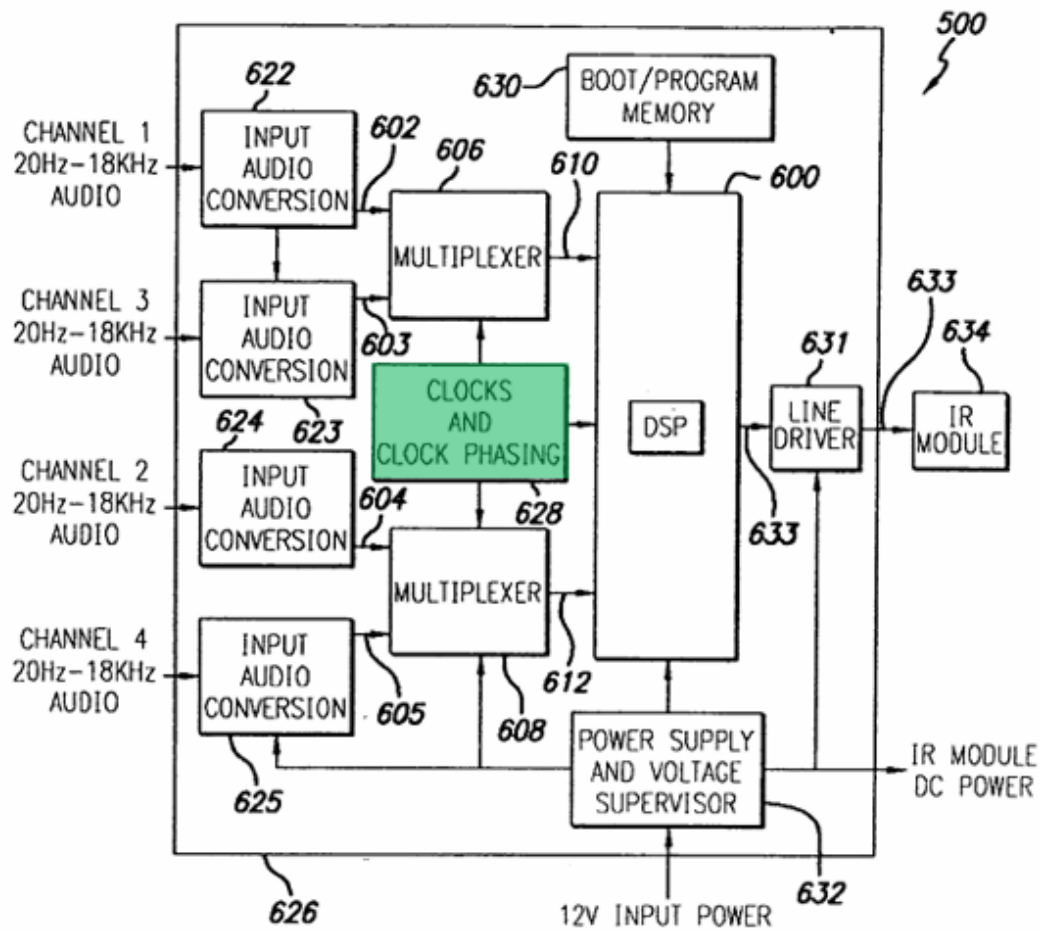


FIG. 7

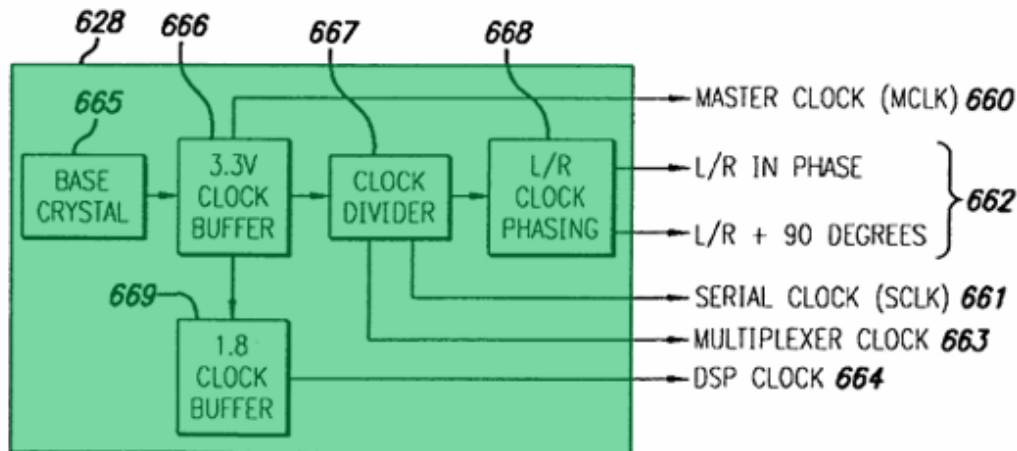
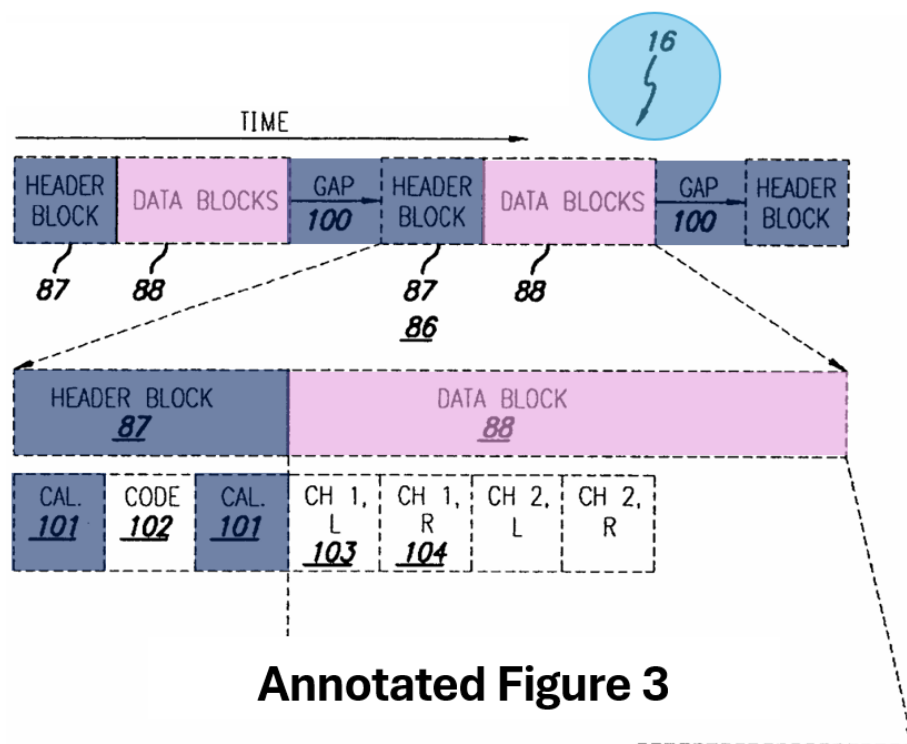
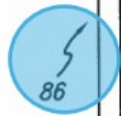


FIG. 8

92. For these independently clocked devices to playback audio content in synchrony, Richenstein uses the audio bitstream signals 16 to communicate the audio data and synchronization control information along with the audio data so that the receiving playback device can playback the audio data at the proper timing in synchrony with the transmitting playback device. Specifically, Richenstein provides two preferred embodiments for the audio bitstream signals 16 in Figs. 3 and 12, where the bitstream contains the encoded audio data, calibration data, and code or “control” data. (EX1005, [0033].) As Richenstein further provides, with reference to Figure 3, calibration data would include “timing data, signal magnitude data, volume and/or frequency data as well as control data related, for example, to audio format or other acoustic information.” (EX1005, [0057]). Referring to Figs. 3 and 12 (both showing embodiments of signals 16), Richenstein explains that synchronizing the playback between transmitting and receiving playback devices

can be achieved in multiple different ways, providing examples using header blocks 87, gap fields 100 and 90, and calibration fields 101. (EX1005, [0066]-[0069], [0101]-[0102].)





Annotated Fig. 12

93. Richenstein further explains that using “two-way” or bidirectional audio devices where each device can both transmit and receive signals allows complex networks. (EX1005, [0161].) As summarized in further detail the exemplary embodiments below, Richenstein describes such systems as bidirectional

audio networks for vehicles including automobiles, buses, train cars, naval vessels, airplanes, etc. (in connection with Figures 19-22), as well as bidirectional audio networks in buildings (in connection with Figs. 23), which describe. (EX1005, Figs. 19-23.)

94. In the exemplary embodiment of Fig. 20, Richenstein provides multiple playback devices connected over a vehicle local network, including an in-dashboard audio device 34, which may be hardwired or otherwise connected to various audio source devices including cellular telephone 805, DVD player 803, and video game console 837. (EX1005, [0146], [0152]). Using this exemplary embodiment, Richenstein details how flexibly control data may be used to control different devices in a bidirectional system. As a first example, Richenstein explains that due to the bidirectional nature of the network, multiple networked devices in the embodiment of Fig. 20 may communicate with the cellular telephone 805 or other similar device through audio device 34:

Vehicle 800 may also include cellular telephone or other wireless communication device 805 that may be connected to audio device 34, which again can encode a voice stream from the telephone for IR transmission. As described below, equipment may be provided for two-way communication by passengers to converse on the telephone via audio device 34 and other IR devices according to the invention.⁴⁰

95. Richenstein explains that due to the bidirectional nature of the

⁴⁰ EX1005, [0146].

embodiment, multiple devices in the vehicle can control the audio source devices through audio device 34. First, Richenstein provides an example of headphones 80 and microphone 832 controlling the cellular phone:

Headphones 80, or microphone 83[2], may incorporate certain controls to access features of the cellular telephone or other communication device, such as hang-up, dial, volume control, and communication channel selection.⁴¹

Second, Richenstein describes how game control devices 836 can issue commands to game console 837 via audio device 34:

Optionally, game control device 836 may also be connected to module 822 for communicating with video gaming console 837 connected to audio device 34. In this embodiment, passengers may wear headphones 80 to listen to the soundtrack of a game software executed by video gaming console 837 to generate audio and video signals for transmission by audio device 34. The video signals may be displayed to the passengers on display device 838, and the passengers may interact with the game software being executed on the gaming console via inputs through game control device (e.g. a joystick, touch pad, mouse, etc.) 836.⁴²

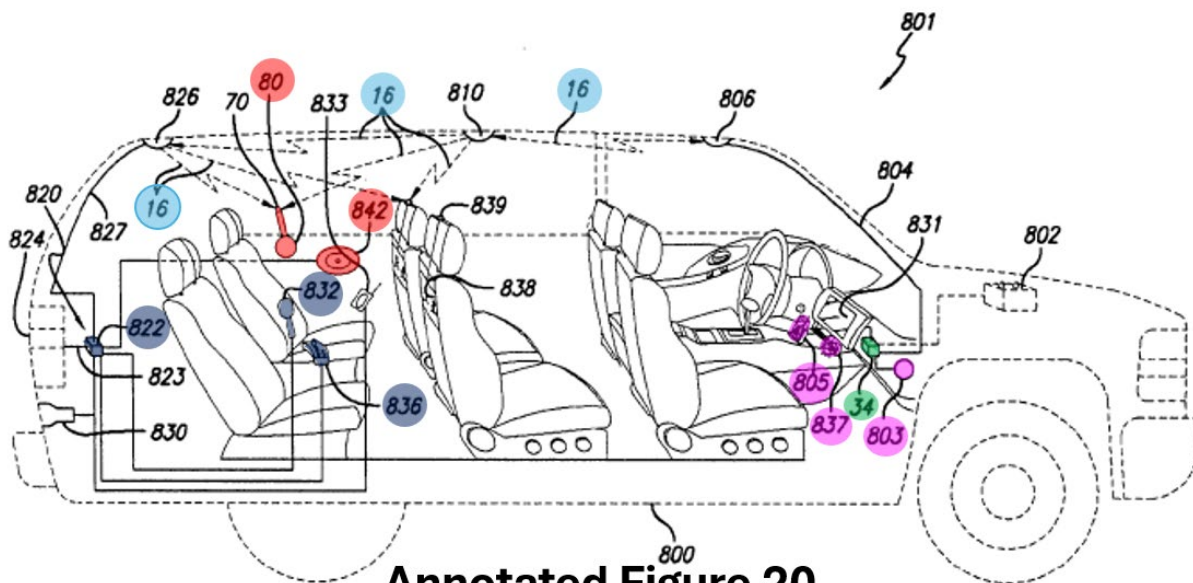
In yet another example, Richenstein describes how game control devices 836 (shown in dark blue), audio device 34 (shown in green), or *any other input device*, could be used to select the audio channel for speaker 842 (shown in red) using control information in the header of a packet:

The channel played through speaker 84[2] may be selected through audio device 34 (i.e. by the driver of vehicle 800) or any other input

⁴¹ EX1005, [0149].

⁴² EX1005, [0152].

device including game control device 836 (i.e. by a passenger in the vehicle), and the channel thus selected may be indicated in the header of each packet transmitted from the audio device for decoding by a DSP within module 822.⁴³



Annotated Figure 20

96. Richenstein provides further examples of flexible control throughout the additional embodiments. For example, in Fig. 21's additional vehicle embodiment, Richenstein describes how that bidirectional module 923, which is connected to a CD player/changer in the rear of a vehicle, and may both transmit cd audio and receive commands from audio device 34 (shown in green) to switch CDs or to select, shuffle, or repeat tracks:

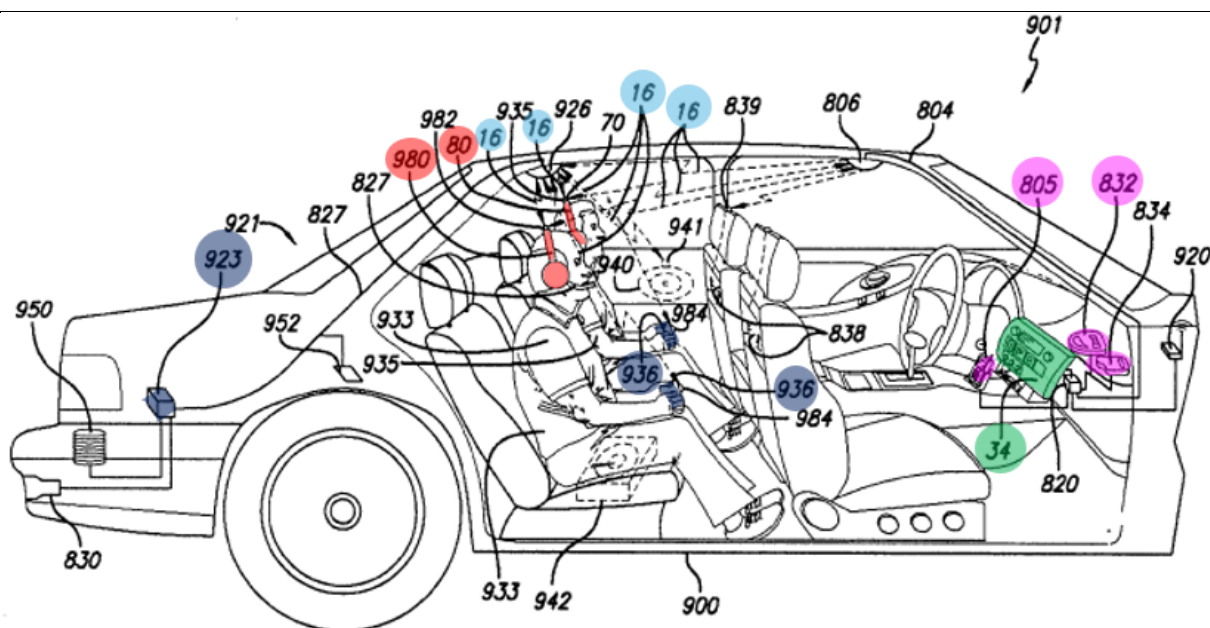
Module 923 may also receive audio data from audio device 34 and provide the audio data to subwoofer 942 that may be installed in the trunk or, as shown, underneath the rear seat of vehicle 900. Additionally, module 923 may also be hardwired to trunk-mounted CD changer 950

⁴³ EX1005, [0153].

and accept audio data from the CD changer to transmit to audio device 34 for playback within vehicle 900, as well as receive control commands input by the vehicle driver through audio device 34 to control the CD changer, such as CD and track selection, shuffle, repeat, etc.⁴⁴

Similar to Fig. 20, Richenstein explains that Fig. 21's headphones 980 (shown in red) may control the cellular phone 805 through audio device 34, using a headphone dialing pad or voice controls to initiate a call. (EX1005, [0166].) Richenstein even provides that remote controllers 936 (shown in dark blue) may be used to control a variety of devices via audio device 34 including cellular telephone 805, game console 922 (game play), DVD player 803 (play, pause, stop, fast forward a movie), CD changer 950, headsets 980 and 80, and even vehicle functions like locking and unlocking doors or opening and closing windows. (EX1005, [0166].)

⁴⁴ EX1005, [0162].

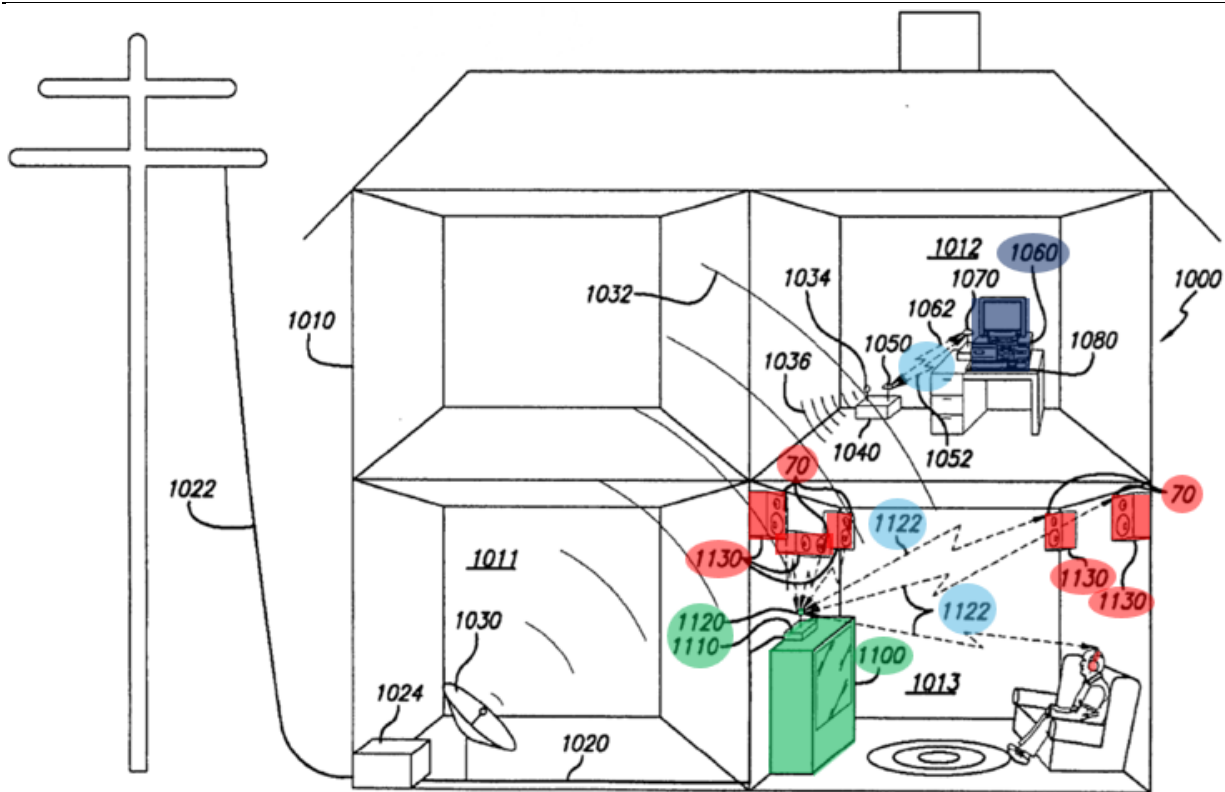


Annotated Figure 21

97. With reference to Fig. 22, Richenstein further explains that while transmitting devices, receiving devices, and bidirectional devices use exemplary IR modules for signals 16, devices may be networked using other means including the exemplary data bus 990 according to well-known standards including Bluetooth wireless communications or Media Oriented Systems Transport (MOST). (EX1005, [0171].) Richenstein provides that using the data bus or similar networks, audio device 34 is not required to be a central control unit, and such responsibilities may be distributed throughout the network, including to exemplary vehicle CPU 924. (EX1005, [0173].) Richenstein explains that by using proper headings and addresses to identify individual devices within the network, the network may be used to provide individual channels and commands throughout the network as long as the

devices share a compatible coding scheme. (EX1005, [0173].)

98. In Fig. 23, Richenstein provides an additional example and details building on the embodiments described in Figures 1-22. For example, Richenstein explains how the capabilities described can be applied to a home or building environment, where the devices may be connected to a LAN. (EX1005, [0174]). Richenstein shows a LAN network with room 1013, where home theatre system 1100 (shown in green) includes digital signal processing 1110 and transmitter 1120 (as Fig. 1's audio device 34 includes DSP 24 and transmitter 18) and wireless speakers 1130 (shown in red, including the same receiver unit 70 as Fig. 1's headset). (EX1005, [0176]). Richenstein further provides room 1012, where CPU 1060 includes encoder/decoder 1080 for two-way communication for communication with various devices including "televisions, radios, video game consoles, personal digital assistants, various household appliances equipped for remote control, and home security systems." (EX1005, [0176].)



Annotated Figure 23

B. MOST Specification Rev. 2.0 (EX1008)

99. Media-Oriented Systems Transport (“MOST”) is a well-known in-vehicle network protocol for the transfer of multimedia data developed in the late 1990’s.⁴⁵ As referenced in Richenstein, MOST provides a communications standard for fiber optic networks. (EX1005, [0171].) In 2000, the MOST Cooperation published Rev. 2.0 of the MOST Specification (“MOST”) detailed the standard’s

⁴⁵ EX1035 (https://www.soundlabsgroup.com.au/c/Becker-History.html?srsId=AfmBOoq4Q69j9Z6TR-sSm0xG_fzL_ZnGyecktddeadLL0YJ69XTZRPVC9).

operation, attached as EX1008. As described, MOST “contains the detailed specification of the application layer, the network layer, and the MOST hardware.” (EX1008, 11.) As explained above in Section VI.A, standards are generally made available to members of the industry, whether for free or for a fee. I understand that MOST announced that it was making its specifications available to the public on its website by at least May 22, 2000.⁴⁶ Based on my experience with working with industry standards, the cover dates on the reference as “12/1999” and 2000, and the MOST press release indicating it would be available on its website, it is my opinion that the MOST-2.0 reference was available to those in the field on or before May 22, 2000.

100. Additionally, the MOST standard, including version 2.0 of the Specification, has been referenced in patent filings, such as Pat. No. 6,947,776 filed 2001 by Robert Bosch GMBH, EX1044, 5:12-13, and Richenstein. EX1005, [0171]. Based on its existence at the time, the evidence it was made available to the public by MOST on its website, and its reference by members of the field, it is my opinion that a POSITA would have had access to MOST Specification Rev 2.0 before April 25, 2003.

101. MOST provides for a network of up to 64 devices. (EX1008, 13.)

⁴⁶ EX1007 (MOST Press Release and Internet Archive Record, as retrieved 2/1/25).

MOST further explains that the devices include function areas comprised of MOST_{Transceiver}, Crystal, and PLL-Filter. (EX1008, 166.)

102. Because each of the devices has its own clock (crystal, PLL-filter, etc.), MOST explains that any of the devices can be the “timing master,” which generates and transmits its clock information to all other nodes to set the bus time (system clock).

By configuration, any of the transceivers can be the timing master, all the others are slaves. The timing master provides generation and transporting of system clock, the frames, and blocks. All slave devices derive their clock from the MOST bus.⁴⁷

103. MOST explains that the slave devices are phase- and frequency-locked to the master’s clock through the bitstream. (EX1008, 87). MOST further explains that for received data functions, the Master device will also then lock to the phase and frequency it receives from the bitstream.

This phase shift is due to delays from each active node, and additional accumulated delays due to tolerances in the phase lock within the slave nodes. The master node re-synchronizes the received data by the use of a PLL to lock onto the incoming bit stream, thereby re-synchronizing the incoming data to the proper bit alignment.⁴⁸

104. MOST provides communications protocols to support both

⁴⁷ MOST, 84; *see also*, 94 (“...every node may be active or passive with respect to source data handling...”).

⁴⁸ MOST, 87.

synchronous and asynchronous data transmission between devices on a network.

On the MOST_{Network} there are 60 bytes available for synchronous and asynchronous data transfer. It is possible to divide up these resources between synchronous and asynchronous channels by means of a boundary descriptor.⁴⁹

105. MOST further explains that some nodes can include user interfaces or “MMI’s” and that each device may simultaneously fill the roles of MMI, master, and slave for different functions. (EX1008, 15) MOST explains that each device may be identified either individually as an “InstanceID” or grouped together as a “DeviceID.” (EX1008, 29 & 31).

106. MOST further explains that MMI’s provide commands to network devices through “function interfaces.” (EX1008, 19.) MOST explains that “function interfaces” allow for remote commands to playback devices including play, pause, etc.

On the application level, a MOST_{Device} contains multiple components, which are called function blocks, e.g., tuner, amplifier, or CD player.... In addition to the function blocks which represent applications, each MOST_{Device} has a special function block called the NetBlock. The NetBlock provides functions related to the entire device. Between the function blocks and the MOST_{Transceiver}, NetServices form an intermediate layer providing routines to simplify the handling of the MOST_{Transceiver}...Each function block contains a number of single functions. For example, a CD player possesses functions such as Play, Stop, Eject, and Played. To make a function accessible from outside, the function block provides a function interface (FI), which represents the interface between the function in a function block and its usage in another function block.⁵⁰

⁴⁹ MOST, 13.

⁵⁰ EX1008, 14.

107. MOST further provides that the MMI as “Network Master” will store configuration entries for each device, and that during initialization or when a device is added/removed, the devices will send the master their configuration status for confirmation. (EX1008, 113-116.)

C. Chatterton (EX1009)

108. Like the '357 patent, Chatterton addresses retrieving media content and distributing it for playback across a local area network. Specifically, Chatterton provides a way to translate between different sampling formats and enables synchronized playback across a network regardless of the media source. Specifically, Chatterton provides that DVD's are regularly sampled according to a “program stream” timestamp format while many devices decode according to a “transport stream” format.

Although the underlying MPEG-2 compression algorithm is similar for each application, the manner in which the compressed audio/video content is packetized, transmitted, stored and otherwise processed varies considerably from one application to the next. For example, cable and satellite companies transmit the MPEG-encoded channels within a multiplexed “transport streams” comprising transport packets of a fixed 188 bytes in length. Transport streams follow the T-STD (transport system target decoder) model defined in ISO/IEC 13818-1. By contrast, MPEG content is stored on DVDs in a unique “program stream” format, using packets of 2048 bytes in length. Normal program streams follow P-STD (program stream target decoder) model defined in ISO/IEC 13818-1.⁵¹

⁵¹ EX1009, 1:22-36.

109. To achieve this, Chatterton discloses a Home Media Server 110 to process, store, and distribute multimedia content over a local network 140.

