Nos. 2020-1350, -1405

In the
United States Court of Appeals
for the Federal Circuit

ZAXCOM, INC.,

Appellant,

v.

LECTROSONICS, INC.,

Cross-Appellant,

ANDREI IANCU, Director, U.S. Patent and Trademark Office,

Intervenor.

Appeal from the United Patent and Trademark Office,
Case No. IPR2018-00972.
The Honorable **Scott Russell Boalick**, **Kalyan K. Despande** and **Lynne Pettigrew**,
Administrative Patent Judges Presiding.

BRIEF OF APPELLANT,
ZAXCOM, INC.

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FORM 9. Certificate of Interest

Form 9
Rev. 10/17

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

Zaxcom, Inc. **v.** Lectrosonics, Inc.

Case No. 2020-1350

CERTIFICATE OF INTEREST

Counsel for the:
☐ (petitioner) ■ (appellant) ☐ (respondent) ☐ (appellee) ☐ (amicus) ☐ (name of party)

Zaxcom, Inc.

certifies the following (use "None" if applicable; use extra sheets if necessary):

1. Full Name of Party Represented by me	2. Name of Real Party in interest (Please only include any real party in interest NOT identified in Question 3) represented by me is:	3. Parent corporations and publicly held companies that own 10% or more of stock in the party
Zaxcom, Inc.	None	None

4. The names of all law firms and the partners or associates that appeared for the party or amicus now represented by me in the trial court or agency or are expected to appear in this court **(and who have not or will not enter an appearance in this case)** are:

N/A

FORM 9. Certificate of Interest **Form 9 Rev. 10/17**

5. The title and number of any case known to counsel to be pending in this or any other court or agency that will directly affect or be directly affected by this court's decision in the pending appeal. *See* Fed. Cir. R. 47. 4(a)(5) and 47.5(b). (The parties should attach continuation pages as necessary).

Zaxcom, Inc. v. Lectrosonics, Inc., 1:19-cv-00109-RB-JKR (D.N.M.)

1/28/2020
Date

/s/ Rita C. Chipperson
Signature of counsel

Please Note: All questions must be answered

Rita C. Chipperson
Printed name of counsel

cc: Counsel of Record (via ECF)

Reset Fields

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STATEMENT OF RELATED CASES

Under Federal Circuit Rule 47.5, one case might directly affect or be affected by this Court's decision.

- *Zaxcom, Inc. v. Lectrosonics, Inc.*, Civil Action No. 1:19-cv-00109-RB-JKR (D.N.M.)

There are two related patents, involving two other Board proceedings, that are expected to be appealed to this Court in the very near future:

- *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, U.S. Patent 7,929,902
- *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01130, U.S. Patent 8,385,814.

INTRODUCTORY STATEMENT

The Board held that patent claims covering devices that won both an EMMY and a technical OSCAR were unpatentable. Along the way, the Board misconstrued every patent claim under review. All claims require the combining of "said local audio data" with "said remotely recorded audio data," and further require that the local audio data and the remotely recorded audio data both derive from the same local audio (*i.e.*, the same source). The Board erroneously construed the claims to cover two embodiments (*i.e.*, a Dropout Embodiment and a Multitrack Embodiment), when in fact the claims cover solely a Dropout Embodiment. In doing so, the Board determined erroneously that the local audio data and the remotely recorded audio data do not have to be from the same origin in disregard of the

language of the claims. The Board reasoned incorrectly because it exalted extrinsic evidence over intrinsic evidence, then misunderstood both. The improper construction caused the Board conclusion that the claims were obvious over Strub in combination with Nagai or Gleissner, or were anticipated by Strub.

On top of this error, the Board erred in its application of industry praise law to the facts in the record. The Board inexplicably gave no weight to the EMMY nor the technical OSCAR awarded for the merits of an embodiment of the claimed invention *and* for a product that embodies the claims, sidestepping this Court's *en banc* legal standards that require giving such weight.

JURISDICTIONAL STATEMENT

This is an appeal from an inter partes review ("IPR") proceeding of the Patent Trial and Appeal Board ("Board"), IPR2018-00972. Appellant appeals the decision in IPR2018-00972 that claims 1-11 of U.S. Patent No. 9,336,307 (the "'307 Patent") are unpatentable under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 6,825,875 to Strub ("Strub") and U.S. Patent Application No. 2002/0159179 to Nagai ("Nagai") or U.S. Patent Application No. 2004/0028241 to Gleissner ("Gleissner"), and that claims 12-14 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Strub.

The Board issued its decision on November 7, 2019 (Appx1-66). Zaxcom, Inc. ("Zaxcom" or "Appellant") timely appealed (Appx734-807). This Court has

jurisdiction over this appeal from a final agency action (the "United States Patent and Trademark Office", or "USPTO") under 35 U.S.C. §§ 141 and 319 and 28 U.S.C. § 1295(a)(4)(A).

STATEMENT OF THE ISSUES

1. Whether the Board erred in its anticipation and obviousness holdings by misconstruing the claims to be broad enough to cover both a Dropout Embodiment and a Multitrack Embodiment, consequently making findings about prior art disclosures of Multitrack Embodiments that are categorically wrong because the claims should be limited to a Dropout Embodiment.

2. Whether the Board erred in its anticipation and obviousness holdings by misconstruing the claims to be broad enough so that the two types of "audio data" that must be "combined" may come originally from different audio sources, consequently making findings about prior art disclosures of combinations of "local audio data" and "remotely recorded audio data" that are categorically wrong.

3. Regardless of the outcome of Issues 1 and 2, whether the Board erred in its application of industry praise law to the facts that exist in the record, leading it to analyze the ultimate question of obviousness without weighing evidence of nonobviousness that this Court's precedents require it to weigh.

STATEMENT OF THE CASE

In its Decision, the Board made several claim construction and factual errors, including the finding that "local audio data combined with remotely recorded audio data" covers two of the '307 Patent's embodiments instead of one. This misunderstanding rewrote the claims to have far more breadth than the inventor ever intended. This overbreadth, in turn, led directly to mistaken beliefs that prior art disclosed certain claim limitations when it does not. The Board further erred in its application of industry praise law to the facts of record.

The Board itself has signaled that its rejection of Appellant's claim construction was material and outcome-determinative. Appellant presented a successful conditional motion to amend (Appx402-446). The claim amendments in that conditional motion match the narrower scope that Appellant told the Board the original claims already had, albeit using different words (Appx339, 346-348). Put another way, even the Board understands that the claim scope argued in this brief leads to reversal.

(Should this appeal succeed, the patent on remand would be deemed to have always contained only its original claim set, since the "condition" for amendment—unpatentability of original claims—would retroactively go away. This would also moot Lectrosonics' cross-appeal, which seeks to reverse the grant of the conditional motion to amend.).

A. Overview of the ’307 Patent

The ’307 Patent is entitled, “Virtual Wireless Multitrack Recording System.” It claims priority to July 14, 2005. Embodiments of the ’307 Patent won both an EMMY Award and a technical OSCAR (“Academy Award”) (Appx4268-4270, Appx4271-4272). Zaxcom (a small American operating company) owns the ’307 Patent. Zaxcom’s primary owner and managing officer (Glenn Sanders) is a co-inventor with Zaxcom’s Director of Engineering (Howy Stark).

Zaxcom, Mr. Sanders and Mr. Stark need the patent system to function correctly. They have relied on the ’307 Patent (and others) through the years to protect its line of highly successful commercial products, which products compete with those of companies having revenues 10X or more that of Zaxcom. These revolutionary products help movie studios and production companies streamline the audio production and postproduction process when making videos or films. But with success comes imitators. Unfortunately, through the years, Zaxcom has been forced to defend its proprietary marketplace by asking for the federal courts to get involved to stop an infringer who intentionally entered its marketplace, without a license to Zaxcom’s patents.

The ’307 Patent itself addresses the deficiencies of the prior art by assembling a wireless recording system of components including wearable local audio devices

102, a remote control unit 104, a remote receiver 106 and a remote recorder 108, as all shown in FIG. 1 (Appx69) and reproduced below:

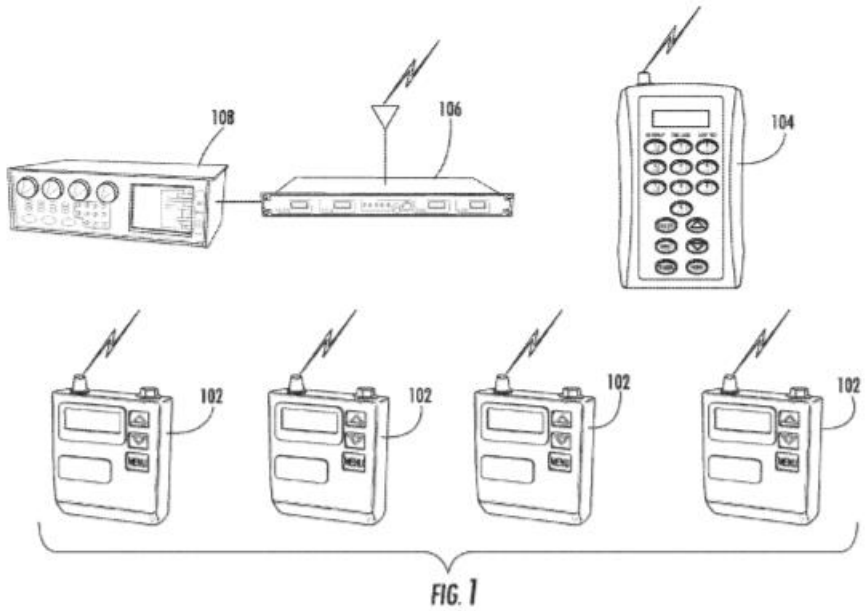


FIG. 1

In a typical use of the system, before the recording of an audio event (for example, a performance), "one or more performers may each don a local audio device, such as local audio device 102" (Appx89, '307 Patent, 13:35-36). Then, once the recording of the performance begins, each of "the local control unit (of local audio device 102) transmits the audio sample through the local transmitter to the other wireless devices such as RCUs, receivers, audio recorders, and the like. For example, audio from multiple local audio devices may be transmitted to a multi-track recorder for recording of the audio event while each local audio device locally records its performer's audio" (Appx89, '307 Patent, 14:30-36, Emphasis Added). A

multi-track recorder, such as recorder 108, "combines the wireless transmissions received from all body packs to create one multi-track audio file" (Appx89, '307 Patent, col. 1, ll. 44-46). The multi-track audio file may be used, for example, as the soundtrack for a movie.

The system just described reflects a significant advance over the prior art. A common problem in the art that preceded the invention of the '307 Patent centered on the unsophisticated use of radio transmission. During the wireless transmission, the system might lose or distort a portion of the audio in the multi-track file created by the remote receiver/recorder. Prior to the invention of the '307 Patent, this loss of audio would require a retake of the movie scene or the like because there was no ability to repair lost data in the remotely recorded multi-track audio file. "Upon the occurrence of interfering signals, audio created during a performance (*e.g.*, a live performance) may simply be lost due to the inability of the receiver to receive a clean audio signal" (Appx89, '307 Patent, col. 2, ll. 9-12).

To remedy this problem, the invention of the '307 Patent incorporated local recording in the local audio devices 102 to create individual backups for use in repair of the remotely recorded multi-track data in order to prevent the need to re-perform and/or re-record the take. "[A]udio from multiple local audio devices may be transmitted to a multi-track recorder for recording of the audio event while each local

audio device locally records its performer's audio" (Appx89, '307 Patent, col. 14, ll. 33-36, Emphasis Added).

In one, non-automatic embodiment of the invention such as that depicted in process 400 of Figs. 4A and 4B, the local audio recording recorded by the individual performer on his or her bodypack 102 is recorded on a removable memory 332 such as "flash memory cards, compact flash memory cards … USB … thumbdisks, and the like" (Appx89, '307 Patent, col. 10, ll. 30-33), which may be removed post-recording to repair the remotely recorded multi-track audio file. "Post-recording, memories 332 may be removed from each local audio device 102 such that locally recorded data may be retrieved and used to repair the corruption of the audio file generated by the receiver/recorders that occurred due to the receipt of corrupted audio data" (Appx89, '307 Patent, col. 12, ll.59-63).

In a second, automatic, embodiment of the present invention such as that depicted in process 600 of Fig. 6, rather than manually repairing the remotely recorded multi-track audio file, the repair is performed automatically "either electronically or via synchronized playback of the individually recorded audio tracks" (Appx89, '307 Patent, col. 16, ll. 10-14). There is a playback of all local audio data on all local audio devices 102, and a remote re-recording of the local audio data as it is played back and wirelessly transmitted to the remote recorder/receiver. "Turning next to FIG. 6, illustrated is a flow diagram of one

embodiment of a process for recording audio and for replaying and re-recording segments of missed audio" (Appx89, '307 Patent, col.16, ll.10-14).

As can be seen already in quotations above, the specification carefully distinguishes the terminology "audio" from the terminology "audio data." This distinction will reappear in the claims, to be discussed later. "Audio" is the analog sound waves of a performance picked up at an audio input device coupled to a local audio device, whereas "audio data" represents its conversion into a digital format that can be stored as a "file."

1. Specification support for "local audio data … is combined with said remotely recorded audio data"

An important feature of the preferred embodiment is, during the performance of a live audio event, "locally recording locally generated audio, said locally generated audio also being wirelessly transmitted to, and remote recorded by, a remote recorder as remotely recorded audio data" such that after the live event has been recorded, the "local audio data may be retrieved after said locally recording and combined with said remotely recorded audio data" (Appx93, '307 Patent, col. 23, ll. 22-25, 40-42, col. 24, ll.15-18, 30-32). In this manner, any local audio that was lost during the wireless transmission from a local audio device to the remote recorder/receiver may be repaired in the remotely recorded multi-track audio file using the local audio, since the local audio is directly recorded and is not susceptible to corruption due to wireless transmission. "The locally recorded audio may then be

used to repair or replace any audio lost during transmission to the master recorder" (Appx67, Abstract).

In embodiments of the invention, timestamps facilitate such a repair or replacement.

> Referring first to FIG. 1, depicted is recording system 100 in accordance with one embodiment of the present invention. Recording system 100 wirelessly records audio events, such as performances, movie takes, etc. having one or more performers. In one aspect of the present invention, *all of the components of recording system 100 are synchronized* to allow each component to accurately stamp its recorded audio with the time at which it occurred such that the timestamps … created by each individual component of recording system 100 are *highly accurate as compared to the timestamps created by all other components of recording system 100*.

(Appx83, '307 Patent, col. 3, l. 66 - col. 4, l.12, Emphasis Added). As per Fig. 1, "all of the components of recording system 100" include local audio devices 102, RCU 104, receiver 106, and recorder 108 (Appx69, '307 Patent, Fig. 1).

The specification continues to describe an embodiment in which the repair or replacement of data in the multi-track audio file is done manually, for example, as shown in process 400 of Figs. 4A and 4B (Appx74-75, '307 Patent, Figs. 4A, 4B). Specifically, the '307 Patent states "[t]his accuracy [of timestamps] allows multiple individually recorded audio tracks to be combined into one or more multi-track audio files electronically post-recording" (Appx89, '307 Patent, col. 4, ll. 12-14). That is, the accuracy of timestamps in the individually recorded local audio files permits the local data's combination into, or insertion into, one or more multi-track audio files

previously created by a remote receiver or recorder, *i.e.*, this task is performed after the initial recording. The result is a system that can repair or replace the remotely recorded audio data, in the places where necessary (such as places that succumbed to distortion, interference or complete dropout). If this were not the intended result of accurate timestamps, there would be no need to synchronize "all of the components of recording system 100."

To avoid the same misunderstandings reached by the Board, it is crucial to appreciate that the aforementioned quoted passage from column 4, with its use of the phrase "combined into," does not mean that multiple individually recorded audio tracks are combined *to create* one or more multi-track audio files. When such an interpretation is intended by the '307 Patent, it is clearly stated. For example, "[t]he audio received from each of the local audio devices (*e.g.*, the local audio device of each performer) may be combined *to create* one or more multitrack audio files that are stored with master timestamps generated by the receiver/recorder's internal master timecode generator" (Appx89, '307 Patent, col. 16, ll. 39-44, Emphasis Added). In this sentence, "to create" clearly indicates that multiple local audio files received at the receiver/recorder are in fact combined together *to create* a single remote multi-track audio file. This is in sharp contrast to the use of the words "combine into" at lines 12-14 of column 4, which means to repair or replace the

remotely recorded audio data by combining the original local audio data *into* the remotely recorded audio data in order to replace or repair any dropouts.

Thereafter, the specification continues on again to describe an embodiment in which the repair or replacement of data in the multi-track audio file is done automatically, for example, as shown in process 600 of Fig. 6 (Appx77, '307 Patent, Fig. 6). Specifically, the '307 Patent states "[f]urthermore, this accuracy allows recording system 100 to *automatically* correct for any audio data lost during an original recording due to wireless transmission problems such as dropout, interference, *etc.* This automatic correction may be performed either electronically or via synchronized playback of the individually recorded audio tracks" (Appx83, '307 Patent, col. 4, ll. 15-20, Emphasis Added).

The '307 Patent further elaborates on the use of local audio to repair a remote multi-track audio file in stating:

> [s]ince the local audio device and recorder timestamps are synchronized, the replayed audio may be inserted in the proper time sequence with respect to the other recorded audio samples based upon the synchronized timestamp data. Synchronization is essential to ensure that each performer's audio is synchronized with all other performers' audio and to ensure that the newly recorded replayed audio is in the correct sequence with respect to the previously recorded live audio. Such synchronization must maintain a high accuracy for each performer's timestamps with respect to all other performers' timestamps to prevent the occurrence of phasing artifacts when the multiple audio recordings are combined to create one single recording.

(Appx89, '307 Patent, col. 4, l.63 – col. 5, l.8).

That is, replayed *local* audio may be *inserted* or *combined into* the proper time sequence of the remote multi-track audio file generated by a receiver/recorder based upon timestamp data when the multiple audio recordings (*i.e.*, the locally replayed audio and the remote multitrack audio file generated by the receiver/recorder) are combined to create one single recording.

2. Claim language reciting the "local audio data … is combined with said remotely recorded audio data"

The claim limitation "said local audio data … is combined with said remotely recorded audio data" is recited in independent claim 1 and similarly recited in independent claim 12. This claim limitation along with the limitations relating to the "local audio data" and the "remotely recorded audio data" require that: (i) locally generated audio or local audio generated by a performer or creator of locally generated audio is stored in a wearable local audio device as local audio data; (ii) the same locally generated audio or local audio is transmitted to a remote recorder or receiver; (iii) the same locally generated audio or local audio is remotely recorded at the recorder or receiver as remotely recorded audio data; and (iv) the local audio data is retrieved after said locally recording and combined with the remotely recorded audio data (Appx346, ¶ 15).

This claim construction is consistent with the claim language itself.

Claim 1 explicitly recites these limitations. Column 23, lines 21-25, require "[a]n apparatus or system for locally recording locally generated audio, said locally

generated audio also being wirelessly transmitted to, and remotely recorded by, a remote recorder as remotely recorded audio data" (Appx93, '307 Patent, col. 23, ll. 21-25, Emphasis Added).

"Said locally generated audio" is received at an "audio input port for receiving said locally generated audio from an audio input device … wearable by a creator of said locally generated audio" (Appx93, '307 Patent, col. 23, ll. 32-34, Emphasis Added).

Column 23, lines 38-39, further requires "at least one control unit electronically coupled to … said audio input device, and said memory… for creating local audio data and storing said local audio data in said memory" (Appx93, '307 Patent, col. 23, ll. 38-39).

The end of claim 1 requires that "said local audio data" is "combined with" "said remotely recorded audio data" (Appx93, '307 Patent, col. 23, ll. 40-42, Emphasis Added).

Similarly, Claim 12 explicitly recites that "local audio data is retrieved during or subsequent to said audio event and is combined with said remotely recorded audio data" (Appx93, '307 Patent, col. 24, ll. 30-33). Claim 12 also requires both the "local audio data" and the "remotely recorded audio data" to originate from the "local audio generated by at least one performer" (Appx93, '307 Patent, col. 24, ll. 19-20). In particular, claim 12 recites "transmitting said local audio … to … a recorder, a

receiver and combinations thereof" (Appx93, '307 Patent, col. 24, ll. 21-23) and "remotely recording said transmitted local audio via … a recorder, a receiver, and combinations thereof as remotely recorded audio data" (Appx93, '307 Patent, col. 24, ll. 27- 29). Claim 12 also recites "locally recording said local audio as local audio data in … at least one local audio device wearable by a creator of said local audio" (Appx93, '307 Patent, col. 24, ll. 24-26).

B. Embodiments of the claimed invention won both of the highest awards in the industry—an EMMY and a technical OSCAR—thus "industry praise" permeates this record

Secondary considerations of non-obviousness support the non-obviousness of the claims, including industry praise of the patented invention.

The industry praise is indeed the highest level of praise achievable. Mr. Sanders received an EMMY Award from the Academy of Television Arts and Sciences for the Zaxcom, Inc. digital recording wireless products that embody the claimed invention of the '307 Patent (Appx3102-3103, ¶¶ 8 and 10, Appx4268-4270).

(Appx4269).

Zaxcom's expert, Mr. DeFilippis, was a member of the relevant 2016 Engineering Awards committee that awarded the EMMY to Mr. Sanders and is thus a percipient occurrence witness to its deliberations (Appx4303). His testimony of those recollections is fact testimony, not expert testimony. With regard to the

patented invention, Mr. DeFilippis did give expert testimony, including the following:

> [t]here is a strong nexus between the objective indicia of non-obviousness and the issued and substitute claims of the ’307 patent. The Zaxcom technology that satisfied a long felt need and received industry praise and recognition include the features that are recited in the issued and substitute claims of the ’307 patent.

(Appx3052, ¶ 78).

Indeed, the Zaxcom technology was repeatedly praised for the claimed features. The Television Academy that awarded the Engineering EMMY stated as follows:

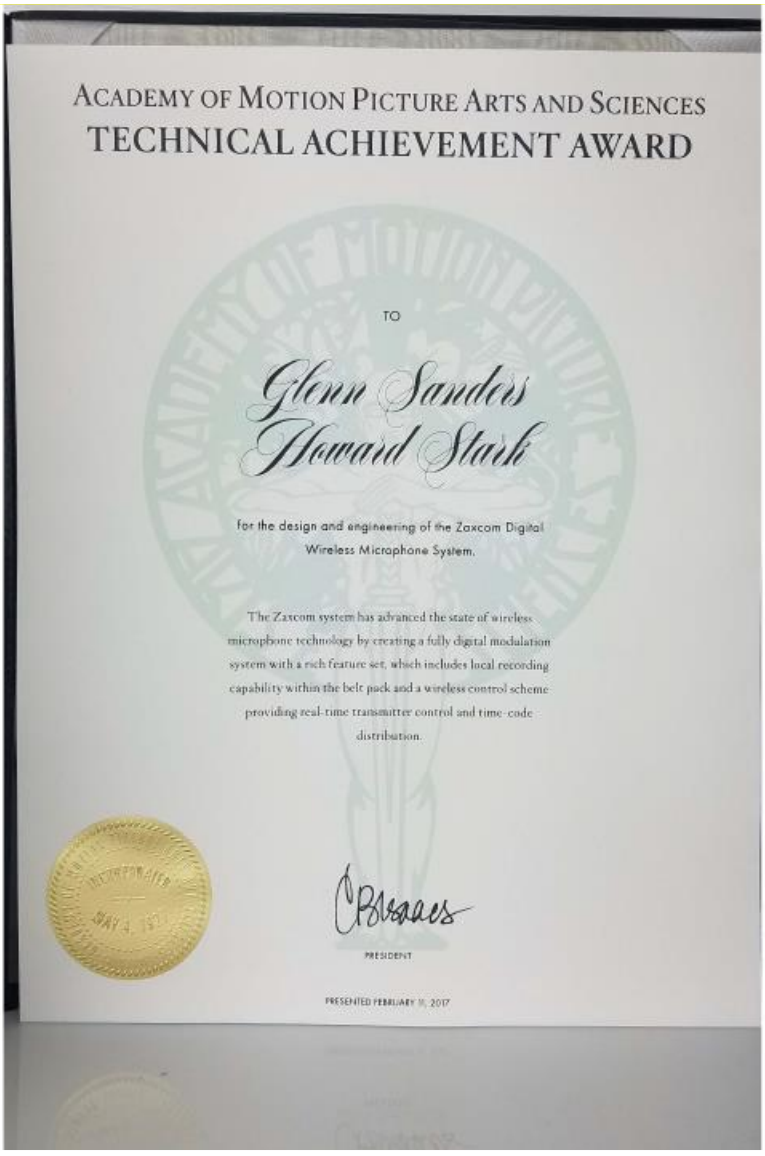
> Zaxcom, widely considered the industry leader in digital wireless technology, has significantly contributed to the advancement of television broadcasting. Its innovative products include the first digital wireless transmission system for microphones and a production tool that married wireless transmission with a recording device located within the actor’s body pack. Zaxcom will be honored for innovations in digital wireless technology.

(Appx4296, Emphasis Added).

The program for the Engineering EMMYs further recognizes the awarding of the EMMY due to the “[d]igital recording of microphone signal in the wireless transmitter to provide backup recording of the original microphone signal” (Appx4307).

Glenn Sanders and the co-inventor of the ’307 Patent, Howard Stark, also received the Technical Achievement Award from the Academy of Motion Picture

Arts and Sciences (the "Academy Award," or OSCAR) for the digital recording wireless products that embody the claimed invention of the '307 Patent (Appx3102-3103, ¶¶ 9 and 10, Appx4271-4272).



ACADEMY OF MOTION PICTURE ARTS AND SCIENCES
TECHNICAL ACHIEVEMENT AWARD

TO

Glenn Sanders
Howard Stark

for the design and engineering of the Zaxcom Digital Wireless Microphone System.

The Zaxcom system has advanced the state of wireless microphone technology by creating a fully digital modulation system with a rich feature set, which includes local recording capability within the belt pack and a wireless control scheme providing real-time transmitter control and time-code distribution.

PRESIDENT

PRESENTED FEBRUARY 11, 2017

(Appx4272).

As indicated on the face of the Academy Award, it was awarded for advancing "the state of wireless microphone technology by creating a fully digital modulation system with a rich feature set, which includes local recording capability within the belt pack and a wireless control scheme providing real-time transmitter control and time code distribution" (Appx4272).

Many motion picture and television sound technicians of ordinary skill in the art at the time of the invention of the '307 Patent, who have decades of experience crafting well-known movies and television shows *(e.g.*, American Gangster, Mr. Robot, Inside Man, Sex and the City, Salt, Sicario, The Last Samurai, Independence Day, Almost Famous) also lavished industry praise upon the claimed invention. The industry praise also included a recognition of a long felt need for a wireless, wearable, transmitting and recording device that could reliably capture sound data from actors recording a movie or television show.

In his declaration, one such sound technician, Mr. Wexler states:

> Soon after introducing digital wireless transmitters, Zaxcom developed a transmitter that had recording capability…. I soon realized that this was truly a "game changer" for my work.

(Appx4283, ¶5).

> Each Zaxcom transmitter can digitally record the output of the microphone along with transmitting the signal to the receiver. If there is a drop out of the RF signal, the identical recording in the transmitter can be used by post production.

(Appx4283, ¶ 6).

> I have been in many situations where for a variety of reasons there have been RF dropouts and in some cases the wireless on the talent has moved way out of range … when working with moving cars, moving shots or ambitious and unplanned scenes … prior to Zaxcom's invention, the audio would be lost forever in these situations.

(Appx4283-4284, ¶ 6).

> [U]sing the digital recording wireless transmitter … I could always deliver a track to post production even … where there were failures of the RF transmission. Zaxcom was the first and only company to provide this; nothing else even came close. I would never want to be without this function because it has allowed me to deliver audio to post in a manner which no other product provided.

(Appx4284, ¶ 7).

Petitioner's expert Mr. Tinsman agreed that the wireless devices available prior to May 2005 "had a potential for dropouts" (Appx4432). The claimed invention of the '307 Patent received praise for its solution to this problem, because it satisfied this long felt need with a wireless, wearable, transmitter/recorder that combines audio data stored locally in the wearable recorder with the same audio data transmitted and stored at a remote recorder to repair dropouts.

Another sound engineer, Mr. Sarokin, also states: "I can say without the slightest qualification that the work of Zaxcom as described and claimed in the '307 patent has revolutionized the sound for picture industry" (Appx4274, ¶ 3). He goes on:

> Mr. Sanders announced his 3rd generation units. I purchased 12 TRX 900 transmitters and these included a mini SD card slot for recording

> …. This capability solved the major limitation of radio mics … radio mics had a very limited range. Depending on what else is on the frequency, the range can be as little as 50 feet. In a big motion picture scene, especially on a film that Ridley Scott is directing, there can be simultaneous action hundreds of feet apart. Prior to Zaxcom's invention of recording radios, the field mixer would capture as much of the dialog as his equipment would allow and the rest would have to be dubbed in post production. I can't emphasize enough the revolution these recording radios brought on. If the actors in a scene went in and out of radio range the SD card on the transmitter would continue to record the audio …. Zaxcom also integrated all their equipment so a sound mixer could hit a single button on a Zaxcom recorder and all the radios in use would play back from a certain take or time code start point so the scene could be remixed without any radio drop outs. Zaxcom has been doing this since 2005. 14 years!

(Appx4276-4277, ¶ 6).

Clearly, if there was ever a strong case of industry praise, this is it. The evidence of industry praise is beyond substantial, and the satisfaction of a long felt need and failure of others indicates that the claimed invention of the '307 Patent was a "game changer" for the industry and would not have been obvious to a person of ordinary skill in the art.

SUMMARY OF THE ARGUMENT

The Board erred in construing "local audio data … is combined with said remotely recorded audio data" to encompass more than the Dropout Embodiment of the '307 Patent. The Board further erred in finding that the local audio data and said remotely recorded audio data do not have to derive from the same source. The Board

concluded that this unintended breadth causes certain prior art disclosures to read on the "combined" claim limitation, when in fact they do not.

The claims require that "local audio data is combined with said remotely recorded audio data," thus excluding any embodiments of the invention taught by the '307 Patent that are not related to Dropout Replacement. And, as the Board already found in its decision relating to the substitute claims, the prior art Strub disclosure does not anticipate or render obvious claims limited to the Dropout Replacement embodiment because "Petitioner's proposed combination of the teachings of the references present a weak case of obviousness, whereas the objective indicia of nonobviousness weigh heavily in favor of nonobviousness" (Appx63).

Further, even if its overbroad claim construction were correct, the Board erred in its application of industry praise law to the facts of record by overlooking *en banc* legal standards from this Court that require consideration of industry praise as evidencing nonobviousness, whenever it is directed to the claimed invention or a product that embodies the claimed invention. In this case, the evidence meets both prongs.

ARGUMENT

I. STANDARD OF REVIEW

In an appeal from the Board, this Court employs a substantial evidence standard of review for questions of fact. *Dickinson v. Zurko*, 527 U.S. 150, 162 (1999). When considering whether or not a Board finding meets the substantial evidence standard, the Court considers whether a reasonable fact finder could have arrived at the decision. *Id*. The Court reverses when a Board factual finding about the disclosures of the prior art is not based on substantial evidence. *See Institut Pasteur v. Focarino*, 738 F.3d 1337, 1345 (Fed. Cir. 2013) (reversing *inter partes* reexamination rejection upheld by the Board because the Board lacked substantial evidence to conclude that the prior art disclosed a particular claim limitation).

During its review, the Board applied the "broadest reasonable interpretation" ("BRI") framework to its claim constructions, in accordance with 37 C.F.R. § 42.100(b)(2017) because Lectrosonics filed its Petition on April 25, 2018, prior to the rule change that replaces the BRI standard.

In general, because the ultimate question of proper claim construction of a patent is a question of law, this court reviews claim construction *de novo*. *Teva Pharms. USA Inc. v. Sandoz Inc.*, 135 S. Ct. 831, 837, 841 (2015). Where, as here, nothing in the case implicates the deference to fact findings contemplated by the decision in *Teva*, this Court reviews the Board's claim construction *de novo*. *In re*

Imes, 778 F.3d 1250, 1252 (Fed. Cir. 2015). Under the BRI framework, this Court reverses when the Board's construction is unreasonable, for example by contradicting the specification or prosecution history. *D'Agostino v. MasterCard Int'l, Inc.*, 844 F.3d 945, 948 (Fed. Cir. 2016); *Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015) (in reversing the Board's "unreasonably broad" construction in an IPR, restating principle that a claim construction "cannot be divorced" from the specification and prosecution history record).

II. THE BOARD ISSUED INCORRECT UNPATENTABILITY RULINGS AND ERRED IN ITS APPLICATION OF INDUSTRY PRAISE LAW

A. The Board erred in its claim construction

The Board's claim construction conclusions that sided with Lectrosonics are wrong. First, the claims solely encompass a Dropout Embodiment and do not encompass a Multitrack Embodiment, thus excluding Strub's purported Multitrack Embodiment. Second, the plain language of the claims and the proper construction of antecedent basis require that the local audio data and the remotely recorded audio data derive from the same source. Without question, Strub's respective audio tracks derive from different sources. Since Strub is the primary reference in support of the Board's decision of unpatentability, and since the Board found patentable the substitute claims that had the same scope advocated here, this Court should reverse.

1. The Board erred in construing "local audio data … is combined with said remotely recorded audio data" to encompass the Multitrack Embodiment of the '307 Patent

The Board erred in the construction of "said local audio data … is combined with said remotely recorded audio data." The Board wrongly held that this limitation "encompasses the multi-track embodiment of the '307 Patent" (Appx9-10). This error was material and prejudicial. This overly broad construction may read on prior art in which the "combined" data is used for the creation of a multitrack file regardless of whether there is combination of data to repair or replace audio in an already existing multitrack file.

Specifically, the Board stated "[a]lthough we agree with the Patent Owner that the '307 patent specification describes an embodiment of a dropout, *i.e.*, a loss of audio data during a wireless transmission, is remedied through the replacement of data [the 'Dropout Embodiment'], we are not persuaded that the 'combined' limitation is limited to that embodiment, but rather also encompasses the multi-track embodiment of the '307 Patent [the 'Multitrack Embodiment']" (Appx9-10). The Board went on to

> determine that the limitation "said local audio data is retrieved during or subsequent to said audio event and is combined with said remotely recorded audio data" does not require that the local and remote audio data originate from the same source because the '307 patent specification contemplates a broader definition—one that includes the

> combination of local audio data and remotely recorded audio data to create a multi-track audio file. *See* Ex. 1001, 4:12–14, 5:6–7, 16:40–44, 19:2–4; Ex. 2086 ¶ 18.

(Appx10).

Whereas the Board is correct that the '307 Patent teaches a Dropout Embodiment and a Multitrack Embodiment, nothing in the intrinsic evidence (or otherwise) signaled the inventor's intention that these claims cover both. The Board erred in construing that a combination of "local audio data" and "remotely recorded audio data," as required by the claims, can be a Multitrack Embodiment. It cannot, as the specification only teaches two possibilities for creation of a multitrack file: 1) a user combines the "local audio data" of a plurality of local audio devices to create a single, local multi-track file, wherein the local audio data is never transmitted ("Local/Local Multitrack Embodiment"); and 2) the receiver/recorder combines audio received wirelessly from multiple local audio devices to create a single, remote multitrack file, wherein this remote multitrack file may later be repaired via the Dropout Embodiment ("Remote Multitrack Creation").

That is, in a Local/Local Multitrack Embodiment, "local audio data" of a first local audio device is combined with the "local audio data" of one or more other local audio devices. Clearly such an embodiment is not envisioned by claims which each require "said locally generated audio also being wirelessly transmitted to, and remotely recorded by, a remote recorder as remote audio data" and "wherein said

local audio data may be retrieved after said locally recording and combined with said remotely recorded audio data" (Appx93, '307 Patent, col. 23, ll. 22-25, 40-42, col. 24, ll. 15-19, 30-32). "Transmission" never happens in this Local/Local type of "combination."

Regarding the Remote Multitrack Creation, this is not a separate embodiment but rather a necessary step or inevitable precursor to the Dropout Embodiment, and, in either case, it does not (without more) include the combination of "local audio data" and "remotely recorded audio data" as required by the claims. The intrinsic evidence, *i.e.*, the specification, makes this clear, as one cannot repair something unless and until it is created. In other words, the intrinsic teachings of the Remote Multitrack Creation were never meant to stand alone but rather, are a backdrop to facilitate discussion of the Dropout Embodiment as they discuss accurate timestamping such that the file may be later repaired using local audio data in accordance with the Dropout Embodiment. This is why the preambles of claims 1 and 12 refer to remote recording of remotely recorded audio data, rather than the final combining limitation (Appx93, col. 23, ll. 22-25, 40-42, col. 24, ll. 15-18, 30-32).

In both scenarios, the claim language "said local audio data combined with remotely recorded audio data" forces the claims to be limited to the Dropout Embodiment because the '307 Patent specification never teaches, in a vacuum, the

combination of local audio data and remote recorded audio data to create a multitrack file. The Local/Local Multitrack Embodiment combines local audio data with local audio data, without the transmission of any data; and similarly, Remote Multitrack Creation brings together several tracks of audio received wirelessly at the remote recorder/receiver. As such, all specification references to the combination of local audio data being used with remotely recorded audio data are in fact references to the repair of a remote multitrack file, *i.e.*, a Dropout Embodiment.

In reaching its erroneous construction, the Board opined that it was relying on "Mr. DeFilippis's testimony that the 'combined' limitation allows 'multiple individually recorded audio tracks to be combined into one or more multi-track audio files' (Ex. 2086 ¶ 18)" (Appx9). The Board erred on three fronts in this reliance. First, Mr. DeFilippis never testified to words the Board attributed to him (what the "combined" limitation supposedly "allows"). Rather, it appears that the Board ripped from context and reworded a relatively tiny portion of a language quotation by Mr. DeFilippis identifying specification support for the combined limitation in his claim chart (as set forth in his Supplemental Declaration) and made this conclusion on its own.

Second, the Board focused on a very small subset of what was actually quoted from a specification in the '307 Patent family by Mr. DeFilippis. The language quoted by the Board is underlined, to demonstrate how much the Board overlooked

within Mr. DeFilippis's full re-quotation of large sections of a prior patent specification in that cell of his claim chart (N.B. all words double-indented below are verbatim inner quotations of a prior Sanders/Stark patent specification):

> "This accuracy allows multiple individually recorded audio tracks to be combined into one or more multi-track audio files electronically postrecording. Furthermore, this accuracy allows recording system 100 to automatically correct for any audio data lost during an original recording due to wireless transmission problems such as dropout, interference, etc. This automatic correction may be performed either electronically or via synchronized playback of the individually recorded audio tracks." 12:12-17. "Whenever playback of locally recorded audio is required (e.g., to remedy recording errors caused by transmission losses), RCU 104 transmits a digital command to all local audio devices 102 to playback the audio data stored in the respective memories 332 starting with and subsequent to a specific time reference as indicated by a specific timecode. The digital command is received by local receivers 302, which transmit or relay the command to their respective local control unit 310. Thereafter, local control units 310 access the data stored in the respective memory 332 and cause this data to be played or transmitted sequentially via local transmitter 308 starting with the data associated with the requested timecode." 26:3-11. "Post-recording, memories 332 may be removed from each local audio device 102, such that locally recorded data may be retrieved and used to repair the corruption of the audio file generated by the receiver/recorders that occurred due to the receipt of corrupted audio data." 28:18-21. "The audio received from each of the local audio devices (e.g., the local audio device of each performer) may be combined to create one or more multi-track audio files that are stored with master timestamps generated by the receiver/recorder's internal master timecode generator." 35:14-17

(Appx2993-2994).