As illustrated in FIG. 1, in one embodiment of the invention, a digital media server **110** equipped with a processor and a mass storage device acts as a central repository for decoding, storing and distributing multimedia content and data.⁵²

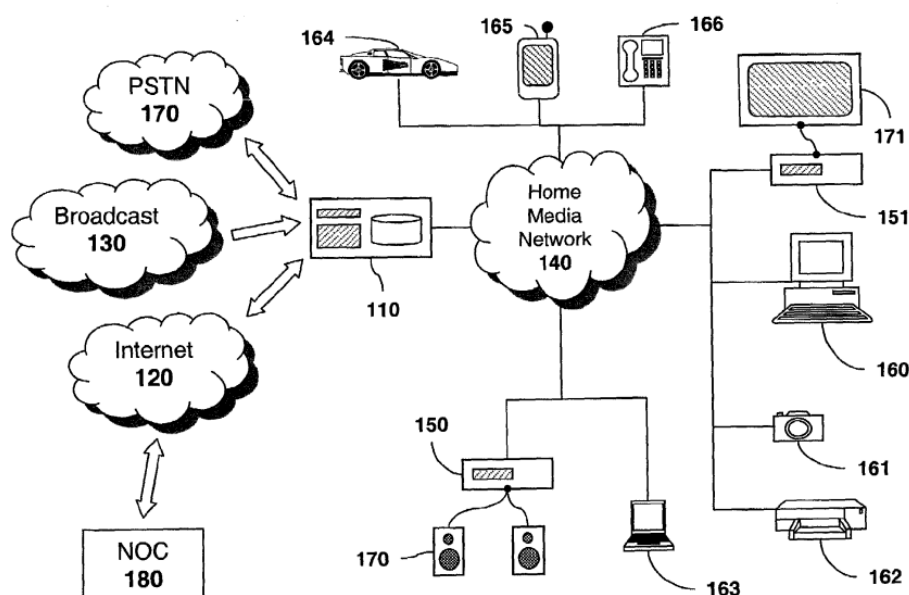


FIG. 1

110. The home media server 110 plays a similar role as the “audio information channel device 23” described in the ’357 patent, including, to coordinate sourcing audio content from outside the network, to generate and transmit data packets including the audio content, playback timing and its clock time values to other playback devices over the network for synchronous playback. (EX1001, 7:51-

⁵² EX1009, 1:59-63.

17:53, FIG. 2; EX1009, 1:63-4:3, 12:49-55, 7:29-32, 13:51-55, 5:38-46.)

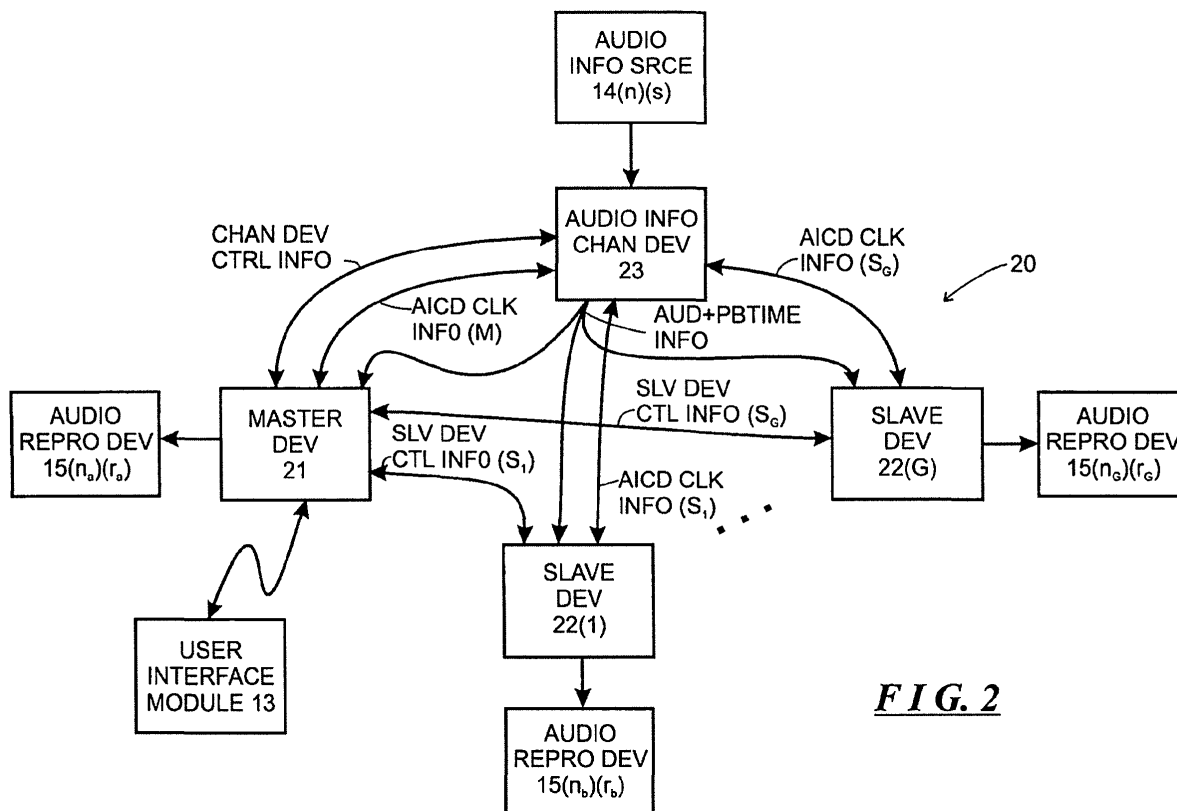


FIG. 2

111. Chatterton explains that the Home Media Server 110 obtains audio content from broadcast communication channels, internet communication channels, and even the telephone network.

More particularly, the digital media server **100** coordinates multimedia content from Internet communication channels **120** (e.g., DSL, cable Internet), broadcast communication channels **130** (e.g., digital/analog cable, satellite), and/or Public Switched Telephone Network (“PSTN”) communication channels **170** (i.e., standard telephone) to provide a stable, real-time home media network **140** for a plurality of network devices **150–151, 160–166**.⁵³

⁵³ EX1009, 1:63-4:3.

112. Chatterton discloses that in addition to storage and distribution, Home Media Server 110 can be a player itself.

As illustrated in FIG. 4, one embodiment of the system includes a DVD player **420** (and/or a CD player, CD-ReWritable drive, recordable DVD drive or other type of portable digital media player/recorder). The DVD player **420** is capable of playing a DVD directly and/or transferring multimedia content from the DVD to the mass storage device **230**.⁵⁴

113. Chatterton further provides that Home Media Server 110 can be controlled by commands from an IR receiver through remote control devices 530, 532.

In one embodiment, the local infrared interface **670** receives control commands from a remote control unit (e.g., unit **532** in FIG. 5) operated by a user. As described below with reference to FIG. 5, control data/commands received through the infrared interface **670** may subsequently be transmitted to the home media server **110** for processing.⁵⁵

114. As Chatterton explains, remote control unit 532 may also include LCD for displaying information from the Home Media Server 110 to the user.

In one embodiment, the remote control devices include an LCD (not shown) or other type of display for displaying information about the multimedia content stored on home media server **110** (i.e., instead of, or in addition to, the multi media node **522** display **524**).⁵⁶

⁵⁴ EX1009, 12:49-55.

⁵⁵ EX1009, 7:29-32.

⁵⁶ EX1009, 13:51-55.

115. Chatterton provides that Home Media Server 110 can be configured to provide synchronized playback through various streaming protocols. For example, Chatterton explains that Home Media Server may be configured to apply RTP, which includes a header with timestamping and synchronization information.

In one embodiment, the home media server **110** is configured with support for the realtime transport protocol (“RTP”) and the realtime streaming protocol (“RTSP”) (see, e.g., RTP/RTSP module **251**). Briefly, RTP is an IP protocol which supports real time transmission of voice and video. An RTP packet typically resides on top of a user datagram protocol (“UDP”) and includes timestamping and synchronization information in its header for proper reassembly at the receiving end. RTSP is a well known protocol for streaming multimedia content over a network. It should be noted, however, that various other streaming protocols may be implemented while still complying with the underlying principles of the invention (e.g., Quicktime®, Windows Media, . . . etc).⁵⁷

116. Chatterton further explains that the Home Media Server 110 may transmit status updates about the network’s operations to a Network Operations Center or “NOC” 180, allowing the user to monitor network activity.

In one embodiment, the home media server 110 periodically transmits a status update to the NOC 180, indicating whether any particular services are required and/or whether any problems have arisen.⁵⁸

D. RFC 1889 (EX1010)

117. In January 1996, the IETF published RFC 1889, an RTP standardization document titled “RTP: A Transport Protocol for Real-Time

⁵⁷ EX1009, 5:38-46.

⁵⁸ EX1009, 9:12-15.

Applications.”⁵⁹ IETF has been a well known organization in the field of network communications, publishing industry standards for networking and transmission protocols for decades, including well before April 25, 2003. I have personally been using and referring to IETF RFC’s since the 1990’s, including RFC 1889 itself. Standards, such as IETF’s RFC’s along with IEEE materials, are a vital resource for those in the field to resolve problems, and as a result, it is common for universities and other organizations to provide access to both free and subscription based standards for its students and members. Accordingly, it is common for members of the field to have access to standards of this kind, and it is my opinion that a POSITA would have had access to RFC 1889 before April 25, 2003-which I myself did.

118. This opinion is supported by the Chatterton reference’s citations to RTP as a well known protocol for streaming audio and video.

119. For example, Chatterton provides:

In one embodiment, the home media server **110** is configured with support for the real-time transport protocol (“RTP”) and the realtime streaming protocol (“RTSP”) (see, e.g., RTP/RTSP module **251**). Briefly, RTP is an IP protocol which supports real time transmission of voice and video. An RTP packet typically resides on top of a user datagram protocol (“UDP”) and includes timestamping and synchronization information in its header for proper reassembly at the receiving end.⁶⁰

120. As explained in RFC 1889, RTP provides end-to-end network

⁵⁹ EX1010, 1.

⁶⁰ EX1009, 5:38-46.

transportation of audio and video data.

This memorandum describes RTP, the real-time transport protocol. RTP provides end-to-end network transport functions suitable for applications transmitting real-time data, such as audio, video or simulation data, over multicast or unicast network services. RTP does not address resource reservation and does not guarantee quality-of-service for real-time services.⁶¹

121. RFC 1889 explains that RTP uses RTP headers on top of UDP payloads, and that the headers are used to convey timing information to allow correct playback timing despite unreliable transmissions.

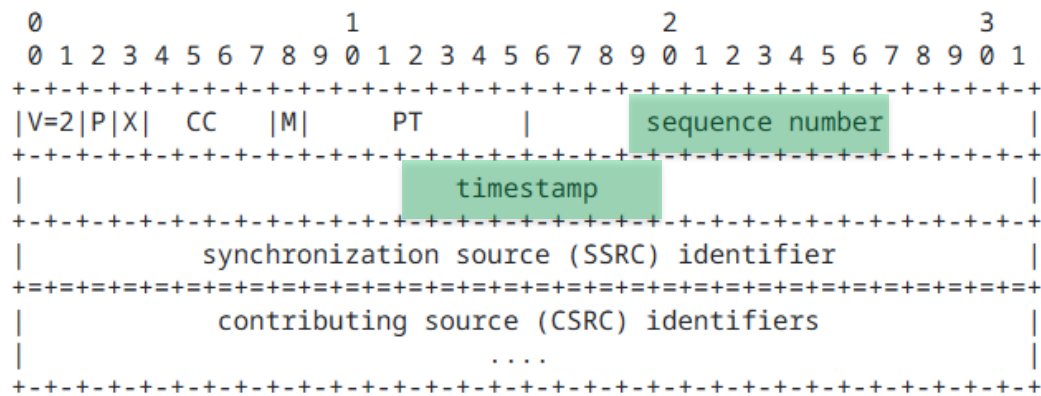
Each chunk of audio data is preceded by an RTP header; RTP header and data are in turn contained in a UDP packet...The Internet, like other packet networks, occasionally loses and reorders packets and delays them by variable amounts of time. To cope with these impairments, the RTP header contains timing information and a sequence number that allow the receivers to reconstruct the timing produced by the source, so that in this example, chunks of audio are contiguously played out the speaker every 20 ms.⁶²

As shown in green, the header contains a sampling timestamp to identify when it was created and a sequence number to identify its order amongst other packets in the stream.⁶³

⁶¹ EX1010, 1.

⁶² EX1010, 5.

⁶³ EX1010, 10.



122. RFC 1889 explains that the timestamp reflects the sampling instant is usually an incremental value based on the source’s clock and frequency and allows for synchronization between playback receivers.

The timestamp reflects the sampling instant of the first octet in the RTP data packet. The sampling instant must be derived from a clock that increments monotonically and linearly in time to allow synchronization and jitter calculations (see Section 6.3.1)...As an example, for fixed-rate audio the timestamp clock would likely increment by one for each sampling period. If an audio application reads blocks covering 160 sampling periods from the input device, the timestamp would be increased by 160 for each such block, regardless of whether the block is transmitted in a packet or dropped as silent.⁶⁴

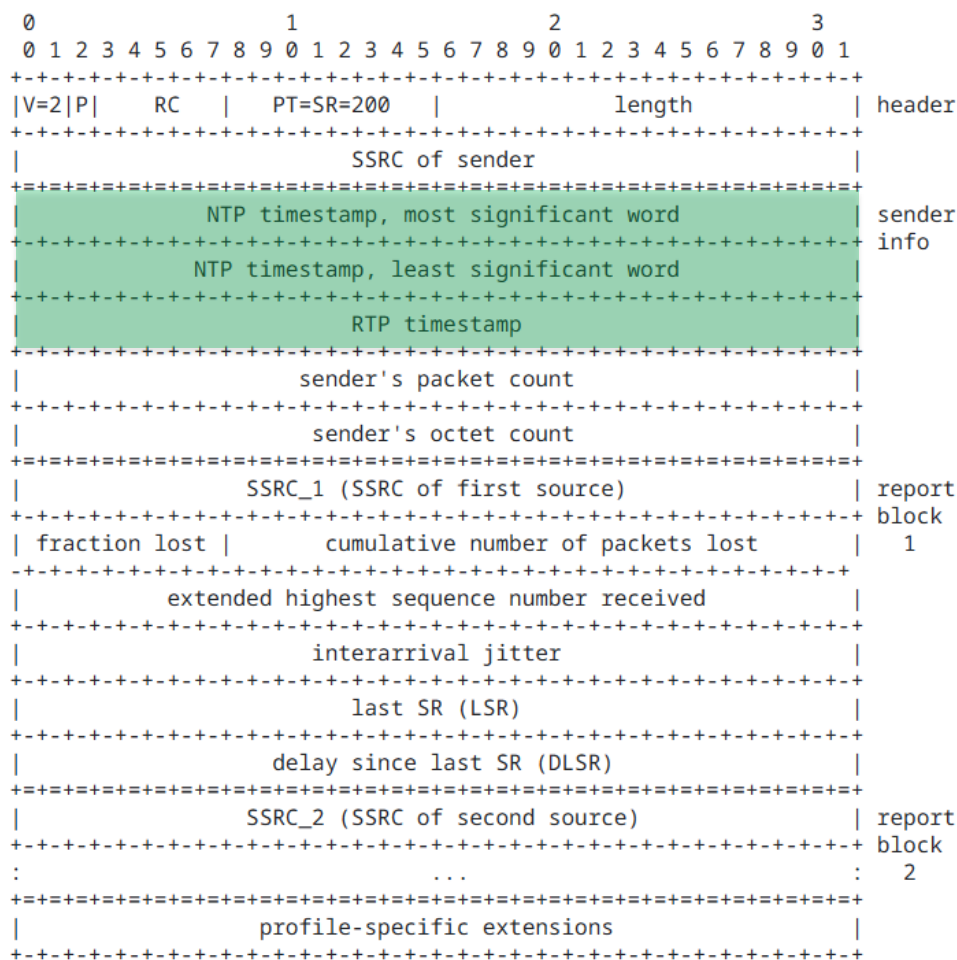
123. RFC 1889 further provides that in addition to the data packets, RTP is supported by a control protocol called “RTCP.”

The data transport is augmented by a control protocol (RTCP) to allow monitoring of the data delivery in a manner scalable to large multicast networks, and to provide minimal control and identification functionality.⁶⁵

⁶⁴ EX1010, 11-12.

⁶⁵ EX1010, 1.

124. RFC 1889 explains that each device transmits RTCP sender reports to each other device providing their own clock information as both a NTP timestamp and an RTP timestamp.⁶⁶



125. As explained in RFC 1889, the NTP timestamp provides the wallclock time when the data is sent, while the RTP timestamp provides the transport stream timestamp based on the sampling frequency and counter, which receivers can use

⁶⁶ EX1010, 23.

for synchronization.

NTP timestamp: 64 bits

Indicates the wallclock time when this report was sent so that it may be used in combination with timestamps returned in reception reports from other receivers to measure round-trip propagation to those receivers.⁶⁷

RTP timestamp: 32 bits

Corresponds to the same time as the NTP timestamp (above), but in the same units and with the same random offset as the RTP timestamps in data packets. This correspondence may be used for intra- and inter-media synchronization for sources whose NTP timestamps are synchronized, and may be used by media-independent receivers to estimate the nominal RTP clock frequency. Note that in most cases this timestamp will not be equal to the RTP timestamp in any adjacent data packet. Rather, it is calculated from the corresponding NTP timestamp using the relationship between the RTP timestamp counter and real time as maintained by periodically checking the wallclock time at a sampling instant.⁶⁸

126. RFC 1889 further explains that the reports may be extended to provide additional application specific information as needed to monitor the transport stream's senders and receivers.

A profile should define profile- or application-specific extensions to the sender report and receiver if there is additional information that should be reported regularly about the sender or receivers. This method should be used in preference to defining another RTCP packet type because it requires less overhead.⁶⁹

⁶⁷ EX1010, 24.

⁶⁸ EX1010, 25.

⁶⁹ EX1010, 25.

IX. Grounds 1-3: Richenstein Anticipates Or Renders Obvious Alone or In View of MOST.

127. As explained above, Richenstein discloses devices and methods for creating an audio playback network, where multiple bidirectional devices can synchronously play audio content from sources connected to any device on the network. Richenstein further describes that this network may be built using various communication standards, specifically citing to the Media Oriented Systems Transport.

In one embodiment, data bus 990 may operate according to the Bluetooth wireless communications standard, or to the Media Oriented Systems Transport (MOST) communications standard for fiber optic networks.⁷⁰

128. In light of Richenstein's disclosures towards devices that can send, receive, and control network functions, it is my opinion that a POSITA would understand Richenstein to disclose the use of MOST standards corresponding to those functions. Specifically, a POSITA would understand, to implement the MOST standards as Richenstein expressly discloses, Richenstein necessarily uses MOST's timing master function for transmitting audio data for synchronized playback, MOST's slave functions for receiving audio data for playback, and MOST's MMI function for issuing commands to other devices on the network.

129. To any extent Richenstein does not itself disclose, explicitly or

⁷⁰ EX1005, [0171].

inherently, these uses and applications, it is my further opinion that a POSITA would have been motivated to look to the MOST Specification (EX1008) for the details provided based on Richenstein's instruction to do so. Richenstein and MOST are in the same field of endeavor to provide a network for connecting various devices and solve similar problems such as synchronization of the connected devices on the network. Further, because Richenstein discloses a flexible system for synchronized playback and audio distribution, and Richenstein further discloses that the MOST standard provides one such manner to distribute multimedia across a network, it is my opinion that a POSITA would have found express and sufficient teaching, suggestion and motivation from Richenstein to implement the details disclosed by the MOST standards (EX1008) along with Richenstein's disclosures. It is my further opinion that a POSITA would have a reasonable expectation that modification of Richenstein using the MOST standards would succeed and yield predictable result, as indicated by the disclosure of Richenstein.

130. For reasons further explained below, it is my opinion that: Richenstein anticipates claims 1-20 of the '357 Patent with either explicate or inherent disclosures; to whatever extent Richenstein does not anticipate the claims, a POSITA would have found Richenstein alone renders claims 1-20 obvious; and to whatever extent Richenstein does not alone anticipate or render obvious claims 1-20 of the '357 Patent, a POSITA would have found the claimed subject matter at least

obvious in light of Richenstein in view of MOST.

A. Independent Claim 1

131. Claim 1 is reproduced below. For ease of discussion, I have included a label for each claim limitation.

[1.P] A method comprising:

[1.1.1] receiving, by a first playback device from a network device configured to control the first playback device and communicatively coupled to the first playback device over a local area network (LAN), control information comprising an address identifying a location of audio information available at an audio information source,

[1.1.2] wherein the audio information source is outside of the LAN; and

[1.2.1] after receiving the control information (i) obtaining, by the first playback device from the audio information source outside of the LAN, the audio information;

[1.2.2] (ii) transmitting, by the first playback device to a second playback device, the audio information, playback timing information associated with the audio information, and device clock information of the first playback device; and

[1.2.3] (iii) playing back, by the first playback device, the audio information in synchrony with the second playback device by using the playback timing information associated with the audio information and the device clock information of the first playback device to play back the audio information,

[1.2.4.2] wherein the first and second playback devices remain independently clocked during synchronous playback of the audio

information.

1. [1.P] A method comprising

132. Richenstein discloses “[a] method.” Specifically, Richenstein discloses multiple methods for synchronous audio playback over a network. For example, Richenstein discloses methods for synchronous audio playback between or among multiple audio playback devices equipped in a vehicle over a local network. See, e.g., Richenstein, [0149], [0153], [0165]-[0166]. In another example, Richenstein discloses a home entertainment system with multiple audio playback devices connected to a local area network to playback audio synchronously. See, e.g., Richenstein, [0003], [0005], [0050], [0052]-[0053], [0070], [0100], and Figs. 1-23.

2. [1.1.1] receiving, by a first playback device from a network device configured to control the first playback device and communicatively coupled to the first playback device over a local area network (LAN), control information comprising an address identifying a location of audio information available at an audio information source,

133. Richenstein discloses *receiving, by a first playback device from a network device configured to control the first playback device and communicatively coupled to the first playback device over a local area network (LAN), control information comprising an address identifying a location of audio information available at an audio source.*

134. Richenstein alone discloses or suggests this element in both the vehicle

infotainment embodiment of Figs. 20 and 21 and the home entertainment embodiment of Fig. 23.

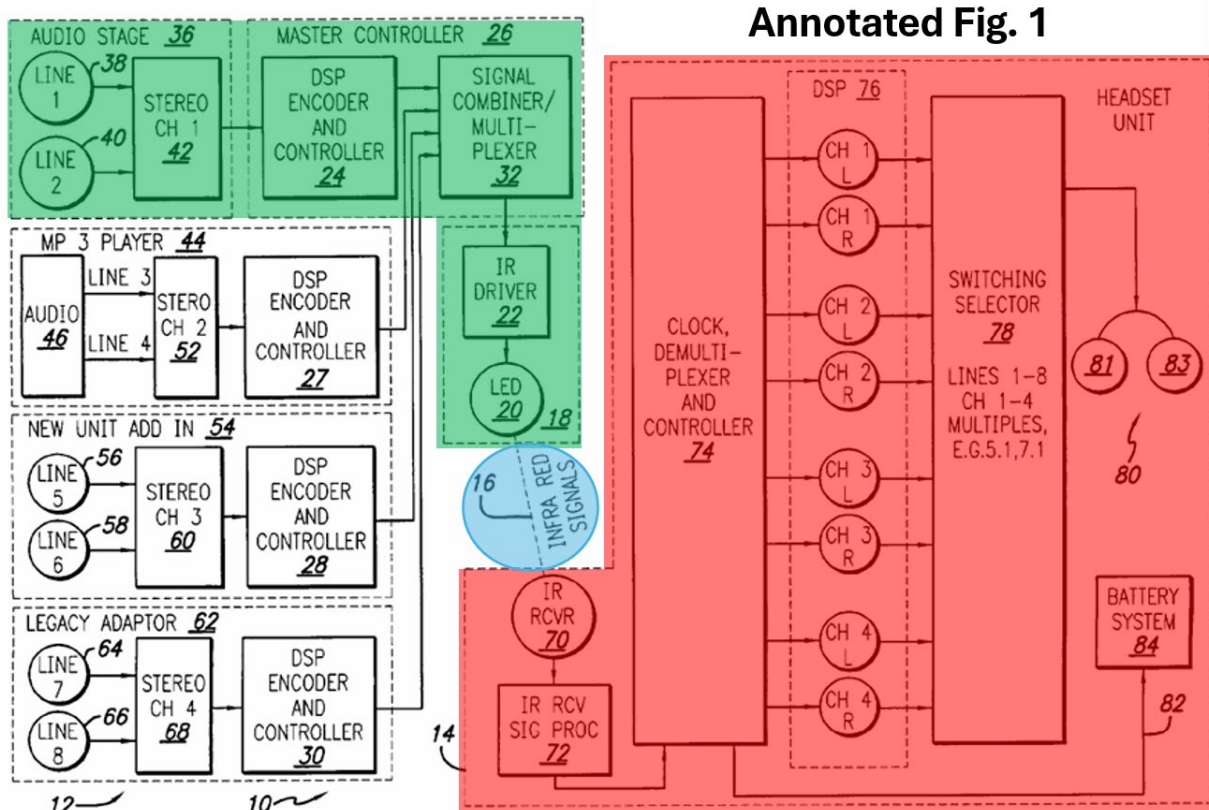
135. In Figures 20 and 21, Richenstein discloses audio device 34 (“*a first playback device*”) which is a data network device that processes and outputs audio. (See, e.g., EX1005, [0005], [0033], [0040]-[0041], [0044], [0049], [0052]-[0055], [0057]-[0058], [0064]-[0069], & Figs. 1 and 19-23) Specifically, Richenstein discloses an audio device 34 used alone or as a component to another device to playback audio. For example, Richenstein discloses audio device 34 with exemplary audio sources 44 (MP3 player), 54 (New Unit Add In), and 62 (Legacy Adaptor), in addition to its own audio stage 36, explaining exemplary audio device 34’s as various audio players and the audio components of more general playback devices:

Audio device 34 thereby represents any audio, video or data source including mono and stereo radios, CD and cassette players, mini-disc players, as well as the audio portions of electronic devices that provide other types of signals such as computers, television sets, DVD players and the like.⁷¹

136. As Richenstein explains, audio device 34 includes digital signal processing components to create the digital audio stream (master controller 26 with DSP encoder 24) and a transmitter 18 to transmit the stream as signals 16 to other playback devices (exemplary headset 14) on the network (network 10). (EX1005, [0033]-[0041], FIG. 1 annotated below). To the extent necessary, a POSITA would

⁷¹ EX1005, [0036].

be motivated to include a speaker closer to the front of the vehicle near audio device 34 so that the front passengers might hear audio more clearly. A POSITA would further have an expectation of success because Richenstein describes audio device 34 in a similar way to a variety of other playback devices including MP3 players, and an amps/speaker output would be routine, ordinary, and within the regular capabilities of a POSITA working with audio device 34. A POSITA would understand Richenstein's audio device 34 is a playback device.