Third, the Board misunderstood the idea Mr. DeFilippis sought to convey by making such bulk quotations. When Mr. DeFilippis quoted the language cited by the

Board in his claim chart, he quoted it in full as it appears in a predecessor application within the same family as the '307 Patent specification: "[t]his accuracy allows multiple individually recorded audio tracks to be combined into one or more multi-track audio files electronically post-recording." Upon a close reading of the language preceding the cited sentence as it appears in the '307 Patent specification itself, as cited above and as also analyzed in greater detail above in Section IV.A.1, the accuracy referred to in this sentence is the *timestamping* "accuracy of all of the components of the recording system 100," wherein those components include local audio devices 102, RCU 104, receiver 106, and recorder 108. Put into the context of the specification, it is clear that this language means that the *timestamping* accuracy of all of the components of recording system 100 allows the multiple individually recorded audio tracks to be "*combined into,*" or inserted into, one or more multi-track audio files already created by a remote receiver or recorder post-recording. Contrary to the Board's misbelief, Mr. DeFilippis categorically did *not* give "testimony that the 'combined' limitation allows multiple individually recorded audio tracks to be combined *to create* one or more multi-track audio files." The true grammatical subject for the verb "allows" is "[timestamping] accuracy," not "the 'combined' limitation."

And, the language cited by the Board does not mean that multiple individually recorded audio tracks are combined *to create* one or more multi-track audio files,

i.e., the Multitrack Embodiment (nor did the DeFilippis testimony suggest such a thing). When such an interpretation is intended by the ’307 Patent specification, it is clearly stated. For example, “The audio received from each of the local audio devices (*e.g.*, the local audio device of each performer) may be combined *to create* one or more multitrack audio files that are stored with master timestamps generated by the receiver/recorder's internal master timecode generator” (Appx89, ’307 Patent, col.16, ll. 39-44). In this sentence, “to create” clearly indicates that multiple local audio files received wirelessly at the receiver/recorder are in fact combined together *to create* a single remote multi-track audio file (*i.e.*, Remote Multitrack Creation, again, one cannot repair a remote multi-track audio file using the Dropout Embodiment without first creating the remote multi-track audio file). This is in sharp contrast to the use of the term “combine into” which means to combine the local audio data into already-extant remotely recorded audio data in order to repair or replace any data lost during wireless dropout (*i.e.*, a Dropout Embodiment).

In addition to citing to Mr. DeFilippis’ claim chart to support its construction, the Board cited four sections of the ’307 Patent, myopically scrutinizing the mere word “combining” without appreciating exactly what gets combined. The Board stated: “In other words, we construe the ‘combining’ limitation to encompass the disclosed multitrack embodiment in the ’307 patent specification, where separate audio tracks are combined to form a multitrack audio file. *See* Ex. 1001, 4:12–14,

5:6–7, 16:40–44, 19:2–4" (Appx10). The Board erred in its interpretation of each cited specification line range.

With regard to the first of these (Ex. 1001, 4:12-14), this section has been addressed above as it is the same language cited by Mr. DeFilippis in his claim chart. Its use of terminology "combined into" means that it, in fact, discloses the Dropout Embodiment—clearly linking a form of the word "combine" with the Dropout Embodiment.

The Board's second citation to Ex. 1001, 5:6-7 also invokes a Dropout Embodiment, thus cannot signal the inventor's intent to cover a Multitrack Embodiment. The passage cited by the Board at col. 5, ll. 6-7, underlined below, comes at the tail end of a paragraph starting at col. 4, l.51 that discloses how

> [t]he ability to synchronize the local timestamps at the local audio device 102 and recorder 108 … allows any audio not recorded by recorder 108 during an event due to transmission errors to be recovered by replaying the missed audio and recording the replayed audio in the correct time sequence with respect to the other audio samples … Since the local audio device and recorder timestamps are synchronized, the replayed audio may be inserted in the proper time sequence with respect to the other recorded audio samples based upon the synchronized timestamp data … Such synchronization must maintain a high accuracy for each performer's timestamps with respect to all other performers' timestamps to prevent the occurrence of phasing artifacts when the multiple audio recordings are combined to create one single recording

(Appx93, '307 Patent, col. 4, ll.51- col.5,l.8). When read in context, the entire paragraph describes a Dropout Embodiment, and the "multiple audio recordings being combined to create a single recording" refers to the combination of replayed

local audio data with the previously recorded remote audio data (*i.e.*, the remote multi-track file) to create a new single recording in which the dropouts have been repaired, *i.e.*, the Dropout Embodiment.

The Board's third citation to Ex. 1001, col. 16, ll. 40–44, invokes mere Remote Multitrack *Creation* and not a combination of "local audio data" with "remotely recorded audio data." Specifically, col. 16, ll. 35-44 states that "[e]ach local audio device also simultaneously transmits its received audio *to recorders or receiver/recorder* such as receivers 106 and recorders 108 in real time … The audio received from each of the local audio devices (e.g., the local audio device of each performer) may be combined to create one or more multitrack audio files" (Appx89, '307 Patent, col. 16, ll. 35-44, Emphasis Added). That is, the receiver/recorder receives audio wirelessly from the local audio devices and combines them together to create a remote multi-track audio file. This citation does not describe a combination of "local audio data" with "remotely recorded audio data," nor a Multitrack Embodiment separate from the Dropout Embodiment. Rather, in the context of the language of claims 1 and 12, this paragraph describes that the audio received (at the remote recorder) from each of the local audio devices is "remotely recorded by, a remote recorder as remotely recorded audio data," and does not pertain to "local audio data combined with said remotely recorded audio data." In other words, separate and possibly numerous instances of audio (originating from

separate local devices) get multitracked at the remote receiver/recorder to initially create the remote multitrack file that is (later in the claim) repaired using the systems and methods of the present invention in accordance with the "combined" limitation at the ends of claims 1 and 12. Consequently, this specification excerpt is relevant to the preambles of both claims 1 and 12, and is not germane to proper claim construction of "local audio data combined with remotely recorded audio data" as it occurs in the final wherein limitation of each of these claims.

Finally, with regard to the Board's fourth citation, col. 19, ll. 2-4, the text of these citations describes a Local/Local Multitrack Embodiment that combines "local audio data" with "local audio data," wherein there is no transmission of any audio data (a requirement elsewhere in claims 1 and 12), and in no way combines "local audio data" with "remotely recorded audio data" as required by the claims. Column 18, line 65 to column 19, line 4 states "the memory of each local audio device … may be removed after completion of a performance, videotaping, etc. Each memory may then be inserted into a corresponding one of memory ports 802. Thereafter, all of the *individual audio files* may be combined to provide one or more comprehensive audio files" (Appx90-91, '307 Patent, col. 18, l.65 – col. 19, l.4, Emphasis Added). This activity, again, is irrelevant to the claims. It is not a covered embodiment as, at a minimum, it excludes any form of transmission or remotely recorded audio, and

thus should not have tempted the Board to shoehorn its features into the claim construction.

As such, the Board erred in finding that the claims cover *both* a Dropout Embodiment and a Multitrack Embodiment because the specification leaves no breadcrumbs in any way suggesting a Multitrack Embodiment in which "local audio data is combined with remotely recorded audio data" that is separate from the Dropout Embodiment. Every citation quoted by the Board in its zeal for shoehorning a Multitrack Embodiment into the claim scope in fact teaches a Local/Local Multitrack Embodiment (local audio data combined with local audio data, and none of the audio data was ever transmitted wirelessly), Remote Multitrack Creation (which is a subset of and integral to the Dropout Embodiment as described above), or a Dropout Embodiment (the only embodiment that fits comfortably into the plain language of the claims). The Board simply tried too hard to get as much of the specification as it could into the claim scope, and this led to error. As such, the Court should reverse and find that the "combining" claim term covers only a Dropout Embodiment.

2. The Board erred in determining that "claims 1 and 12 do not require the claimed 'local audio data' and 'remotely recorded audio data' to be derived from the same source"

The Board also erred in the construction of "said local audio data … is combined with said remotely recorded audio data" in wrongly holding that this

limitation "does not require that the local and remote audio data originate from the same source . . . ." (Appx10). This error was material and prejudicial. This overly-broad construction may read on prior art where the "combined" data comes from different audio sources (*e.g.*, a single recording that combines two microphone tracks of distinct instances of sound).

The correct construction is narrower. Under the correct construction, a technology is within the claim scope when that which is combined comes from the same audio source, *i.e.*, the same "creator of said locally generated audio." A technology is outside the claim scope when that which is combined comes from different sources. This correct construction demands a single audio source (*e.g.*, one person's audio that is recorded in two ways—both locally at and remotely from that person—resulting in local data being available to fix problems with flawed remotely recorded data). As will be discussed, the Strub reference never discloses the type of "combining" specified by the claims, but the Board mistakenly held the contrary.

The structure and grammar of the claim itself mandates Zaxcom's "same source" construction, while negating the Board's. The claim language itself provides the context in which a claim term is used. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (*en banc*); *see also In re Hyatt*, 708 F.2d 712, 714 (Fed. Cir. 1983) ("A claim must be read in accordance with the precepts of English

grammar."). Here, it takes little effort to trace back the two things that are "combined" at the end of claims 1 or 12.

Referring first to claim 1, at the end of claim 1, it is specified that "said local audio data" is "combined with" "said remotely recorded audio data" (Appx93, '307 Patent, col. 23, ll. 40-42, Emphasis Added). That is, the two "combined" things are "said local audio data" and "said remotely recorded audio data." Crucially, these two types of data each trace lineage solely back to one instance of audio, *i.e.*, locally generated audio, the locally generated audio created by "a creator of locally generated audio" (Appx93, '307 Patent, col. 23, ll. 22-39).

With respect to "said remotely recorded audio data," its antecedent basis is found at col. 23, ll. 21-25, which states "[a]n apparatus or system for locally recording locally generated audio, said locally generated audio also being wirelessly transmitted to, and remotely recorded by, a remote recorder as remotely recorded audio data." That is, the "remotely recorded audio data" derives from "locally generated audio" that is received wirelessly at, and recorded at, a remote recorder. "Locally generated audio" is, in practice, the analog audio spoken by "a creator of said locally generated audio," as explained in further detail in the next paragraph.

With respect to "said local audio data," this claim 1 wording within the claim-ending "combining" phrase has antecedent basis at col. 23, l.38 ("at least one control unit electronically coupled to … said audio input device, and said memory… for

creating local audio data.") (Appx93, '307 Patent, col. 23, l.38). That is, the "local audio data" is in a digital audio file created by a piece of electronics, *i.e.*, the "at least one control unit." This is in contrast to "locally generated audio" which is generated by a human (*i.e.*, a creator of said locally generated audio) in analog form—a sound wave.

Put yet another way, "locally generated audio" begins its life as audio spoken by "a creator of said locally generated audio." "A creator of locally generated audio" is first referred to in claim 1 at col. 23, ll. 26-27, which states "at least one local audio device wearable by a creator of said locally generated audio" (Appx93, '307 Patent, col. 23, ll. 26-27). As such, the "locally generated audio" is created by "a creator" who is wearing the "at least one local audio device" or bodypack, such as local audio device 102 (Appx69, '307 Patent, Fig. 1), and the claims with specificity and particularity call out the origin of the "locally generated audio" in the singular (*i.e.*, "***a***" creator of said locally generated audio).

Once the "locally generated audio" is spoken by "a creator of said locally generated audio," it is received by an audio input device (*e.g.*, a microphone) that is also "wearable by a creator of locally generated audio" (Appx93, '307 Patent, col. 23, ll. 31-34). Next, the at least one control unit receives the locally generated audio via its electronic coupling to "said audio input device." (Appx93, '307 Patent, col. 23, ll. 36-37). The at least one control unit is responsible for "creating local audio

data and storing said local audio data in said memory" (Appx93, '307 Patent, col. 23, ll. 38-39).

In two different instances, claim 1 refers to "a creator of said locally generated audio." "A creator" makes the audio, not "at least one creator," nor a "plurality of creators." As such, the claim clearly intends that the locally generated audio is generated by a single creator, and this same audio is recorded both remotely and locally, wherein the local recording is performed through interoperation of two different devices "wearable by a creator of said locally generated audio," namely, the "at least one local audio device" and the "audio input device."

The language of the claims concretely requires that the locally generated audio generated by "a creator of said locally generated audio" be the same audio that is recorded both locally and remotely as local audio data and remotely recorded audio data, respectively. There is no other reasonable interpretation of this intrinsic evidence, and the Board misconstrued the claims based on its erroneous interpretation of extrinsic evidence, *i.e.*, misreliance on a miniscule subsection of a claim chart entry prepared by Zaxcom's expert, read out of context as discussed in greater detail above. The Board erred in both misconstruing the extrinsic evidence and exalting it above the intrinsic evidence.

The Board further erred in reaching a claim construction that is illogical, *i.e.*, the audio received at the audio input device (*e.g.*, microphone) of one performer or

creator of said locally generated audio may be used to repair the audio remotely recorded by a second performer or creator of said locally generated audio. In doing so, the Board appears to assume that all recorded locally generated audio is the same. If this were true, there would be no need for each performer or "creator of said locally generated audio" to be equipped with its own local audio device and its own audio input device. Such a conclusion does not make sense, either logically or technologically.

Similarly, with respect to claim 12, the same rationale applies. At the end of claim 12, the two "combined" things are specified as "said local audio data" on the one hand, and "said remotely recorded audio data" on the other hand. Crucially, these two types of data each trace lineage solely back to one instance of audio, *i.e.*, locally generated audio (Appx93, '307 Patent, col. 24, ll. 15-32).

On the one hand, the claim 12 wording "said local audio data" within the claim-ending "combining" phrase has antecedent basis at col. 24, l.24 ("locally recording said local audio as local audio data"). In turn, the phrase "said local audio" that transforms into "local audio data," has a different antecedent basis higher in the claim. That is found at col. 24, l.19 ("locally receiving said local audio generated by" one or more performers). And this "said local audio" at line 19 has antecedent basis at the highest point in the claim, the preamble. That is where the phrase "locally generated audio" first appears, at col. 24, l.15. Crucially, "locally generated audio"

is the very thing that the preamble states will eventually be "wirelessly transmitted to, and remotely recorded by, a remote recorder."

The point is this: The "local" data that gets combined in the claim-ending "combining" phrase originated with a specific instance of "audio" mentioned in the preamble. Sound waves got captured by a microphone and processed thereafter into data, eventually to become what the claim labels "said local audio data."

The "remote" data has the same verbal origin at the preamble as "local" data does. Similar verbal ligatures and connections marry the "remotely recorded audio data" of the "combining" phrase with the exact same instance of audio named in the preamble. For example, the wording "said remotely recorded audio data" in the "combining" limitation at col. 24, lines 31-32 has antecedent basis at col. 24, l.29 ("as remotely recorded audio data"). In turn, this instance of data comes from "said transmitted local audio" received on the remote side of the system, and specified at col. 24, l.27. And here is the lynchpin. That particular line 27 instance of audio has antecedent basis at col. 24, l.21, which mentions "transmitting said local audio." Because of the use of the word "said" at this precise point in the claim, this "said local audio" is the exact same instance of local audio mentioned at col. 24 l.19 (discussed already above), which, again, finds support all the way up at the preamble in the wording "locally generated audio." In other words, on the remote side within claim 12, the remote audio data that gets combined in the "combining" phrase traces

back to the exact same instance of audio as does the local audio data in the "combining" phrase.

It is not only the claim language itself that proves the Board too broad in its belief about claim scope. The Board's analysis on its own terms was facially flawed as well. Namely, the Board strained unnecessarily to construe the claims in a way that might cover multiple distinct Zaxcom embodiments, when only one of those embodiments actually fits. Thus the Board incorrectly bootstrapped its belief that the claims covered irrelevant embodiments into a rejection of Zaxcom's "same audio" claim construction, for supposedly excluding a claimed embodiment. This backwards analysis made neither legal nor logical sense. "[When] the patent describes multiple embodiments, every claim does not need to cover every embodiment. This is particularly true [when] the plain language of a limitation of the claim does not appear to cover that embodiment." *Pacing Techs., LLC v. Garmin Int'l, Inc.*, 778 F.3d 1021, 1026 (Fed. Cir. 2015). The Board should have started with the claim language, then interpreted it in light of the specification. It was error to interpret the specification, then force a belief about specification scope onto the claim language.

B. Strub alone or in combination with any other art does not anticipate or render obvious properly construed claims limited to the dropout embodiment

Strub alone or in combination with any other art does not anticipate or render obvious properly construed claims that are limited to the Dropout Embodiment. This is true because neither Strub alone nor Strub in combination with Nagai or Gleissner discloses "local audio data combined with remotely recorded audio data" as required by all claims 1-14. In fact, Strub (a never-commercialized technology) has nothing to do with the type of revolutionary improvement to the field brought about by Messrs. Sanders and Stark. Strub (Appx1110-1168) merely discloses a system where groups of backpackers or hikers can each broadcast what they see and hear to one another, with an option for an individual to substitute another's broadcast for her own local recording. This has nothing to do with dropout replacements (or even the recognition of the problem that dropout replacement solves), or the industry revolutionized by the claimed invention.

In its Petition, when addressing its element "1.6", *i.e.*, "wherein said local audio data may be retrieved after said locally recording and combined with said remotely recorded audio data," Petitioner states as follows:

> [t]he '307 patent uses timestamps to combine the local audio data with two types of remotely recorded data: (1) a remote recording captured by other devices (*id.*, 4:1-14 ('allows multiple individually recorded tracks to be combined')); and (2) a remote recording of the local audio data being repaired (*id.*, 4:15-25 ('mixed post-recording to automatically correct for any audio data lost')). Strub discloses the first

> embodiment, using timestamps for post-event synchronization of audio recordings. EX1003, 13:48-58, 63:41-49, 79:54-80:9, 84:5-25. Wood discloses the second embodiment, combining local audio data with previously received audio to repair a dropout. EX1008, 1:31-2:13.

(Appx126).

For at least the reasons discussed in greater detail above, embodiment (1) of the aforementioned quote is directed to a Multitrack Embodiment and embodiment (2) is directed to a Dropout Embodiment. Petitioner, in the above-referenced citation, admits that Strub only discloses a type of Multitrack Embodiment and does not disclose any kind of Dropout Embodiment. As such, Petitioner advanced no argument that Strub anticipates or renders obvious (when combined with Gleissner or Nagai) claims 1-14 when such claims are properly construed to be limited to the Dropout Embodiment. Nor did the Board hold that there can be anticipation or obviousness when the claims are so limited.

Crucially, the Board already analyzed what conclusion follows when claims are limited to the Dropout Embodiment: no obviousness. In reference to the substitute claims, the Board found that a combination of Wood and Strub, or Wood and Strub in combination with Nagai or Gleissner, does not render Dropout Embodiment claims obvious. In its analysis, the Board opined as follows:

> Petitioner asserts that Strub recognized the problem of deficient recordings, and a person of ordinary skill in the art would have known that one such deficiency would have been dropouts. Pet. 27 (citing Ex. 1003, 48:18–30, 85:28–41 (‘during an event, the recording obtained by a particular recording unit will be deficient in some way’); Ex. 1011 ¶

> 60). In order to solve the problem of dropouts, Petitioner asserts a person of ordinary skill in the art would have combined Wood with Strub in order to improve signal quality and produce a program free of dropouts. Id. at 29 (citing Ex. 1003, 35:54– 57, 37:53–38:4; Ex. 1008, 1:28–30, 3:4–6; Ex. 1011 ¶ 63).

(Appx48-49). The Board continued:

> Nevertheless, in view of the differences between the asserted prior art references and the subject matter of the proposed substitute claims, Petitioner presents a weak case of obviousness. For instance, although Strub recognizes that recordings may be deficient, Strub does not specifically contemplate deficiencies resulting from dropouts in transmission of local audio to a remote recorder or receiver. See Ex. 1003, 48:18–30, 85:28–41. Moreover, even if a person of ordinary skill in the art would have understood that dropouts could be one cause of deficient recordings in Strub, as Petitioner's expert opines, and Wood teaches a method for repairing dropouts, Wood focuses on repairing dropouts in a received TV broadcast signal rather than during post-processing of a recording, as in the '307 patent. Furthermore, the evidence that a person with ordinary skill in the art would have looked to combine a small, wearable device for recording the audio of an event, as taught in Strub, with a method for repairing a TV broadcast signal, as taught in Wood, does not support a strong showing of obviousness.

(Appx50-51).

In this regard, the Board was correct. Petitioner failed to show a strong case of obviousness, or any at all for that matter. Furthermore, the Board held that "the factors of long-felt need and industry praise weigh heavily towards nonobviousness" in analyzing the substitute claims, which, again were directed to a Dropout Embodiment (Appx62). In reaching this determination, with regard to long-felt need, the Board stated:

> [c]onsidering the totality of the evidence, we determine that Patent Owner has demonstrated that a long-felt need existed for a 'wireless, wearable, transmitting and recording device that could reliably capture sound data from actors recording a movie or television show.' As discussed above, we credit the testimony of Mr. Sarokin and Mr. Wexler, who both identify repairing dropouts as a long-felt need. PO Resp. 52–56 (citing Ex. 2103 ¶ 6; Ex. 2104 ¶ 6) … We also credit the testimony of Mr. Wexler in explaining how the 'replacing' limitation solved the long-felt need of repairing dropouts. PO Resp. 52–56 (citing Ex. 2104 ¶ 6).

(Appx57-58).

With respect to industry praise, the Board stated as follows: "[a]lso probative is Patent Owner's evidence of the received awards. Patent Owner asserts the EMMY award specifically praises … digital recording of microphone signals in the wireless transmitter 'to provide backup recording of the original microphone signal.' PO Resp. 59 (quoting Ex. 2106)" (Appx60). Further, "the testimonial evidence by Mr. Sarokin and Mr. Wexler praising Patent Owner's dropout correction features … weighs in favor of nonobviousness. Furthermore, the awards evidence that praises Patent Owner's digital recording devices that 'married wireless transmission with a recording device located within the actor's body pack' also strongly weighs in favor of nonobviousness" (Appx60).

Appellant agrees with the Board, for at least the reasons stated by the Board, that Petitioner failed to show a strong case of obviousness and that there is strong evidence of long-felt need and industry praise. Factual conclusions supporting reversal already exist in the record, once this Court corrects the claim construction

as discussed above. The weakness of Petitioner's obviousness argument combined with the strength of the long-felt need and industry praise evidence leads to a conclusion that claims 1-14 are not anticipated by Strub, nor obvious over a combination of Wood and Strub, nor a combination of Wood and Strub with Nagai or Gleissner.

C. The Board erred in its application of industry praise law

If this Court agrees with Appellant's claim construction for either of the two reasons above, Appellant is entitled to reversal. This is clear because even the Board agrees that the scope Appellant sought for the original independent claims leads to patentability (since the substitute claims used amended wording to achieve that scope, and the Board approved the substitute claims, Appx34-66). But even if the Board's claim construction of the original claims were correct, this Court should still reverse because the Board erred in its treatment of objective indicia of nonobviousness, as they relate to industry praise for both the merits of the claimed invention and products that embody the claims.

The Board misapprehended the law in its treatment of industry praise objective evidence of nonobviousness.

Here, it went undisputed that products embodying the claimed invention (*i.e.*, Zaxcom's wireless audio recording system) received a technical Academy Award (an OSCAR) and an EMMY (Appx30-31.) Yet the Board quixotically failed to find

that the claimed invention received any industry praise, because the Board held that the "feature of repairing dropouts by replacing data" was not required by the claims (Appx24). Put another way, the Board gave no weight in its obviousness analysis to the fact that products embodying the claimed invention undisputedly received the equivalent of not just one "Nobel Prize" in its field, but two!

It is well settled that the proponent of obviousness must address four factors, including objective evidence of secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 86 S. Ct. 684, 694 (1966). "A determination of whether a patent claim is invalid as obvious under § 103 requires a consideration of all four Graham factors, and it is error to reach conclusion of obviousness until all those factors are considered." *Apple, Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1048 (Fed. Cir. 2016) (*en banc*). "[E]vidence of secondary considerations may often be the ***most probative*** and cogent evidence in the record. It may often establish that an invention appearing to have been obvious in light of the prior art was not." *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling USA, Inc.*, 699 F.3d 1340, 1349 (Fed. Cir. 2012) (emphasis added). Secondary considerations can be the most reliable evidence to avoid the trap of hindsight bias.

Any objective evidence of nonobviousness must have nexus to the claimed invention, but that nexus need only be "reasonably commensurate," and the case law

cautions against unduly "strict requirements" in evaluating nexus. *Rambus Inc. v. Rea*, 731 F.3d 1248, 1257 (Fed. Cir. 2013).

Industry praise nexus in particular exists in either of two ways. "Evidence that the industry praised [1] ***a claimed invention or*** [2] ***a product that embodies the patent claims*** weighs against an assertion that the same claimed invention would have been obvious." *Apple*, 839 F.3d at 1053 (*en banc*) (emphasis added).

With respect to [1], the Board gave no weight to industry praise because it found no nexus to the claimed invention, believing the industry praise only covered one of the two embodiments covered by the claims (*i.e.*, industry praise was for the Dropout Embodiment, but not the Multitrack Embodiment) (Appx24). This contradicts the very case law cited by the Board, *ClassCo, Inc., v. Apple, Inc.*, 838 F.3d 1214 (Fed. Cir. 2016), which states:

> [w]hile claims 2 and 14, which depend from claim 1, also encompass the praised embodiment, the Board found the evidence not commensurate in scope with these claims on the ground that they are too broad, encompassing other embodiments. But we do not require a patentee to produce objective evidence of nonobviousness for every potential embodiment of the claim. Rather, we have consistently held that a patent applicant need not sell every conceivable embodiment of the claims in order to rely upon evidence of objective indicia of nonobviousness. As such, the Board should have afforded ClassCo's evidence *some* weight.

ClassCo, Inc., v. Apple, Inc., 838 F.3d 1214, 1221 (Fed. Cir. 2016) (citations and internal quotations and alterations omitted). The same principle applies here. The Board should have afforded Appellant's industry praise evidence weight even if it

believed the claims covered more embodiments than that which received industry praise.

The Board arrived at its erroneous conclusion because it did not understand what it means for evidence of industry praise to be "reasonably" commensurate with the scope of the claims. The Board adopted a categorical rule that there is "no nexus" if the claims cover both a praised and a non-praised embodiment. In its words, there is "no nexus" if what the industry praised is "not required" by the claim, on account of it being only one of multiple covered embodiments. (Appx23-24). But *ClassCo* (cited by the Board) and decisions leading up to *ClassCo* long ago debunked the Board's mistaken categorical rule. *ClassCo*, 838 F.3d at 1221 (rejecting Board's analysis that industry praise evidence was "not commensurate in scope with [the] claims on the ground that they are too broad.").

For authority supporting its categorical rule, the Board cited *In re Kau*, 639 F.3d 1058, 1068-69 (Fed. Cir. 2011) (Appx23-24). Yet *Kau* did not address industry praise, but rather "unexpected results" and "commercial success." As such, *Kau* did not address the nexus requirement between industry praise and a claimed invention. Even with respect to unexpected results and commercial success, *Kau* supports Appellant, not the Board. This is because *Kau* vacated a Board decision that (like here) incorrectly discounted objective indicia on grounds that the proffered evidence did not reach every conceivable claimed embodiment. *See id.* at 1069 ("applicant

'need not sell every conceivable embodiment of the claims in order to rely upon evidence of commercial success, so long as what was sold was within the scope of the claims.'") (citation omitted).

Once the Board concluded that the Dropout Embodiment was inside the claim scope (which it did, Appx9-10), that the Dropout Embodiment was novel (which it did, Appx50-51), and that the industry praised this embodiment with its outstanding recognition of an EMMY and an OSCAR (which it did, Appx24-25), that compelled the Board to find that such praise addressed the merits of the claimed invention (*i.e.*, there was nexus). *Id.* at 1068-70. It was legal error to find "no nexus" simply because the Board thought the claims were "too broad" (*i.e.*, the praised features of a covered embodiment were "not required," Appx24). *ClassCo*, 838 F.3d at 1221.

Further, regarding the second prong of *Apple*, 839 F.3d at 1053, under controlling law announced by this Court *en banc*, for such evidence to receive weight, it is not necessary for industry praise to be directed solely to a claimed invention. It is sufficient for the praise to be directed to "a product that embodies the patent claims." *Id.* The Board's "no nexus" conclusion contradicts this second prong as well. This is because it was not disputed that the EMMY and OSCAR were for sold embodiments of the claimed invention.

No statement of law by the Board reflected the Board's awareness that industry praise of "a product that embodies the patent claims" deserves weight in the

analysis (Appx23-25). Thus the Board misapplied the legal standards, including the case cited by the Board itself: *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317 (Fed. Cir. 2016). Indeed under *WBIP*, Patent Owner's "showing – that the specific ***products*** are embodiments of the claimed invention and that the proffered objective evidence relates to these ***products*** – ***is sufficient to establish the presumption of nexus*** . . . ." *Id*. at 1330 (emphasis added). Only ***after*** attachment of such a presumption did *WBIP* find it appropriate to analyze connection to "the merits of the claimed invention" to test whether the presumption was ***rebutted***. *Id.* at 1331.

No rebuttal here was possible, nor did the Board investigate the question of "rebuttal" (as it misconstrued the entirety of the "nexus" burden resting on Appellant's shoulders). Appellant presented substantial and undisputed evidence that its second generation wireless transmitter (*i.e.*, the first digital wireless transmitter with internal recording having model nos. TRX900, TRX901, TRX910, and TRX990 and also referred to in the record as "transmitters"), and all later generations of this product, embody the patent claims (Appx2068, Appx2094, Appx2340-2341, Appx2613, Appx2900-2901, Appx2903, Appx2976-2981, Appx4275-4278, ¶¶5-7, Appx4283-4284, ¶¶5-7). "I purchased two of the first generation units but Mr. Sanders was already speaking of the next generation units that would be fully remote controllable and have *internal recording capability* with

SMPTE time code as a sync reference to tie it together with all the other radio microphones and the main mixer/recorder" (Appx4275, ¶5, Emphasis Added).

The Board also ignored admissible percipient testimony from an occurrence witness, which left no doubt that the industry praise was for products embodying the claimed invention and thus deserved full credit in the obviousness inquiry (Appx3052, ¶78). Mr. DeFilippis in particular was a member of the relevant EMMY Awards Committee, thus a percipient witness to its deliberations (Appx4296, 4304, 4316). He confirmed that the inventors "received the Technical Achievement Award from the Academy of Motion Picture Arts and Sciences for the digital recording wireless ***products that embody the claimed invention of the '307 patent***" and that Mr. Sanders "received the EMMY Award from the Academy of Television Arts and Sciences for the Zaxcom, Inc. digital recording wireless ***products that embody the claimed invention of the '307 patent***" (Appx3051, ¶ 76, Emphasis Added, internal citations omitted). He testified that there was a "strong nexus" between the "issued [] claims" and such objective indicia, noting with citation to the record that the "recognition include[d] the features that are recited in the issued [] claims" (Appx3052, ¶ 78). Notably, in this aspect with respect to the EMMY, Mr. DeFilippis did not merely testify as an expert witness whose testimony might be brushed aside if found "conclusory." Rather, his testimony was percipient testimony of an occurrence witness, which no legal doctrine permitted the Board to ignore.

Additionally, Mr. Wexler praised "the merit" of "the products embodying the claimed invention" in his own words: "With Zaxcom's brilliant invention, I had the fool-proof solution that I could only have imagined: using ***the digital recording wireless transmitter*** I had the assurance and confidence that I could always deliver a track to post production even in those situations where there were failures of the RF transmission . . . which no other ***product*** provided" (Appx4284, ¶ 7, Emphasis Added).

Zaxcom's second generation and later products including internal recording are the very products that earned it the technical OSCAR and the EMMY, and these products embody all embodiments of the patent claims under the Board's erroneous construction (*i.e.*, both the Multitrack Embodiment and the Dropout Embodiment). Nothing more was required under this Court's *en banc* legal standards for industry praise, as recited in *Apple v. Samsung*.

A traditional nexus rebuttal requires proof that the objective indicia arose for reasons other than the merits of the claimed invention. *WBIP*, 829 F.3d at 1331. "Merit" means the advantages or results that the claim as a whole permits, not isolated limitations. *Id.* at 1325, 1331 (finding "merits of the claimed invention" to be "low-carbon monoxide emission marine gen-set," which was not itself a claim limitation). On the facts here, the record contained praise for the "merits of the

claimed invention," and the product as a whole, *i.e.*, rendering impossible any nexus rebuttal by Lectrosonics.

The Board erred determining that there was no nexus to the claims on a theory that the nexus applied to only the Dropout Embodiment, and not the Multitrack Embodiment. The record shows that the industry praise is for the merits of the claimed invention as well as Zaxcom's products, which embody the claimed invention (both the Multitrack Embodiment and the Dropout Embodiment in the Board's construction), and, as such, a presumption of nexus applies regardless of whether the correct claim construction is Zaxcom's or the Board's. Here, nexus is presumed and Lectrosonics failed to provide evidence to rebut it. As a matter of law, the objective indicia arose for the merits of the claimed invention.

Summing up, even if the Board's claim construction were correct that the original claims are broad enough to cover the Multitrack Embodiment in addition to the Dropout Embodiment, the EMMY and the OSCAR compel a conclusion of nonobviousness of those claims over combinations that include Strub. They are remarkable awards—the most important in the industry. If awards such as these cannot inoculate a claimed invention against hindsight conclusions of obviousness, then industry praise effectively gets written out of the law as potential objective indicia of nonobviousness. Since the Board had no authority to rewrite the patent law in this way, this Court should reverse.

CONCLUSION

Only a relatively small subset of inventions can lay claim to being a "game changer" in the marketplace and winning the accolades of *both* an EMMY and a technical OSCAR. This is particularly remarkable when achieved by the "little guy" as he encounters a multitude of Goliaths including Sony, Shure, Lectrosonics, and many other competitors with revenues in the tens to hundreds of millions per year.

For the reasons discussed above, the IPR under appeal should never have succeeded. Within the Decision under appeal, the Board unnecessarily strained to find a construction of the claims that would cover two embodiments, rather than the intended single embodiment, thereby invalidating the original claims despite such construction flying in the face of the plain language of the claims and other intrinsic evidence. This erroneous claim construction in combination with the incorrect application of industry praise law on this record should lead to reversal of the Board's decision.

For the reasons discussed above, this Court should reverse the decision of the Board. Zaxcom specifically requests reversal, whether or not this Court upholds the claim construction. In the alternative, if the claim construction is affirmed, the Court should at least remand for correct consideration of industry praise under *en banc* legal standards that mandate that industry praise weighs against obviousness when

it is directed to the claimed invention or a product that embodies the claimed invention.

Respectfully Submitted,

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ADDENDUM

TABLE OF CONTENTS TO ADDENDUM

Trials@uspto.gov
571-272-7822

Paper 41
Date: November 7, 2019

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LECTROSONICS, INC.,
Petitioner,

v.

ZAXCOM, INC.,
Patent Owner.

IPR2018-00972
Patent 9,336,307 B2

Before SCOTT R. BOALICK, *Chief Administrative Patent Judge*, KALYAN K. DESHPANDE, and LYNNE E. PETTIGREW, *Administrative Patent Judges.*

DESHPANDE, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
Granting Patent Owner's Motion to Amend
35 U.S.C. § 318(a)

I. INTRODUCTION

A. Background

Lectrosonics, Inc. ("Petitioner") filed a Petition requesting an *inter partes* review of claims 1–14 of U.S. Patent No. 9,336,307 B2 (Ex. 1001, "the '307 patent"). Paper 2 ("Pet."). Zaxcom, Inc. ("Patent Owner") filed a Preliminary Response. Paper 10 ("Prelim. Resp.").

On September 13, 2018, we issued a Decision ordering that "an *inter partes* review of claims 1–14 of the '307 patent is hereby instituted with respect to all grounds set forth in the Petition." Paper 11 ("Dec."). After institution, Patent Owner filed a Patent Owner's Response (Paper 16, "PO Resp.") and a Patent Owner's Contingent Motion to Amend (Paper 17, "PO MTA"). In reply, Petitioner filed a Petitioner's Reply to Patent Owner's Response (Paper 26, "Pet. Reply") and a Petitioner's Opposition to Motion to Amend (Paper 27, "Pet. Opp. to MTA"). In response, Patent Owner filed a Patent Owner's Sur-Reply (Paper 28, "PO Sur-Reply") and a Patent Owner's Reply in Support of Motion to Amend (Paper 29, "PO Reply to Opp. to MTA"). In reply, Petitioner filed a Petitioner's Sur-Reply in Opposition to Patent Owner's Motion to Amend (Paper 31, "Pet. Sur-Reply to Opp. to MTA"). Patent Owner and Petitioner presented oral arguments on August 5, 2019, and a transcript has been entered into the record. Paper 40 ("Tr.").

The Board has jurisdiction under 35 U.S.C. § 6. In this Final Written Decision, after reviewing all relevant evidence and assertions, we determine that Petitioner has met its burden of showing, by a preponderance of the evidence, that claims 1–14 of the '307 patent are unpatentable. We further determine that Petitioner has not met its burden of showing, by a

preponderance of the evidence, that proposed substitute claims 15–28 are unpatentable.

B. Related Proceedings

The parties indicate that the '307 patent is involved in *Zaxcom, Inc. v. Lectrosonics, Inc.*, Civil Action No. 1:17-cv-03408 (E.D.N.Y.), and *Zaxcom, Inc. v. Lectrosonics, Inc.*, Civil Action No. 2:17-cv-02840 (D.N.J.). Pet. 77; Paper 4, 2. The following proceedings before the Board also involve the same parties: IPR2018-01129 and IPR2018-01130.

C. The '307 Patent (Ex. 1001)

The '307 patent discloses a system and method "for recording and processing audio having one or more tracks received from one or more wireless devices operating in either an asynchronous or synchronous mode." Ex. 1001, 1:35–38. Figure 1 is reproduced below.

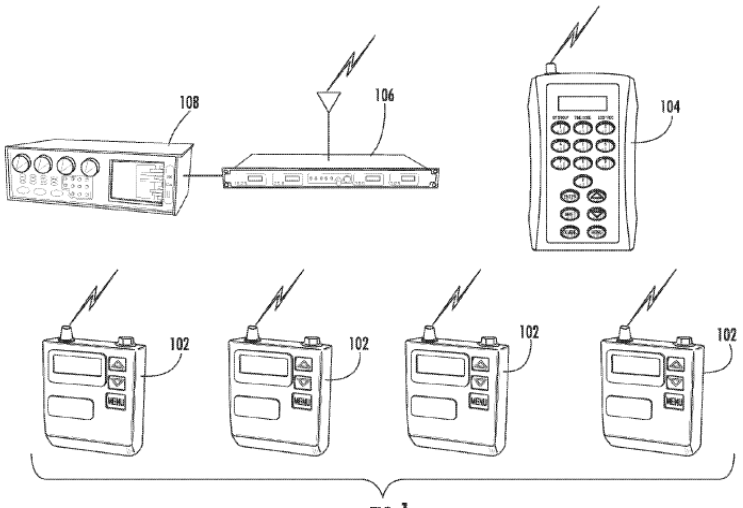

FIG. 1

Figure 1 depicts recording system 100, which "wirelessly records audio events, such as performances, movie takes, etc. having one or more performers." Ex. 1001, 4:1–3. Recording system 100 includes local audio

devices 102, remote control unit ("RCU") 104, receiver 106, and recorder 108. *Id.* at 4:26–29. Local audio devices 102 record live audio and store the audio in memory. *Id.* at 4:51–63. Local audio devices 102 may transmit both live and replayed audio to receiver 106 to be recorded by audio recorder 108. *Id.* at 4:39–42. "RCU 104 includes an RF transmitter capable of transmitting one or more of a time reference signal, digital commands, and audio to one or more other components of recording system 100." *Id.* at 4:29–32. The RCU may remotely control local audio devices 102, receiver 106, and recorder 108 for "initiating audio playback of all local audio devices 102 starting at the same time reference, as well as recording thereof by receiver 106 and recorder 108." *Id.* at 4:32–38 (bolding omitted).