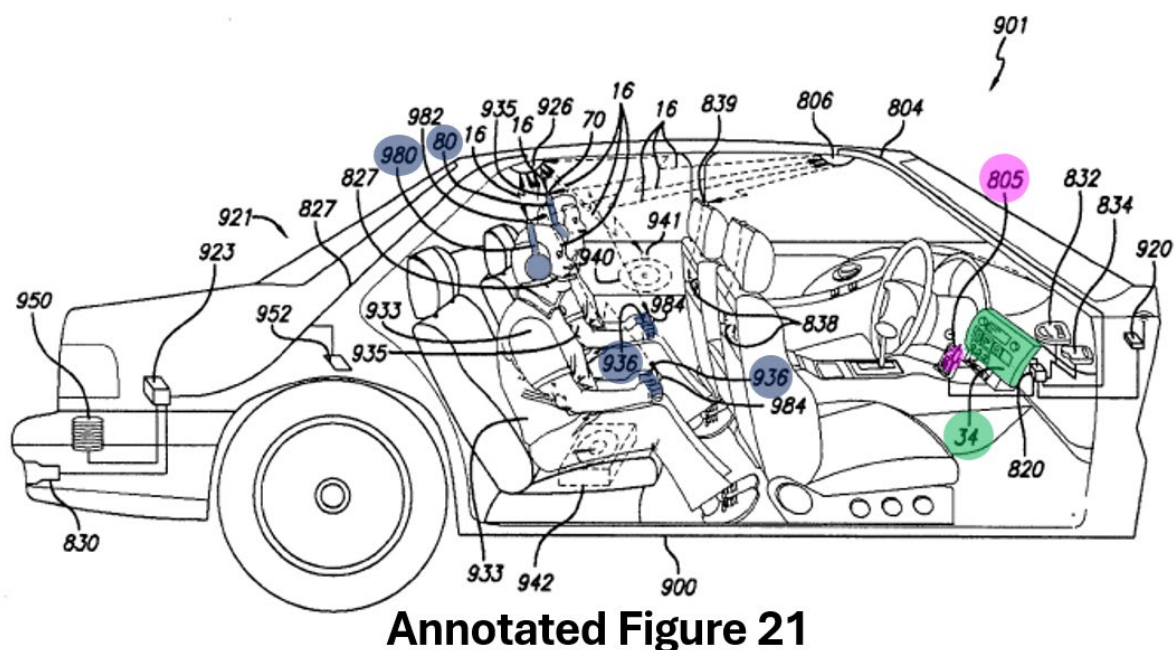
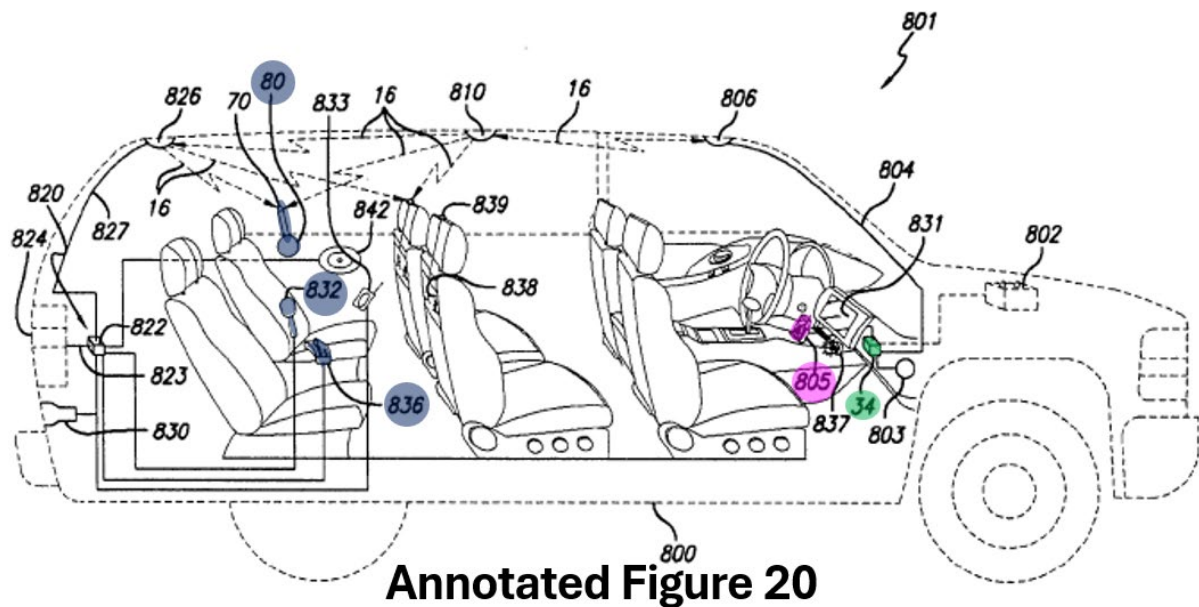


137. With respect to Fig. 23, Richenstein further discloses a home theater system 1100, which “receive[s] television and audio programming,” and “connected to decoder 1110 to receive one or more channels of audio from a pre-amp of the home theatre System and drive IR transmitter 1120 to transmit the channels of audio as IR signals 1122.” (EX1005, [0176].) Richenstein discloses that home theater system 1100 can be implemented using the structures of an audio device described in connection with its FIG. 1 and would likely include both a high quality screen as well as basic unit speakers, while allowing for the addition of speaker system speakers shown as 1130. (EX1005, [0041], [0176].) A POSITA would recognize that home theater system 1100 is also a playback device.

138. I understand that “*playback device*” has been previously construed as “data network device configured to process and output audio.” It is my opinion that the subject matter would have been disclosed and suggested regardless of whether this term is construed as it has previously or according to its plain and ordinary meaning. For example, audio device 34 and home theater system 1100 discussed above are both data network device configured to process and output audio, and thus fall within the construed meaning.

139. As described above in Section VIII.A, Richenstein provides that game controllers 836/936, microphone 832/984, and headphones 80/980, shown below in dark blue along with headphones 80/90, (each a “*network device*”) may send

commands to audio device 34, shown below in green, (“*configured to control the first playback device*”) using wireless network signals 16 (“*over a local area network*”) to control and access the cellular telephone 805, shown in pink (“*an audio information source*”). EX1005, [0149], [0153], [0165]- [0166].



140. Richenstein discloses multiple examples how the control devices (“*network device*”) control audio device 34 (“*the first playback device*”) to access audio information available on the local area network that connects those devices. In one example, Richenstein describes that game controllers 836/936 (“*network device*”) can control audio device 34 (“*the first playback device*”) to control and access cellular device 805 (“*audio information source*”). (EX1005, [0166]). As a further example, Richenstein also describes that headphones 80, 980 and microphones 984 (“*network device*”) may be used to control audio device 34 (“*the first playback device*”) to initiate phone calls to other phones identified by phone number (“*audio information source*”). (EX1005, [0165]).

141. Richenstein describes that the commands from the control devices (“*network device*”) to audio device 34 (“*the first playback device*”) includes an address that indicates a location of the audio information on cellular phone 805 (“*audio information source*”). A POSITA would recognize that in order for audio device 34 to accept or initiate a call through cellular device 805, the controller would need to identify the acceptance or initiation of the call with specificity in order for audio device 23 to implement the command correctly, directing it to the correct device, and informing the device of exactly what action it needed to take with respect to what application on the end device and where the source of audio data associated

with the call is located. For example, for an incoming phone call, the controller would need to indicate a specific control information to start the call, including an address of cellular phone 805 for receiving the audio data for the call (“*address identifying a location of audio information available*”). Similarly, in order for a call to be answered, the answer command needs to be sent to the correct device (cellular phone 805) and then directed to the specific application/programming on cellular device 805 responsible for answering or rejecting a call. Again, the command includes an address of cellular phone 805 for receiving the audio data for the call including address of cellular phone 805 for receiving the audio data for the call (“*address identifying a location of audio information available*”). As a further example, Richenstein also describes that headphones 80/980 may have a dialpad or audio device 34 may contain voice recognition capabilities to enable the user to input a telephone number from microphones 984, and the telephone number would be an “*address identifying a location of audio information available at an audio information source.*” Accordingly, Richenstein discloses multiple embodiments of addresses locating available audio from the controller devices to audio device 34.

142. Furthermore, a POSITA would recognize that Richenstein also describes that proper addressing and device identification is a critical part of routing requests to their proper destination:

By properly addressing and identifying the data transmitted over data

bus 990 (e.g. via information placed in the header of each data block or data packet), each device connected to the data bus can identify the channel of data it is required to decode and use, and may optionally be assigned a unique address to which the data it is intended to receive can be uniquely addressed[.]⁷²

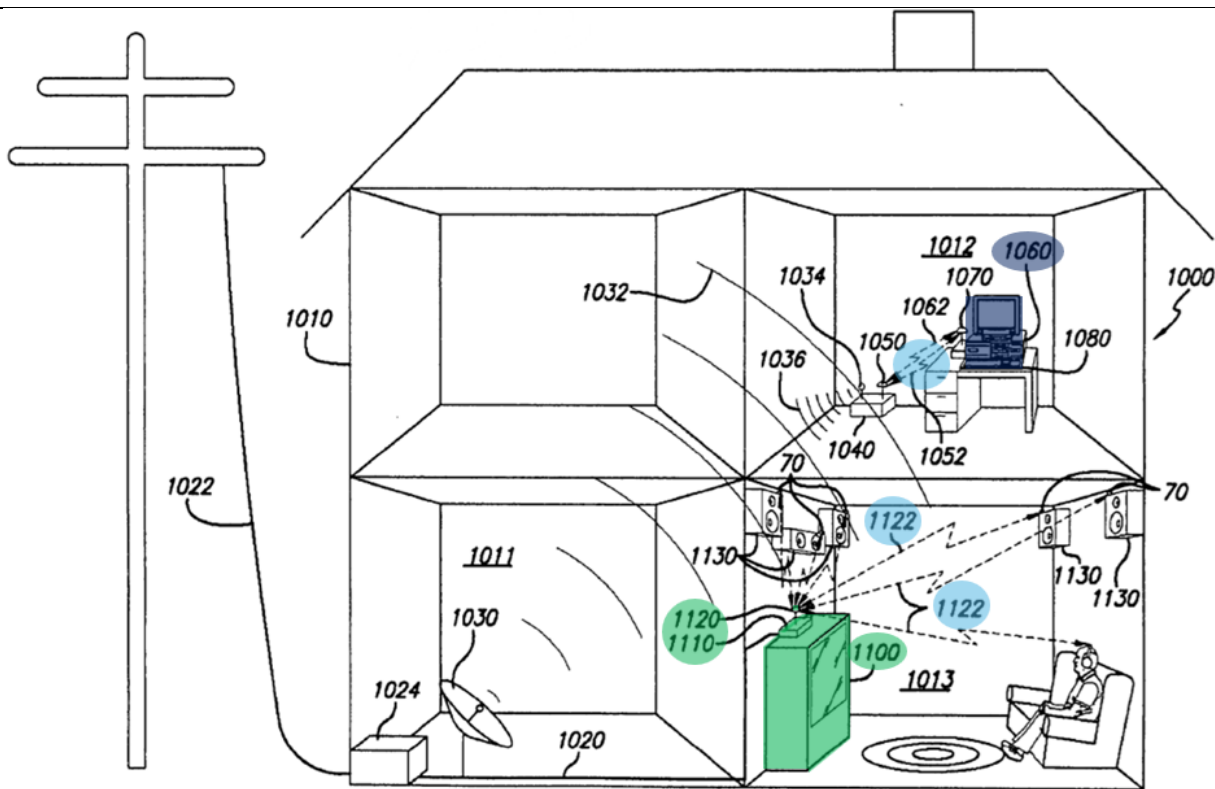
A POSITA would have understood that both the cell phone interface for accepting a call and phone call routing on the PSTN operate in a similar fashion, requiring proper routing information to reach their destination. Thus, for audio device 34 to access the cellular phone 805 calls, audio device 34 needs to be provided with this “unique address” indicating the location of the cellular phone 805 as well as the location for the call function or phone number to be dialed. Accordingly, Richenstein’s commands sent from the control devices (e.g., game controllers 836/936, microphone 832/984, and headphones 80/980) to audio device 34 regarding cellular phone 805 would also need to identify the cellular phone 805 and the address for the source of audio they wish to access.

143. Accordingly, it is my opinion that element [1.1.1] “*receiving, by a first playback device from a network device configured to control the first playback device and communicatively coupled to the first playback device over a local area network (LAN), control information comprising an address identifying a location of audio information available at an audio information source*” is disclosed or

⁷² EX1005, [0173].

suggested by Richenstein in Figs. 20 and 21.

144. Richenstein further discloses or alone suggests element [1.1.1] in Fig. 23 and its descriptions. Richenstein discloses a home theatre 1100, shown in green, (*“a first playback device”*), which can be implemented using audio device 34 including its IR transmitter 20 sitting on top of a TV cabinet. (EX1005, [0041] & [0167]). This home theater system 1100 along with decode 1110 and transmitter 1120 *“receive[s] television and audio programming.”* EX1005, [0176]. As described above in section VIII.A, Richenstein shows an embodiment where computer 1060, shown in dark blue, (a *“network device”*) is connected to (*“communicatively coupled”*) may send commands to home theatre 1100, shown in green, (*“configured to control the first playback device”*) via local area network 1020 (*“over a local area network”*). EX1005, [0149], [0153], [0165]-[0166].



Annotated Figure 23

145. In describing room 1012, Richenstein explains that computer 1060 is a “two-way” device indicating it can both transmit and receive messages. (EX1005, [0175]). Accordingly, a POSITA would understand the computer 1060 to be able to perform similar functions as the other bidirectional devices discussed in previous embodiments, including the game controllers 836/936. Richenstein specifically discloses such control capability, describing how other devices could be networked for remote control “various household appliances equipped for remote control.” (EX1005, [0176]). Based on this description and the shared components between Fig. 23 and Figs. 1-22, a POSITA would have understood Richenstein to disclose

that PC 1060 could be used to control other devices on the network (including home theatre device 1100), and that such commands could include media control and selection ([0149], [0152], [0153], [0162], [0166]) and interactions with external networks ([0149], [0165], [0166]).

146. Fig. 23 further provides that LAN 1020 (*“local area network”*) is connected to an external cable network, which Richenstein specifically states as a source of “media content such as television and music channels, and further to provide a connection to the Internet” 1022 (*“audio information source”*). (EX1005, [0174]). A POSITA would have further been familiar with cable networks media options such as “Pay Per View” where content can be selectively requested to a location for playback. A POSITA would recognize each of the television and music stations and media sources on the Internet as a possible *“location of audio information available at an audio information source”* and that in order to send commands to home theatre 1100 (*“first playback device”*) it would be necessary to provide the station, encoding, URL, or otherwise identify the source of the audio to be retrieved from external network 1022. (EX1005, [0174]).

147. Accordingly, it is my opinion that element [1.1.1] *“receiving, by a first playback device from a network device configured to control the first playback device and communicatively coupled to the first playback device over a local area network (LAN), control information comprising an address identifying a location of*

audio information available at an audio information source” is disclosed or alone suggested by Richenstein in Figure 23.

3. [1.1.2] wherein the audio information source is outside of the LAN; and

148. Richenstein discloses that the audio information source is outside of the LAN.

149. In Figs. 20 and 21, the cellular phone 805 is on a cellular network outside the vehicle network on which the audio playback devices are connected to. A POSITA would have recognized Richenstein’s cellular phone 805 as “outside of the LAN.” Additionally, for the embodiment of the audio source as the device receiving the call initiated by the numeric pad or voice activated dialing of Fig. 21 (EX1005, [0165]), the recipient is connected through the cellular network, not any LAN or local audio network of audio device 34.

150. Accordingly, Richenstein discloses and a POSITA reading Richenstein would understand the audio information source of Fig. 20/21 to be “*outside of the LAN.*”

151. In Fig. 23, the audio information source of “media content such as television and music channels, and [] a connection to the Internet” is though external cable network 1022 through cable box 1024. (EX1005, [0174]). In order for home theatre device 1100 to obtain the selected media, it must connect to the external

network 1022.

152. Accordingly, Richenstein discloses and a POSITA reading Richenstein would understand the audio information source of Fig. 23 to be “*outside of the LAN.*”

153. Thus, it is my opinion that Richenstein discloses or alone suggests element [1.1.2] “*wherein the audio information source is outside of the LAN.*”

4. [1.2.1] after receiving the control information (i) obtaining, by the first playback device from the audio information source outside of the LAN, the audio information;

154. Richenstein discloses this element for both embodiments in Figs. 20/21 and Fig. 23.

155. As described above with respect to Figs. 20/21, Richenstein discloses or alone suggests that audio device 34 (“*first playback device*”) receives commands from game controllers 836/936, microphone 832/984, or headphones 80/980 (Figs. 20/21) (“*network device*”) relating to obtaining audio information. EX1005, [0149], [0153], [0165]-[0166]. As explained below, a POSITA would understand Richenstein to disclose or alone suggest audio device 34 in a vehicle embodiment of Figs. 20/21 (“*first playback device*”) would obtain phone call audio (“*the audio information*”) from cellular device 805 (“*audio information source outside the LAN*”) as an exemplary “New Unit 54” audio source.

156. And as described above with respect to Fig. 23, Richenstein discloses or alone suggests that another embodiment of audio device 34 - home theatre system

1100, receives commands from PC 1060 (Fig. 23) (“*receiving control information*”) relating to playing audio information. EX1005, [0041], [0167]. As explained below, a POSITA would understand Richenstein to disclose or alone suggest audio device 34’s embodiment as home theatre system 1100 (“*first playback device*”) would obtain music, pay per view programming, or internet multimedia (“*the audio information*”) from cable network 1022 (“*audio information source outside the LAN*”) as an exemplary “New Unit 54” audio source. EX1005, [0174].

157. As shown in Fig. 1, audio device 34 obtains audio information from a variety of exemplary sources including MP3 player 44, New Unit Add In 54, and Legacy Adaptor 52.

Transmitter subsystem 12 IR transmitter section 18 including IR transmitter 20, such as an infra-red light emitting diode or LED, driven by an appropriate IR transmitter driver 22 receiving digitized audio data from one or more digital signal processors, or DSPs, such as DSP encoder and controller 24, 27, 28 and/or 30. The digital data stream provided by IR transmitter section 18 is preferably formatted in accordance with any one of the proprietary formats described herein below with reference to FIGS. 3, 10 and 16.⁷³

158. Based on Richenstein’s explanation that audio device 34 receives audio through its various sources, a POSITA would understand audio device 34 would obtain audio information through a means such as “New Unit 54” for each of cellular phone 805 and cable network 1022. For cellular phone 805, as described above, a

⁷³ EX1005, [0034]; [0046]; [0036]-[0037].

POSITA would recognize that audio device 34 would need to interface with the cellular phone 805 in order to accept or initiate the call before receiving audio. For cable network 1022, a POSITA would further recognize that internet sources and pay-per-view options require a means of selecting and directing a request.

159. Thus, it is my opinion that Richenstein discloses or alone suggests element [1.2.1] “*obtaining, by the first playback device from the audio information source outside of the LAN, the audio information.*”

5. [1.2.2] (ii) transmitting, by the first playback device to a second playback device, the audio information, playback timing information associated with the audio information, and device clock information of the first playback device; and

160. Richenstein discloses or alone suggests “*transmitting, by the first playback device to a second playback device, the audio information, playback timing information associated with the audio information, and device clock information of the first playback device.*”

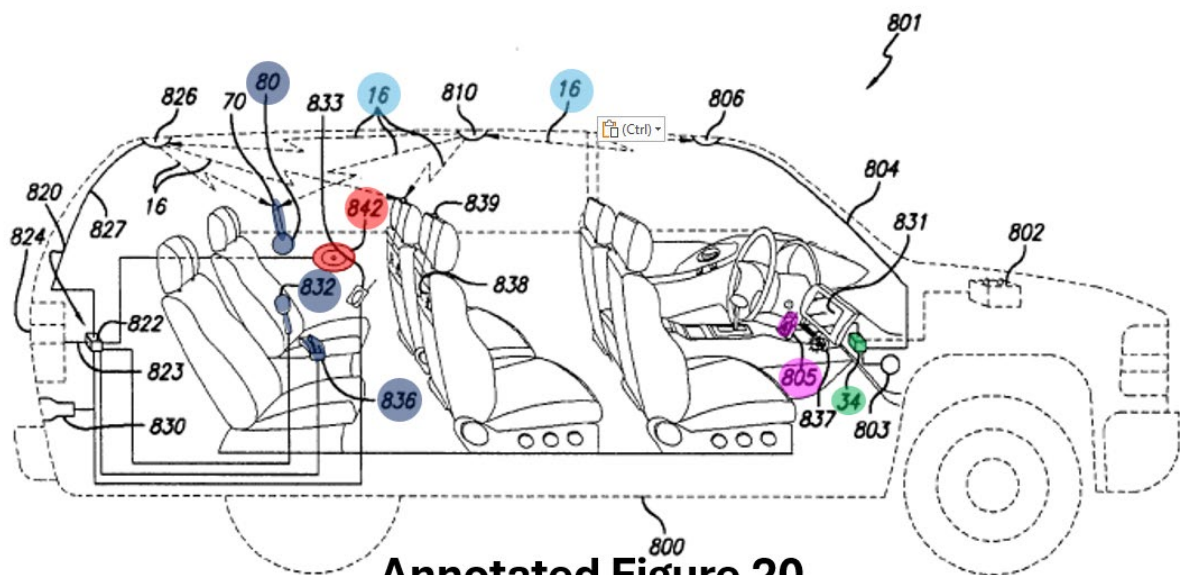
161. As explained above in Section VII.E, I understand that “playback timing information” and “device clock information of the first playback device” have been previously construed.

162. Specifically, I understand that “*playback timing information*” has been construed as “information indicating when the audio information [content] is to be played back.” It is my opinion that the subject matter would have been disclosed and

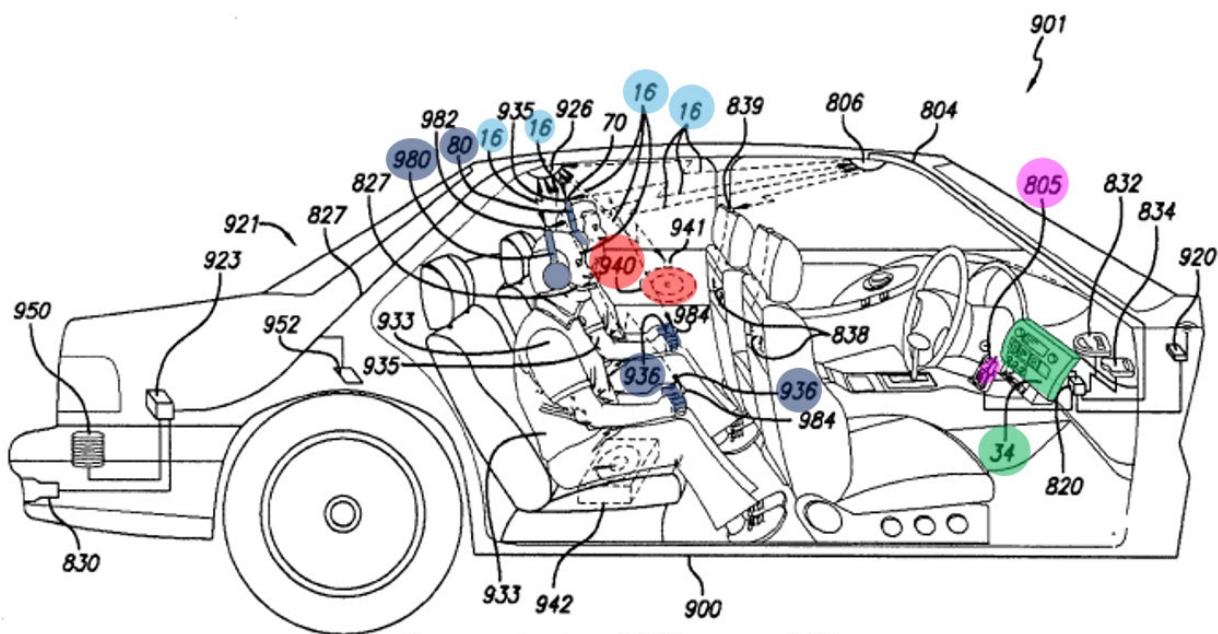
suggested regardless of whether this term is construed as it has previously or according to its plain and ordinary meaning.

163. Additionally, I understand that “*clock information/device clock information of the first playback device*” has been construed as “information representing a time value indicated by a device's clock.” It is my opinion that the subject matter would have been disclosed and suggested regardless of whether this term is construed as it has previously or according to its plain and ordinary meaning.

164. As further described above, each of Fig. 20/21's audio devices 34, shown in green, (“*first playback devices*”) includes a transmitter for sending audio data bitstream signals 16, shown in light blue, (Figs. 20/21) (“*transmitting...the audio information*”). For example, Richenstein discloses audio devices 34 (“*first playback devices*”) transmits signals to speakers 842/940, shown in red (“*a second playback device*”) (in connection with Figs. 20/21). EX1005, [0144] (842 receives signals 16); [0164] (940 receives transmitted encoded audio data).



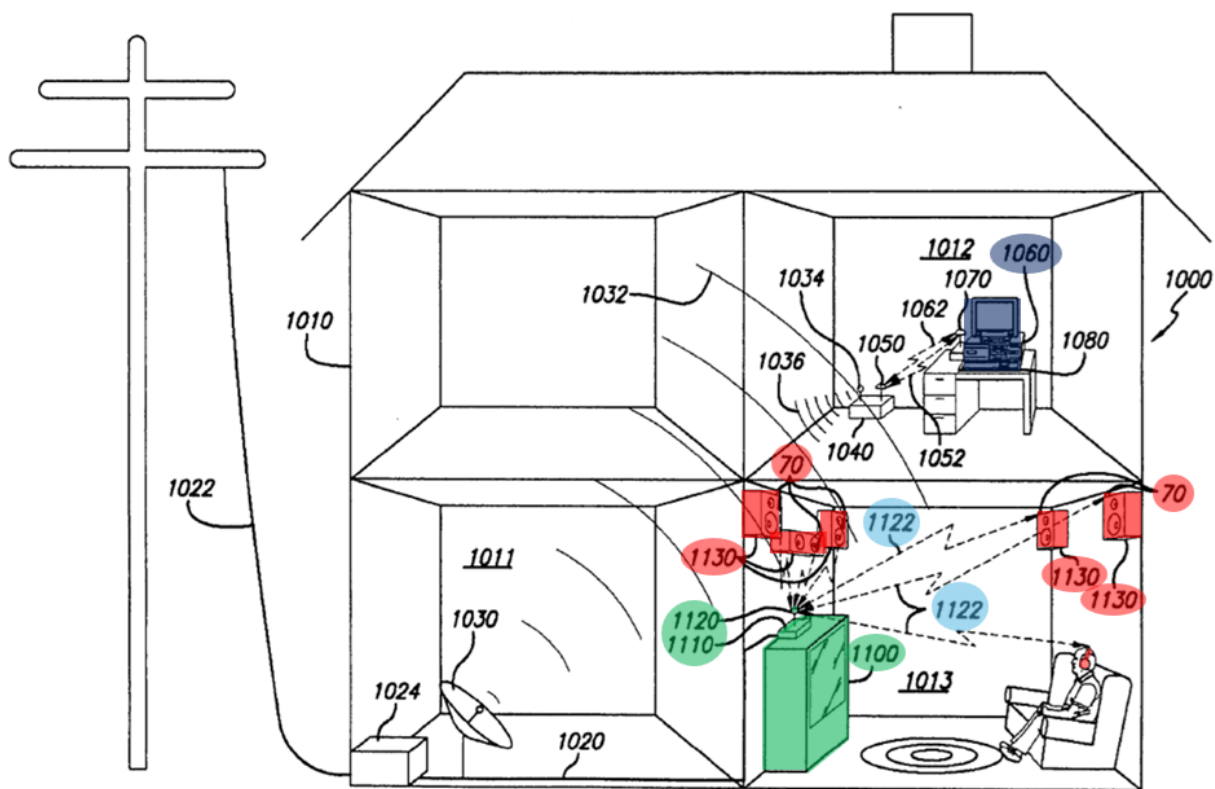
Annotated Figure 20



Annotated Figure 21

165. As also described above, Fig. 23's home theatre system 1100, shown in green, (*"first playback devices"*) includes a transmitter for sending audio data bitstream signals 1122, shown in light blue (Fig. 23) (*"transmitting...the audio*

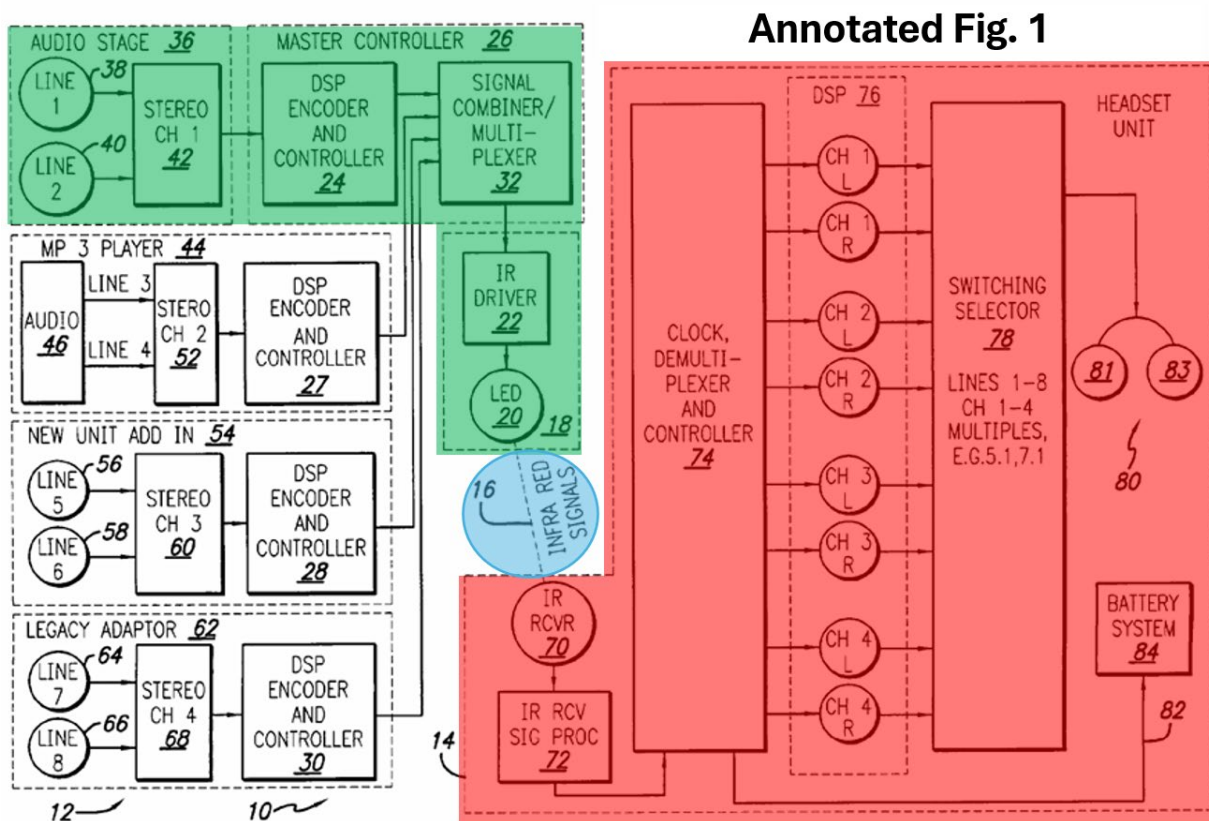
information”). For example, Richenstein discloses that home theatre system 1100 (“*first playback devices*”) transmits signals to receiver components 70 in multiple receiving units including headsets 14 and loudspeaker 1130, shown in red, (“*a second playback device*”) (Fig. 23) for playback. EX1005, [0176] (receivers 70 receiver signals 1122 for speakers 1130)).