D. Illustrative Claims

Petitioner challenges claims 1–14 of the '307 patent. Pet. 8–76. Claims 1 and 12 are the independent claims at issue. Claims 1 and 12 are illustrative of the challenged claims and are reproduced below:

> 1. An apparatus or system for locally recording locally generated audio, said locally generated audio also being wirelessly transmitted to, and remotely recorded by, a remote recorder as remotely recorded audio data comprising:
>
> at least one local audio device wearable by a creator of said locally generated audio including:
>
> at least one local audio device receiver for receiving at least one of the group consisting of digital data, time data, and audio data;
>
> at least one audio input port for receiving said locally generated audio from an audio input device, said audio input device wearable by a creator of said locally generated audio;
>
> at least one memory; and
>
> at least one control unit electrically coupled to said local audio device receiver, said audio input device,

and said memory for creating local audio data and storing said local audio data in said memory;

wherein said local audio data may be retrieved after said locally recording and combined with said remotely recorded audio data.

Ex. 1001, 23:22–42.

12. A method of locally recording locally generated audio, said locally generated audio also being wirelessly transmitted to, and remotely recorded by, a remote recorder as remotely recorded audio data comprising the steps of:

locally receiving said local audio generated by at least one performer during an audio event; and

transmitting said local audio, directly or indirectly, to at least one of the group consisting of a recorder, a receiver, and combinations thereof;

locally recording said local audio as local audio data in at least one memory of at least one local audio device wearable by a creator of said local audio;

remotely recording said transmitted local audio via at least one of the group consisting of a recorder, a receiver, and combinations thereof as remotely recorded audio data;

wherein said local audio data is retrieved during or subsequent to said audio event and is combined with said remotely recorded audio data.

Id. at 24:15–32.

II. ANALYSIS

A. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–14 of the '307 patent are unpatentable based on the following grounds (*see* Pet. 8–76): [1]

Claims Challenged	35 U.S.C. §	Reference(s) / Basis
1–11	103	Strub,[2] Nagai[3]
1–11	103	Strub, Nagai, Wood[4]
1–11	103	Strub, Gleissner[5]
1–11	103	Strub, Gleissner, Wood
12–14	102	Strub
12–14	103	Strub, Wood
1–7, 10–14	102	Lee[6]
1–14	103	Lee, Nagai

B. Claim Construction

The Petition was filed on April 25, 2018, prior to the effective date of the rule change that replaces the broadest reasonable interpretation ("BRI") standard. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (final rule) ("This rule is effective on

[1] Petitioner supports its challenge with the Declaration of John Tinsman. Ex. 1011.

[2] U.S. Patent No. 6,825,875 B1, issued Nov. 30, 2004 (Ex. 1003, "Strub").

[3] U.S. Patent Application Publication No. 2002/0159179 A1, pub. Oct. 31, 2002 (Ex. 1004, "Nagai").

[4] World Intellectual Property Organization Publication No. WO 2004/091219 A1, pub. Oct. 21, 2004 (Ex. 1008, "Wood").

[5] U.S. Patent Application Publication No. 2004/0028241 A1, pub. Feb. 12, 2004 (Ex. 1005, "Gleissner").

[6] U.S. Patent Application Publication No. 2006/0270465 Al, pub. Nov. 30, 2006 (Ex. 1009, "Lee").

November 13, 2018 and applies to all IPR, PGR and CBM petitions filed on or after the effective date."). We, therefore, interpret claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b) (2017); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142–46 (2016). Under the broadest reasonable construction standard, claim terms are generally given their ordinary and customary meaning, as would have been understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

1. "local audio data . . . is combined with said remotely recorded audio data"

Petitioner asserts that "[f]or the purposes of this Petition, no explicit construction is needed." Pet. 8. In its Preliminary Response, Patent Owner proposed a construction of the limitation "local audio data . . . is combined with said remotely recorded audio data," as recited by independent claim 12 and similarly recited by independent claim 1, to require

> (i) local audio generated by a performer is stored in a wearable local audio device as local audio data, (ii) the same local audio is transmitted to a remote recorder or receiver, (iii) the same local audio is remotely recorded at the recorder or receiver as remotely recorded audio data, and (iv) that the local audio data is combined with the remotely recorded audio data (*i.e.*, that a time segment of the local audio data replaces a corresponding time segment of the remotely recorded audio data).

Prelim. Resp. 10. Patent Owner argued that this interpretation is consistent with both the claims and the '307 patent specification. *Id.* at 10–12. In our Decision on Institution, we disagreed with Patent Owner that this limitation requires *replacing* the remotely recorded audio data with local audio data. Dec. 7–9.

Patent Owner now asserts a different construction of this limitation, requiring

> that (i) local audio generated by a performer is stored in a wearable local audio device as local audio data, (ii) *the same* local audio is transmitted to a remote recorder or receiver, (iii) *the same local audio* is remotely recorded at the recorder or receiver as remotely recorded audio data, and (iv) that the local audio data is combined with the remotely recorded audio data.

PO Resp. 8 (citing Ex. 2086 ¶ 15) (emphasis added). Patent Owner asserts that this construction is consistent with both the claim language and the '307 patent specification. PO Resp. 8–10.

Turning first to the claims, Patent Owner asserts that claim 12 requires the local audio data and the remotely recorded audio data to originate from the same audio. PO Resp. 8 (citing Ex. 1001, 24:19–20); *see* Tr. 25:11–24. Patent Owner asserts that "said local audio data" is combined with "said remotely recorded audio data" and both originate from the same source—the "local audio generated by at least one performer." PO Resp. 8; PO Sur-Reply 3. Patent Owner further argues that the '307 patent specification supports its construction. PO Resp. 9. Specifically, Patent Owner argues that Figure 6 discloses audio replaying and re-recording processing. *Id.* (citing Ex. 1001, Fig. 6).

Petitioner argues that Patent Owner's proposed construction contradicts the claims and fails to distinguish between "local audio" and "local audio data." Pet. Reply 3–4. Petitioner asserts that there is a distinction between audio from a performer and audio data from memory. Pet. Reply 8. Petitioner asserts that local audio is generated by a creator in claim 1 or a performer in claim 12, and "there's nothing in the record that distinguishes audio from one device as being different local audio from a

different device." Tr. 48:21–23. Petitioner further argues Mr. DeFilippis, Patent Owner's expert, explains the '307 patent's multitrack embodiment supports the "combined" limitation. Pet. Reply 19 (citing Ex. 2086 ¶ 18). Specifically, Mr. DeFilippis explains that the '307 patent specification discloses that the "accuracy allows multiple individually recorded audio tracks to be combined into one or more multi-track audio files electronically post-recording." Ex. 2086 ¶ 18 (citing Ex. 1001, 12:12–14).

We agree with Petitioner that the "combined" limitation encompasses the multitrack embodiment of the '307 patent. Both independent claims 1 and 12 recite that the "local audio data" is "*combined* with said remotely recorded audio data." In view of Mr. DeFilippis's testimony that the "combined" limitation allows "multiple individually recorded audio tracks to be combined into one or more multi-track audio files" (Ex. 2086 ¶ 18), we determine that claims 1 and 12 do not require the claimed "local audio data" and "remotely recorded audio data" to be derived from the same source.

Furthermore, every occurrence of the term "combined" in the '307 patent specification outside of the claims refers to the combination of audio into a multi-track file. *See,e.g.*, Ex. 1001, 4:12–14 ("This accuracy allows multiple individually recorded audio tracks to be combined into one or more multi-track audio files electronically post-recording."), 5:6–7 ("the multiple audio recordings are combined to create one single recording"), 16:40–44 ("[T]he local audio device of each performer . . . may be combined to create one or more multitrack audio files that are stored with master timestamps generated by the receiver/recorder's internal master timecode generator."), 19:2–4 ("[A]ll of the individual audio files may be combined to provide one or more comprehensive audio files."). Although we agree with Patent Owner that the '307 patent specification describes an embodiment of a

dropout, *i.e.*, a loss of audio data during a wireless transmission, is remedied through the replacement of data, we are not persuaded that the recited "combined" limitation is limited to that embodiment, but rather also encompasses the multi-track embodiment of the '307 patent. *Id.* at 4:15–18. Thus, we determine that the limitation "said local audio data is retrieved during or subsequent to said audio event and is combined with said remotely recorded audio data" does not require that the local and remote audio data originate from the same source because the '307 patent specification contemplates a broader definition—one that includes the combination of local audio data and remotely recorded audio data to create a multi-track audio file. *See* Ex. 1001, 4:12–14, 5:6–7, 16:40–44, 19:2–4; Ex. 2086 ¶ 18.

Based on the foregoing, we construe the "combining" limitation as broad enough to encompass combining local audio data and remotely recorded audio data, without a requirement that the local audio data and remotely recorded audio data are the same. In other words, we construe the "combining" limitation to encompass the disclosed multitrack embodiment in the '307 patent specification, where separate audio tracks are combined to form a multitrack audio file. *See* Ex. 1001, 4:12–14, 5:6–7, 16:40–44, 19:2–4.

2. "wearable"

Patent Owner and Petitioner propose different meanings for the term "wearable." *See* PO Resp. 9–12; Pet. Reply 1–2; PO Sur-Reply 4–6. Claim 1 recites "audio input device wearable by a creator of said locally generated audio" and claim 12 recites "one local audio device wearable by a creator of said local audio."

Patent Owner, relying on the Microsoft Encarta Dictionary, asserts that an "electronic device (e.g., a local audio device, an audio input device)

would have been considered to be 'wearable' if it were 'suitable and in a condition to be worn.'" PO Resp. 10 (citing Ex. 2110, 1628). Patent Owner, accordingly, proposes that "wearable" means "small, lightweight, unobtrusive, easily hidden, not visible, and designed to be worn on the body of a creator of audio (*i.e.*, performer)." PO Resp. 11 (citing Ex. 2086 ¶ 15). Patent Owner argues that Petitioner's expert, Mr. Tinsman, agrees with this narrower construction. PO Resp. 10–11 (citing Ex. 2109, 41:7–42:5, 47:15–48:2).

Patent Owner further asserts that the '307 patent specification "repeatedly describes the local audio device and the audio input device as being suitably worn on the body of a creator of audio (*i.e.*, a performer)." PO Resp. 11–12 (citing Ex. 1001, 1:57–58 ("Such wireless transmitters may take the form of body packs that are worn by each performer."), 8:55–56 ("Such audio devices may be manufactured in the form of body-packs, such as those typically worn by news announcers, performers, and the like."), 9:63–66 ("In one aspect of the present invention, local control unit 310 receives recordable audio from local audio input device 312, which may be worn by the performer and connects to local audio device 102 at local audio input device port 314.")).

Petitioner argues that the '307 patent specification does not support the narrow construction proposed by Patent Owner. Pet. Reply 1–2. Rather, Petitioner argues that the '307 patent specification only indicates that a device may be worn. Pet. Reply 2 (citing Ex. 1001, 1:57–58, 8:55–56, 9:63–66). Petitioner asserts that Mr. Tinsman explains that "wearable" means "something that was straightforward to carry on your person," or "designed to be worn on the body." Pet. Reply 2 (citing Ex. 2109, 41:2–10).

We agree with Petitioner that the term "wearable" means "suitable and in a condition to be worn." Pet. Reply 1–2 (quoting Ex. 2110, 1628). This definition is consistent with the plain meaning of "wearable," and we find no credible evidence on the record that requires a narrower definition. Furthermore, we are not persuaded that Petitioner's expert, Mr. Tinsman, provides a definition consistent with Patent Owner's narrow definition. Rather than defining "wearable," Mr. Tinsman explains that the term "bodypack" is "[s]omething relatively small and lightweight." Pet. Reply 2 (citing Ex. 2109, 41:18–22). Further, when describing "wearable" as "unobtrusive, easily hidden," Mr. Tinsman clarifies this description as "[y]ou know, reasonable to carry around." Ex. 2109, 47:20–22.

We determine that no other express claim construction analysis of any claim term is necessary. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (holding that only terms in controversy must be construed and only to the extent necessary to resolve the controversy) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

C. Obviousness and the Level of Ordinary Skill in the Art

"Section 103(a) forbids issuance of a patent when 'the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.'" *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) if in the record, objective

evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

Petitioner asserts that a person of ordinary skill in the art, at the time of the '307 patent, would have "a Bachelor's degree in electrical engineering or a related subject and two to five years working with audio and wireless communications systems." Pet. 8 (citing Ex. 1011 ¶ 24). Patent Owner's expert, Mr. DeFilippis, similarly opines that a person of ordinary skill in the art would have a "Bachelor's degree in electrical engineering and two years of experience working with audio and wireless communications systems either in industry or in graduate school." Ex. 2086 ¶ 13.

We adopt Petitioner's and Patent Owner's proffered level of ordinary skill in the art as it is agreed upon and consistent with the prior art of record. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966); *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) ("[T]he level of skill in the art is a prism or lens through which a judge, jury, or the Board views the prior art and the claimed invention."); *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991) ("The importance of resolving the level of ordinary skill in the art lies in the necessity of maintaining objectivity in the obviousness inquiry."). Specifically, we adopt that a person of ordinary skill in the art, at the time of the '307 patent, would have had a Bachelor's degree in electrical engineering and two or more years of experience working with audio and wireless communications systems. Pet. 8 (citing Ex. 1011 ¶ 24); Ex. 2086 ¶ 13. To that end, we note that the prior art itself often reflects an appropriate skill level. *See Okajima*, 261 F.3d at 1355.

D. Obviousness of claims 1–11 of the '307 patent over Strub in combination with Nagai or Gleissner

Petitioner contends that claims 1–11 of the '307 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Strub in combination with Nagai or Gleissner. Pet. 16–44. For the reasons discussed below, we determine Petitioner has demonstrated by a preponderance of the evidence that claims 1–11 of the '307 patent are unpatentable under 35 U.S.C. § 103 as obvious over Strub in combination with Nagai or Gleissner.

1. Strub (Ex. 1003)

Strub, titled "Hybrid Recording Unit Including Portable Video Recorder and Auxiliary Device," is directed to "recording of the event by multiple participants (i.e., from multiple points of view), often simultaneously." Ex. 1003, 1:25–31. Strub discloses a "hybrid recording unit" that is "constructed by adding to a portable video recorder (e.g., camcorder, portable dockable videotape recorder (VTR)) one or more devices (an 'auxiliary device') that provide additional functionality to the portable video recorder." *Id.* at 5:25–29. "The auxiliary device can advantageously provide, for example, one or more of the following capabilities: marking, position sensing, physiological monitoring and/or biometric identification." *Id.* at 28–32. The hybrid recording unit is adapted to obtain a visual recording of the event as well as an audio recording of the event. *Id.* at 8:44–52. Multiple hybrid recording units may record a single event and one recording unit may transmit its recording to another recording unit. *Id.* at 37:18–40, 38:8–10.

2. Nagai (Ex. 1004)

Nagai is directed to a data recording and reproducing apparatus for recording and reproducing voice data. Ex. 1004 ¶¶ 3–5. Nagai's apparatus

includes an audio input, a headphone jack for audio output, a memory card to store audio data, and a USB port for transferring audio data to another device. Ex. 1004 ¶¶ 106, 125, 126, 139, 140, 145, Figs. 1, 2A, 2B.

3. Gleissner (Ex. 1005)

Gleissner is directed to an audio data recorder that includes a microphone unit and a recording appliance (audio data recorder), connected to one another via a plug connection. Ex. 1005 ¶ 10. The plug connection between the microphone unit and recording appliance provides both an electrical connection and a rigid mechanical connection. *Id.* The recording appliance may further be connected to headphones to allow a user to simultaneously hear the input into the microphone. *Id.* ¶ 33.

4. Analysis

a. Petitioner's Contentions

Petitioner contends that claims 1–11 of the '307 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Strub in combination with Nagai or Gleissner. Pet. 16–44.

Claim 1 recites a "[a]n apparatus or system for locally recording locally generated audio, said locally generated audio also being wirelessly transmitted to, and remotely recorded by, a remote recorder as remotely recorded audio data." Petitioner asserts that Strub discloses a recording unit that acquires audio data from an attached microphone and both stores it in a local storage device and wirelessly transmits it to another recording unit. Pet. 16–17 (citing Ex. 1003, 12:13–21, 12:31–39, 25:35–49, 35:54–65, 37:18–40, 38:1–4; Ex. 1011 ¶¶ 45–46). Petitioner also asserts that Strub discloses a recording unit that includes "audio data acquisition device 303, transmitter 309, receiver 310, position sensing device 311, and data storage device 305." *Id.* at 17 (citing Ex. 1003, Fig. 3). Petitioner further asserts

that audio data acquisition device 303 acquires local audio, the recording unit stores the audio data in data storage device 305, and transmitter 309 wirelessly transmits the locally generated audio to a remote recording unit. *Id.* at 17–18 (citing Ex. 1003, 6:1–8, 12:13–21, 12:31–39, 25:35–49, Fig. 1).

Claim 1 also recites "at least one local audio device wearable by a creator of said locally generated audio." Petitioner asserts that Strub discloses "a small, lightweight, *wearable* recording unit." *Id.* at 19 (quoting Ex. 1003, 4:29–31; citing Ex. 1003, 4:29–31, 14:59–15:11, 16:66–17:24, 38:65–39:11, 66:33–51, 67:54–68:10, 72:10–19, Figs. 1, 8A–8C, 9A, 9B; Ex. 1011 ¶ 46) (emphasis added).

Claim 1 further recites "at least one local audio device receiver for receiving at least one of the group consisting of digital data, time data, and audio data." Petitioner asserts that Strub discloses a local audio device that includes audio receiver 310 and position sensing device 311 that records audio data, GPS position data or biometric data, and time data. *Id.* (citing Ex. 1003, 12:39–52, 35:53–61, 37:55–62, 63:41–60; Ex. 1011 ¶ 47).

Claim 1 additionally recites "at least one audio input port for receiving said locally generated audio from an audio input device, said audio input device wearable by a creator of said locally generated audio." Petitioner argues that Strub discloses the recording unit can receive audio from a microphone such as a lavalier worn by the creator. *Id.* at 20–21 (citing Ex. 1003, Fig. 3, 21:65–25:49, 68:63–69:67). The microphone or lavalier passes the audio data to the recording unit "using wired or wireless techniques." *Id.* at 21 (citing Ex. 1003, 64:50–65:3). Petitioner asserts that a person with ordinary skill in the art would have understood Strub's wireless or wired connections would include an "audio input port," such as a standard microphone jack in the case of a wired connection. *Id.* Petitioner's

expert, Mr. Tinsman, explains that Strub's wired or wireless techniques connecting the microphone and recording unit would include an audio input port. *Id.* (citing Ex. 1011 ¶ 48).

Alternatively, Petitioner asserts that Strub's recording unit could be modified to include an input port disclosed by either Nagai or Gleissner. *Id.* (citing Ex. 1011 ¶ 49). Petitioner asserts that Nagai discloses a "mike jack" that "receives a voice signal from an external device such as an external mike." Pet. 22–23 (quoting Ex. 1004 ¶ 109). Mr. Tinsman explains that Nagai's "mike jack" would be understood by a POSITA to include, for example, a conventional tip-ring-sleeve ("TRS") microphone connector. *Id.* (citing Ex. 1011 ¶ 52). Petitioner further asserts that Gleissner also discloses an audio input, arguing that Gleissner discloses an "XLR plug connector." *Id.* (citing Ex. 1005 ¶¶ 13, 23, 24, 32; Ex. 1011 ¶ 53).