Annotated Figure 23

166. Richenstein discloses that the receiving units (including both speakers 842/940 in Figs. 20/21 and headsets 14 and loudspeaker 1130 in Fig. 23) can be implemented using the structures shown in Fig. 1 annotated below, which includes

a Decoder 74 with clock, multiplexer, and controller. A POSITA would understand these devices on the receiving end are all playback devices (“a second playback device”).



167. Richenstein discloses that, in addition to the audio content, (“audio information”), audio device 34 also send its “timing information” used by the receiving device “to synchronize the timing of the operations” (“playback timing information”) and its clock information used by the receiving device to reproduce its clock, e.g., PPM IR Data (“device clock information of the first playback device”).

168. Richenstein provides exemplary block diagrams for the individual

packets 86 in signals 16 (and signals 1122) in Figs. 3 and 12. EX1005, [0052]-[0053], [0057]. A POSITA would be familiar with similar block diagrams for formatting audio transmissions. Different kinds of audio are formatted according to different rules about block size, frame length, and sampling rate. A POSITA would further understand that while some formats require each individual sample to be time stamped, others use consistent segment lengths that correspond to specific durations of time, allowing each device to calculate the time by the order the segments are arranged (*i.e.* multiplying the duration by the number of segments that precedes it). As such, a POSITA would recognize the exemplary structures of Figs 3 and 12 to operate in a similar manner to other such transmission mechanisms, including the ones described in the specification of the '357 Patent.

The audio track is divided into a series of frames, each of which is associated with a time stamp indicating the time, relative to the clock maintained by an audio information channel device, which, in that embodiment, serves as the task distribution device, at which the members of the synchrony group are to play the respective frame.⁷⁴

169. Richenstein explains that an important task of the transmitting/receiving system is to synchronize operations between devices, highlighting that there are several ways to synchronize across devices.

Referring again to FIGS. 1 and 4, one important task in maintaining proper operation of system **10** is to maintain synchronization between the operations, particularly the sampling and/or A/D operations

⁷⁴ EX1001, 2:66-3:4.

of transmitter subsystem **12** and the decoding and related operations of headset receiver unit **14**.⁷⁵

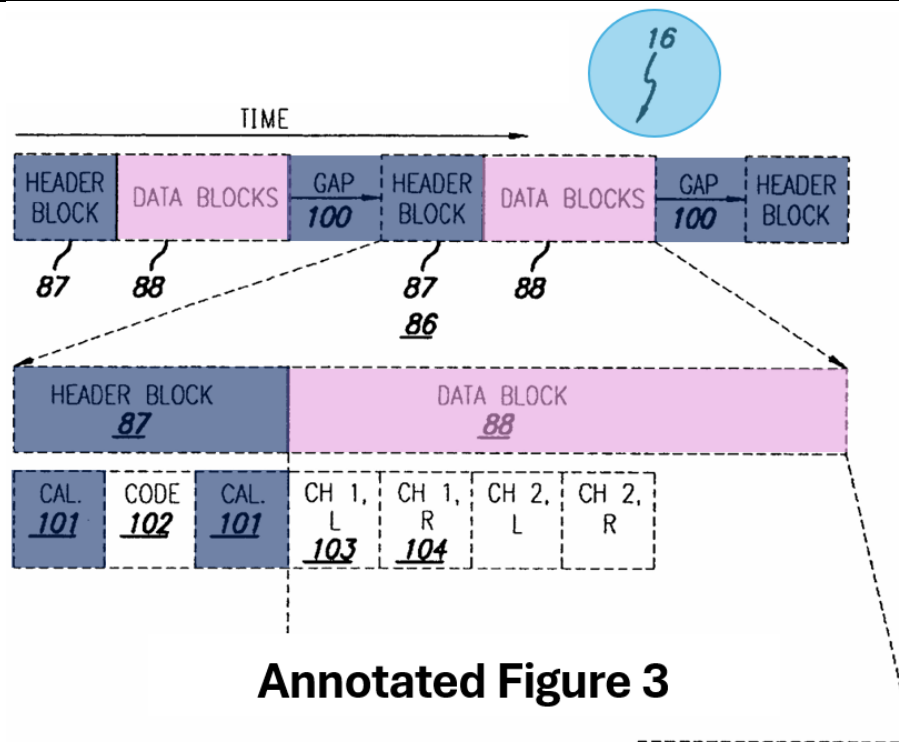
170. Richenstein further explains that one implementation includes using the transmitter subsystem's timing information for the receiver subsystems to synchronize with.

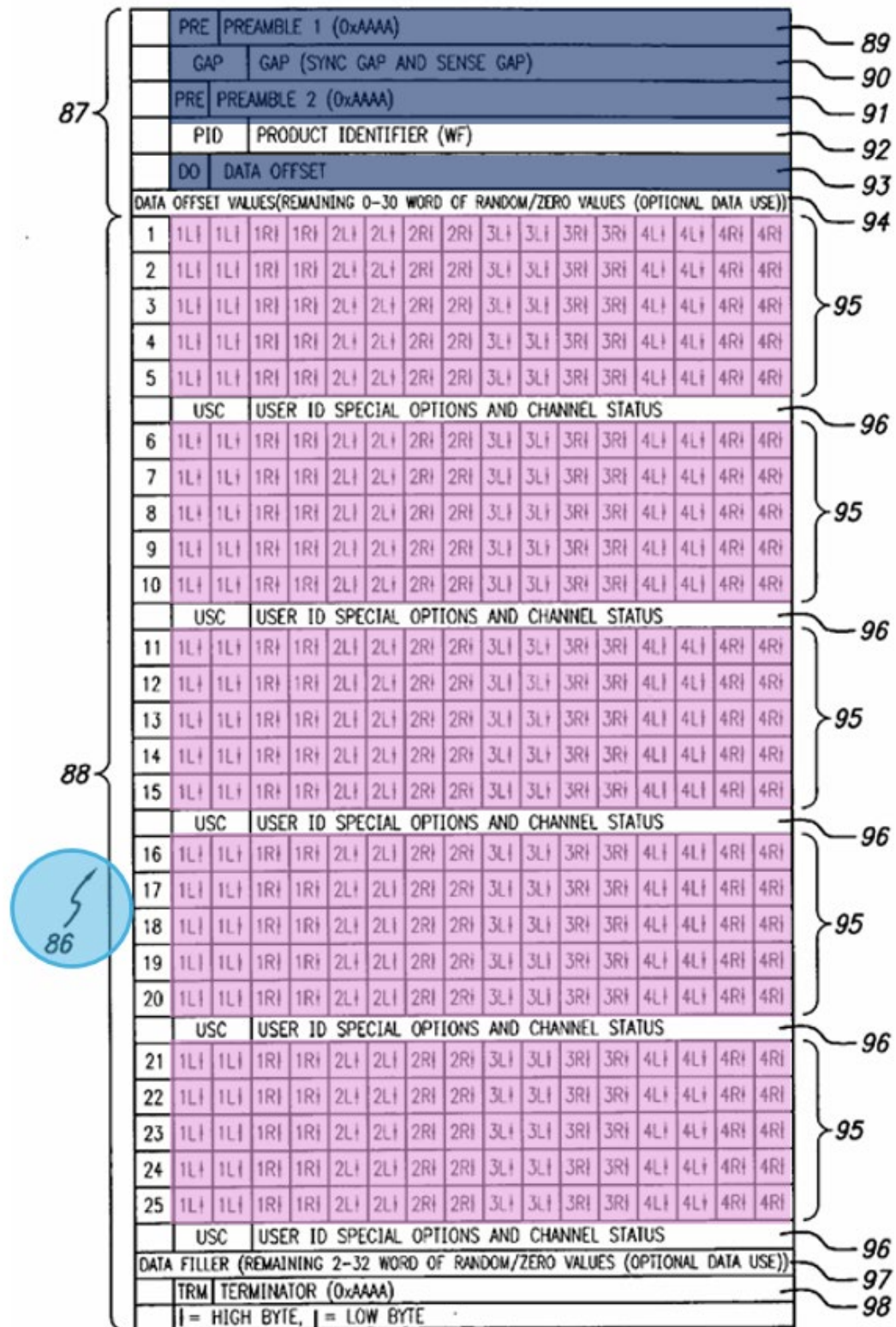
Although synchronization may be maintained in several different ways, it has been found to be advantageous particularly for use in a system (such as system **10**) including a possible plurality of battery powered remote or receiver units (such as headset units **14**) to synchronize the timing of the operations of headset receiver units **14** to timing information provided by transmitter subsystem **12** and included within IR signals **16** to assure that the synchronization was accurately achieved for multiple receiver units that may be replaced or moved between automobiles from time to time.⁷⁶

171. Richenstein further provides multiple ways of conveying timing information between the transmitter and receiver devices. Specifically, Richenstein explains that the packets shown in Figs. 3 and 12 can provide the audio information data in data blocks 88, shown in pink, while synchronizing timing information can be included in the header sections 87, gaps 100/90, preambles 89 and 91, and offset 93, shown in dark blue.

⁷⁵ EX1005, [0066].

⁷⁶ EX1005, [0066].





Annotated Fig. 12

172. A POSITA would recognize that in order to synchronize activity between devices, the devices must be able to operate at the same speed (synchronizing “clocking rate”) and begin/end operations simultaneously (synchronizing “phase”). Richenstein provides exemplary embodiments of how to synchronize transmitting and receiving devices using transmitting device 500 (Figs. 6-10) and receiving device 700 (Figs. 13-18). Richenstein explains that transmitting device 500 is an exemplary embodiment of audio device 34 (and by association, home theatre system 1100). (EX1005, [0079]). Richenstein further discloses that receiving device 700 is an exemplary embodiment of a device receiving packets 86, and by association signals 16, in the same manner as speakers 842/940 (Figs. 20/21), and loudspeaker 1130 (Fig. 23). (EX1005, [0100]).

173. As shown in Fig. 7 and 8, Richenstein discloses that transmitting device 500 includes “Clocks and Clock Phasing” circuitry 628, which includes “Master clock” 660. Richenstein explains that master clock 660 is used to drive the timing required by multiplexer(s) 606 and 608, as well as DSP 600. A POSITA would understand the multiplexers and DSP to use the master clock timing to organize the audio information into the individual frames of Figs. 3 and 12, corresponding to the bitrate of playback. Accordingly, a POSITA would understand the encoding of audio data into individual frames or equal duration according to an audio format to provide

the “*playback timing information associated with the audio information*” and “*information indicating when the audio information [content] is to be played back.*”

174. To the extent the “playback timing information” might require a specific timestamp labeled rather than the format of the encoding itself, A POSITA would have further understood the inclusion of playback timing information as a routine, well-understood means for transmitting sampled audio for playback. For example, Richenstein discloses the use of timestamps through the implementation of MOST, which includes the well-known use of timestamps in labeling multimedia content. (EX1008, 177 (including timestamps in function buffer for events and triggering conditions).) Accordingly, to any extent it is not specifically disclosed by the above, a POSITA would have considered it obvious to apply based on Richenstein’s disclosures.

175. With respect to the “*device clock information,*” Richenstein discloses the transmission of PPM IR Data from transmitting devices like audio device 34. Richenstein further shows in Figs. 14 and 15 that receiver 700 includes “Clock Recovery” 716. As Richenstein provides, clock recovery circuit 716 “is used to reproduce the data clock used by transmitter **500.**” (EX1005, [0118].) Figs. 15 and 16 of Richenstein shows that clock recovery 716 uses “PPM IR Data” to produce the DSP digital clock and reproduction of the transmitting device’s data clock used to sample the IR data. A POSITA would recognize that this could be achieved using

the headers and gaps in exemplary packet embodiments of Figs. 3 and 12, which Richenstein confirms in referring to the start of the IR data stream, 712:

The start of IR data stream **712** creates the frame synchronization for the incoming data packet. Clock recovery circuit **716** develops the IR data clock used to sample the IR data. The DSP serial port completes clocking for the 16-bit DAC. The master clock for the 16-bit D/A converter is developed from an additional serial port.⁷⁷

176. Accordingly, because the PPM IR Data is used to reproduce the transmitting device's clock used to sample and create the signals 16 and packets 86 received by the receiving device, a POSITA would understand that the PPM IR data would include information about audio device 34's clock ("*clock information of the first playback device*"). Accordingly, it is my opinion that under the plain and ordinary meaning of the term, Richenstein discloses the transmission of clock information.

177. However, as explained above, I understand "*clock information of the first playback device*" has been previously construed to mean "information representing a time value indicated by a device's clock." Although Richenstein does not specify whether the "master clock" of the audio device 34 used for synchronization and playback is a counter or a real-world time, either type of time reference can be used to achieve the purpose of synchronization. For systems that

⁷⁷ EX1005, [0109].

require playback with more connection to the real-world and user-readable timing, it may be beneficial to use a real-world time for synchronization. In other applications, it may be beneficial to synchronize based on a logical counter. Such a decision would be well within the design choices of a POSITA at this time depending on the specific needs of their intended purpose. In my opinion, regardless how the “master clock” of the audio device 34 in Richenstein is implemented, it falls within the construed meaning

178. In either application, the PPM IR data would include some sort of a time value, regardless of units, in order to enable the receiving device to use it to synchronize with the transmitting device’s clock for synchronized playback. Accordingly, it is my opinion that Richenstein discloses transmitting “information representing a time value indicated by a device's clock.”

179. Accordingly, it is my opinion that Richenstein discloses or alone renders obvious this element in both the embodiments of Figs. 20/21 and Fig. 23.

6. [1.2.3] (iii) playing back, by the first playback device, the audio information in synchrony with the second playback device by using the playback timing information associated with the audio information and the device clock information of the first playback device to play back the audio information,

180. Richenstein discloses or alone renders obvious playing back the audio. Richenstein further explains how playing back audio on multiple speakers without doing so with appropriate synchronization measures in place degrades the quality of

audio:

Upon detection of appropriate synchronization data, sync detector 112 may then maintain appropriate clocking information for headset receiver unit 14 by adjusting a clock or, preferably, maintaining synchronization by updating a phase lock loop circuit (or PLL), such as PLL 114. The output of PLL 114 may then be applied to DSP 76 for synchronizing the decoding and/or sampling of the IR data, for example, by controlling the clock rate of the D/A conversion functions of DSP 76. The resultant synchronized signals are then applied by switching selector 78 to headphones 80. Applicants have found that without such synchronization, the audio quality of the sounds produced by headphones 80 may be seriously degraded.⁷⁸

181. In the context of Figs. 20/21, a POSITA would recognize that when playing back audio for the car, it would be expected for there to be a speaker at the front of the car attached to or as part of audio device 34. Accordingly, when more than one person in the car is participating on a phone call or otherwise listening to the same media, it would be beneficial for audio device 34, including its speaker, (“*first playback device*”) and rear speaker 842/940 (“*second playback device*”) to play the audio in synchrony using the existing synchronization means (“*using the playback timing information associated with the audio information and the device clock information of the first playback device to play back the audio information.*”)

182. Further, in Fig. 23, home theatre system 1100 and speakers 1130 are part of a home theatre. As a result, it would be expected that the devices would play

⁷⁸ EX1005, [0068].

back the selected media in synchrony using the synchronization methods (“*using the playback timing information associated with the audio information and the device clock information of the first playback device to play back the audio information.*”)

183. Accordingly it is my opinion that both embodiments of Figs. 20/21 and Fig. 23 disclose or alone suggest this element.

7. [1.2.4] wherein the first and second playback devices remain independently clocked during synchronous playback of the audio information.

184. Richenstein discloses or alone suggests this element. I understand “*independently clocked*” has been construed as “operating in accordance with their own respective clocks during synchronous playback.” It is my opinion that the subject matter would have been disclosed and suggested regardless of whether this term is construed as it has previously or according to its plain and ordinary meaning.

185. Richenstein discloses that both audio device 34 (“*first playback device*”) and speakers 842 and 1130 through exemplary receiving device 700 (“*second playback device*”), can operate according to their own oscillator crystals and their own clocks.

186. Additionally, both transmitting and receiving devices have their own independent crystal oscillators which each provide a physical clocking rate for the respective devices. (EX1005, Fig. 16 (receiver crystal oscillator 776); Fig. 8 (base crystal 665.)) In fact, because the devices are independently clocked, Richenstein

discloses that one device's clock information will be used to superficially adjust the clock information of another device for them to synchronize with other. For example, Richenstein explains that synchronization could include adjusting the clocking rate of the clock to be the same, i.e. removing independent clocking, or by instead aligning a reconstructed "PLL" software clock limited to the specific synchronized activities of DSP 76.

Upon detection of appropriate synchronization data, sync detector **112** may then maintain appropriate clocking information for headset receiver unit **14** by adjusting a clock or, preferably, maintaining synchronization by updating a phase lock loop circuit (or PLL), such as PLL **114**. The output of PLL **114** may then be applied to DSP **76** for synchronizing the decoding and/or sampling of the IR data, for example, by controlling the clock rate of the D/A conversion functions of DSP **76**.⁷⁹

187. Accordingly, regardless of which construction is applied, it is my opinion that Richenstein discloses or alone suggests that the first and second playback devices are "*independently clocked*."

188. Thus, it is my further opinion that Richenstein anticipates or alone renders obvious claim 1.

⁷⁹ EX1005, [0068].

B. Dependent Claim 2: The method of claim 1, further comprising: after receiving the control information, additionally (i) generating, by the first playback device, the playback timing information associated with the audio information; and (ii) generating, by the first playback device, the device clock information of the first playback device.

189. It is my opinion that Richenstein discloses or alone suggests the additional subject matter of this claim.

190. As explained above regarding element [1.2.2], Richenstein discloses that the first playback devices, audio device 34 and home theatre system 1100 transmit playback timing information and device clock information. Richenstein further discloses that transmitting devices include multiple circuits used to generate the packets 86 and signals 16 containing that data. Specifically, Richenstein describes using “clocks and clock phasing” circuit 628 in creating the timing (“*generating*”) necessary for processing of the multiplexers and DSP which provide the inputs to IR module 634 for transmission. (EX1005, Fig. 7, [0080]-[0082], [0083]-[0086].)

191. Accordingly, it is my opinion that Richenstein discloses or alone suggests generating the “*playback timing information associated with the audio information*” and the “*device clock information of the playback device.*”

192. Thus, it is my further opinion that Richenstein anticipates or alone renders obvious claim 2.

C. Dependent Claim 3: The method of claim 1, wherein the control information further comprises one or more instructions for the first playback device and the second playback device to playback audio information.

193. It is my opinion that Richenstein discloses or alone suggests the additional subject matter of this claim.

194. As described above with respect to element 1.1.1, Richenstein describes using various devices in embodiments of Fig. 20/21 to control media playback of multiple devices. (EX1005, [0149], [0153], [0165]- [0166].)

195. Richenstein further provides a home theatre embodiment in Ex. 23. Richenstein provides that home theatres such as this may apply more complex audio formats such as home theatre 5.1 (EX1005, [0176].) A POSITA would recognize that 5.1 and 7.1 formats require synchronization of 5 and 7 speakers respectively, and that in order for the format to be enabled, each device involved would need to be instructed to play back the audio information. Richenstein explains that when applying such a format, a user may selectively override the selection instructed for the headphones. (EX1005, [0047].) A POSITA would recognize this to indicate that the multiplexed audio includes instructions for specific devices to play audio, which would include both first and second playback devices.

196. As a result, it is my opinion that Richenstein discloses or alone suggests this element.

197. Thus, it is my further opinion that Richenstein anticipates or alone renders obvious claim 3.

D. Dependent Claim 4: The method of claim 3, wherein the first and second playback devices are members of a synchrony group, and wherein the method further comprises: transmitting, by the first playback device to the network device, status information that comprises a status of the synchrony group.

198. It is my opinion that Richenstein discloses or suggests the additional subject matter of this claim alone or in view of MOST.

199. As discussed above for element 1.2.3, “*first playback devices*” audio device 34 and home theatre system 1100 may playback audio in synchrony with a “*second playback device*,” speaker 842/940 and speakers 1130 respectively, and it’s my opinion that these devices are members a “*synchrony group*.”

200. A POSITA would recognize the ability of devices to play back audio together to constitute a “*synchrony group*.” Accordingly, both Figs. 20/21 and Fig. 23 embodiments in Richenstein disclose “*wherein the first and second playback devices are members of a synchrony group*.”

201. Richenstein further discloses the audio device 34 (“*first playback device*”) transmitting telemetry data and channel status information (“*status information*”) to user control devices (“*to the network device*”). As explained below, a POSITA would consider it obvious that audio device 34 similarly provide status information regarding audio device 34 and speakers 842 and 1130 (“*status of the*

synchrony group”). Additionally, as further described below, Richenstein also discloses audio device 34 transmitting status information to game controller 836 and PC 1060 in Figs. 20/21 and Fig. 23 respectively through its reference to MOST.

202. As described in detail above for elements [1.1.1], each of “*first playback devices*” audio device 34 and home theatre system 1100, and “*network devices*” game controllers 836/936, microphone 832/984, and headphones 80/980 (Figs. 20/21) and PC 1060 may be a bidirectional device capable of both sending and receiving transmissions to other devices. Richenstein describes that audio device 34 may be used to provide information back to game controllers 836/936. Specifically, Richenstein describes that remote controllers may both “access and control” cellular phone 805 through audio device 34. (EX1005, [0166]). A POSITA would recognize that *controlling* cellular device 805 through audio device 34 requires control information to go from game controllers 836/936 to audio device 34 and then to cellular telephone 805, as described above. *Accessing* cellular device 805, however, would require status information regarding the operations of cellular device 805 to go from cellular device 805 to audio device 34, and then go from audio device 34 to game controller 836/936, establishing that Richenstein’s audio devices 34 are equipped for sending status information from audio device 34 to game controller 836/936.

203. Richenstein further explains that game controllers themselves may

receive feedback for the user in the form of audio or vibrations. (EX1005, [0166].)

Richenstein then explains how remote controllers 836/936 can be used in conjunction with video displays 838 situated on the back of the seats in front of them to provide more fulsome control capabilities based on telemetry data displayed on the screen.

Remote controller 936 may further be used to control video display 838 and adjust display functions and controls, to control DVD player 803 to display a movie on video display 838 and control its functions (e.g. pause, stop, fast forward), to control trunk-mounted CD changer 950, to request telemetry data from vehicle CPU 924 to display on video display 838, or to control other vehicle 900 functions such as locking/unlocking doors and opening/closing windows.⁸⁰

204. A POSITA would recognize that while Richenstein specifically explains this capability extending beyond the primary teachings on audio playback and synchronization, such detailed telemetric data would be inherently part of the embodiment's capabilities. For example, Richenstein describes how game controllers can issue playback commands through audio device 34 to control dvd player 803 and playback on the screens 838, allowing the game controllers to make commands including pause, stop, fast forward, etc. (EX1005, [0166].) A POSITA would recognize that the user would rely on the visual indicator of scene/dvd menu in making the appropriate command selections to achieve the desired result, i.e.,

⁸⁰ EX1005, [0166].

watching a particular scene to fast forward or reward through, or when to pause, etc. Similarly, a POSITA would understand the video game screen on display 838 to be a critically important piece to inform the passenger of what commands to input on the game controller 836/936 to effectively play the game. (EX1005, [0166].)

205. As discussed previously, Richenstein also discloses that the game controller may be used to make selections for CD changer 950, including switching CDs or repeating, shuffling, or skipping tracks, for what channel to play on speaker 842, and even which headset 980/80 to use for which video game player. (EX1005, [0153], [0162], [0166].) A POSITA would understand that just as controlling the cellular phone 805, dvd player 832, and game console 922 required status information and feedback for the user about current operations, controlling CD changer 950, speaker 842, headsets 980/80 with game controller 836/936 would also require operation status information for the user, whether through game controllers 836/936 themselves or through displays 838.

206. To any extent Richenstein does not specifically disclose such capability, it would be suggested based on Richenstein's own disclosures regarding providing status information to the user to support control operations. Specifically, in the context of headset 14, Richenstein explained that headset 14 might have a channel selection switch allowing the listener to select different channels corresponding to different audio sources from audio device 34 in Fig. 1. Richenstein explains how the

headset 14 might include indicators, an LCD, or other display providing information including device functionality, selected audio stream, status of various channels, or even providing advertising messages, with the status information being encoded into transmissions from audio device 34.

Alternatively, an LCD or other type of display may indicate the channel selected, volume level, and any other information. Such information may be encoded in the header of each data packet, and may include additional data regarding the selected audio stream (e.g. artist, song name, album name, encoding rate, etc.) as well as any other type of information such as content being streamed on the other available channels, identification of the available (versus unavailable or 'dead' channels), environmental variables (speed, temperature, time, date), and messages (e.g. advertising messages). The information displayed may include text and graphics, and may be static or animated.⁸¹

207. A POSITA would understand this description of a control mechanism paired with means for information the user with regard to the options to suggest that when providing controls to the user, it is beneficial to provide them information regarding the current state of the system. In the context of using game controllers 836/936 to control synchronized playback between audio device 34 and speaker 842, a POSITA would recognize that the user's ability to control the devices effectively would be improved by receiving status information about the devices.

208. Accordingly, it is my opinion that to the extent it is not specifically disclosed, a POSITA would recognize Richenstein to suggest this embodiment based

⁸¹ EX1005, [0124].

on the value of current operating states to effective control. A POSITA would further expect this to be successfully implemented based on Richenstein's teachings towards bidirectional control, audio device 34's transmission capabilities, and game controller 836/936's abilities to provide feedback to the user through its own vibrations or audio, or in cooperation with display 838.

209. Similarly, with respect to Fig. 23, a POSITA would recognize the superior user interface capabilities available at PC 1060. Just as game controller 836/936 combined with display 838 allowed the passengers to request and view telemetry data from the vehicle CPU and optionally make any responsive commands necessary, a POSITA would understand that the PC 1060's screen, keyboard, and mouse would enable an even higher level of user information and input flexibility. Accordingly, just as in Fig. 20/21, a POSITA would understand that when Richenstein's PC 1060 acts as a "*network device*" controlling other device on the LAN, receiving operating status information from home theatre system 1100 would be an inherent part of the disclosure.

210. Additionally, Richenstein discloses transmitting status information about the synchrony group through the implementation of the MOST communication standards. Specifically, MOST provides that function blocks corresponding to specific functions of different devices, such as audio device 34 and speakers 842 and 1130, ("*first and second playback devices*") can be grouped

together for control purposes, and that an assigned controller, such as audio device 34 (“*first playback device*”) would provide rank assignments on behalf of its assigned function block grouping (“*status information that comprises the status of the synchrony group*”) to the MMI or “interface”, game controller 832 and PC 1060 (“*network device*”).

211. MOST provides that devices can be cataloged according to specific functions or “function blocks” for control purposes.

Functions are grouped together in function blocks with respect to their contents. Therefore, function blocks are good references for external applications to localize a certain function. A function is addressed in a function block.⁸²

212. MOST further provides that functions can be grouped together and controlled by a single component, for example, audio device 34 as an “audio controller.”

By defining an audio controller, all audio functions can be provided by a single hand, even if the components are distributed. The audio controller coordinates the audio components in this case. The audio controller does not need to be a real physical device in the ring, it can be part of another device. It could even be a software module in the MMI.⁸³

213. MOST further provides that within the groups, (“*synchrony group*”), different device function blocks can be assigned a class, including slave, controller,

⁸² EX1008, 15.

⁸³ EX1008, 24.

system controller, or MMI.⁸⁴

Class	Ranking
Slave	0
Controller	1
System Controller	2
MMI	3

Table 2-1: Ranking of device classes

214. MOST then explains that controllers and MMI may request devices to identify themselves according to their function rankings, and that when there is a controller controlled by an MMI, the controller may optionally pass the information along to the MMI (TP=ON), with reference to the architecture in Fig. 2-10.

The example above also shows a second mechanism - the heredity of functions. The audio controller receives function TA from the tuner and hands it through to the MMI in a modified form. The TA function of the tuner is complemented by an on/off function. TA information is only passed to the MMI in case of TP = ON.⁸⁵

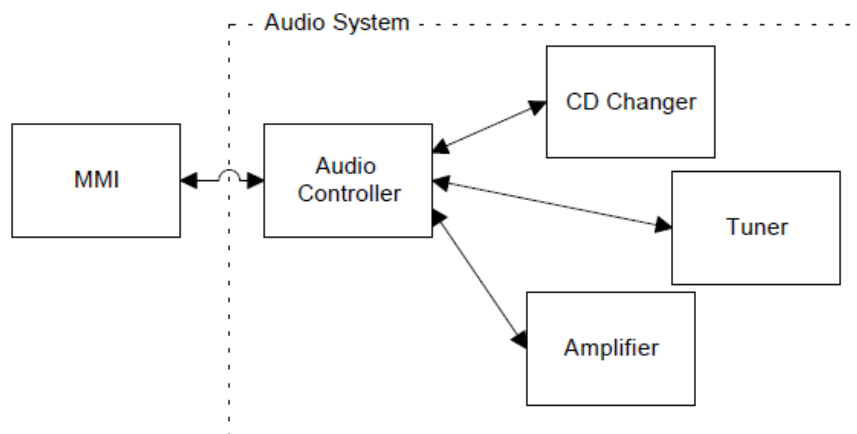


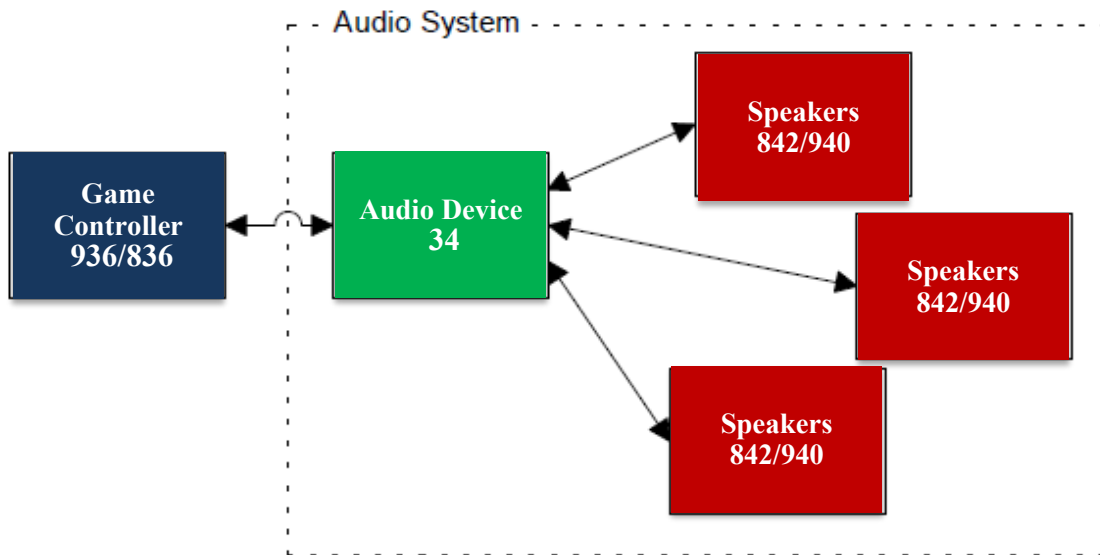
Figure 2-10: Delegation of functions of all audio components to one audio controller

215. A POSITA would recognize Richenstein's vehicle audio network

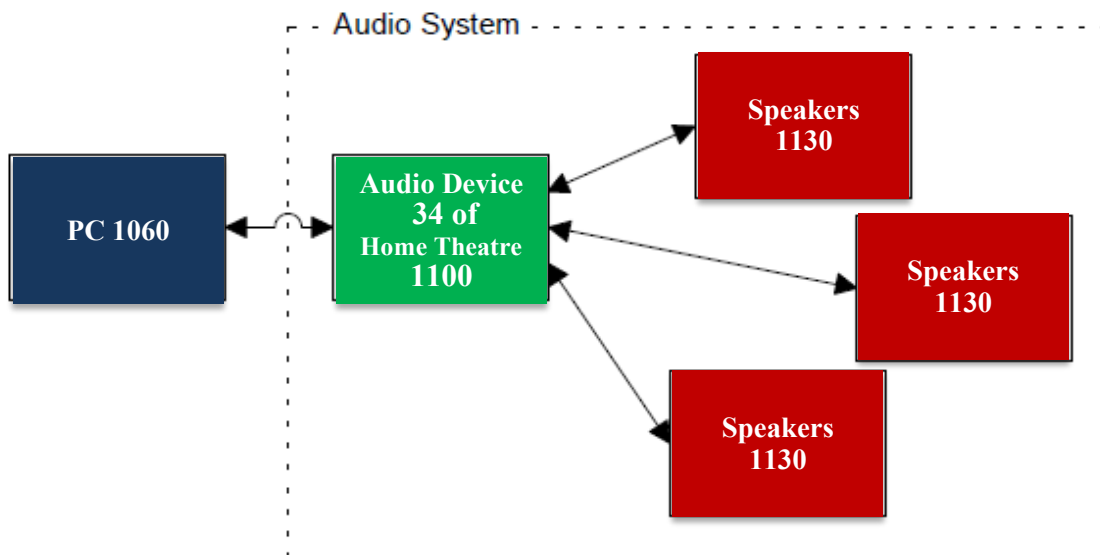
⁸⁴ EX1008, 25.

⁸⁵ EX1008, 24-25.

embodiments of Figs. 20/21 to align with the exemplary structure accordingly:



216. A POSITA would further recognize Richenstein's home entertainment embodiments of Fig. 23 to align with the exemplary structure accordingly:



217. Thus, with TP=ON, the audio controller, i.e., audio devices 34 (*"first playback device"*), receives function class rankings (*"status information"*) from the

synchrony group (“*audio system*”), and transmits the information to the MMI, game controllers 836/936 or PC 1060 respectively.

218. It is my opinion that POSITA would have found it obvious and been motivated to include or implement the status information disclosed by MOST with the disclosures of Richenstein because doing so increases the robustness of control of Richenstein’s system and also providing the user more information to aid user interactions with Richenstein’s system. A POSITA would have recognized that status information of the playback devices in a synchrony group is a type of feedback information valuable to the controller to adjust its control (e.g., to improve the quality of synchronization) and to the user to facilitate his input (e.g., to selectively adjust the members of the group). It is my opinion that a POSITA would have been motivated to look to the MOST Specification for the details of implementing the status information, for all the reasons I stated at the beginning of Section IX, which is incorporated here without repetition. Further, including status information in a message is straightforward, routine, and easy to implement to a POSITA. It is my further opinion that a POSITA would have a reasonable expectation that modification of Richenstein using the status information disclosed by the MOST standards would succeed and yield predictable result, as indicated by the disclosure of Richenstein.

219. Accordingly, based on Richenstein’s disclosure of the MOST standards

implementing its disclosed functions, it is my opinion that Richenstein discloses or renders obvious alone or in view of MOST, the subject matter of claim 4.

220. Accordingly, it is my opinion that each of the embodiments of Fig. 20/21 and Fig. 23 disclose or suggest “*wherein the first and second playback devices are members of a synchrony group, and wherein the method further comprises: transmitting, by the first playback device to the network device, status information that comprises a status of the synchrony group.*”

221. Thus, it is my further opinion that Richenstein anticipates claim 4 or renders obvious claim 4 alone or in view of MOST.

E. Dependent Claim 5: The method of claim 4, wherein the status information further comprises an identification of each playback device in the synchrony group.

222. It is my opinion that Richenstein discloses or alone suggests the additional subject matter of this claim alone or in view of MOST.

223. As described above for claim 4, Richenstein’s embodiments in Figs. 20/21 and Fig. 23 disclose or suggest that “*first playback devices,*” audio device 34 and home theatre system 1100, each transmit “*status information*” to “*network devices,*” game controller 836/936 and PC 1060, respectively.

224. Richenstein repeatedly discloses the importance of identifying individual devices within the audio network. As a first example, Richenstein teaches that being able to uniquely address data is a critical component of a distributed

system like the bidirectional network described in Figs. 20, 21, and 23.

By properly addressing and identifying the data transmitted over data bus 990 (e.g. via information placed in the header of each data block or data packet), each device connected to the data bus can identify the channel of data it is required to decode and use, and may optionally be assigned a unique address to which the data it is intended to receive can be uniquely addressed...⁸⁶

225. As a further example, while describing Fig. 21, Richenstein explains that the user may define individual identifications for each headset 80/980 in order to store and apply customized settings for each one.

Alternatively, custom features may be adjusted via audio device 34 so that even one-way headphones 80 may enjoy customized settings. In embodiments wherein customized features are stored in memory by audio device 34, each individual set of headphones 80 and/or 980 may be provided with a means of individual identification, which may be entered by a user via the controls provided on the headphones (e.g. define the headphones as number one, two, three, etc.). The individual identification will allow the audio device to embed the custom settings for every set of headphones in the data stream representing each channel to be recovered by each set of headphones, following which each set of headphones will identify and select its own appropriate set of custom settings to apply to the signal of the channel selected by the user of the particular set of headphones.⁸⁷

226. A POSITA would recognize that correctly identifying individual devices would become increasingly important as more varied devices joined the network. In discussing Fig. 23, Richenstein provides a wide variety of devices that may be networked together.

⁸⁶ EX1005, [0173].

⁸⁷ EX1005, [0169].

It must be understood that many other types of devices may be connected wirelessly to network 1020 in the manner of the invention including, but not limited to, telephones, facsimile machines, televisions, radios, video game consoles, personal digital assistants, various household appliances equipped for remote control, and home security systems.⁸⁸

A POSITA would understand that such a varied assortment of devices would increase the likelihood of devices receiving the wrong packets and commands. In the embodiments described in Figs. 20/21 and Fig. 23, a POSITA would recognize that identifying individual devices would be an inherent part of maintaining effectiveness and correct use of each device.

227. Richenstein further explains that reception errors can be minimized if receivers are capable of providing feedback to the transmitting devices, specifically providing that the transmitter may reduce the number of samples per packet to minimize reception errors.

To minimize reception errors, the number of audio samples included in each packet may also be adjusted depending on the number and type of errors experienced by the receiver. This feature would likely require some feedback from the receiver on the errors experienced, based upon which the transmitter DSP may be programmed to include fewer audio samples per packet.⁸⁹

A POSITA would recognize that in order for the feedback to be actionable, the feedback provided would include the unique identification of the device where the

⁸⁸ EX1005, [0176].

⁸⁹ EX1005, [0156].

error occurred.

228. As further described above for claim 4, Richenstein's disclosure of implementing the MOST standards includes the status information identifications of each of the devices in the group. For example, according to MOST, different device function blocks within a group will be assigned a class and identified accordingly, including slave, controller, system controller, or MMI.

229. It is my opinion that POSITA would have found it obvious and been motivated to include or implement the status information disclosed by MOST to indicate the playback devices in the synchrony group with the disclosures of Richenstein because doing so increases the robustness of control of Richenstein's system and also providing the user more information to aid user interactions with Richenstein's system. A POSITA would have recognized that identification of the playback devices in a synchrony group is a type of feedback information valuable to the controller to adjust its control (e.g., to improve the quality of synchronization among the devices) and to the user to facilitate his input (e.g., to selectively adjust the members of the group). It is my opinion that a POSITA would have been motivated to look to the MOST Specification for the details of implementing the status information, for all the reasons I stated at the beginning of Section IX, which is incorporated here without repetition. Further, identifying devices in a message is straightforward, routine, and easy to implement to a POSITA. It is my further

opinion that a POSITA would have a reasonable expectation that modification of Richenstein using the status information disclosed by the MOST standards would succeed and yield predictable result, as indicated by the disclosure of Richenstein.

230. Accordingly, it is my opinion that Richenstein discloses or suggests alone or in view of MOST in each embodiment Fig. 20/21 and Fig. 23 that the “*status information further comprises an identification of each playback device in the synchrony group.*”

231. Thus, it is my further opinion that Richenstein anticipates or renders obvious claim 5 alone or in view of MOST.

F. Dependent Claim 6: The method of claim 5, wherein the status information further comprises an identification of a master playback device of the synchrony group.

232. It is my opinion that Richenstein discloses or alone suggests the additional subject matter of this claim alone or in view of MOST.

233. As explained with regard to claim 5, Richenstein discloses or suggests that “*first playback devices,*” audio device 34 and home theatre system 1100, each transmit “*status information*” to “*network devices,*” game controller 836/936 and PC 1060, respectively uniquely identifying the operating status each controlled device, i.e., the synchrony group.

234. Richenstein further discloses or alone suggests the status information including an identification of a master playback device. Specifically, as explained

throughout, Richenstein provides a network where transmitting devices provide data and control information to receiving devices. As described above with regard to element [1.2.2], Richenstein provides an exemplary synchronization method where each receiving device operates according to a reconstructed version of the transmitting device's master clock.

235. In the distributed networks provided in Figs. 20/21 and Fig. 23, where multiple devices are capable of occupying the transmitting device role, a POSITA would consider the operational role (transmitting or receiving) to be a critical piece of status information to include.

236. A POSITA would further recognize that based on the behavior of the receivers (adjusting their operation to synchronize with the transmitting device), a device in a transmitting role would be indicative of its status as the master with the group playing back its transmissions. Such information would be critical when reallocating devices to different purposes, troubleshooting problems, and even calibrating playback.

237. Richenstein highlights the importance of such activities while describing the basic framework of the transmitter/receiver design, explaining that individual devices and their roles can be accounted for to aid the listener experience:

Techniques for adjusting the listener's acoustic experience may be aided by data within calibration sections 101, and/or by operation of switching selector 78, as noted above, and also be controlled, adjusted

or affected by the data contained in control code section 102. Control code data 102 may also be used for controlling other operations of system 10, such as an auto-off function of battery system 84, error detection and/or correction, power saving, and automatic available channel selection.⁹⁰

238. Accordingly, to the extent identification of playback device roles is not disclosed or inherent to the disclosures of Richenstein, a POSITA would have understood Richenstein to suggest it in light of the emphasis on calibrating based on individual devices and to have a reasonable expectation of success based on Richenstein's teachings toward adjusting operations based on individual devices, roles, and capabilities.

239. As further provided above, Richenstein discloses the implementation of the MOST communication standard. A POSITA would recognize that the roles of "controller" and "slave" indicate the controller's status as a "master" within the group. Accordingly, the identification of the audio device 34 ("*first playback device*") as a "controller" identifies it as the "*master playback device of the synchrony group*").

240. As further described above for claim 4, Richenstein's disclosure of implementing the MOST standards includes the identifications of each of the devices in the group. For example, according to MOST, different device function blocks within a group will be assigned a class and identified accordingly, including slave,

⁹⁰ EX1005, [0061].

controller or system controller (“*master*”), or MMI.

241. It is my opinion that POSITA would have found it obvious and been motivated to include or implement the status information disclosed by MOST to indicate the roles of playback devices in the synchrony group (e.g., a master device) with the disclosures of Richenstein because doing so increases the robustness of control of Richenstein’s system and also providing the user more information to aid user interactions with Richenstein’s system. A POSITA would have recognized that identification of roles of the playback devices in a synchrony group is a type of feedback information valuable to the controller to adjust its control (e.g., to improve the quality of synchronization among the devices) and to the user to facilitate his input (e.g., to selectively adjust the members of the group). It is my opinion that a POSITA would have been motivated to look to the MOST Specification for the details of implementing the status information, for all the reasons I stated at the beginning of Section IX, which is incorporated here without repetition. Further, identifying roles of devices in a message is straightforward, routine, and easy to implement to a POSITA. It is my further opinion that a POSITA would have a reasonable expectation that modification of Richenstein using the status information disclosed by the MOST standards would succeed and yield predictable result, as indicated by the disclosure of Richenstein.

242. Accordingly, it is my opinion that Richenstein discloses or suggests

alone or in view of MOST in each embodiment Figs. 20/21 and Fig. 23 “*wherein the status information further comprises an identification of a master playback device of the synchrony group.*”

243. Thus, it is my further opinion that Richenstein anticipates or renders obvious claim 6 alone or in view of MOST.

G. Dependent Claim 7: The method of claim 6, wherein the first playback device is the master playback device of the synchrony group.

244. It is my opinion that Richenstein discloses or alone suggests the additional subject matter of this claim alone or in view of MOST.

245. As explained with regard to claim 6, Richenstein discloses or suggests that “*first playback devices,*” audio device 34 and home theatre system 1100, each transmit “*status information*” to “*network devices,*” game controller 836/936 and PC 1060, respectively uniquely identifying the operating status each controlled device, i.e., the synchrony group, including which device is the “*master.*”

246. As further explained with regard to claim 6, Richenstein discloses that a synchronization method where the transmitting devices control the operation of the receiving devices through the use of their master clock, which the receiving devices adjust their operations to match. A POSITA would understand this behavior to indicate the transmitting device is a “*master*” device and that the receiving devices operate according to its commands.

247. Accordingly, as explained above with respect to claim 6, Richenstein discloses or alone suggests the status information identifies which device is controlling the timing (“*master*”), i.e., the transmitter, and which devices are operating according to that transmitter’s clock.

248. Thus, it is my opinion that the status information identifying the transmitting device as a master, would specifically be identifying audio device 34 in Fig. 20/21 and home theatre system 1100 in Fig. 23 as the “*master playback device of the synchrony group*.”

249. It is my opinion that POSITA would have found it obvious and been motivated to include or implement the status information disclosed by MOST to indicate the roles of playback devices in the synchrony group with the disclosures of Richenstein (e.g., indicating the first playback device as disclosed by Richenstein as a master device) for all the same reasons as I stated for Claims 4-6.

250. Accordingly, it is my opinion that Richenstein discloses or suggests alone or in view of MOST this element.

251. Thus, it is my further opinion that Richenstein anticipates or renders obvious claim 7 alone or in view of MOST.

H. Independent Claim 8:

1. [8.P]: A tangible non-transitory computer-readable medium having instructions stored thereon that, when executed, cause a first playback device to:

252. To the extent that it is limiting, Richenstein discloses or suggests alone or in view of MOST the subject matter described in this element.

253. Richenstein discloses the use of processors and computer-readable media in support of the operations described for the audio device 34.

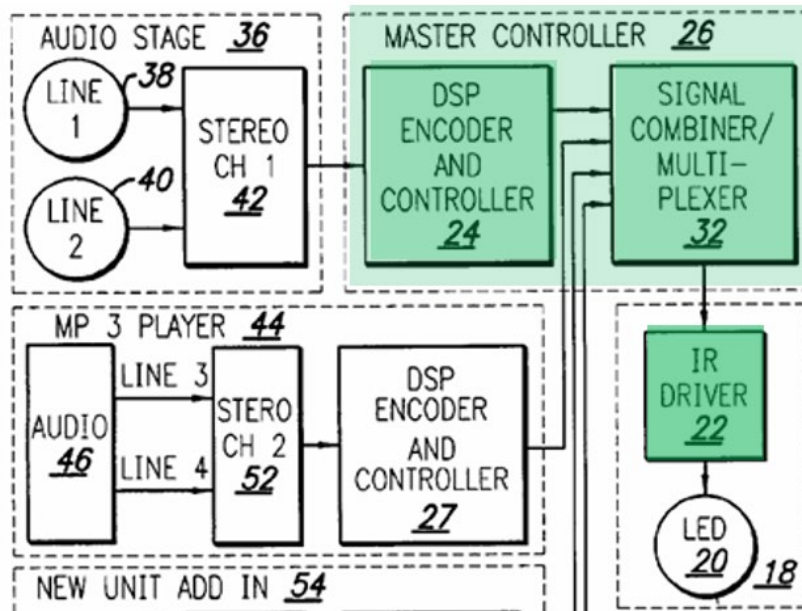
As shown in FIG. 1, the output of stereo channel circuitry 52 may be applied to DSP encoder and controller 27 for combining in signal combiner/multiplexer 32 of master controller 26 included within audio device 34. In this manner, an unmodified conventional stereo audio source such as MP3 player 44 may be added to wireless headphone system 10 by use of an add on DSP device such as DSP encoder and controller 27.⁹¹

With continued reference to FIG. 7, boot memory 630 stores the program memory for DSP 600 (that contains the software controlling the DSP) during shut down. An 8-bit serial EEPROM may be used as boot memory 630. Upon power up, the DSP may be programmed to search external memory circuits for its boot program to load and commence executing. Boot memory 630 is attached to multi-channel buffered serial port 615 (McBSP 1) of DSP 600. In alternative embodiments, the DSP software may be provided in DSP read-only-memory (ROM).⁹²

⁹¹ EX1005, [0037].

⁹² EX1005, [0083].

Annotated Fig. 1



254. A POSITA would recognize Richenstein to disclose or alone suggest that the master controller 26, DSP encoder and controller, the signal combiner/multiplexer 32, and IR driver 22 would all contain computer-readable medium which dictate and execute the functions disclosed by Richenstein.

255. Accordingly, it is my opinion that the embodiment of Figs. 20/21 disclose audio device 34 contains processors operate according to “*tangible non-transitory computer-readable medium having instructions stored thereon*” to achieve the functions described throughout Richenstein.

256. It is my further opinion that a POSITA would understand Richenstein to disclose that home theatre system 1100 of Fig. 23 includes processors that operate

according to “*tangible non-transitory computer-readable medium having instructions stored thereon*” to achieve the functions described throughout Richenstein. As referenced with respect to element 1.1 above, Richenstein provides home theatre system 1100 with DSP and transmission capabilities through components 1120 and 1110. As further explained, the role and capabilities of audio device 34, align with the role and capabilities of home theatre system 1100. Accordingly, a POSITA would understand that just as for audio device 34, home theatre system 1100 is disclosed to contain processors operating according to “*tangible non-transitory computer-readable medium having instructions stored thereon.*”

257. Accordingly, it is my opinion that Richenstein discloses or alone suggests that the first and second playback devices are “*independently clocked.*”

258. Thus, it is my further opinion that Richenstein anticipates or alone renders obvious claim 1.

2. [8.1.1]: receive, from a network device configured to control the first playback device and communicatively coupled to the first playback device over a local area network (LAN), control information comprising an address identifying a location of audio information available at an audio information source, [8.1.2] wherein the audio information source is outside of the LAN; and

259. Richenstein discloses or suggests alone or in view of MOST this element. The subject matter in this element corresponds to the subject matter

described in element [1.1.1]-[1.1.2] Accordingly, based on the same analysis detailed above, it is my opinion that Richenstein discloses or suggests alone or in view of MOST this element.

3. [8.2.1]: after receiving the control information, (i) obtain, from the audio information source outside of the LAN, the audio information; [8.2.2] (ii) transmit, to a second playback device, the audio information, playback timing information associated with the audio information, and clock time information for the first playback device; and [8.2.3] (iii) play back the audio information in synchrony with the second playback device by using the playback timing information associated with the audio information and the clock time information of the first playback device to play back the audio information, [8.2.4] wherein the first and second playback devices remain independently clocked during synchronous playback of the audio information.

260. Richenstein discloses or suggests alone or in view of MOST this element. The subject matter in this element corresponds to the subject matter described in elements [1.2.1]-[1.2.4] Accordingly, based on the same analysis detailed above, it is my opinion that Richenstein discloses or suggests this element.

261. Thus, it is my further opinion that Richenstein anticipates or renders obvious claim 8.

I. Independent Claim 9:

1. [9.P]: A first playback device comprising:

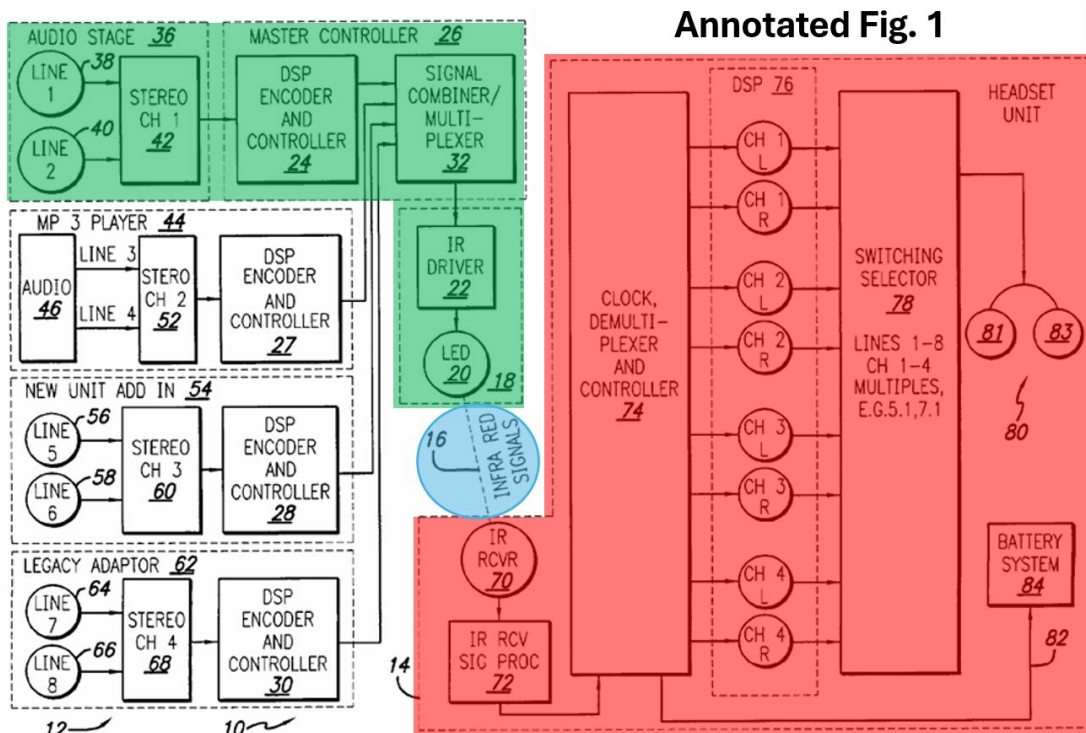
262. Richenstein discloses or alone suggests this element. As disclosed above with respect to element [1.1.1], Richenstein discloses audio device 34 for

vehicle embodiment of Fig. 20/21 and home theatre system 1100 for the building embodiment of Fig. 23 are both *playback devices*

263. Accordingly, a POSITA would understand audio device 34 and home theater system 1100 to be “*first playback devices.*”

2. [9.1]: one or more processors;

264. Richenstein discloses or alone suggests this element. The subject matter in this element overlaps with the subject matter described in element [8.P] Accordingly, based on the same analysis detailed above, it is my opinion that Richenstein discloses or alone suggests this element. See EX1005, [0035]-[0038], Fig. 1.



3. *[9.2]: a network interface; and*

265. Richenstein discloses or alone suggests this element.

266. I understand that “*network interface*” has been previously construed as “physical component of a device that provides an interconnection with a data network.” It is my opinion that the disclosed and suggested subject matter would have applied equally regardless of whether this term is construed as it has previously or according to its plain and ordinary meaning.

267. For each of Fig. 20/21’s audio device 34 and Fig. 23’s home theatre system 1100, Richenstein discloses the inclusion of a network interface.

268. With respect to audio device 34 in a vehicle environment, Richenstein explains that each IR module includes a network interface to support communication with a vehicle data bus.