Petitioner argues that it would have been obvious to combine the teachings of Nagai or Gleissner with Strub. Pet. 21. Petitioner argues that a person with ordinary skill in the art would have understood that Strub suggests the use of an audio input port, which "provide[s] the benefit of interchangeability by allowing the user to select the appropriate microphone for the recording scenario." *Id.* at 21–22 (citing Ex. 1003, 25:8–49). Petitioner further asserts that the '307 patent recognizes that such a benefit of using a port for a microphone was not new, and describes "input port 314 as 'any commercially available audio input device port'" using "any commercially available audio input device such as a microphone." *Id.* at 22 (citing Ex. 1001, 9:2–8). Accordingly, Petitioner concludes that a person with ordinary skill in the art would have known to combine the input ports described by Nagai or Gleissner with Strub to provide the benefit of customization and detachability. *Id.* (citing Ex. 1011 ¶ 51).

Claim 1 also recites "at least one memory." Petitioner asserts that Strub discloses its recording unit includes data storage device 305, which may include a hard disk, removable data storage medium, or non-volatile data storage device. Pet. 24 (citing Ex. 1003, 27:36–51, 33:20–35:50, 76:6–34, 94:14–19; Ex. 1011 ¶ 54).

Claim 1 additionally recites "at least one control unit electrically coupled to said local audio device receiver, said audio input device, and said memory for creating local audio data and storing said local audio data in said memory." Petitioner argues that Strub discloses system controller 301 and data processing device 304 that are coupled to receiver 310 and position sensing device 311. *Id.* at 24–25 (citing Ex. 1003, 12:4–13, 13:36–14:13, Fig. 3; Ex. 1011 ¶¶ 55–57). Petitioner asserts that system controller 301 controls the operation of the components of recording unit 300, "for creating local audio data and storing said local audio data in said memory." *Id.* at 25 (quoting Ex. 1003, 12:4–13, 13:36–14:13, 66:7–25, 70:1–5).

Claim 1 further recites "wherein said local audio data may be retrieved after said locally recording and combined with said remotely recorded audio data." Petitioner argues that Strub teaches "the recording units timestamping the recorded audio and synchronizing recordings from multiple recording units using those timestamps in post-processing." *Id.* at 26 (citing Ex. 1003, 13:50–67). Petitioner contends that the local audio data is retrieved and transmitted to other devices via transmitter 309 or wired connections. *Id.* at 27 (citing Ex. 1003, 12:4–39, 66:7–25, Fig. 3).

We are persuaded by Petitioner's arguments, as they are supported by the cited evidence. Notwithstanding Patent Owner's arguments, which we address below, we determine that Petitioner has demonstrated by a preponderance of the evidence that claim 1 of the '307 patent is unpatentable

under 35 U.S.C. § 103(a) as obvious over Strub combined with Nagai or Gleissner. Petitioner provides a similar analysis for claims 2–11, and we similarly determine that Petitioner has demonstrated by a preponderance of the evidence that claims 2–11 of the '307 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Strub combined with Nagai or Gleissner. *See* Pet. 16–44.

b. Patent Owner's Arguments

Patent Owner argues that Petitioner fails to demonstrate by a preponderance of the evidence that claims 1–11 would have been obvious over Strub in combination with Nagai or Gleissner. PO. Resp. 30–37. Specifically, Patent Owner argues that (i) Petitioner fails to demonstrate that one of ordinary skill in the art would have been motivated to combine the teachings of the cited prior art references with a reasonable expectation of success; (ii) Petitioner fails to demonstrate that any of the different combinations teaches each and every element of the challenged claims; and (iii) the objective indicia of nonobviousness indicates that the claimed invention of the '307 patent would not have been obvious to a person of ordinary skill in the art. *Id.* at 35.

i. Differences between the prior art and claims

Patent Owner argues that Strub fails to teach or suggest "that the same local audio is stored at both the wearable local audio device as local audio data and the remote receiver/recorder as remotely recorded audio data and that the local audio data is combined with the remotely recorded audio data." PO. Resp. 32. More specifically, Patent Owner asserts that Strub does not satisfy the claim requirements of "(1) the same audio data to be (i) stored at the local audio device (as 'local audio data') and (ii) transmitted to and recorded at the remote recorder (as 'remotely recorded audio data') and

(2) 'the local audio data' and the 'remotely recorded audio data' to be combined." PO Resp. 31; *see id.* at 8–10. Patent Owner argues that Petitioner fails to identify (1) two different devices taught by Strub that correspond to the claimed wearable local audio device and remote receiver/recorder or (2) the audio data in Strub that corresponds to the claimed local audio. PO Resp. 33.

Rather than storing the same data at the local device and the remote recorder, Patent Owner asserts that Strub discloses that different audio data from different recording units or data acquisition devices are combined. PO Resp. 32 (citing Ex. 1003, 13:50–67). Patent Owner contends that Petitioner's expert, Mr. Tinsman, conceded that Strub discloses "combining the different audio data from the different recording units." *Id.* (citing Ex. 2109, 55:3–7). Patent Owner further contends that its expert, Mr. DeFilippis, explains that in Strub, a "mere multi-track recording (combining multiple tracks of audio onto a single media) also does not satisfy these claim requirements." PO Resp. 32–33 (citing Ex. 2079 ¶ 21). Accordingly, Patent Owner asserts that Strub's "blending (e.g., mixing) of data from multiple, different data acquisition devices," is different from the claims, which require "the same audio data to be (i) received and stored locally, (ii) transmitted and stored remotely, and (iii) then combined." PO Resp. 33–34 (citing Ex. 2086 ¶ 23).

We are not persuaded by Patent Owner's argument. Petitioner identifies a first local audio device disclosed by Strub as "a small, lightweight, wearable recording unit." Pet. 19 (quoting Ex. 1003, 4:29–31; citing Ex. 1003, 4:29–31, 14:59–15:11, 16:66–17:24, 38:65–39:11, 66:33–51, 67:54–68:10, 72:10–19, Figs. 1, 8A–8C, 9A, 9B; Ex. 1011 ¶ 46). Petitioner further identifies the first local audio device as including position

sensing device 311 and audio receiver 310 that records *audio data,* GPS position data or biometric data, and time data. Pet. 20 (citing Ex. 1003, 12:39–52, 35:53–61, 37:55–62, 63:41–60; Ex. 1011 ¶ 47). Finally, Petitioner identifies Strub's disclosure of other recording devices to which local audio data is transmitted via transmitter 309 or wired connections. Pet. 27 (citing Ex. 1003, 12:4–39, 66:7–25, Fig. 3). In summary, Strub discloses a local audio device that records local audio and transmits the local audio to other remote devices. Ex. 1001, Fig. 1, 105–108, 8:50–53, 12:4–39, 66:7–25). Therefore, Petitioner has identified two devices in Strub—a local audio device and a remote audio device that receives the transmitted audio. Ex. 1003, 12:4–39, 66:7–25, Fig. 3. Petitioner has also identified the claimed local audio as the audio that is stored by a local audio device and transmitted to a remote audio device. *Id.*

Furthermore, Patent Owner's argument that Strub fails to disclose "that the same local audio is stored at both the wearable local audio device as local audio data and the remote receiver/recorder as remotely recorded audio data and that the local audio data is combined with the remotely recorded audio data" is not persuasive because it is inconsistent with our claim construction discussed above. *See* Section II.B.1; PO Resp. 32. We do not construe the limitation "said local audio data may be retrieved after said locally recording and combined with said remotely recorded audio data" to require that the local audio data and remotely recorded audio data be the same data. *Id.* Accordingly, we agree with Petitioner that Strub discloses the disputed element because Strub discloses local audio devices transmitting recordings to other recording units and the recording units timestamping the recorded audio and synchronizing, i.e., combining,

recordings from multiple recording units using those timestamps in post-processing. Ex. 1003, 13:50–67.

Patent Owner further argues that Strub does not disclose a local audio device "wearable by a creator of said locally generated audio." PO Resp. 34–35. Patent Owner argues that Strub's device is not "small, lightweight, unobtrusive, easily hidden, not visible, and designed to be worn on the body of a creator of audio (i.e., performer)" based on its claim construction. *Id.* at 34; *see* Section II.B.2. Mr. DeFilippis, Patent Owner's expert, opines that Strub's system "would require a computer that could compare content from multiple mpeg sources in real time and multiplex the results to a recording," and the "hardware and software to do this could not be incorporated into a back pack, let alone a bodypack." *Id.* at 34–35 (citing Ex. 2086 ¶ 43).

We are not persuaded by Patent Owner's argument that Strub fails to teach a "wearable" device because Patent Owner's argument is based on a claim construction we do not agree with and do not apply. *See* Section II.B.2. We construe "wearable" as "suitable and in a condition to be worn." *Id.*; *see also* PO Resp. 10 (citing Ex. 2110, 1628). We further agree with Petitioner that Strub's device is "wearable." Pet. Reply 4–6. Strub describes its device as a "small, lightweight, wearable" unit. *Id.* at 6 (citing Ex. 1003, 4:29-31; Ex. 1024, 120:21–133:5). Accordingly, we are not persuaded by Patent Owner's argument that Strub fails to disclose a "wearable" device. For the same reasons, we also are not persuaded by Patent Owner's argument that Strub's device is not a "bodypack" as required by dependent claim 3.

ii. Objective Indicia of Nonobviouness

Patent Owner further asserts that the nonobviousness of the claims is supported by objective indicia of nonobviousness including long-felt need, failure of others, and industry praise of the patented invention. PO Resp. 52–59 (citing Exs. 2103–2108); PO Sur-Reply 28–32. Petitioner disagrees. Pet. Reply 25–30. For the reasons below, we determine that Patent Owner fails to show the requisite nexus between its alleged objective indicia of nonobviousness and the merits of the claimed invention.

For objective indicia of nonobviousness to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention. *ClassCo, Inc., v. Apple, Inc.*, 838 F.3d 1214, 1220 (Fed. Cir. 2016). "[T]here is no nexus unless the evidence presented is 'reasonably commensurate with the scope of the claims.'" *Id.* (quoting *Rambus Inc. v. Rea*, 731 F.3d 1248, 1257 (Fed. Cir. 2013)). "Where the offered secondary consideration actually results from something other than what is both claimed and *novel* in the claim, there is no nexus to the merits of the claimed invention," meaning that "there must be a nexus to some aspect of the claim not already in the prior art." *In re Kao*, 639 F.3d 1057, 1068–69 (Fed. Cir. 2011) (emphasis in original). On the other hand, there is no requirement that "objective evidence must be tied exclusively to claim elements that are not disclosed in a particular prior art reference in order for that evidence to carry substantial weight." *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1331 (Fed. Cir. 2016). A patent owner may show, for example, "that it is the claimed combination as a whole that serves as a nexus for the objective evidence; proof of nexus is not limited to only when objective evidence is tied to the supposedly 'new' features(s)." *Id.* Ultimately, the fact finder must weigh the secondary considerations

evidence presented in the context of whether the claimed invention as a whole would have been obvious to a skilled artisan. *Id.* at 1331–32.

We determine that no nexus exists between the evidence presented and the merits of the claimed invention because the evidence is directed to features that are not required by the claims. *See In re Kao*, 639 F.3d at 1068–69. Patent Owner submitted the Declarations of Mr. Sarokin and Mr. Wexler, as well as evidence of awards for its products. *See generally* PO Resp. 52–59. We determine that the evidence submitted by Patent Owner primarily is directed towards the feature of fixing dropouts. *See,e.g.*, Ex. 2104 ¶ 6 ("I have been in many situations where for a variety of reasons there have been RF dropouts . . . ."); *id.* ("If there is a drop out of the RF signal, the identical recording in the transmitter can be used by post production."); Ex. 2103 ¶ 6 ("If the actors in a scene went in and out of radio range the SD card on the transmitter would continue to record the audio. . . . [A] sound mixer could hit a single button on a Zaxcom recorder and all the radios in use would play back from a certain take or time code start point so the scene could be re-mixed without any radio drop outs."). As discussed above, however, we are not persuaded by Patent Owner that the feature of repairing dropouts by replacing data is required by the claims. *See* Section II.B.1.

Patent Owner asserts that an Emmy award received by the inventors listed the '307 patent as covering the award-winning technology. PO Resp. 59 (citing Ex. 2108). We do not discount the importance of receiving an Emmy award; however, our analysis requires determining whether a nexus exists between the evidence and the claimed invention. *ClassCo*, 838 F.3d at 1220. The evidence suggests that the Emmy was awarded for,

among other things, the elimination of dropouts. Ex. 2108, 3; Pet. Reply 29–30 (citing Ex. 2106, 11); *see* Section II.B.1.

Accordingly, we are not persuaded that there is a nexus between the received award and the claimed invention. Absent a nexus between the merits of the claimed invention and the submitted evidence towards a long-felt need, industry praise, and the failure of others, we determine that Patent Owner's evidence of secondary considerations does not weigh in favor of nonobviousness.

5. Conclusion

Having considered the *Graham* factors, including the scope and content of the prior art, the differences between the prior art and the challenged claims, and the objective evidence of nonobviousness, we determine Petitioner has demonstrated by a preponderance of the evidence that claims 1–11 of the '307 patent are unpatentable under 35 U.S.C. § 103 as obvious over Strub in combination with Nagai or Gleissner.[7]

E. Anticipation of claims 12–14 of the '307 patent by Strub

Petitioner contends that claims 12–14 of the '307 patent are unpatentable under 35 U.S.C. § 102(e) as anticipated by Strub. Pet. 44–48. We determine that Petitioner has demonstrated by a preponderance of the evidence that claims 12–14 of the '307 patent are unpatentable under 35 U.S.C. § 102(e) as anticipated by Strub.

As discussed above, Petitioner relies on Strub as disclosing all of the elements of claim 1, except Petitioner also relies on Strub in combination with Nagai or Gleissner for teaching an audio input port. *See* Section II.D.4.

[7] In view of this determination, we do not reach Petitioner's challenge to claims 1–11 as obvious over Strub in combination with Nagai or Gleissner, and Wood.

Independent claim 12 recites a method that claims the same subject matter as independent claim 1, except for an audio input port. Accordingly, Petitioner argues that Strub discloses all the limitations of claim 12 for the same reasons as discussed above with respect to similar limitations recited in claim 1. Pet. 44–46; *see* Section II.D.4. Patent Owner provides substantially the same arguments as those discussed above. PO Resp. 30–35.

For the same reasons discussed above, we determine that Petitioner has demonstrated by a preponderance of the evidence that claim 12 is anticipated by Strub, and we are not persuaded by Patent Owner's arguments. *See* Section II.D.4. Petitioner provides a similar analysis for claims 13 and 14, and we similarly determine that Petitioner has demonstrated by a preponderance of the evidence the unpatentability of these claims as well.[8] *See* Pet. 47–48.

F. Anticipation of claims 1–7 and 10–14 of the '307 patent by Lee and obviousness of claims 1–14 of the '307 patent over Lee and Nagai

Petitioner contends that claims 1–7 and 10–14 of the '307 patent are unpatentable under 35 U.S.C. § 102 as anticipated by Lee and that claims 1–14 of the '307 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Lee and Nagai. Pet. 48–76. For the reasons discussed below, we determine Petitioner has not demonstrated by a preponderance of the evidence that claims 1–7 and 10–14 of the '307 patent are unpatentable under 35 U.S.C. § 102 as anticipated by Lee or that claims 1–14 of the '307

[8] In view of this determination, we do not reach Petitioner's challenge to claims 12–14 as obvious over Strub in combination with Wood.

patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Lee and Nagai.

1. Lee (Ex. 1009)

Lee is directed to a wireless microphone system for use with a mobile digital recording system. Ex. 1009, Abstract. The disclosed recording system is comprised of

> (1) a mobile in-vehicle digital audio/video/data recorder; (2) a wireless digital audio recorder and transceiver body pack (Body Pack Transceiver or BPT); (3) an in-vehicle transceiver to send and receive signals to/from wireless microphone (In-Vehicle Transceiver or IVT); and (4) a central server management system to view and manage videos after recording.

Id. ¶ 29.

The BPT includes microphone 101 to collect audio input directly from a user. *Id.* ¶¶ 28–30. When the BPT is out of range of the IVT, the BPT stores the audio input in its memory. *Id.* ¶¶ 34–38. When the BPT returns to within range of the IVT, the stored audio stream and the real-time audio stream are transmitted for recording by the mobile digital recording system. *Id.* ¶ 35. "Time stamps embedded in both the audio and the video streams are used to correctly synchronize and align the two data streams." *Id.*

2. Analysis

Petitioner contends that claims 1–7 and 10–14 of the '307 patent are unpatentable under 35 U.S.C. § 102(e) as anticipated by Lee. Pet. 48–71. Petitioner asserts that Lee is entitled to priority to provisional application 60/685,974, filed May 31, 2005, for purposes of § 102(e). Pet. 51–54; Ex. 1009. Patent Owner does not dispute that Lee is entitled to the benefit of the filing date of the provisional application. *See* PO Resp. 12. Instead, Patent Owner contends that the named inventors of the '307 patent

conceived of their invention before May 31, 2005, the earliest effective date of Lee, and acted diligently from just before that date to constructively reduce their invention to practice on July 14, 2005, when their first patent application was filed. *Id*. at 12–29 (citing Exs. 2001, 2017, 2018, 2086–2088). We are persuaded that Patent Owner has demonstrated conception and diligence to reduction to practice necessary to antedate Lee. Accordingly, we determine that Lee does not qualify as prior art under 35 U.S.C. § 102(e), and, therefore, Petitioner has not established by a preponderance of the evidence that claims 1–7 and 10–14 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Lee or that claims 1–14 are unpatentable under 35 U.S.C. § 103(a) as obvious over Lee and Nagai.

The Federal Circuit has held

> When the issue of priority concerns the antedating of a reference, the applicant is required to demonstrate, *with sufficient documentation*, that the applicant was in possession of the later-claimed invention before the effective date of the reference. *Demonstration of such priority requires documentary support, from which factual findings and inferences are drawn, in application of the rules and law of conception, reduction to practice, and diligence.* The purpose is not to determine priority of invention—the province of the interference practice—but to ascertain whether the applicant was in possession of the claimed invention sufficiently to overcome the teachings and effect of an earlier publication of otherwise invalidating weight.

In re Steed, 802 F.3d 1311, 1316 (Fed. Cir. 2015) (emphases added); *see also Perfect Surgical Techniques, Inc. v. Olympus Am., Inc.*, 841 F.3d 1004, 1008 (Fed. Cir. 2017) (citing *Steed*, 802 F.3d at 1316–17). "The principles are legal, but the conclusions of law focus on the evidence, for which the Board's factual findings are reviewed for support by substantial evidence."

Steed, 802 F.3d at 1316; *see also NFC Tech., LLC v. Matal*, 871 F.3d 1367, 1371 (Fed. Cir. 2017).

"[C]onception is established when the invention is made sufficiently clear to enable one skilled in the art to reduce it to practice without the exercise of extensive experimentation or the exercise of inventive skill." *Hiatt v. Ziegler*, 179 USPQ 757, 763 (Bd. Pat. Inter. 1973). "Conception must be proved by corroborating evidence which shows that the inventor disclosed to others his 'completed thought expressed in such clear terms as to enable those skilled in the art' to make the invention." *Coleman v. Dines*, 754 F.2d 353, 359 (Fed. Cir. 1985) (quoting *Field v. Knowles*, 183 F.2d 593, 601 (CCPA 1950)); *see Burroughs Wellcome Co. v. Barr Labs., Inc.*, 40 F.3d 1223, 1228 (Fed. Cir. 1994) (determining that draft patent application disclosing treatment of AIDS with AZT reciting dosages, forms, and routes of administration was sufficient to corroborate conception).