Additionally, each IR module 992 includes circuitry (e.g. network interface card) for interfacing with data bus 990 to read data being transmitted over the bus and convert the data to IR signals for transmission by the LED(s), and also to convert received IR signals to a data format accepted by the bus and transmit such data over the bus to audio device 34 or to any other devices connected to the bus. The interface circuitry may further include a buffer or cache to buffer data if the IR receiver and/or transmitter operate at a different speed from data bus 990.⁹³

269. A POSITA would understand this explanation to disclose or alone suggest that audio device 34 in the embodiment of Fig. 20/21 may include a network

⁹³ EX1005, [0172].

interface.

270. With regard to Fig. 23, Richenstein provides an embodiment in a home LAN environment. As Richenstein explains, Fig. 23 describes a building using the exemplary LAN network with wired or wireless connections according to 802.11 (WiFi). Richenstein further describes that home theater system 1100 is “connected to network 1020 to receive television and audio programming.” (EX1005, [0176]). A POSITA would recognize that in order for a device to connect to LAN network 1020, it would include a network interface.

271. As a result, it is my opinion that a POSITA would understand this explanation to disclose or alone suggest that home theater 1100 includes a “*network interface*.”

272. Accordingly, it is my opinion that Richenstein discloses or alone suggests this element.

4. [9.3]: tangible, non-transitory computer-readable memory comprising program instructions that, when executed by the one or more processors, cause the first playback device to:

273. Richenstein discloses or suggests alone or in view of MOST this element. The subject matter in this element overlaps with the subject matter described in element [8.P].

274. Accordingly, based on the same analysis detailed above, it is my opinion that Richenstein discloses or suggests this element.

5. [9.3.1]: receive, via the network interface from a network device configured to control the first playback device and communicatively coupled to the first playback device over a local area network (LAN), control information comprising an address identifying a network location of audio information available at an audio information source, wherein the audio information source is outside of the LAN; and

275. Richenstein discloses or suggests alone or in view of MOST this element. The subject matter in this element overlaps with the subject matter described in elements [1.1.1]-[1.1.2]. Accordingly, based on the same analysis detailed above, it is my opinion that Richenstein discloses or suggests this element.

6. [9.3.2]: after receiving the control information, (i) obtain, via the network interface from the audio information source outside of the LAN, the audio information; (ii) transmit, via the network interface of the first playback device to a second playback device, the audio information, playback timing information associated with the audio information, and device clock information of the first playback device; and (iii) play back the audio information in synchrony with the second playback device by using the playback timing information associated with the audio information and the device clock information of the first playback device to play back the audio information, wherein the first and second playback devices remain independently clocked during synchronous playback of the audio information.

276. Richenstein discloses or suggests alone or in view of MOST this element. The subject matter in this element corresponds to the subject matter described in elements [1.2.1]-[1.2.4]. Accordingly, based on the same analysis detailed above, it is my opinion that Richenstein discloses or suggests this element.

277. Thus, it is my further opinion that Richenstein anticipates or renders

obvious claim 9.

J. Dependent Claim 10: The first playback device of claim 9, wherein the program instructions, when executed by the one or more processors, further cause the first playback device to: generate the playback timing information associated with the audio information; and generate the device clock information of the first playback device.

278. Richenstein discloses or suggests alone or in view of MOST the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 2. Accordingly, based on the same analysis detailed above, it is my opinion that Richenstein discloses or suggests the subject matter in this claim.

279. Thus, it is my further opinion that Richenstein anticipates or alone renders obvious claim 10.

K. Dependent Claim 11: The first playback device of claim 9, wherein the control information further comprises one or more instructions for the first playback device and the second playback device to playback audio information.

280. Richenstein discloses or suggests the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 3. Accordingly, based on the same analysis detailed above, it is my opinion that Richenstein discloses or alone suggests the subject matter in this claim.

281. Thus, it is my further opinion that Richenstein anticipates or alone

renders obvious claim 11.

L. Dependent Claim 12: The first playback device of claim 11, wherein the first and second playback devices are members of a synchrony group, and wherein the program instructions, when executed by the one or more processors, further cause the first playback device to: transmit, to the network device, status information that comprises a status of the synchrony group.

282. Richenstein discloses or suggests alone or in view of MOST the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 4. Accordingly, based on the same analysis detailed above, it is my opinion that Richenstein discloses or alone suggests the subject matter in this claim.

283. Thus, it is my further opinion that Richenstein anticipates or renders obvious alone or in view of MOST claim 12.

M. Dependent Claim 13: The first playback device of claim 12, wherein the status information further comprises an identification of each playback device in the synchrony group.

284. Richenstein discloses or suggests alone or in view of MOST the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 5. Accordingly, based on the same analysis detailed above, it is my opinion that Richenstein discloses or suggests alone or in view of MOST the subject matter in this claim.

285. Thus, it is my further opinion that Richenstein anticipates or renders

obvious alone or in view of MOST claim 13.

N. Dependent Claim 14: The first playback device of claim 12, wherein the status information further comprises an identification of a master playback device of the synchrony group.

286. Richenstein discloses or suggests alone or in view of MOST the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 6. Accordingly, based on the same analysis detailed above, it is my opinion that Richenstein discloses or suggests alone or in view of MOST the subject matter in this claim.

287. Thus, it is my further opinion that Richenstein anticipates or renders obvious alone or in view of MOST claim 14.

O. Dependent Claim 15: The first playback device of claim 14, wherein the first playback device is the master playback device of the synchrony group.

288. Richenstein discloses or suggests alone or in view of MOST the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 7. Accordingly, based on the same analysis detailed above, it is my opinion that Richenstein discloses or suggests alone or in view of MOST the subject matter in this claim.

289. Thus, it is my further opinion that Richenstein anticipates or renders obvious alone or in view of MOST claim 15.

P. Dependent Claim 16: The first playback device of claim 12, wherein the status information further comprises an identification of one or more slave playback devices in the synchrony group, and wherein the second playback device is one of the one or more slave playback devices in the synchrony group.

290. Richenstein discloses or suggests alone or in view of MOST the additional subject matter of this claim. As described above with respect to claims 6-7, Richenstein provides a synchronization method whereby transmitting devices provide master timing and commands to receiving devices, which adopt the master timing and carry out their operations in accordance with that timing and the accompanying commands. A POSITA would recognize the receiving device role as a “*slave*” device. Accordingly, a POSITA would understand that “*second playback device*” speakers, 842/940 in Figs. 20/21 and 1130 in Fig. 23, may operate as slave devices to audio device 34 and home theatre system 1100.

291. Accordingly, as described above with regard to claim 6, a POSITA would consider that the operational role of the speakers as receivers (“*slaves*”) to be important status information expected to be included.

292. As further described above, Richenstein discloses the implementation of the MOST communication standard which provides for the identification of each device (including “*one or more slave devices*”) in an audio system (“*synchrony group*”) to the controller, audio device 34, which transmits the identifications on to the MMI, game controller 836/936 and PC1060 (“*network devices*”).

293. As a result, it is my opinion that a POSITA would understand Richenstein to disclose or suggest alone or in view of MOST that the status information include an identification of the second playback devices as “*slave playback devices*.”

294. It is my opinion that POSITA would have found it obvious and been motivated to include or implement the status information disclosed by MOST to indicate the roles of playback devices in the synchrony group with the disclosures of Richenstein (e.g., indicating any of the above-identified second playback device as disclosed by Richenstein as a slave device) for the same reasons as I stated for Claims 4-7.

295. Thus, it is my further opinion that Richenstein anticipates or renders obvious alone or in view of MOST claim 16.

Q. Dependent Claim 17: The first playback device of claim 16, wherein the instructions, when executed by the one or more processors, further cause the first playback device to: generate a plurality of frames, wherein an individual frame comprises at least a portion of the audio information and the playback timing information associated with the audio information, and wherein the first playback device transmitting to the second playback device the audio information, playback timing information, and device clock information of the first playback device comprises transmitting the plurality of frames to the second playback device.

296. Richenstein discloses or suggests the additional subject matter of this claim.

297. Richenstein describes its audio data transmission method as an encoded digital bitstream.

A wireless transmission device for communicating a plurality of audio streams to remote devices comprises a plurality of inputs for receiving a plurality of digital audio streams, a combiner connected to the inputs for combining control codes and the received audio streams in a predetermined format to form a signal wherein the control codes for controlling the operation of a remote device equipped for processing the signal to extract the audio streams therefrom in accordance with the predetermined format, and a transmitter connected to the combiner to transmit the signal for reception by the remote device. The transmitter may include an infra-red light emitter for transmitting the signal as an infra-red light signal.⁹⁴

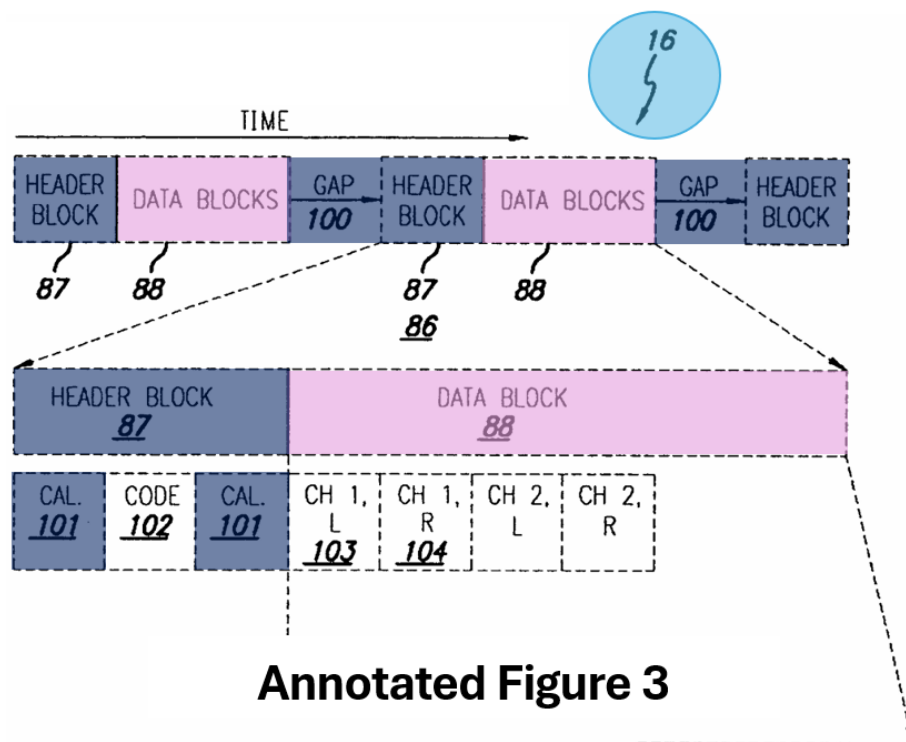
298. A POSITA would further recognize a bitstream transmission includes a “*plurality of frames*.” Further, Richenstein provides that the start of each stream provides “frame synchronization” to the receiving device. (EX1005, [0109], [0131]-[0133]). Additionally, Richenstein explains that it uses its clock “to *frame* the data into distinct audio samples.” (EX1005, [0090] (emphasis added).) And Richenstein provides for applications using a “dual-phase frame” where multiple frame formats are used to encode the audio sample. (EX1005, [0135].)

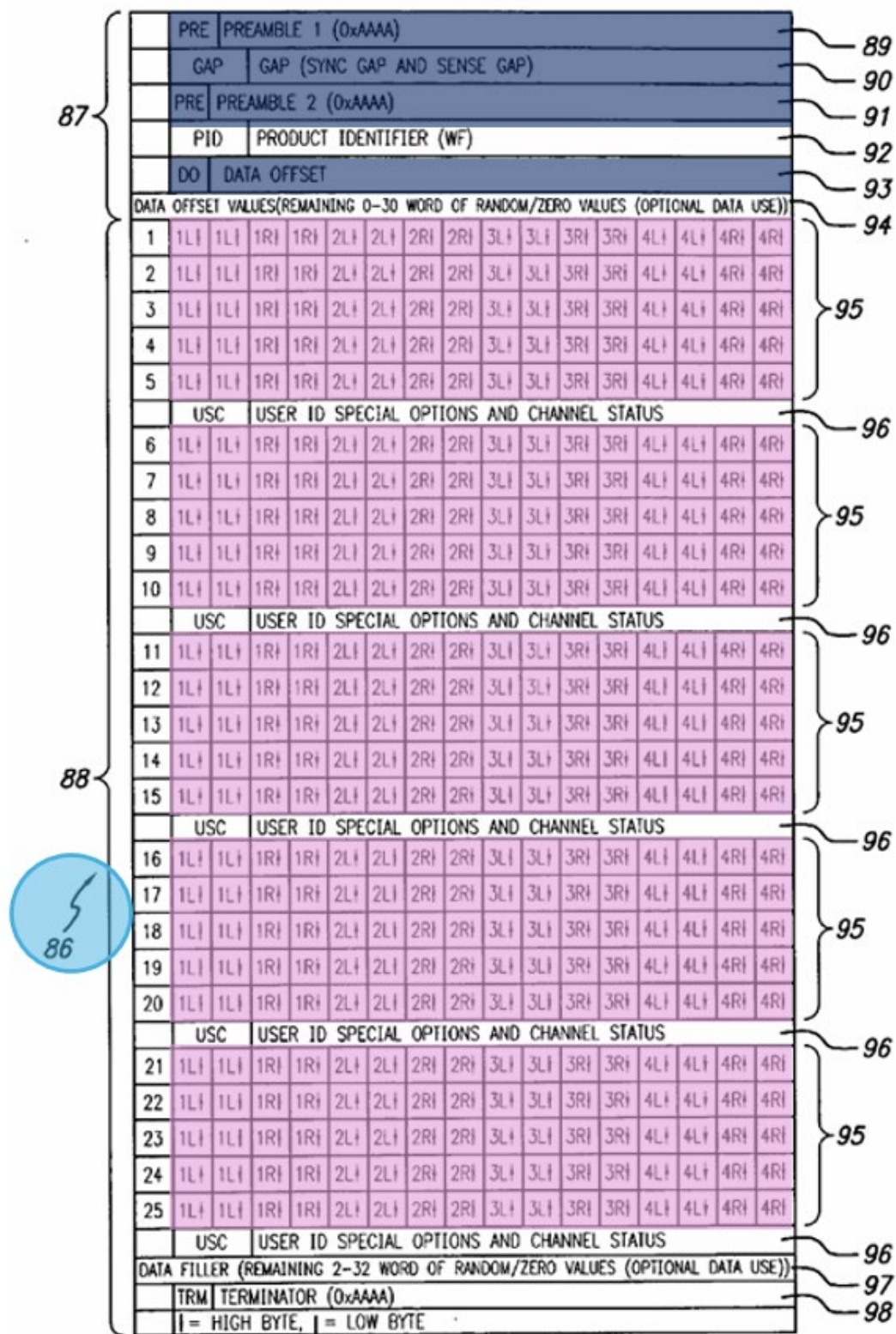
299. As explained with respect to claim 2, Richenstein discloses that the transmitting devices, or “*first playback devices*” audio device 34 and home theatre system 1100, generate the data using master clocks and digital signal processors, which the transmitting subsystem then transmit. A POSITA would understand that

⁹⁴ EX1005, [Abstract].

this would include the organization of data into the plurality of frames for transmission.

300. Further, as described above with respect to claim element [1.2.2], Richenstein provides exemplary packets 86 and signals 16 transmitted by, including Figs. 3 and 12.





Annotated Fig. 12

301. A POSITA would understand the exemplary data structures of Figs. 3 and 12 to each be indicative of Richenstein's use of frames to transmit the “*audio information*” data, which Richenstein explains to be included in datablock areas 88, and in individual data blocks in each section 95, and the playback timing and device clock information as identified in claim element [1.2.2] above.

302. Accordingly, it is my opinion that Richenstein discloses or alone suggests “*wherein the instructions, when executed by the one or more processors, further cause the first playback device to: generate a plurality of frames, wherein an individual frame comprises at least a portion of the audio information and the playback timing information associated with the audio information, and wherein the first playback device transmitting to the second playback device the audio information, playback timing information, and device clock information of the first playback device comprises transmitting the plurality of frames to the second playback device.*”

303. Thus, it is my further opinion that Richenstein anticipates or renders obvious alone or in view of MOST claim 17.

R. Dependent Claim 18: The first playback device of claim 9, wherein the audio information comprises one of audio files or packetized streaming audio information.

304. Richenstein discloses or suggests the additional subject matter of this

claim. As described with respect to element [1.1.1] above, Richenstein describes a network where audio device 34 and home theater system 1100 may receive commands to obtain audio from outside of Richenstein's audio network.

305. As further explained above in element 1.1, Richenstein discloses a variety of different audio sources, including MP3 players, CD players, DVD players, satellite radio stations, cellular telephones, and cable network television and music channels. (EX1005, [0037], [0161].) A POSITA would recognize that MP3, CDs, and DVDs are file-based audio storage means that store audio content in files ("*audio files*"), while satellite radio stations, cellular telephones, and cable network media provides audio information in the form of streams of data packets ("*packetized streaming audio information*").

306. Specific to the embodiment of Figs. 20/21 as described above with respect to element 1.1, a POSITA would recognize that the cellular telephone 805's phone call would constitute "*packetized streaming audio information.*"

307. Specific to the embodiment of Fig. 23, a POSITA would recognize that the obtaining audio from the channels on cable network 1022 would also represent obtaining "*packetized streaming audio information,*" while downloading a track to be stored on home theater system from the internet or potentially a pay-per-view item may be received as a file.

308. However, a POSITA would further recognize that the abundance of

both “*audio file*” sources and “*packetized streaming audio information*” sources throughout Richenstein would suggest the applicability of either format for obtaining audio information.

309. Accordingly, it is my opinion that Richenstein discloses or suggests alone or in view of MOST “*the audio information comprises one of audio files or packetized streaming audio information.*”

310. Thus, it is my further opinion that Richenstein anticipates or renders obvious alone or in view of MOST claim 18.

S. Dependent Claim 19: The first playback device of claim 9, wherein the audio information source outside of the LAN is an Internet-accessible audio information source, and wherein obtaining, from the audio information source outside of the LAN, the audio information, comprises obtaining the audio information from the Internet-accessible audio information source.

311. Richenstein discloses or suggests the additional subject matter of this claim.

312. As described above with respect to claim elements [1.1.1]-[1.1.2], Richenstein discloses audio device 34 obtaining audio from cellular phone 805 as embodied in Figs. 20/21 and home theater system 1100 obtaining audio via cable network 1022 as embodied by Fig. 23.

313. With respect to Figs. 20/21, a POSITA would recognize that cellular telephone 805 may have internet capabilities. As a result, when game controllers

836/936 “access and control” cellular telephone 805, it could include accessing the internet via the “General Packet Radio Service,” including any audio information available online. To the extent such a use is not expressly disclosed, it would have been inherent to the capabilities of a cellular phone at the time.

314. With respect to Fig. 23, Richenstein specifically provides that the LAN 1020 provides access to the Internet through cable network 1022.

As known in the art, network 1020 may thus interface with cable network 1022 to receive media content such as television and music channels, and further to provide a connection to the Internet via cable modem 1024.⁹⁵

315. A POSITA would understand this to disclose the accessibility of media stored on the Internet, including home theatre system 1100 “*obtaining the audio information from the Internet-accessible audio information source.*”

316. Accordingly, it is my opinion that Richenstein discloses or suggests that “*the audio information source outside of the LAN is an Internet-accessible audio information source, and wherein obtaining, from the audio information source outside of the LAN, the audio information, comprises obtaining the audio information from the Internet-accessible audio information source.*”

317. Thus, it is my further opinion that Richenstein anticipates or renders obvious alone or in view of MOST claim 19.

⁹⁵ EX1005, [0174].

T. Dependent Claim 20: The first playback device of claim 9, wherein obtaining, from the audio information source outside of the LAN, the audio information, comprises sending, to the audio information source, a request for the audio information.

318. Richenstein discloses or alone suggests the additional subject matter of this claim.

319. As described above with respect to claim elements [1.1.1]-[1.1.2], Richenstein discloses audio device 34 obtaining audio from cellular phone 805 as embodied in Figs. 20/21 and home theater system 1100 obtaining audio via cable network 1022 as embodied in Fig. 23.

320. First, Richenstein specifically discloses the use of game controllers 836/936 to make requests for resources, requesting the exemplary telemetry data from CPU 924 via audio device 34. (EX1005, [0166].) A POSITA would recognize the request+response exchange between networked devices as fundamental within the field of networking.

321. Second, Richenstein further provides an analog version of the request and response format, in using game controller 836/936 to request specific cd's stored within CD changer 950. (EX1005, [0171].)

322. Accordingly, Richenstein discloses requesting specific media and receiving it in response (CD changed 950) and making network requests for specific data to be transmitted.

323. Within the specific context of embodiment of Figs. 20/21, as described above with respect to element [1.1.1], Richenstein discloses sending request to cellular telephone 805 to answer or initiate a call, i.e., to obtain audio from outside the audio network through audio device 34. (EX1005, [0146], [0161], [0165]-[0166].)

324. Similarly, with specific context of Fig. 20/21, as described above with respect to element [1.1.1], Richenstein discloses accessing media content through cable network 1011 that needs to be requested for, including downloading specific items, making a pay-per-view request, or accessing content requiring a membership of any kind. A POSITA would recognize that accessing these forms of media from the internet would require home theater system 1100 to send a request to the audio information source, likely addressed using a URL of some kind.

325. Accordingly, it is my opinion that Richenstein discloses or suggests that *“wherein obtaining, from the audio information source outside of the LAN, the audio information, comprises sending, to the audio information source, a request for the audio information.”*

326. Thus, it is my further opinion that Richenstein anticipates or alone renders obvious claim 20.

X. Grounds 4-6: Chatterton Anticipates Or Renders Obvious Alone or In View of RFC 1889.

327. As explained above in Section VIII.C, Chatterton discloses storage and distribution of multimedia over a network for playback. Chatterton further describes that the playback stream may be created in accordance with RTP.⁹⁶

328. In light of Chatterton's disclosures of using a transport stream to distribute multimedia for synchronized playback, it is my opinion that a POSITA would understand Chatterton to disclose the use of the RTP standards as specified in RFC 1889. Specifically, a POSITA would understand Chatterton to disclose the use of RTP's packet header timestamping and synchronization information, as well as RTCP's sender report NTP and RTP timestamps supporting synchronized playback, as detailed above in Section VIII.D.

329. To any extent Chatterton does not itself disclose, explicitly or inherently, it is my opinion that a POSITA would have known the described uses and applications of RTP and RTCP, because RTP standards are well-known in the field at the relevant time, and a POSITA would have been familiar with content of the standards such as those documented by RFC1889.

330. It is my further opinion that a POSITA would have been motivated to look to RFC 1889 (EX1010), standard describing RTP and RTCP, for the details

⁹⁶ EX1009, 5:38-46.

provided based on Chatterton's explanation of their application to the disclosed system and transport stream. Chatterton and RFC 1889 are in the same field of endeavor and solve similar problems pertaining to synchronizing various devices such as synchronization of the connected devices on the network. Further, because Chatterton specifically describes how to implement RTP to support the multimedia distribution system for improving a multimedia network, and the RFC 1889 standard specifies how RTP is used to distribute multimedia across a network, it is my opinion that a POSITA would have found express and sufficient teaching, suggestion and motivation from Chatterton to implement the details disclosed by RFC 1889 (EX1010) along with Chatterton's disclosures. It is my further opinion that a POSITA would have a reasonable expectation that such an application of RFC 1889 to the home media network disclosed by Chatterton succeed and yield predictable result, as indicated by the disclosure of Chatterton.

331. For reasons further explained below, it is my opinion that: Chatterton anticipates claims 1-20 of the '357 Patent with either explicit or inherent disclosures; to whatever extent Chatterton does not anticipate the claims, a POSITA would have found Chatterton alone renders claims 1-20 obvious; and to whatever extent Chatterton does not alone anticipate or render obvious claims 1-20 of the '357 Patent, a POSITA would have found the claimed subject matter obvious in light of Chatterton in view of RFC 1889.

A. Independent Claim 1

1. [1.P] A method comprising

332. Chatterton discloses or suggests this element. Chatterton discloses a home media network and methods of using it to playback media content across a home network.⁹⁷

333. Accordingly it is my opinion that Chatterton discloses or suggests this element.

2. [1.1.1] receiving, by a first playback device from a network device configured to control the first playback device and communicatively coupled to the first playback device over a local area network (LAN), control information comprising an address identifying a location of audio information available at an audio information source,

334. Chatterton discloses or suggests this element. Chatterton discloses home media network 140 (“LAN”) including home media server (“*first playback device*”) that receives content (“*audio information*”) selection commands (“*control information*”) from websites through internet communication channels 120 or broadcast channels (“*audio information source*”) from either of remote control unit 532 and/or computers 160/163 (“*network device configured to control the first playback device*”).

335. I understand that “*playback device*” has been previously construed as

⁹⁷ See e.g., EX1009, 1:22-36, 1:59-63, 1:63-4:3, 5:38-46, & Figs. 1, 6a, and 16c.

“data network device configured to process and output audio.” It is my opinion that the subject matter would have been disclosed and suggested regardless of whether this term is construed as it has previously or according to its plain and ordinary meaning.

336. Chatterton discloses a home media network 140 (“LAN”) including home media server 110 (“*first playback device*”), which is able to retrieve, store, and distribute media to other network devices.

More particularly, the digital media server **100** coordinates multimedia content from Internet communication channels **120** (e.g., DSL, cable Internet), broadcast communication channels **130** (e.g., digital/analog cable, satellite), and/or Public Switched Telephone Network (“PSTN”) communication channels **170** (i.e., standard telephone) to provide a stable, real-time home media network **140** for a plurality of network devices **150–151, 160–166**.⁹⁸

337. As discussed below in more detail for [1.2.1], Chatterton further describes that after retrieving the audio content, home media server (“first playback device”) processes the audio content, e.g., encoding it into data packets, and outputs/distributes the audio content, e.g., streaming the data packets to PCs and multiple multimedia nodes. The audio processing and output functionality of home media server 110 makes it a playback device. Furthermore, Chatterton also expressly discloses home media server 110 to be a playback device itself.

⁹⁸ EX1009, 1:63-4:3.

As illustrated in FIG. 4, one embodiment of the system includes a DVD player **420** (and/or a CD player, CD-ReWritable drive, recordable DVD drive or other type of portable digital media player/recorder). The DVD player **420** is capable of playing a DVD directly and/or transferring multimedia content from the DVD to the mass storage device **230**.⁹⁹

338. Chatterton further provides that home media server may be controlled by multiple devices (*“network devices configured to control the first playback device”*) remotely including at least remote control 532 and PCs 160/163. Specifically, Chatterton discloses that remote control unit 532 can send commands to home media server 110 through a multimedia node.

Data/commands sent from remote control devices 530, 532 are transmitted through the nodes 520, 522 to the home/media server 110 as indicated. In one embodiment, the remote control devices include an LCD (not shown) or other type of display for displaying information about the multi media content stored on home media server 110 (i.e., instead of, or in addition to, the multimedia node 522 display 524).¹⁰⁰

339. Chatterton further discloses several examples of how home media server 110 receives various control commands from the remote control devices 530 and 532, such as to tune to a particular broadcast channel or to play music of a particular music playlist. (EX1009, 7:29-32, 8:18-25, 8:49-54.), As Chatterton explains, the remote control devices are connected via “local infrared interface.”¹⁰¹

⁹⁹ EX1009, 12:49-55; *see also* Fig. 3 (A/V output ports 307 and 308).

¹⁰⁰ EX1009, 13:49-55.

It is my opinion that a POSITA would understand that remote control devices 530/532 and/or computers 160/163 controlling home media server 110 may be “*communicatively coupled to the first playback device over a local area network.*” Chatterton further discloses that users may control home media network 140, including home media server 110, remotely through a browser “from any room in the home or over the Internet.” (EX1009, 14:64-66.)

Accordingly, users of this embodiment are able to monitor and control home appliances and systems from anywhere in the world. In one embodiment this includes the ability to select broadcast listings and direct the home media server **110** to make recordings (e.g., based on date/time or broadcast ID code).¹⁰²

A POSITA would recognize that computers 160/163 coupled to home media server 110 can be among such control devices “anywhere in the world,” through which the users can “monitor and control” the home media server 110. For example, Chatterton expressly discloses that “a user from a PC . . . may log in to his home media server 110.”¹⁰³ It is also common knowledge that PCs such as computers 160/163 are capable of accessing browsers and web pages that can be used to “select broadcast listings and direct the home media server **110** to make recordings,” as disclosed by Chatterton to control the home media server 110. Accordingly, a POSITA would also recognize a PC on the home media network, such as computers

¹⁰² EX1009, 15:5-12.