To establish conception, Patent Owner provides the Declaration of Mr. Glenn Sanders. Ex. 2001. Mr. Sanders declares that the inventions claimed in the '307 patent were conceived of prior to May 31, 2005. Ex. 2001 ¶¶ 2–6. As corroboration, Patent Owner submits the Declaration of Ms. Rita Chipperson and draft patent applications dated at least as of May 9, 2005. Ex. 2001 ¶ 4; Ex. 2003; Ex. 2078. Mr. Sanders identifies each claim element and its support in a draft patent application asserted to be dated May 16, 2005. Ex. 2001 ¶¶ 4–6 (citing Ex. 2017); *see also* Ex. 2078 ¶ 18 ("Exhibit 2017 . . . is dated by Windows Explorer as being last modified on 5/16/2005."); Ex. 2087 ¶ 6. For example, the draft patent application shown in Exhibit 2017 states:

> [l]ocal recorder 306 of local audio device 102 locally records audio received via audio receiving device 312. Audio

> receiving device 312 is also worn by the speaker and connects to local audio device 102 at audio input port 314. The locally recorded audio is stored along with time code numbers that indicate when, during the live audio event, each segment of audio occurred in local memory 31. . . . Simultaneously, audio received from audio receiving device 312 is transmitted via local transmitter 308 to receiver 106 to allow live recording of the audio event.

Ex. 2017, 5 (bolding omitted); Ex. 2001 ¶ 6.

Petitioner argues that the record fails to show conception prior to May 31, 2005. Pet. Reply 17–20. Specifically, Petitioner contends that neither the Patent Owner Response nor the draft patent application identifies the date of the draft patent application. *Id.* at 17. In other words, Petitioner argues that Patent Owner has not provided sufficient proof for the date of the draft patent application. *Id.* (citing *CBS Interactive Inc. v. Helferich Patent Licensing, LLC*, IPR2013-00033, Paper 122 at 46 (PTAB Mar. 3, 2014)).

We disagree with Petitioner. Patent Owner identifies the date of the draft patent application as "prior to May 31, 2005." PO Sur-Reply 6–7 (citing PO Resp. 12–13; Ex. 2017; Ex. 2088 ¶ 19). Ms. Chipperson attests that Exhibit 2017 "is dated by Windows Explorer as being last modified on 5/16/2005 at 7:29pm, as indicated by the screen shot of the folder attached as Exhibit 2077." *Id.* at 7 (citing Ex. 2088 ¶ 19). Considering the totality of the evidence, we are persuaded that Patent Owner has sufficiently established that the date of the draft patent application is May 16, 2005, prior to the May 31, 2005 earliest priority date of Lee.

Petitioner further argues that Patent Owner provides no substantive analysis as to how draft patent application provides support for the claims. Pet. Reply 18 (citing PO Resp. 13–25, Ex. 2087 ¶ 6; Ex. 1027, 44:13–54, 57:13–58:23). Petitioner further notes that the draft patent application

generally includes comments identifying the fact that more detail needs to be added to the draft patent application. *Id.* at 19 (citing Ex. 2017, 2, 3, 7, 9–10). Patent Owner responds that the elements asserted by Petitioner to be lacking are supported by the draft patent application's disclosure of

> At 416, one or more local audio devices transmit its respective stored audio starting with the audio that corresponds to the time specified by the time reference data. The receiving equipment simultaneously records the replayed audio at the same time reference point. That is, the receiving equipment may insert the replayed audio data that was not recorded during the live audio event due to wireless transmission errors into the original recording at the exact time at which the missed audio originally occurred, thereby compensating for any transmission losses.

PO Resp. 17 (citing Ex. 2017, 11).

We agree as the cited portions of the draft patent application sufficiently describe conception of wireless transmission, worn by the speaker (wearable), receiver for receiving . . . audio data, a control unit, and "combining" audio. PO Resp. 16–17 (citing Ex. 2017, 5–6, 11). The draft patent application, titled "Wireless Multitrack Recording System," sufficiently describes the combining into a multitrack file of audio transmitted from one or more local devices where the "receiving equipment simultaneously records the replayed audio at the same time reference point," and "insert[s] the replayed audio data that was not recorded during the live audio event due to wireless transmission errors into the original recording." Ex. 2017, 1, 11; *see* PO Resp. 17 (citing Ex. 2017, 11). Petitioner makes similar arguments with respect to the "identifier" recited in claims 2 and 14 and the "bodypack" recited in claim 3. However, we are persuaded that Patent Owner has sufficiently demonstrated conception of these features.

PO Sur-Reply 7–8 (citing Ex. 2017, 1; Ex. 2080; Ex. 2081; Ex. 2083; Ex. 2087 ¶ 4).

We are persuaded that Patent Owner's evidence sufficiently demonstrates and corroborates that conception of the invention occurred prior to the earliest effective filing date of Lee. Patent Owner asserts that constructive reduction to practice occurred with the filing of application 11/181,062 (the "'062 application"), the '307 patent's parent application, on July 14, 2005. PO Resp. 25–26; PO Sur-Reply 9–13; Ex. 1001. Application 13/774,744, which issued as the '307 patent, is a continuation of application 12/772,471, which is a continuation of 11/404,735, which is a continuation-in-part of the '062 application. Ex. 1001. Patent Owner relies upon the Declaration of James DeFilippis to demonstrate that the '062 application provides written description support for claims 1–14 of the '307 patent. PO Resp. 26–30 (citing Ex. 2079).

Having produced evidence sufficient to demonstrate conception of the invention and constructive reduction to practice, Patent Owner must also produce evidence demonstrating that reasonable diligence was shown throughout the entire critical period, which begins just prior to the competing reference's effective date and ends on the date of the invention's reduction to practice. *Perfect Surgical Techniques*, 841 F.3d at 1007 (citation omitted); *see also id.* at 1009 ("A patent owner . . . must show there was *reasonably continuous* diligence."). "Under this standard, an inventor is not required to work on reducing his invention to practice every day during the critical period." *Id.* (citing *Monsanto Co. v. Mycogen Plant Sci., Inc.*, 261 F.3d 1356, 1369 (Fed. Cir. 2001)). Rather, "the point of the diligence analysis . . . is to assure that, in light of the evidence as a whole, 'the invention was not abandoned or unreasonably delayed.'" *Id.* (quoting

Brown v. Barbacid, 436 F.3d 1376, 1379 (Fed. Cir. 2006)). A party alleging diligence must provide corroboration with evidence that is specific both as to facts and dates. *Gould v. Schawlow*, 363 F.2d 908, 920 (CCPA 1966); *Kendall v. Searles*, 173 F.2d 986, 993 (CCPA 1949).

Hence, Patent Owner must produce evidence demonstrating diligence from the time period just prior to May 31, 2005, to the constructive reduction to practice on July 14, 2005, with the filing of the '062 application. As evidence of diligence, Patent Owner relies on the Declarations of Mr. Sanders and Ms. Chipperson. PO Resp. 25–26; Ex. 2001 ¶ 2; Ex. 2078; Ex. 2088 ¶¶ 2–80; Ex. 2087 ¶ 7. Specifically, Ms. Chipperson states:

> I diligently worked together with the inventors on editing and improving the '062 patent application nearly every day during the time period beginning just prior to May 31, 2005 and ending on July 14, 2005 with the filing of the '062 application (e.g., May 20, June 2, 3, 16, 17, 18, 20, 21, 22, 23, 24, 27, July 5, 6, 7, 8, 11, 12). The only days during the period from just prior to May 31, 2005 and ending on July 14, 2005 that I did not work on the '062 application were either a holiday, a weekend, or days on which I worked on other matters for other clients.

Ex. 2078 ¶ 78. As corroboration, Ms. Chipperson references Exhibits 2019 through Exhibit 2076, which include draft specifications, figures, and claims for the '062 application that were generated throughout the critical period. Ex. 2078 ¶ 19.

Petitioner argues that Patent Owner's explanation of diligence is deficient because it alleges work on only 17 out of 45 days of the critical period. Pet. Reply 21. Petitioner further asserts that the submitted declarations do not cure the alleged deficiencies of the Patent Owner Response because they too "lack any specificity regarding what they did and

when they did it." *Id.* (citing *GEP Power Prods., Inc. v. Arctic Cat Inc.*, IPR2016-01385, Paper 27 at 16 (PTAB Dec. 5, 2017)). In general, Petitioner asserts that the submitted evidence is conclusory and lacks explanation. Pet. Reply 22–24.

We, however, are persuaded that Patent Owner has sufficiently demonstrated diligence. As asserted by Patent Owner, Mr. Sanders and Ms. Chipperson worked diligently "nearly every day" during the time period beginning May 31, 2005 and ending on July 14, 2005, and prepared and exchanged 18 different versions of the draft patent application during that time. PO Sur-Reply 10. Patent Owner submits a table detailing the dates on which the draft patent applications were created and edited. *Id.* at 11–12.

For the aforementioned reasons, we are persuaded that Patent Owner has sufficiently demonstrated diligence from the time period prior to May 31, 2005, to the constructive reduction to practice on July 14, 2005.

3. Conclusion

Because we conclude that Patent Owner has produced evidence sufficient to demonstrate conception and diligence to constructive reduction to practice to antedate Lee, we are not persuaded that Petitioner has shown by a preponderance of the evidence that claims 1–7 and 10–14 of the '307 patent are anticipated by Lee or claims 1–14 of the '307 patent are unpatentable as obvious over Lee and Nagai.

III. PATENT OWNER'S CONTINGENT MOTION TO AMEND

Pursuant to 35 U.S.C. § 316(d)(1) and 37 C.F.R. § 42.121(a), Patent Owner moves to replace claims 1–14 of the '307 patent with proposed substitute claims 15–28. PO MTA 1. The motion is contingent on our determination as to whether a preponderance of the evidence establishes that

claims 1–14 of the '307 patent are unpatentable. *Id.* As discussed above, we determine that original claims 1–14 of the '307 patent have been shown to be unpatentable by a preponderance of the evidence. *See* Sections II.D.4, II.E. Therefore, we proceed to address Patent Owner's contingent Motion to Amend.

In support of the Motion to Amend, Patent Owner relies on the Declaration of Mr. DeFilippis. *Id.*

A. Proposed substitute claims

Patent Owner submits the following proposed substitute claims 15–28:

> 15. An apparatus or system for locally recording locally generated audio, [said locally generated audio also being wirelessly transmitted to, and remotely recorded by, a remote recorder] and remotely recording said locally generated audio as remotely recorded audio data comprising:
>
> at least one local audio device wearable by a creator of said locally generated audio including:
>
> at least one local audio device receiver for receiving at least one of the group consisting of digital data, time data, and audio data;
>
> at least one audio input port for receiving said locally generated audio from an audio input device, said audio input device wearable by a creator of said locally generated audio;
>
> a wireless transmitter transmitting said locally generated audio to a remote recorder;
>
> at least one memory; [and]
>
> at least one control unit electrically coupled to said local audio device receiver, said audio input device, and said memory for creating local audio data and storing said local audio data in said memory; and
>
> said at least one remote recorder receiving and remotely recording said locally generated audio as remotely recorded

audio data, receiving said local audio data, and replacing said remotely recorded audio data with said local audio data.

[wherein said local audio data may be retrieved after said locally recording and combined with said remotely recorded audio data.]

16. A system according to claim [1]15, wherein said local audio data includes at least one identifier selected from the group consisting of track identifiers, local audio device identifiers, performer identifiers, and combinations thereof.

17. An apparatus or system according to claim [1]15 wherein said at least one local audio device is at least one bodypack.

18. An apparatus or system according to claim [1]15 wherein said creator of said locally generated audio is a live performer.

19. An apparatus or system according to claim [1]15 wherein said at least one local audio device further includes:

at least one audio output port.

20. An apparatus or system according to claim [5]19 wherein said locally generated audio is transmitted from said at least one local audio output port directly or indirectly to a remote recorder.

21. An apparatus or system according to claim [1]15 wherein said audio input device is a microphone.

22. An apparatus or system according to claim [1]15 wherein said at least one memory is removable from said at least one local audio device.

23. An apparatus or system according to claim [1]15 wherein said at least one memory is a memory card.

24. An apparatus or system according to claim [1]15 wherein said time data includes at least one of the group consisting of hour data, minute data, second data, and combinations thereof.

25. An apparatus or system according to claim [1]15 wherein said digital data includes setting data for said at least one local audio device.

26. A method of locally recording locally generated audio, said locally generated audio also being wirelessly transmitted to, and remotely recorded by, a remote recorder as remotely recorded audio data comprising the steps of:

locally receiving said local audio generated by at least one performer during an audio event; and

transmitting said local audio, directly or indirectly, to at least one of the group consisting of a recorder, a receiver, and combinations thereof;

locally recording said local audio as local audio data in at least one memory of at least one local audio device wearable by a creator of said local audio;

remotely recording said transmitted local audio via at least one of the group consisting of a recorder, a receiver, and combinations thereof as remotely recorded audio data;

retrieving [wherein] said local audio data [is retrieved] from said at least one memory of said at least one local audio device during or subsequent to said audio event and replacing [is combined with] said remotely recorded audio data with said local audio data.

27. A method according to claim [12]26, said method further comprising the step of:

locally receiving or generating master time data;

wherein said master time data includes at least one of the group consisting of hour data, minute data, second data, and combinations thereof.

28. A method according to claim [12]26, further comprising:

manipulating said local audio data contained in at least a portion of said memory;

wherein said manipulation includes at least one of the group consisting of adding said track identifier to at least a portion of said memory, deleting said track identifier from at least a portion of said memory, altering said track identifier associated with at least a portion of said memory, adding said local audio device identifier to at least a portion of said memory, deleting said local audio device identifier from at least a portion of said memory, altering said local audio device identifier associated with at least a portion of said memory, adding said performer identifier to at least a portion of said local audio data, deleting said performer identifier from at least a portion of said local audio data, altering

> said performer identifier associated with at least a portion of said local audio data, and combinations thereof.

PO MTA 31–34.

B. Procedural Requirements

"Before considering the patentability of any substitute claims, however, the Board first must determine whether the motion to amend meets the statutory and regulatory requirements set forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121." *Lectrosonics, Inc. v. Zaxcom, Inc.*, Case IPR2018-01129, Paper 15 (PTAB Feb. 25, 2019) (precedential) ("*Lectrosonics*").

First, the Motion to Amend proposes a reasonable number of substitute claims. 35 U.S.C. § 316(d)(1)(B). "There is a rebuttable presumption that a reasonable number of substitute claims per challenged claim is one (1) substitute claim." *Lectrosonics* at 4–5 (citing 37 C.F.R. § 42.121(a)(3)). The Petition challenges 14 claims. The Motion to Amend proposes 14 substitute claims. PO MTA 1. We determine that the number of proposed claims is reasonable.

Second, the proposed substitute claims respond to a ground of unpatentability involved in this trial. *Lectrosonics* at 5–6. The Motion to Amend proposes adding the following limitation to independent claim 1, resulting in proposed substitute independent claim 15:

> said at least one remote recorder receiving and remotely recording said locally generated audio as remotely recorded audio data, receiving said local audio data, and replacing said remotely recorded audio data with said local audio data.

Further, the Motion to Amend proposes adding the following limitation to independent claim 12, resulting in proposed substitute independent claim 26:

> retrieving [wherein] said local audio data [is retrieved] from said at least one memory of said at least one local audio device during or subsequent to said audio event and replacing [is combined

> with] said remotely recorded audio data <u>with said local audio data</u>.

PO MTA 31–34. Patent Owner asserts that the proposed substitute claims are patentable over the references at issue in this proceeding. *Id.* at 17–31. We determine that the amended language in the proposed substitute claims is responsive to the grounds of unpatentability involved in this trial.

Third, "[a] motion to amend may not present substitute claims that enlarge the scope of the claims of the challenged patent or introduce new subject matter." *Lectrosonics* at 6–8 (citing 35 U.S.C. § 316(d)(3); 37 C.F.R. § 41.121(a)(2)(ii)). Patent Owner asserts that the proposed substitute claims add only narrowing features and do not enlarge the scope of the claims. PO MTA 2.

Petitioner argues that Patent Owner's proposed substitute claims improperly enlarge the scope of the claims. Pet. Opp. to MTA 2–3. Specifically, Petitioner asserts that the proposed amendments enlarge the claims because "they cover something the original claims do not—a full replacement of the remotely recorded audio data with the locally recorded audio data. The original claims required combining, which the amendments change to replacing." *Id.* (citing PO MTA 31, 33; Ex. 1024, 173:19–174:6).

Patent Owner asserts that Petitioner's argument is premised on an overly narrow interpretation of "combining." PO Reply to Opp. to MTA 2–3. Patent Owner asserts that the term "combining" encompasses any operation on inputs that produces a result. *Id.* at 3. We agree with Patent Owner. As described above, we construe the "combining" limitation broadly to encompass embodiments including the combining of multiple audio tracks into a multitrack audio file. *See* Section II.B.1. Patent Owner proposes an amendment that limits claims 15 and 26 to "replacing" remotely

recorded audio data with local audio data, thereby limiting the scope of the claims. *See* PO MTA 31–34. We determine that the proposed amendment narrows claims 15 and 26.

Petitioner further asserts that the amendment to claim 15 to delete "after said locally recording" broadens the claim to cover retrieving both during and after the local recording. *Id.* at 3. Patent Owner asserts that local audio data cannot be retrieved until after it is created. PO Reply to Opp. to MTA 3. We agree with Patent Owner that proposed substitute claim 15 cannot be properly construed as to cover retrieving both during and after the local recording because local audio data cannot be retrieved until after it is created. PO Reply to Opp. to MTA 3. Accordingly, we determine the proposed substitute claims do not improperly enlarge the scope of the claims.

Patent Owner asserts that proposed substitute claims 15–28 are supported by the original disclosure in U.S. Patent Application No. 11/181,062 ("the '062 application"). PO MTA 4–13 (providing claim charts with citations to Ex. 2018). Petitioner asserts that the Motion fails to show support in the original disclosure for the "replacing" limitation. Pet. Sur-Reply to Opp. to MTA 4.

We disagree with Petitioner. We recognize that the '062 application does not recite the term "replacing." *See generally* Ex. 2018. However, the "description need not recite the claimed invention *in haec verba* but must do more than merely disclose that which would render the claimed invention obvious." *ICU Med., Inc. v. Alaris Med. Sys., Inc.*, 558 F.3d 1368, 1377 (Fed. Cir. 2009). The '062 application describes that locally recorded data may be retrieved and used to repair the corruption of the audio file generated by the receiver/recorders that occurred due to the receipt of corrupted audio

data or dropouts. Ex. 2018, 12:12–17, 28:18–21. In other words, the '062 application describes repairing corrupted remotely stored audio using locally recorded audio data. We determine, based on the testimony of Mr. DeFilippis, that the term "repair," in the context of the specification, adequately supports the claimed "replacing." Ex. 2086 ¶¶ 54–56. Mr. Tinsman, Petitioner's expert, explains that the '307 patent specification discloses that timestamps are used to synchronize the "local audio with the wirelessly transmitted version of the local audio to *replace* any dropouts." Ex. 1011 ¶ 18 (emphasis added). Accordingly, we agree with Patent Owner that the proposed substitute claims do not enlarge the scope of the claims or introduce new subject matter.

Finally, the Motion to Amend includes a claim listing, as required by 37 C.F.R. § 42.121(b). PO MTA 26–34; *Lectrosonics* at 8.

In view of the above, we determine that Patent Owner's Motion to Amend meets the statutory and regulatory requirements of 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121 in a manner sufficient to proceed with the issue of whether Petitioner has met its burden of persuasion with respect to patentability.

C. Claim Construction

Patent Owner argues that the limitation of "retrieving said local audio data from said at least one memory of said at least one local audio device during or subsequent to said audio event and replacing said remotely recorded audio data with said local audio data" (the "replacing" limitation) requires:

> (i) local audio generated by a performer is stored in a memory of a wearable local audio device as local audio data,

> (ii) the same local audio is transmitted to a remote recorder or receiver,
>
> (iii) the same local audio is remotely recorded at the recorder or receiver as remotely recorded audio data, and
>
> (iv) the local audio data is retrieved from the memory of the wearable local audio device and the remotely recorded audio data is replaced with the local audio data.