¹⁰³ EX1009, 12:3-5.

160/163, as “a *network device communicatively coupled to the first playback device over a local area network.*”

340. Chatterton also discloses that the Home Media Server 110 can be monitored and controlled remotely by a monitoring device such as NOC 180. Chatterton discloses that NOC 180 performs various control functions of the Home Media Server 110, including: remote monitoring and maintenance, automatic downloading and upgrades, logging/data warehousing, archiving, registration/configuration, bridge to satellite/cable operations, e-commerce support, application support, and remote-access gateway, etc. (EX1009, 9:1-12:32.)

341. While NOC 180 is generally described by Chatterton as a remote control device connected to home media server 110 over the Internet for a user in a remote location to “monitor and control” the home media server 110, a POSITA would have understood or at least found it obvious that the monitoring functionalities disclosed by Chatterton on NOC 180 can be readily implemented on any local control device on the home media network 140, such as both remote control unit 532 and computers 160-163 (“*network device*”) also disclosed by Chatterton.

342. Accordingly, it is my opinion that any of remote control unit 532 or computers 160/163 constitute “a *network device.*”

343. Chatterton further discloses that commands to home media server 110 can identify specific audio to be obtained from specific locations and played back.

Chatterton discloses an exemplary embodiment where home media server receives a request (“*control information*”) to tune to a particular broadcast channel (e.g., cable, satellite broadcast).

A user initially selects a particular channel (e.g., via a remote control device) to be viewed at the local multimedia node 151. The command is received by the local TV tuning application 601 executed on the multimedia node 151, which sends a tuning request to the home media server 110 over the home media network 140.¹⁰⁴

344. Chatterton discloses an exemplary embodiment where home media server receives a request (“*control information*”) identifying a specific playlist to be played on a ‘jukebox server module 604’ on home server module 110.

A jukebox server module 604 executed on the home media server 110 receives the request and forwards the request to the media server file system 606 (through the media toolkit 260), which retrieves the music files from the mass storage device 230. The jukebox server module 604 then creates the audio stream for the specified files and feeds the stream to the multimedia node 150.¹⁰⁵

345. Chatterton further describes that home media server 110 can retrieve audio content from the internet, i.e., websites identified by a URL (“*address identifying an audio information source*”).¹⁰⁶ As another example, Chatterton further explains home media server can be used to perform the processing intensive

¹⁰⁴ EX1009, 8:18-25.

¹⁰⁵ EX1009, 8:54-58.

¹⁰⁶ EX1009, 14:19-22; 12:55-59.

functions of other network devices.¹⁰⁷ Such a function might include the disclosed use of multimedia node 150 accessing specific webpages to download content (“*audio information available at an audio information source*”).

In addition, support for the hypertext markup language (“HTML”) and/or the extensible markup language (“XML”) are included in one multimedia node **150** embodiment, allowing users to download, view and modify various types of Internet content (e.g., Web pages).¹⁰⁸

346. Finally, Chatterton discloses that home media server may request “pay-per-view” content (“*audio information*”) from various cable/satellite operators (“*audio information sources*”), which a POSITA would understand would require identification in a command to the home media server 110.

For example, the NOC **180** may forward pay-per-view requests transmitted from the home media server **110** to the various cable/satellite operators, and perform the back-end processing (e.g., authentication, billing) required for the pay-per-view transaction.¹⁰⁹

347. Accordingly, it is my opinion that Chatterton discloses or suggests this element.

3. [1.1.2] wherein the audio information source is outside of the LAN; and

348. Chatterton discloses or suggests this element. As described above, with respect to claim 1, Chatterton discloses internet 120 and cable/satellite operators

¹⁰⁷ EX1009, 6:30-41.

¹⁰⁸ EX1009, 8:4-8.

¹⁰⁹ EX1009, 11:35-39.

(“*audio information sources*”). A POSITA would recognize each of these as outside of home media network 140 (“*outside the LAN*”).

349. Accordingly, it is my opinion that Chatterton discloses or suggests this element.

4. [1.2.1] after receiving the control information (i) obtaining, by the first playback device from the audio information source outside of the LAN, the audio information;

350. Chatterton discloses or suggests this element. As described above with respect to element 1.1, Chatterton discloses home media server (“*first playback device*”) retrieving audio and video content (“*audio information*”) from internet 120 and cable/satellite operators (“*audio information source outside of the LAN*”) according to commands (“*control information*”)

351. For example, Chatterton discloses an exemplary embodiment where home media server receives a request (“*control information*”) to tune to a particular broadcast channel (e.g., cable, satellite broadcast) and the home media server obtains the content of that channel (“*audio information*”) from the cable/broadcast source (“*audio information source outside of the LAN*”).

A user initially selects a particular channel (e.g., via a remote control device) to be viewed at the local multimedia node 151. The command is received by the local TV tuning application 601 executed on the multimedia node 151, which sends a tuning request to the home media server 110 over the home media network 140. A tuner server module 602 executed on the home media server 110 receives the request and forwards the request to the tuner driver 271 (e.g., through the media toolkit 260). In response to the command, the

tuner driver 271 directs the tuner hardware (see, e.g., tuner 910 in FIG.9 described below) to tune to the specified channel. The tuner driver also communicates with the conditional access subsystem (see, e.g., module 930 in FIG.9) to determine whether the user has the right to view the particular channel (e.g., the channel may be a Subscription based channel such as HBO).

¹¹⁰

352. Accordingly it is my opinion that Chatterton discloses or suggests this element.

5. [1.2.2] (ii) transmitting, by the first playback device to a second playback device, the audio information, playback timing information associated with the audio information, and device clock information of the first playback device; and

353. Chatterton discloses or suggests this element.

354. As explained above in Section VII.E, I understand that “playback timing information” and “device clock information of the first playback device” have been previously construed.

355. Specifically, I understand that “*playback timing information*” has been construed as “information indicating when the audio information [content] is to be played back.” It is my opinion that the subject matter would have been disclosed and suggested regardless of whether this term is construed as it has previously or according to its plain and ordinary meaning.

356. Additionally, I understand that “*clock information/device clock*

¹¹⁰ EX1009, 8:18-35.

information of the first playback device” has been construed as “information representing a time value indicated by a device’s clock.” It is my opinion that the subject matter would have been disclosed and suggested regardless of whether this term is construed as it has previously or according to its plain and ordinary meaning.

357. Chatterton discloses that home media server 110 (“*first playback device*”) distributes audio and video content (“*audio information*”) as a stream with timestamps for playback (“*playback timing information*”) and transmits a resynchronization signal 1616 (“*device clock information of the first playback device*”) to devices 160-163 and multimedia nodes 150 and 151 (any of them can be a “*second playback device*” depending on the specific application). Chatterton further discloses the use of RTP for its transport stream, which additionally provides for RTCP sender report packets with NTP timestamps and RTP timestamps (“*device clock information of the first playback device*”).

358. As described above regarding element [1.1.1], Chatterton discloses that home media server 110 distributes media content on home media network 140. Chatterton further discloses that home media server 110 converts media stream formats to ensure they can be played back on the home media network 140 devices.

More particularly, the invention relates to a system and method for converting digital multimedia streams from a first format playable on a first type of system to a second format playable on a second type of system.¹¹¹

¹¹¹ EX1009, 1:8-11.

359. Chatterton expressly discloses that the media streams (audio or video) are created “using the RTP/RTSP protocol.”

If the user has access rights, then the tuner server module 252 creates video stream for the specified broadcast channel and feeds the stream to the multimedia node 151. In one embodiment, the tuner server module 602 creates the stream using the RTP/RTSP protocol (i.e., by communicating with the RTP/RTSP module 251). The media node receives the stream through the local TV tuning application 601 and decodes the stream using a codec embedded within the media toolkit 260 (various additional encoding features of the system are set forth below). Once decoded, the video image is generated on the video display.¹¹²

The jukebox server module 604 then creates the audio stream for the specified files and feeds the stream to the multimedia node 150. In one embodiment, the tuner server module 252 uses the RTP/RTSP protocol to create the stream (e.g., through communication with the RTP/RTSP module 251). The multimedia node 150 receives the stream through its jukebox application 601 and decodes the stream using a codec embedded within the media toolkit 260. Once decoded, the music tracks are reproduced on a set of speakers.¹¹³

360. Chatterton explains that different formats use different spacing between playback timestamps. Specifically, Chatterton points to “System Clock Reference” timestamps compared to “Program Clock Reference” timestamps, and explains a method for generating PCR timestamps to include for transmission.

A method for converting a program stream to a transport stream is described comprising: reading program stream packets from a digital versatile disk (“DVD”) based on user selections and navigation

¹¹² EX1009, 8:36-47.

¹¹³ EX1009, 8:54-67.

metadata contained on the DVD; extracting audio and video content packetized within the program stream packets; reading system clock reference (“SCR”) timestamps from the program stream packets, the SCR timestamps indicating relative times at which the audio and video should be rendered; determining a point within consecutively read program stream packets at which the SCR timestamps are non-consecutive; converting the SCR timestamps to program clock reference (“PCR”) timestamps interpretable by a transport stream decoder; and generating a transport stream of transport stream packets containing the audio and video content and using the PCR timestamps to provide for decode timing at the transport stream decoder; and generating a resynchronization signal causing the transport stream decoder to resynchronize with the transport stream when it receives corresponding non-consecutive PCR timestamps associated with the non-consecutive SCR timestamps.¹¹⁴

361. Chatterton discloses that the transport stream playback timing timestamps (“*playback timing information*”) may be provided on headers of the data streams (“*associated with audio information*”) by home media server 110 (“*first playback device*”) according to RTP/RTSP protocol.

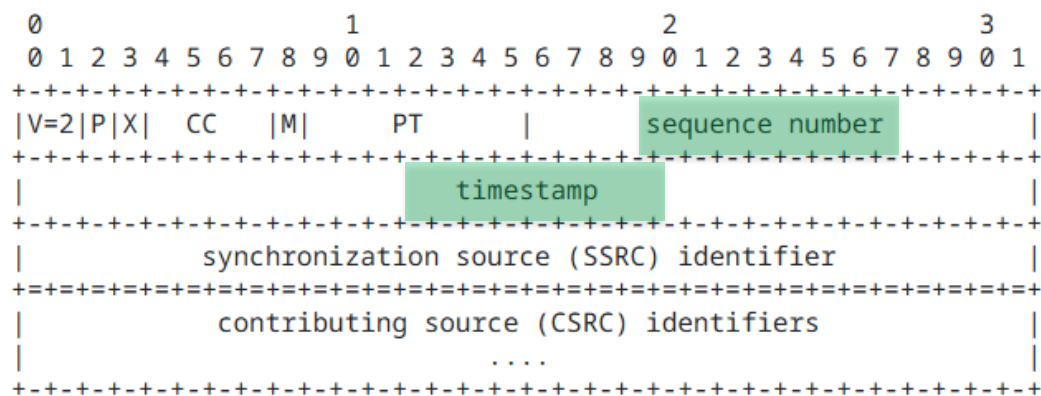
In one embodiment, the home media server **110** is configured with support for the realtime transport protocol (“RTP”) and the realtime streaming protocol (“RTSP”) (see, e.g., RTP/RTSP module **251**). Briefly, RTP is an IP protocol which supports real time transmission of voice and video. An RTP packet typically resides on top of a user datagram protocol (“UDP”) and includes timestamping and synchronization information in its header for proper reassembly at the receiving end.¹¹⁵

362. A POSITA would recognize or at least find it obvious these

¹¹⁴ EX1009, Abstract.

¹¹⁵ EX1009, 5:38-46.

timestamps disclosed by Chatterton for media transmissions are inherently implemented in headers consistent with the RTP standards, as described by RFC 1889 (EX1009). As shown in green, the header contains a sampling timestamp and sequence number to identify its order amongst other packets in the stream (“*playback timing information associated with audio information*”).¹¹⁶



363. A POSITA would understand that with the specific formatting of each transmission required by the RTP protocol, the sequence number of the packet will be used to calculate a time to play a packet based on the intervals between the packets and the sampling frequency. It is my opinion that Chatterton discloses timestamps, such as those in the RTP header, are “*playback timing information*” regardless of whether the previous construction is applied or the term is read according to its plain and ordinary meaning.

364. Chatterton further explains that home media network 140 devices,

¹¹⁶ EX1010, 10.

including devices 160-163 and multimedia nodes 150 and 151 (any of them can be a “*second playback device*”) can use their stream decoders to synchronize with the home media server 110 (“*first playback device*”) when it sends a resynchronization signal 1616 from its content conversion module (“*device clock information*”).

In addition, in one embodiment, a resynchronization signal **1616** is generated by the content conversion module **1610** to cause the transport stream decoder **1620** to resynchronize with the converted DVD content **1612** under certain conditions, described in detail below.¹¹⁷

Accordingly, in one embodiment, at 1650, when the stream processing logic 1681 detects a non-consecutive jump in the SCR/PCR timestamps, it will activate the resynchronization signal 1616, directing the transport stream decoder to resynchronize itself to the new PCR timeline.¹¹⁸

365. A POSITA would understand that in order for Chatterton’s resynchronization signal to achieve their stated purpose within Chatterton of “proper reassembly at the receiving end”¹¹⁹ when the playback timing timestamps are non-consecutive, it must include some type of information about the home media server 110’s clock, and that it suggests the inclusion of at least a current time value. Accordingly, it is my opinion that resynchronization signal 1616 constitutes “*device clock information of the first playback device*” regardless using the previous construction or its plain and ordinary meaning.

¹¹⁷ EX1009, 26:47-52.

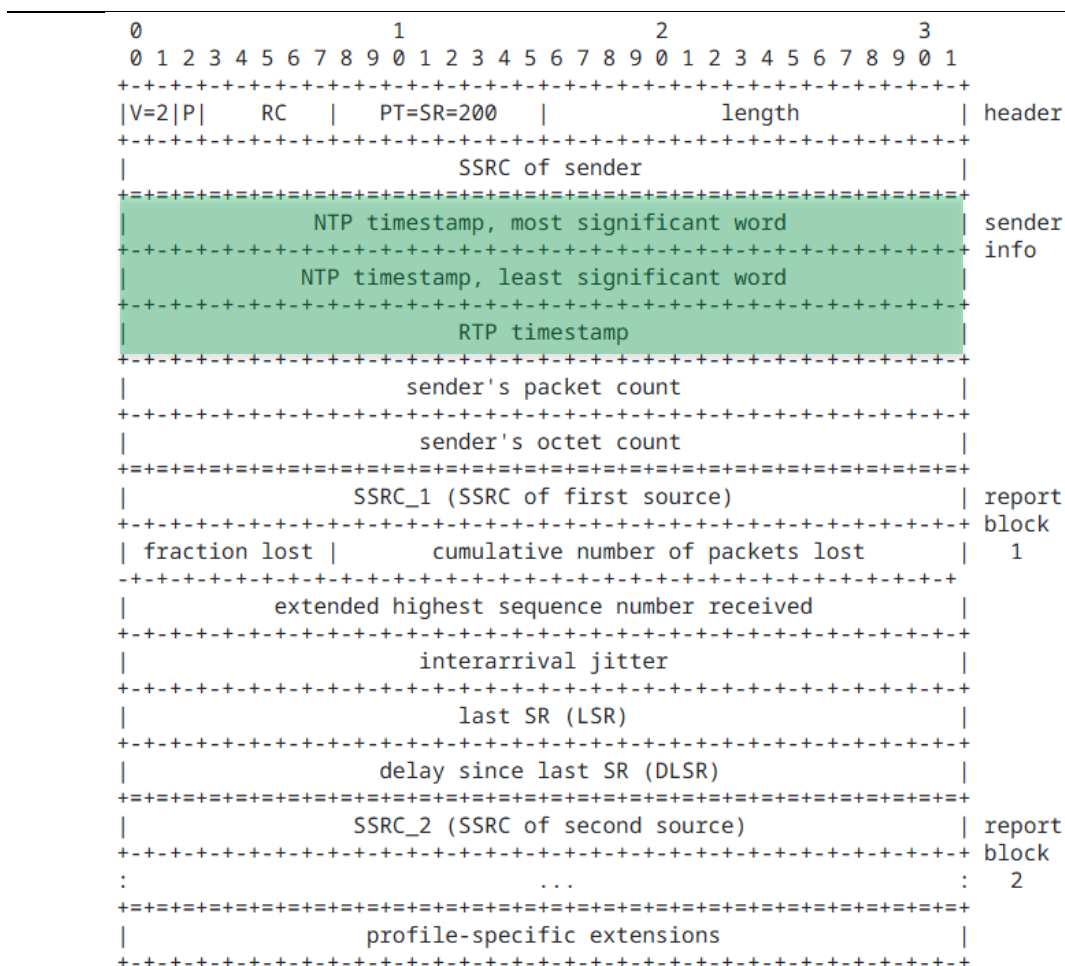
¹¹⁸ EX1009, 28:42-47.

¹¹⁹ EX1009, 5:38-46.

366. Additionally, Chatterton discloses that its media streams are created using RTP/RTSP protocol, or RTCP protocol, “a companion protocol to the realtime transport protocol (“RTP”) used to maintain a minimum QoS.”.¹²⁰ RTP and RTCP were well-known implementations for streaming, as expressly disclosed by Chatterton, and a POSITA would have known streams created using these protocols include RTCP packets. Accordingly, a POSITA would understand Chatterton’s disclosure of using RTP and RTCP to inherently include the use of RTCP packets, which required by the RTP/RTCP standard to include device clock time information, e.g., in the form of both a “NTP timestamp” and an “RTP timestamp” shown in the figure below.¹²¹

¹²⁰ EX1009, 16:12-15.

¹²¹ EX1010, 23.



367. As a result, a POSITA would understand Chatterton to disclose or at least suggest the use of RTCP sender report packets in the media streams it creates with RTP/RTCP standards to provide the stream transmitting device's clock information to each other stream receiving devices, ("*device clock information of the first playback device*"), consistent with RFC 1889.

368. Accordingly, it is my opinion that Chatterton discloses or suggests this element.

6. *[1.2.3] (iii) playing back, by the first playback device, the audio information in synchrony with the second playback device by using the playback timing information associated with the audio information and the device clock information of the first playback device to play back the audio information,*

369. Chatterton discloses or suggests this element. As explained above with respect to element [1.1.1], home media server itself can be a playback device for playing back audio content. As further explained above with respect to element [1.2.2], Chatterton discloses or suggests home media server 110 (“*first playback device*”) transmitting media content (“*audio information*”) with associated playback timestamps and sequencing (“*playback timing information*”) and provides clock information in resynchronization signal 1616 or otherwise in RTCP sender reports (“*device clock information of the first playback device*”), according to real-time protocols, to devices 160-163 and multimedia nodes 150 and 151 (any one of them can be a “*second playback devices*”) for synchronized playback with the home media server.

370. Chatterton discloses that the home media server 110 provides “real time transmission of voice and video” under the realtime transport protocol and realtime streaming protocol over a realtime home media network 140 “for proper reassembly at the receiving end.”

In one embodiment, the home media server **110** is configured with support for

the realtime transport protocol (“RTP”) and the realtime streaming protocol (“RTSP”) (see, e.g., RTP/RTSP module **251**). Briefly, RTP is an IP protocol which supports real time transmission of voice and video. An RTP packet typically resides on top of a user datagram protocol (“UDP”) and includes timestamping and synchronization information in its header for proper reassembly at the receiving end. RTSP is a well known protocol for streaming multimedia content over a network. It should be noted, however, that various other streaming protocols may be implemented while still complying with the underlying principles of the invention (e.g., Quicktime®, Windows Media, . . . etc).¹²²

Accordingly, because one embodiment of the home media server **110** operates over a realtime home media network **140** and communicates to devices other than PCs (e.g., media nodes **150**, **151**), certain optimizations **290** may be programmed within the RTP/RTSP component **251**.¹²³

371. Chatterton further discloses that, on the receiving end, the decoders in the devices 160-163 and multimedia nodes 150 (any one of them can be a “*second playback device*”) use the resynchronization signals to resynchronize with the home media server.¹²⁴ Chatterton further discloses that the devices on home media network 140 play back content according to the timestamps provided with the media content.¹²⁵

372. As such, a POSITA would have understood that home media server 110 (“*first playback device*”) plays back the audio content by encoding it and outputting it to a receiving device (“*second playback device*”), and the receiving device plays

¹²² EX1009, 5:38-51.

¹²³ EX1009, 5:53-62.

¹²⁴ EX1009, 26:47-52.

¹²⁵ EX1009, 6:36-41.

back by decoding it and outputting it, e.g., through audio amplifiers and speakers. A POSITA would have understood the audio information is played back on home media server 110 and the receiving device are *in synchrony* because the realtime nature of the data sharing and the synchronization information contained in the data for the receiving end to synchronize with the home media server 110. Therefore, a POSITA would have understood that Chatterton discloses the home media server 110 and the receiving device play back the audio information in synchrony (“*playing back, by the first playback device, the audio information in synchrony with the second playback device*”).

373. To any extent Chatterton does not explicitly disclose synchronized playback on multiple devices, it is my further opinion that it at least suggests it based on its teachings and applications. For example, Chatterton discloses the use of home media server to provide simultaneous streams at once, including one or more video streams and several audio streams. A POSITA would understand that the simultaneous distribution of realtime streams of the same content to different devices is for the devices to playback the content simultaneously, in synchrony.

The transmitter 430 (as well as the LAN 390, if one is installed) allows the home media server 110 to simultaneously transmit multimedia content and other types of data to the various media devices 150–151, 160–166 over the home media network 140 (e.g., at least one MPEG-2 video stream and several audio streams).¹²⁶

¹²⁶ EX1009, 5:53-62.

374. Chatterton further discloses the use of wide-screen and high definition televisions sets and audio systems.

Distributed multimedia nodes **150** and **151** illustrated in FIG. 1 provide an interface to the home media network **140** for audio systems **170** (e.g., audio amplifiers and speakers) and/or video systems **171** (e.g., standard television sets, wide screen television sets, high definition television (“HDTV”) sets, or any other device capable of displaying video).¹²⁷

A POSITA would recognize that based on these disclosures, Chatterton discloses an application of home media server 110 to stream content to home theatres and surround sound devices. A POSITA would be familiar with typical audio stream formatting for surround sound and home theatre environments include synchronized streams for multiple speakers. Accordingly, it is my opinion that Chatterton discloses or suggests the application of synchronized playback between home media server 110, the first playback device and second media playback devices.

375. Accordingly, it is my opinion that Chatterton discloses or suggests this element.

7. [1.2.4] wherein the first and second playback devices remain independently clocked during synchronous playback of the audio information.

376. Chatterton discloses or suggests this element. I understand

¹²⁷ EX1009, 6:64-7:3.

“independently clocked” has been construed as “operating in accordance with their own respective clocks during synchronous playback.” It is my opinion that the subject matter would have been disclosed and suggested regardless of whether this term is construed as it has previously or according to its plain and ordinary meaning

377. As disclosed above, Chatterton discloses the use of a resynchronization signal 1616 from home media server 110 to synchronize playback with devices on network 140.

378. A POSITA would recognize that in order for the separate devices on network 140 to exist in an unsynchronized state, they must include their own clocking components for playback. For example, Chatterton discloses the inclusion of a decoder 1620 that receives the multimedia signal and processes it for playback.¹²⁸ A POSITA would understand this decoder to be or include a digital-to-analog converter and that such devices commonly include a crystal oscillator or other clocking circuit to run its processing in accordance with.

379. Accordingly, based on the ability for devices to go out of synch and the disclosed components and their functions, it is my opinion that regardless of the claim construction applied, a POSITA would understand Chatterton to disclose or suggest that the home media server 110 (*“first playback device”*) and devices 160-

¹²⁸ EX1009, 26:47-52.

163 and multimedia nodes 150 and 151 (any one of them can be a “*second playback device*”) are “*independently clocked*.”

380. Accordingly, it is my opinion that Chatterton discloses or suggests this element.

381. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 1.

B. Dependent Claim 2: The method of claim 1, further comprising: after receiving the control information, additionally (i) generating, by the first playback device, the playback timing information associated with the audio information; and (ii) generating, by the first playback device, the device clock information of the first playback device.

382. Chatterton discloses or suggests the additional subject matter of this claim. As described above with respect to element [1.2.2], Chatterton discloses or suggests, home media server 110 (“*first playback server*”) creates audio streams (“*audio information*”) and associated RTP headers (“*playback timing information*”) and clock information in resynchronization signal 1616, or otherwise in RTCP sender reports, such as in the form of NTP timestamp, and RTP timestamp (“*device clock information*”).

383. Chatterton expressly discloses that the media streams (audio or video) are generated by the home media server 110 “using the RTP/RTSP protocol.”

If the user has access rights, then the tuner server module 252 creates video stream for the specified broadcast channel and feeds the stream to the multimedia node 151. In one embodiment, the tuner server module 602 creates

the stream using the RTP/RTSP protocol (i.e., by communicating with the RTP/RTSP module 251). The media node receives the stream through the local TV tuning application 601 and decodes the stream using a codec embedded within the media toolkit 260 (various additional encoding features of the system are set forth below). Once decoded, the video image is generated on the video display.¹²⁹

The jukebox server module 604 then creates the audio stream for the specified files and feeds the stream to the multimedia node 150. In one embodiment, the tuner server module 252 uses the RTP/RTSP protocol to create the stream (e.g., through communication with the RTP/RTSP module 251). The multimedia node 150 receives the stream through its jukebox application 601 and decodes the stream using a codec embedded within the media toolkit 260. Once decoded, the music tracks are reproduced on a set of speakers.¹³⁰

384. As described in more details above with respect to element [1.2.2], Chatterton discloses, explicitly or inherently, the generated media streams include audio and video content (“*audio information*”) with timestamps for playback, such as timestamps in associated RTP headers (“*playback timing information*”), and a resynchronization signal 1616 and/or device clock time information, e.g., in the form of both a NTP timestamp and an RTP timestamp (“*device clock information*”), generated according to the RTP/RTSP/RTCP protocols, as described by RFC 1889.

385. For example, Chatterton discloses that home media server 110 generates the resynchronization signal 1616 with content conversion module 1610 (“*device clock information*”).

¹²⁹ EX1009, 8:36-47.

¹³⁰ EX1009, 8:36-47.

In addition, in one embodiment, a resynchronization signal **1616** is generated by the content conversion module **1610** to cause the transport stream decoder **1620** to resynchronize with the converted DVD content **1612** under certain conditions, described in detail below.¹³¹

Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

386. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 2.

C. Dependent Claim 3: The method of claim 1, wherein the control information further comprises one or more instructions for the first playback device and the second playback device to playback audio information.

387. Chatterton discloses or suggests alone or in view of RFC 1889 the additional subject matter of this claim. Chatterton discloses that commands for home media network 140 includes commands to play back media. As discussed for [1.1.1], the control information includes commands to home media server 110 can identify specific audio to be obtained from specific locations and played back. as further discussed for [1.2.1]-[1.2.4], such commands cause home media server 110 (“*first playback device*”) to play back the audio information obtained by encoding and distributing to receiving devices, e.g., multimedia nodes (“*second playback device*”) and cause the receiving devices to decode and output to user, e.g., via speakers.

¹³¹ EX1009, 26:47-52.

Therefore, a POSITA would have understood the control information to include *“instructions for the first playback device and the second playback device to playback audio information.”*

388. Further, Chatterton discloses the use of RTSP for playback.¹³² A POSITA would be familiar with RTSP, including its ability to issue commands for playback control over a network. To any extent Chatterton does not expressly disclose the use of control information to instruct playback on home media network 140 devices, a POSITA would understand it to be disclosed or suggested consistent with RTSP.

389. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

390. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 3.

D. Dependent Claim 4: The method of claim 3, wherein the first and second playback devices are members of a synchrony group, and wherein the method further comprises: transmitting, by the first playback device to the network device, status information that comprises a status of the synchrony group.

391. Chatterton discloses or suggests the additional subject matter of this claim. Chatterton discloses or suggests that home media server 110 (*“first playback*

¹³² EX1009, 5:38-46

device”) can be monitored (“*transmit status information*”) by remote control unit 532 and computers 160/163 (“*network devices*”) about network operations (“*status of a synchrony group*”).

392. As described above with respect to element [1.2.3], Chatterton discloses or suggests that home media server 110 (“*first playback device*”) and the devices 160-163 and multimedia nodes 150 and 151 (any one of them a “*second playback device*”) may play back audio in synchrony. A POSITA would understand that devices playing audio back in synchrony would constitute a “*synchrony group*.”

393. Chatterton discloses that the Home Media Server 110 can be monitored by the user anywhere in the world by a monitoring device such as NOC 180 and “the home media server 110 periodically transmits a status update to the” monitoring device (“*status information*”).

The NOC 180 monitors the home media server to ensure that it is operating within normal parameters. In one embodiment, the home media server 110 periodically transmits a status update to the NOC 180, indicating whether any particular services are required and/or whether any problems have arisen.¹³³

As described briefly above, the home media server 110 may poll the NOC 180 periodically (e.g., every few seconds) and transmit a status update.¹³⁴

394. Additionally, Chatterton discloses that users may monitor home media network 140, including home media server 110 and home systems remotely through

¹³³ EX1009, 9:10-15.

¹³⁴ EX1009, 12:8-10.

a browser.

Accordingly, users of this embodiment are able to monitor and control home appliances and systems from anywhere in the world. In one embodiment this includes the ability to select broadcast listings and direct the home media server **110** to make recordings (e.g., based on date/time or broadcast ID code).¹³⁵

395. While NOC 180 is generally described by Chatterton as a remote control device connected to home media server 110 over the Internet for a user in a remote location to “monitor and control” the home media server 110 remotely, a POSITA would have understood or at least found it obvious that the monitoring functionalities disclosed by Chatterton on NOC 180 can be readily implemented on any local control device on the home media network 140, such as both remote control unit 532 and computers 160-163 (“*network device*”) also disclosed by Chatterton. Accordingly, it is my opinion that POSITA would understand that Chatterton discloses or at least found it obvious in light of Chatterton’s disclosures that the home media server 110 (“*first playback device*”) transmits status information to a control device (“*network device*”) on the home media network 140

396. Chatterton further discloses that other devices on the home media network 140 can communicate with the home media server 110 to provide their status information for the home media server 110 to relay to the monitoring device

¹³⁵ EX1009, 15:5-12.

on a periodic basis.¹³⁶ Chatterton also discloses that among the status information transmitted includes the identities of “home media server 110 and related home network devices 150-151 and 160-166,” which the home media server 110 transmits to the monitoring device for certification, registration, or authentication.

In one embodiment, when a user purchases a new device, such as a new telephone, the device may automatically identify itself to the home media server 110 (e.g., via USB, IEEE 1394 or other device identification technology). The home media server 110 will then determine whether the device is supported by the system and, if so, query the NOC 180 for the latest driver.¹³⁷

In addition, the home media server 110 may check the NOC 180 to determine whether the home network device has been certified by the NOC 180 as meeting some minimum level of quality and/or performance. In one embodiment, device drivers will be downloaded and installed on the system only if the device has been certified. In this manner, a minimum quality of service may be maintained for all devices employed on the system.¹³⁸

In one embodiment, users may be required to register with the NOC 180 upon purchasing a home media server 110 and related network devices 150–151, 160–166.¹³⁹

397. In light of the above, it is my opinion that a POSITA would understand that that Chatterton further discloses or at least found it obvious in light of Chatterton’s disclosures that the home media server 110 (“*first playback device*”)

¹³⁶ EX1009, 9:27-33.

¹³⁷ EX1009, 9:54-61.

¹³⁸ EX1009, 10:3-10.

¹³⁹ EX1009, 11:17-21.

transmits status information of playback devices, such as their identifications, (“*status information of the synchrony group*”) on the network to the control device (“*network device*”).

398. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

399. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious alone claim 4.

E. Dependent Claim 5: The method of claim 4, wherein the status information further comprises an identification of each playback device in the synchrony group.

400. Chatterton discloses or suggests the additional subject matter of this claim. As described with respect to [1.2.3] and claim 4, Chatterton discloses or suggests that home media server 110 provide status information of multiple playback devices that can play back in synchrony (“*synchrony group*”) to a monitoring device.

401. Chatterton explicitly discloses that among the status information transmitted from the home media server 110 to the monitoring device includes the identifications of “home media server 110 and related home network devices 150-151 and 160-166” (“*an identification of each playback device in the synchrony group*”).

In one embodiment, when a user purchases a new device, such as a new telephone, the device may automatically identify itself to the home media server 110 (e.g., via USB, IEEE 1394 or other device

identification technology). The home media server 110 will then determine whether the device is supported by the system and, if so, query the NOC 180 for the latest driver.¹⁴⁰

In addition, the home media server 110 may check the NOC 180 to determine whether the home network device has been certified by the NOC 180 as meeting some minimum level of quality and/or performance. In one embodiment, device drivers will be downloaded and installed on the system only if the device has been certified. In this manner, a minimum quality of service may be maintained for all devices employed on the system.¹⁴¹

In one embodiment, users may be required to register with the NOC 180 upon purchasing a home media server 110 and related network devices 150–151, 160–166.¹⁴²

402. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

403. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 5.

F. Dependent Claim 6: The method of claim 5, wherein the status information further comprises an identification of a master playback device of the synchrony group.

404. Chatterton discloses or suggests the additional subject matter of this claim. As described above with regard to element [1.2.2] and [1.2.3], home media server 110 provides the master playback timing and clock information to other

¹⁴⁰ EX1009, 9:54-61.

¹⁴¹ EX1009, 10:3-10.

¹⁴² EX1009, 11:17-21.

playback devices on home media network 140, and the other playback devices on the receiving end use the master's playback timing and clock information to "reassemble" the data to play back in synchrony. It is my opinion that a POSITA would understand home media server 110 to be the master playback device based on these functions. A POSITA therefore would have found it obvious that any status information including the home media server 110 would include its identification as a master.

405. Accordingly it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

406. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 6.

G. Dependent Claim 7: The method of claim 6, wherein the first playback device is the master playback device of the synchrony group.

407. Chatterton discloses or suggests the additional subject matter of this claim. As described in claim 6, Chatterton discloses or suggests that home media server 110 is the master playback device and a POSITA would recognize so.

408. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

409. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 7.

H. Independent Claim 8:

1. [8.P]: A tangible non-transitory computer-readable medium having instructions stored thereon that, when executed, cause a first playback device to:

410. To the extent that it is limiting, Chatterton discloses or suggests the subject matter described in this element.

411. Chatterton discloses that home media server 110 includes a central processing unit 200, main memory 201, and an application-specific integrated circuit (“ASIC”) 210.

As illustrated in FIG. 2 *a*, one embodiment of a home media server **110** computing architecture includes a central processing unit **200** capable of processing data and multimedia content stored in main memory **201** and a mass storage device **230** for storing data and multimedia content. In one embodiment, the central processing unit **200** is a Pentium®-class processor such as a Pentium III® operating at a 1 GHz or faster clock frequency. It should be noted, however, that the underlying principles of the invention are not limited to any particular processor speed or processor type. The main memory **201** may be a random access memory or any other dynamic storage medium (e.g., SDRAM, DDRAM, RD-RAM, . . . etc.). The mass storage device **230** of one embodiment is capable of storing hundreds, or even thousands of hours of multimedia content (e.g., movies, digital audio, . . . etc.) as well as other types of digital data (e.g., computer programs, word processing documents, . . . etc.). . .

An application-specific integrated circuit (“ASIC”) **210** coordinates communication between the various system components and offloads certain designated processing tasks from the CPU. The ASIC may be custom built based on the requirements of the home media server **110** or may be built using gate arrays, standard cells or programmable logic devices.¹⁴³

¹⁴³ EX1009, 4:4-34.

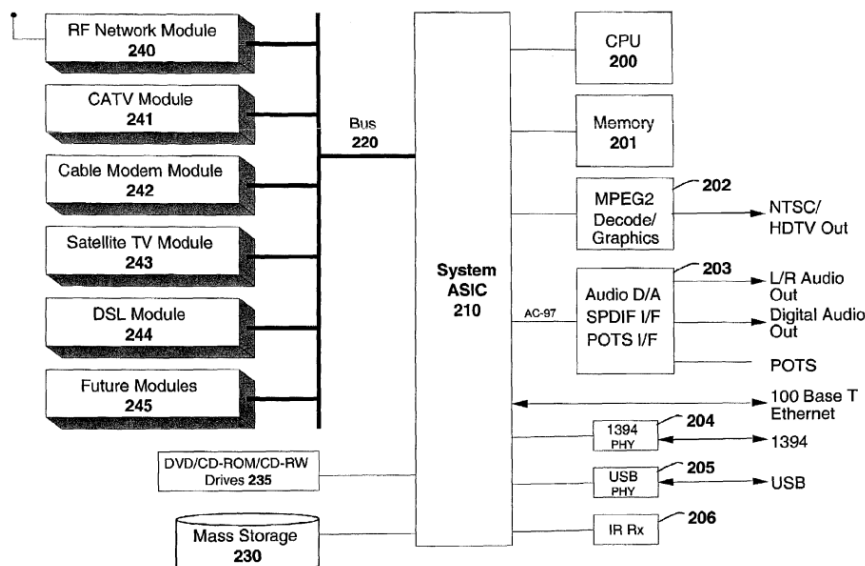


FIG. 2a

412. A POSITA would recognize that processing unit 200, memory 201, and ASIC 210 to store and execute the necessary instructions to implement the disclosed methods of Chatterton.

413. Accordingly, it is my opinion that Chatterton discloses or suggests this element.

2. [8.1.1]: receive, from a network device configured to control the first playback device and communicatively coupled to the first playback device over a local area network (LAN), control information comprising an address identifying a location of audio information available at an audio information source, [8.1.2] wherein the audio information source is outside of the LAN; and

414. To the extent that it is limiting, Chatterton discloses or suggests the subject matter described in this element. The subject matter in this element corresponds to the subject matter described in element [1.1.1]-[1.1.2] Accordingly,

based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests this element.

3. [8.2.1]: after receiving the control information, (i) obtain, from the audio information source outside of the LAN, the audio information; [8.2.2] (ii) transmit, to a second playback device, the audio information, playback timing information associated with the audio information, and clock time information for the first playback device; and [8.2.3] (iii) play back the audio information in synchrony with the second playback device by using the playback timing information associated with the audio information and the clock time information of the first playback device to play back the audio information, [8.2.4] wherein the first and second playback devices remain independently clocked during synchronous playback of the audio information.

415. To the extent that it is limiting, Chatterton discloses or suggests the subject matter described in this element. The subject matter in this element corresponds to the subject matter described in elements [1.2.1]-[1.2.4]. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests this element.

416. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 8.

I. Independent Claim 9:

1. [9.P]: A first playback device comprising:

417. To the extent that it is limiting, Chatterton discloses or suggests home media server 110 as a first playback device, for reasons discussed for [1.1.1].

418. Accordingly, it is my opinion that Chatterton discloses or suggests this element.

2. [9.1]: one or more processors;

419. Chatterton discloses or suggests the subject matter described in this element. The subject matter in this element overlaps with the subject matter described in element [8.P]. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or alone suggests this element.

3. [9.2]: a network interface; and

420. Chatterton discloses or suggests the subject matter described in this element.

421. Chatterton discloses that home media server 110 includes various network interfaces including exemplary RF network module 240, a DSL module 244, ethernet port, infrared port 206, firewire port 204, and other optional interfaces.

In the particular embodiment illustrated in FIG. 2 a, the communication modules 240–245 electrically coupled to the system bus 220 include an RF network module 240 for communicating over the home media network 140 (i.e., via a wireless RF channel), a cable TV module 241 for receiving broadcast cable channels, a cable modem module 242 for providing Internet access via a cable system (i.e., using the TCP/IP protocol), a satellite TV module 243 for receiving satellite broadcasts, and a DSL module 244 for DSL Internet access. Moreover, a virtually unlimited number of new modules may be added as necessary to support new or existing communication channels/protocols (as indicated by module 245)....Other components within the home media server **110** architecture include an MPEG-2 decode module **202** (and/or other decode modules such as AC3, MPEG-1, . . .

etc.); an audio module **203** comprised of a digital-to-analog converter, a Sony-Philips Digital Interconnect Format (“SP-DIF”) interface and a standard telephony interface for providing digital and analog audio and standard telephone service to external audio/telephony devices; an Ethernet port provided directly the system ASIC **210** (as indicated by the “100 Base-T Ethernet” designation); a Firewire (IEEE 1394) port **204**; a Universal Serial Bus (“USB”) port **205**; and an infrared port **206**. Various other communication interfaces may be configured in the system, either directly on the primary home media server architecture **110** (e.g., on the media server **110** “motherboard”), or as an add-on module **240–245**. Moreover, the communication modules (e.g., **202–206**), the CPU **200** and/or the memory **201** may be incorporated within the system ASIC **210**, rather than as separate modules as illustrated in FIG. 2 *a*.¹⁴⁴

422. Accordingly, it is my opinion that Chatterton discloses or suggests this element.

4. [9.3]: tangible, non-transitory computer-readable memory comprising program instructions that, when executed by the one or more processors, cause the first playback device to:

423. To the extent that it is limiting, Chatterton discloses or suggests the subject matter described in this element.

424. The subject matter in this element overlaps with the subject matter described in element [8.P].

425. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests this element.

¹⁴⁴ EX1009, 4:43-5:7.

5. [9.3.1]: receive, via the network interface from a network device configured to control the first playback device and communicatively coupled to the first playback device over a local area network (LAN), control information comprising an address identifying a network location of audio information available at an audio information source, wherein the audio information source is outside of the LAN; and

426. Chatterton discloses or suggests the subject matter described in this element.

427. The subject matter in this element overlaps with the subject matter described in elements [1.1.1]-[1.1.2]. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests this element.

6. [9.3.2]: after receiving the control information, (i) obtain, via the network interface from the audio information source outside of the LAN, the audio information; (ii) transmit, via the network interface of the first playback device to a second playback device, the audio information, playback timing information associated with the audio information, and device clock information of the first playback device; and (iii) play back the audio information in synchrony with the second playback device by using the playback timing information associated with the audio information and the device clock information of the first playback device to play back the audio information, wherein the first and second playback devices remain independently clocked during synchronous playback of the audio information.

428. Chatterton discloses or suggests alone or in view of RFC 1889 the subject matter described in this element. The subject matter in this element corresponds to the subject matter described in elements [1.2.1]-[1.2.4]. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses

or suggests this element.

J. Dependent Claim 10: The first playback device of claim 9, wherein the program instructions, when executed by the one or more processors, further cause the first playback device to: generate the playback timing information associated with the audio information; and generate the device clock information of the first playback device.

429. Chatterton discloses or suggests the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 2. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

430. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 10.

K. Dependent Claim 11: The first playback device of claim 9, wherein the control information further comprises one or more instructions for the first playback device and the second playback device to playback audio information.

431. Chatterton discloses or suggests the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 3. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

432. Accordingly, it is my further opinion that Chatterton anticipates or

renders obvious alone claim 11.

L. Dependent Claim 12: The first playback device of claim 11, wherein the first and second playback devices are members of a synchrony group, and wherein the program instructions, when executed by the one or more processors, further cause the first playback device to: transmit, to the network device, status information that comprises a status of the synchrony group.

433. Chatterton discloses or suggests the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 4. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

434. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 12.

M. Dependent Claim 13: The first playback device of claim 12, wherein the status information further comprises an identification of each playback device in the synchrony group.

435. Chatterton discloses or suggests the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 5. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

436. Accordingly, it is my further opinion that Chatterton anticipates or

renders obvious claim 13.

N. Dependent Claim 14: The first playback device of claim 12, wherein the status information further comprises an identification of a master playback device of the synchrony group.

437. Chatterton discloses or suggests the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 6. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

438. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 14.

O. Dependent Claim 15: The first playback device of claim 14, wherein the first playback device is the master playback device of the synchrony group.

439. Chatterton discloses or suggests the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 7. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

440. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 15.

P. Dependent Claim 16: The first playback device of claim 12, wherein the status information further comprises an identification of one or more slave playback devices in the synchrony group, and wherein the second playback device is one of the one or more slave playback devices in the synchrony group.

441. Chatterton discloses or suggests the additional subject matter of this claim.

442. As described above with regard to element [1.2.2] and [1.2.3], home media server 110 provides the master playback timing and clock information to other playback devices on home media network 140, and the other playback devices on the receiving end use the master's playback timing and clock information to "reassemble" the data to play back in synchrony. It is my opinion that a POSITA would understand home media server 110 to be the master playback device based on these functions, and accordingly, the playback devices, such as multimedia nodes 150-151 and computers 160-163, that receive the master playback timing and clock information from the home media server 110 (any of them a "*second playback device*") are slave playback devices.

443. As discussed with respect to claim 5, Chatterton explicitly discloses that among the status information transmitted from the home media server 110 to the monitoring device includes the identifications of "home media server 110 and related home network devices 150-151 and 160-166" ("*an identification of each playback device in the synchrony group*"). A POSITA therefore would understand

that Chatterton discloses or suggests that the status information includes an identification of one or more slave playback devices (e.g., multimedia nodes 150-151 and computers 160-163).

444. Accordingly it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

445. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 16.

Q. Dependent Claim 17: The first playback device of claim 16, wherein the instructions, when executed by the one or more processors, further cause the first playback device to: generate a plurality of frames, wherein an individual frame comprises at least a portion of the audio information and the playback timing information associated with the audio information, and wherein the first playback device transmitting to the second playback device the audio information, playback timing information, and device clock information of the first playback device comprises transmitting the plurality of frames to the second playback device.

446. Chatterton discloses or suggests the additional subject matter of this claim.

447. Chatterton discloses that home media server 110 generate streams including frames (“*plurality of frames*”) to transmit media (“*audio information*”) to devices 160-163 and multimedia nodes 150 (“*second playback devices*”).

448. As described above with respect to claim 1, Chatterton describes transmitting media in a transport stream to devices on a home media network 140.

Chatterton further provides that the streams can be comprised of frames, with each frame containing portions of content (“*audio information*”).¹⁴⁵

449. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

450. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 17.

R. Dependent Claim 18: The first playback device of claim 9, wherein the audio information comprises one of audio files or packetized streaming audio information.

451. Chatterton discloses or suggests the additional subject matter of this claim.

452. Chatterton describes home media server 110’s media content (“*audio information*”) includes both files and packetized streams.

A jukebox server module **604** executed on the home media server **110** receives the request and forwards the request to the media server file system **606** (through the media toolkit **260**), which retrieves the music files from the mass storage device **230**. The jukebox server module **604** then creates the audio stream for the specified files and feeds the stream to the multimedia node **150**.¹⁴⁶

For example, cable and satellite companies transmit the MPEG-encoded channels within a multiplexed “transport streams” comprising transport packets of a fixed 188 bytes in length.¹⁴⁷

¹⁴⁵ See, e.g., EX1009, 24:10-35, 29:9-24, Figs. 20-22.

¹⁴⁶ EX1009, 8:54-58.

¹⁴⁷ EX1009, 1:26-30; see also, 24:39-49.

453. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

454. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 18.

S. Dependent Claim 19: The first playback device of claim 9, wherein the audio information source outside of the LAN is an Internet-accessible audio information source, and wherein obtaining, from the audio information source outside of the LAN, the audio information, comprises obtaining the audio information from the Internet-accessible audio information source.

455. Chatterton discloses or suggests the additional subject matter of this claim. Chatterton further describes that home media server 110 can retrieve audio content (“*audio information*”) from the Internet, i.e., websites (“*internet-accessible audio information source*”).¹⁴⁸ As another example, Chatterton further explains home media server can be used to perform the processing intensive functions of other network devices.¹⁴⁹ Such a function might include the disclosed use of multimedia node 150 accessing specific webpages to download content (“*audio information from the Internet-accessible audio information source*”).

In addition, support for the hypertext markup language (“HTML”) and/or the extensible markup language (“XML”) are included in one multimedia node **150** embodiment, allowing users to download, view and modify various types of Internet content (e.g., Web pages).¹⁵⁰

¹⁴⁸ EX1009, 14:19-22; 12:55-59.

¹⁴⁹ EX1009, 6:30-41.

¹⁵⁰ EX1009, 8:4-8.

456. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

457. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 19.

T. Dependent Claim 20: The first playback device of claim 9, wherein obtaining, from the audio information source outside of the LAN, the audio information, comprises sending, to the audio information source, a request for the audio information.

458. Chatterton discloses or suggests the additional subject matter of this claim. Chatterton discloses home media server 110 making requests for media content. For example, Chatterton discloses that home media server may request “pay-per-view” content (“*a request for the audio information*”) from various cable/satellite operators (“*audio information sources*”).

For example, the NOC **180** may forward pay-per-view requests transmitted from the home media server **110** to the various cable/satellite operators, and perform the back-end processing (e.g., authentication, billing) required for the pay-per-view transaction.¹⁵¹

459. Chatterton discloses an exemplary embodiment where home media server makes such a request for audio information by tuning to a particular broadcast channel (e.g., cable, satellite broadcast).

A user initially selects a particular channel (e.g., via a remote control device)

¹⁵¹ EX1009, 11:35-39.

to be viewed at the local multimedia node 151. The command is received by the local TV tuning application 601 executed on the multimedia node 151, which sends a tuning request to the home media server 110 over the home media network 140. A tuner server module **602** executed on the home media server **110** receives the request and forwards the request to the tuner driver **271** (e.g., through the media toolkit **260**). In response to the command, the tuner driver **271** directs the tuner hardware (see, e.g., tuner **910** in FIG. 9 described below) to tune to the specified channel.¹⁵²

460. As explained above with regard to claims 1 and 19, Chatterton further discloses home media server obtaining audio from the Internet. A POSITA would recognize that internet protocols are comprised of “Requests” and “Responses,” and that in order to obtain selected content from the internet, home media server 110 would need to make at least one request sent to the audio information source.

461. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

462. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 20.

XI. Additional Remarks

463. I currently hold the opinions expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

¹⁵² EX1009, 8:18-35.

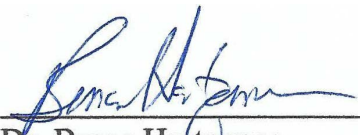
464. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

465. I have reviewed the accompanying Petition for *Inter Partes* Review of the '357 Patent and, given the information set forth in this declaration, I agree with the reasoning and conclusions of the grounds of challenge in the petition. Based on my own analysis, I agree that: (1) Richenstein anticipates claims 1-20; (2) Richenstein renders obvious claims 1-20; (3) Richenstein in view of MOST-2.0 renders obvious claims 4-7 and 12-17; (4) Chatterton anticipates claims 1-20; (5) Chatterton renders obvious claims 1-20; and (6) Chatterton in view of RFC1889 renders obvious claims 1-20

* * *

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this proceeding.

Dated: 2-2-25

By: 
Dr. Bruce Hartpence
Rochester, NY

APPENDIX A

BRUCE HARTPENCE

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A. Professional Preparation

- Finger Lakes Community College, Canandaigua, NY, Computer Science, A.S., 1993
- Rochester Inst of Technology, Rochester, NY, Information Technology, B.S., 1996
- Rochester Inst of Technology, Rochester, NY, Information Technology, M.S., 1998
- Rochester Inst of Technology, Rochester, NY, Computing and Info Sci, Ph.D., 2020

B. Appointments

2016-present Professor, ISCHOOL, GCCIS, RIT

Rochester Institute of Technology, Rochester, NY

2007-2015 Associate Professor, NSSA/IST Departments, RIT

Rochester Institute of Technology, Rochester, NY

1998-2007 Assistant Professor, NSSA/IST Departments, RIT

Rochester Institute of Technology, Rochester, NY

1990-1994 Electrical Technician

Mobil Chemical, Macedon, NY

1984-1990 Nuclear Electrician

U.S. Navy, U.S.S. Enterprise (CVN-65)

C. Products

Recent Publications:

1. B. Hartpence, D. Johnson, B. Stackpole and A. Kwasinski, "RIT Network and Security Dataset Collections," 2024 International Symposium on Networks, Computers and Communications (ISNCC), Washington DC, DC, USA, 2024, pp. 1-6, doi: 10.1109/ISNCC62547.2024.10759040.
2. B. Hartpence, D. Johnson, B. Stackpole and A. Kwasinski, "RIT Network and Security Dataset Collections," 2024 International Symposium on Networks, Computers and Communications (ISNCC), Washington DC, DC, USA, 2024, pp. 1-6, doi: 10.1109/ISNCC62547.2024.10759040.
3. Hartpence, Bruce, and Andres Kwasinski. "CNN and MLP Neural Network Ensembles for Packet Classification and Adversary Defense." 2021 Intelligent and Converged Networks, IEEE, 2021.
4. Hartpence, Bruce. Neural Network Architectures and Ensembles for Packet Classification: Addressing Visibility, Security and Quality of Service Challenges in Communication Networks. Rochester Institute of Technology, 2020.

5. Hartpence, Bruce, and Andres Kwasinski. "A Convolutional Neural Network Approach to Improving Network Visibility." 2020 29th Wireless and Optical Communications Conference (WOCC). IEEE, 2020.
6. Hartpence, Bruce, Andres Kwasinski, "Combating TCP Port Scan Attacks Using Sequential Neural Networks", IEEE ICNC, 2020.
7. Hartpence, Bruce, Andres Kwasinski, "Considering the Blackbox: An Investigation of Optimization Techniques with Completely Balanced Datasets of Packet Traffic", IEEE Big Data, 2019.

Other significant publications:

1. Hartpence, Bruce, and Rossi Rosario. "Software Defined Networking for Systems and Network Administration Programs." The USENIX Journal of Education in System Administration (2016): 12.
2. Sharma, et al., "Performance of Meshed Tree Protocols for Loop Avoidance in Switched Networks", Sharma et al., ICNS 2014
3. Hartpence, Bruce, Kwasinski, A., "Fast Internet Packet and Flow Classification Based on Artificial Neural Networks", IEEE Southeastcon, 2019.
4. Hartpence, Bruce, "Performance Evaluation of Networks with Physical and Virtual Links", IEEE Global Information Infrastructure and Networking Symposium (GIIS), 2015.
5. Hartpence, Bruce. "Curricular and performance measurement challenges in cloud environments." Proceedings of the 15th Annual Conference on Information technology education. 2014.
6. Hartpence, Bruce, "The Packet Guide to Voice over IP", O'Reilly Publishing, 2013.
7. Hartpence, Bruce, "The Packet Guide to Routing and Switching", O'Reilly Publishing, 2011.
8. Hartpence, Bruce, "The Packet Guide to Core Network Protocols", O'Reilly Publishing, 2010.

D. Synergistic Activities

1. RIT Network and Security Research Project: Data Science and Machine Learning for Network Challenges and DNS Security, 2023-present.
2. Standards work: IEEE project 1910.1 - Standard for Meshed Tree Bridging with Loop Free Forwarding (2015-2021)
3. Rochester Institute of Technology Software Defined Network testbed construction and dataset creation. This was a virtualization cluster and physical network testbed deploying Open Daylight controllers and the OpenFlow protocol. (2017-2019)
4. Meshed Tree Protocol Design: This project seeks to improve upon convergence times for layer networks experiencing outages or looped topologies. This foundational work resulted in the formation of an IEEE working group under 802.1. (2012-2013)
5. Virtualization cluster and SAN construction: A major goal of the grant work is to disseminate network and security curricula and ideas to schools named in the grant. This project has resulted in the creation of several smaller projects and papers including the creation of several small clusters based on VMWare ESXi, course development work and security competition architectures. (2010-2013)
6. UNCF Special Programs Corporation (UNCFSP) entitled, "Implementation of a Student Technical Assistance Need-based Developmental Undergraduate Program (STANDUP)", for the NASA Administrator's Fellowship Project (NAFP) Research Award. Oakwood College, Roper, E. (2010)

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CV Addendum

1. History of employment/consulting in expert field

a. Network and VoIP Training and Material Creation (2008-2014)

These were a lengthy series of both on-site and on campus training programs. They incorporated a wide variety of topics ranging from basic networking and protocols to Voice over IP.

Microwave Data Systems

Harris RF (includes license agreement for materials)

Wegmans Food Markets

b. Trocaire College Program Review (2010-2011)

This was a complete review of the existing program, students and the local job market. The final report included recommendations for the future of the program and modifications to be made.

c. Liban (now Vnomics) Wireless Site Survey and System Research (2010-2011)

I was engaged to assist in the development of an intelligent system for monitoring onboard trucking systems. This also included wireless site survey at proposed deployment locations.

d. IEEE 1910.1 Standards Creation (2015-2020)

2. **Expert Witness History:** A listing of cases in which you've been retained as an expert within the last five years.

NA

3. **Patent History**

NA