PO MTA 14–16.

Patent Owner asserts that its proposed claim construction is consistent with both the '307 patent specification and the proposed substitute claim language. PO MTA 15. Patent Owner further asserts that the '307 patent specification supports its proposed claim construction. *Id.* at 15–16 (citing Ex. 1001, 3:46–48, Fig. 6; Ex. 2086 ¶ 15). Specifically, Patent Owner asserts that the '307 patent specification sets forth an embodiment where "the '307 patent replaces segments of the local audio that were previously transmitted by a local audio device to a remote receiver/recorder but not received (e.g., dropout)." *Id.* at 16 (citing Ex. 2086 ¶ 15).

Petitioner argues that Patent Owner's proposed construction is unclear as to which elements Patent Owner wishes to construe and adds unexplained distinctions as to some terms. Pet. Opp. to MTA 2.

We agree with Patent Owner that the amended claim language supports its proposed claim construction. Notably, proposed substitute claim 15 requires "locally recording locally generated audio," transmitting the "locally generated audio to a remote recorder," and "recording said locally generated audio as remotely recorded audio data" for "replacing said remotely recorded audio data with said local audio data." *Id.* Proposed substitute claim 26 recites similar limitations. We determine that the

addition of the step of "transmitting," as well as the explicit step of "replacing," supports Patent Owner's proposed construction.

As argued by Patent Owner, the '307 patent specification discloses "a process for recording audio *and for replaying and re-recording segments of missed audio*." Ex. 1001, 3:46–48 (emphasis added). Figure 6 describes the step of "[l]ocal audio devices record audio and transmit to receiving equipment in real time." *Id*. at FIG. 6, step 608. Later, "[l]ocal audio devices process [a] playback command and synchronize playback to the time code reference contained in the playback command and transmit synchronization data to receiving equipment." *Id*. at FIG. 6, step 614. Next, the "local audio devices transmit stored audio, which is simultaneously recorded by the receiving equipment, starting at the time specified in the playback command." *Id*. at FIG. 6, step 616. The dropout is then corrected as the "local audio devices continue to replay audio while the receiving equipment re-records the audio." *Id*. at FIG. 6, step 618. Although the '307 patent specification does not use the term "replacing," we determine that the aforementioned disclosure, and, more specifically, the playback command causing retransmission of local audio and the subsequent re-recording of the audio, provides adequate support for the amended claim recitation of "replacing."

Based on the foregoing, we agree with, and adopt, Patent Owner's proposed claim construction for the "replacing" limitation to require:

> (i) local audio generated by a performer is stored in a memory of a wearable local audio device as local audio data,
>
> (ii) the same local audio is transmitted to a remote recorder or receiver,
>
> (iii) the same local audio is remotely recorded at the recorder or receiver as remotely recorded audio data, and

> (iv) the local audio data is retrieved from the memory of the wearable local audio device and the remotely recorded audio data is replaced with the local audio data.

PO MTA 14–16.

D. Whether the substitute claims comply with 35 U.S.C. § 112

Petitioner argues that the proposed substitute claims fail to particularly point out and distinctly claim the invention. Pet. Opp. to MTA 5–6 (citing *IPXL Holdings, L.L.C. v. Amazon.com, Inc.*, 430 F.3d 1377, 1384 (Fed. Cir. 2005)). In particular, Petitioner argues that proposed substitute independent claim 15 improperly covers both "an apparatus and a method of using it." *Id.* at 5. Specifically, Petitioner argues that proposed substitute claim 15 recites apparatus or system elements, and also recites "a wireless transmitter transmitting," and "at least one remote recorder receiving and remotely recording . . . , receiving . . . , and replacing." *Id.* at 5 (citing PO MTA 31). Petitioner contends that "if the element 'said at least one remote recorder receiving' is not a method step, the claim would make no sense because that would make 'said at least one remote recorder' part of the local audio device." *Id.* (citing PO MTA 30).

Patent Owner argues that the "claimed phrases quoted by Petitioner are not steps performed by a user with the claimed system," as in *IPXL*, but "instead qualify the types of components that are in the claimed system." PO Reply to Opp. to MTA 5. Patent Owner also argues that proposed substitute claim 15 "separately recites (i) a remote recorder and (ii) a local audio device including particular components (*e.g.*, a local audio device receiver, audio input port, a transmitter, a memory and a control unit)." *Id.* at 5–6.

We agree with Patent Owner. The limitations quoted by Petitioner qualify the functions of the apparatus elements. *See* PO MTA 31. Specifically, the claimed wireless transmitter is for "transmitting said locally generated audio to a remote recorder" and the claimed at least one remote recorder is for "receiving and remotely recording said locally generated audio as remotely recorded audio data, receiving said local audio data, and replacing said remotely recorded audio data with said local audio data." Claim 15 does not recite a step of transmitting or steps of receiving, recording, and replacing, but rather recites a defined functionality for the recited wireless transmitter and at least one remote recorder. We further are not persuaded that substitute claim 15 specifies the remote recorder as part of the local audio device. We agree with Patent Owner that substitute claim 15 clearly recites several elements of the claimed apparatus, of which the remote recorder is one.

Petitioner further argues that "[c]laim 26 is 'not sufficiently precise' because it recite a series of steps without any conjunction before the last step." Pet. Opp. to MTA 6 (citing *IPXL Holdings*, 430 F.3d at 1384). Petitioner argues that "it is unknown whether just one of the 'transmitting,' 'locally recording,' 'remotely recording,' and 'retrieving' steps is required to infringe or all three." *Id.* In response, Patent Owner asserts that each step identified by Petitioner is required by its preceding step, and, "[t]herefore, it is impossible for any of the latter steps to be executed without executing the preceding steps." PO Reply to Opp. to MTA. 6. We agree with Patent Owner. Each step recited by proposed substitute 26 refers to a previous step, and, therefore, we are not persuaded that there is any lack of clarity as to whether any step is required. Accordingly, we determine that the proposed substitute claims comply with 35 U.S.C. § 112.

E. Level of Ordinary Skill in the Art

As discussed above, Petitioner and Patent Owner assert that a person of ordinary skill in the art, at the time of the '307 patent, would have had a Bachelor's degree in electrical engineering and two or more years of experience working with audio and wireless communications systems. Section II.C; Pet. 8 (citing Ex. 1011 ¶ 24); Ex. 2086 ¶ 13. We adopt the same level of ordinary skill in the art in analyzing Patent Owner's proposed substitute claims.

F. Patentability of substitute claims over Strub in combination with Nagai or Gleissner, and Wood

Petitioner argues that substitute claims 15–28 are unpatentable under 35 U.S.C. § 103(a) as obvious over Strub in combination with Nagai or Gleissner, and Wood. PO Opp. to MTA 6–11.

1. Wood (Ex. 1008)

Wood is directed to a method for repairing a broadcast signal to improve the quality of the signal that is available to the end user. Ex. 1008, 2:28–30. Wood discloses a satellite or terrestrial digital television receiver 10 for receiving a digital video and audio stream. *Id.* at 3:16–18. Processor 16 monitors the broadcast signal to ascertain when the signal has been corrupted. *Id.* at 3:22–23. Transceiver 20 may request a replacement undamaged copy of the lost video and audio segments upon the detection of a lost portion of data in order to replace the lost data. *Id.* at 4:4–10. Multiplexor 24 is provided for combining the replacement portions supplied by transceiver 20 with the received broadcast signal. *Id.* at 4:11–12. Multiplexor 24 splices the "lost" video and/or audio obtained via the broadband connection into the "damaged" video and audio stream. *Id.* at 4:12–14.

2. Differences between the prior art and claims

Petitioner argues that substitute claims 15–28 are unpatentable under 35 U.S.C. § 103(a) as obvious over Strub in combination with Nagai or Gleissner, and Wood. Pet. Opp. to MTA 6–11. Petitioner asserts that Strub discloses a recording unit that stores the audio from a microphone as local audio data and transmits the audio to other recording units, which can store it as remotely recorded audio data. *Id.* at 6–8 (citing Pet. 16–29; Ex. 1003, 12:31–39, 35:54–65). That is, Petitioner argues that Strub (alone or in combination with Nagai or Gleissner) teaches limitations of proposed substitute claims 15 and 26 for the same reasons discussed in the Petition. *Id.* at 6–8, 11 (citing Pet. 16–29); *see* Sections II.D.4, II.E. In this way, Petitioner asserts that, under Patent Owner's proposed construction (which we adopt), Strub (alone or in combination with Nagai or Gleissner) teaches all of the limitations of claims 15 and 26 except for the newly amended "replacing" limitation. Pet. Opp. to MTA 6–8, 11; *see* Section III.C.

Petitioner asserts that, although Strub discloses combining local and remotely recorded audio data, it does not expressly disclose "replacing said remotely recorded audio data with said local audio data." Pet. Opp. to MTA 8. For that limitation, Petitioner relies on the combined teachings of Strub and Wood. *Id.* at 8–11. Specifically, Petitioner asserts that Wood discloses a method to "fix defects or gaps in a recording of a received transmission ('*remotely recorded audio data*') by requesting an undamaged local copy and 'combining the replacement portions' ('*local audio data*') with the previously recorded transmission." *Id.* at 8 (citing Pet. 28–30); *see* Ex. 1008, 1:31–2:13, 3:22–29, 4:11–27, Figs. 1, 2; Ex. 1011 ¶ 58 (citing Ex. 1008, 1:31–2:13), ¶ 61 ("Wood discloses sending a request when a dropout is detected so that the content can be resent and combined with the

previously received audio to repair the dropout."). Petitioner contends that, in the event of a transmission failure, it would have been obvious to a person of ordinary skill in the art to fix a defect in a remote recording of Strub's system by replacing the corrupt segment with a local copy. Pet. Opp. to MTA 9–10 (citing Pet. 28–29).

Patent Owner argues that Petitioner fails to demonstrate that Wood teaches "a local audio device locally recording local audio . . . because 'there is no local recording device in Wood.'" PO Reply to Opp. to MTA 7 (quoting Ex. 2086 ¶ 35). We are not persuaded by this argument because, as Petitioner responds, "Petitioner relied on Strub (alone or in combination with Nagai or Gleissner) to disclose each claim element (including the 'local audio device'), except for the 'replacing,' which is disclosed and rendered obvious by the Strub-Wood combination." Pet. Sur-Reply to Opp. to MTA 7 (citing Pet. Opp. to MTA 10–11). This argument by Patent Owner is tantamount to an attack on Wood alone, but Petitioner's argument is based on the combination of Strub (alone or in further combination with Nagai or Gleissner) and Wood. "Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references." *In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986).

Regarding the combination of Strub and Wood, Petitioner asserts that the addition of Wood's method for replacing a dropout would have been obvious because Strub contemplated the problem of deficient recordings and Wood provided a known solution. Pet. Opp. to MTA 9. Specifically, Petitioner asserts that Strub recognized the problem of deficient recordings, and a person of ordinary skill in the art would have known that one such deficiency would have been dropouts. Pet. 27 (citing Ex. 1003, 48:18–30,

85:28–41 ("during an event, the recording obtained by a particular recording unit will be deficient in some way"); Ex. 1011 ¶ 60). In order to solve the problem of dropouts, Petitioner asserts a person of ordinary skill in the art would have combined Wood with Strub in order to improve signal quality and produce a program free of dropouts. *Id.* at 29 (citing Ex. 1003, 35:54–57, 37:53–38:4; Ex. 1008, 1:28–30, 3:4–6; Ex. 1011 ¶ 63). In Petitioner's view, the combination of Strub and Wood would have been expected because techniques for detecting dropouts and requesting replacements were well known, and Wood discloses such a technique. Pet. Opp. to MTA 9 (citing Ex. 1007); Pet. Sur-Reply to Opp. to MTA 8. Patent Owner's own expert, Mr. DeFilippis, explains that if backup audio was available, it was known to replace corrupted audio with replacement audio. *See generally* Ex. 1024, 19:2–21:12.

Patent Owner argues that "it is unclear how the teachings of Strub and Wood could be combined in the manner suggested by Petitioner to achieve the claimed invention with a reasonable expectation of success." PO Resp. 40 (quoting Ex. 2086 ¶ 39). Specifically, Patent Owner asserts that Strub "allows the local audio data to be retrieved by transmitting the data to other devices via transmitter 309 or wired connections, such as USB," which differs substantially from Wood's combining of a broadcast signal transmitted on one channel with a replacement signal on another channel. *Id.* at 41 (citing Ex. 1003, 12:4–39, 66:7–25, Fig. 3). Patent Owner argues that Wood discloses a system for "TV broadcasting and addresses problems with a broadcasting channel using a second channel," and a person with ordinary skill in the art "would not have looked to Wood to address the

problem identified in the '307 patent." *Id.* at 44–45 (quoting Ex. 2086 ¶ 45).[9]

Patent Owner further argues that "Petitioner erred by focusing on whether the concept of repairing dropouts was known." PO Reply to Opp. to MTA 7–8. Patent Owner argues that Petitioner fails to establish that the "claimed combination as a whole" would have been obvious. *Id.* at 7. Patent Owner argues that "Wood would have taught repairing dropouts by a completely different approach using a server and recorder, neither of which is anywhere near the location of the locally generated audio." *Id.* at 8.

We are persuaded by Petitioner that Wood is analogous art, as it is reasonably pertinent to the problem faced by the inventors of the '307 patent. *See In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004); Pet. Reply 9 ("Wood and the '307 patent are in the field of wireless audio recording and processing" and both are "concerned with dropouts, corrupt audio, or the loss of audio associated with transmissions and combining recordings in order to provide a complete signal." (citing Ex. 1001, 16:53–61; Ex. 1008, 1:31–2:13)). Nevertheless, in view of the differences between the asserted prior art references and the subject matter of the proposed substitute claims, Petitioner presents a weak case of obviousness. For instance, although Strub recognizes that recordings may be deficient, Strub does not specifically contemplate deficiencies resulting from dropouts in transmission of local audio to a remote recorder or receiver. *See* Ex. 1003,

[9] Patent Owner presents several arguments towards the bodily incorporation of Wood in to Strub. PO Resp. 41–47. We are not persuaded by these arguments because the test for obviousness is what the combined teachings of the references would have suggested to a person with ordinary skill in the art. *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

48:18–30, 85:28–41. Moreover, even if a person of ordinary skill in the art would have understood that dropouts could be one cause of deficient recordings in Strub, as Petitioner's expert opines, and Wood teaches a method for repairing dropouts, Wood focuses on repairing dropouts in a received TV broadcast signal rather than during post-processing of a recording, as in the '307 patent. Furthermore, the evidence that a person with ordinary skill in the art would have looked to combine a small, wearable device for recording the audio of an event, as taught in Strub, with a method for repairing a TV broadcast signal, as taught in Wood, does not support a strong showing of obviousness. Considering all of the arguments and evidence of record, we conclude that Petitioner's proposed combination of the teachings of Wood with Strub, alone or combined with Nagai or Gleissner, at best only slightly weighs in favor of a conclusion of obviousness.

3. Objective Indicia of Nonobviousness

Patent Owner further argues that objective indicia of nonobviousness demonstrate that the substitute claims are patentable over the prior art. PO MTA 30. Patent Owner asserts that the submitted evidence demonstrates that: (1) there was a long-felt need for a wearable, wireless device that could reliably capture sound data from actors recording a movie or television show and the invention recited in the substitute claims satisfied this need; and (2) the invention received industry praise and recognition. *Id.* (citing Exs. 2103–2104, 2086–2087, 2098–2102); PO Resp. 52–59 (citing Exs. 2103–2108); PO Sur-Reply 28–32.

a. Nexus

As described above, for objective indicia of nonobviousness to be accorded substantial weight, its proponent must establish a nexus between

the evidence and the merits of the claimed invention. *ClassCo*, 838 F.3d at 1220; *see* Section II.D.4.b.ii. "Where the offered secondary consideration actually results from something other than what is both claimed and *novel* in the claim, there is no nexus to the merits of the claimed invention," meaning that "there must be a nexus to some aspect of the claim not already in the prior art." *In re Kao*, 639 F.3d at 1068–69.

In contrast to the original claims of the '307 patent, we construe substitute claims 15–28 as being directed to repairing dropouts by receiving local audio data and replacing remotely recorded audio data with the received local audio data. *See* Section III.C. In light of the different scope of proposed substitute claims 15–28, we consider the issue of nexus anew.

In its Motion to Amend, Patent Owner argues that there was a "long felt need for a wearable wireless device that could reliably capture sound data from actors recording a movie or television show" and the "invention received industry praise and recognition including an Emmy award and a Technical Achievement Award from the Academy of Motion Picture Arts and Sciences." PO MTA 30 (citing Exs. 2086, 2098–2102, 2087). Although Patent Owner does not provide any more analysis in its Motion to Amend (Pet. Opp. to MTA 25–26), Patent Owner's arguments and evidence submitted in its Response are directed to the scope of the proposed substitute claims, and we therefore consider the totality of the evidence regarding objective indicia of nonobviousness.

Patent Owner submits the testimony of Mr. Wexler, who explains: "I have been in many situations where for a variety of reasons there have been *RF dropouts and in some cases the wireless on the talent has moved way out of range . . . . [P]rior to Zaxcom's invention, the audio would be lost forever in these situations*." PO Resp. 52 (citing Ex. 2104 ¶ 6) (emphasis

added). That is, Mr. Wexler refers generally to the prevention of dropouts and lost audio, i.e., the "replacing" limitation. *See* Section III.C. Mr. Wexler's testimony has probative value in establishing that the asserted objective evidence is tied to the proposed substitute claims.

Patent Owner also cites the following testimony from Mr. Sarokin and Mr. Wexler:

> I can say without the slightest qualification that the work of Zaxcom as described and claimed in the '307 patent has revolutionized the sound for picture industry . . . .
>
> Mr. Sanders announced his 3rd generation units. I purchased 12 TRX 900 transmitters and these included a mini SD card slot for recording and a built in remote control receiver . . . Not only could they transmit audio, they could also receive time code sync signals and remote control commands. Zaxcom combined this incredible capability with a built in digital recorder, making his digital transmitters full synchronous recording systems. This capability solved the major limitation of radio mics … radio mics had a very limited range. Depending on what else is on the frequency, the range can be as little as 50 feet. In a big motion picture scene, especially on a film that Ridley Scott is directing, there can be simultaneous action hundreds of feet apart. Prior to Zaxcom's invention of recording radios, the field mixer would capture as much of the dialog as his equipment would allow and the rest would have to be dubbed in post production. I can't emphasize enough the revolution these recording radios brought on. If the actors in a scene went in and out of radio range the SD card on the transmitter would continue to record the audio . . . Zaxcom also integrated all their equipment so a sound mixer could hit a single button on a Zaxcom recorder and all the radios in use would play back from a certain take or time code start point so the scene could be remixed without any radio drop outs. Zaxcom has been doing this since 2005. 14 years! . . .
>
> Each Zaxcom transmitter can digitally record the output of the microphone along with transmitting the signal to the receiver.

> If there is a drop out of the RF signal, the identical recording in the transmitter can be used by post production. . .
>
> With the Zaxcom recording transmitters, the audio will always be available directly from the transmitter. I have done scenes where the actors have gone out of wireless range resulting in no audio at the receiver, but when the transmitters are back in range I have played back the full track from the transmitters, re-mixed and delivered to post production. The microSD cards from the transmitter can be directly delivered to post for their use as well . . . .

PO Resp. 53–55 (citing Ex. 2103 ¶¶ 3, 4, 6; Ex. 2104 ¶ 6). Mr. Sarokin and Mr. Wexler refer specifically to the "replacing" limitation of the '307 patent recited by the proposed substitute claims. For instance, Mr. Wexler states that each "transmitter can digitally record the output of the microphone along with transmitting the signal to the receiver. If there is a drop out of the RF signal, the identical recording in the transmitter can be used by post production." Ex. 2104 ¶ 6. In other words, a dropout causing an issue with remotely recorded audio can be fixed by "replacing" the remotely recorded audio with local audio data from a recording transmitter. We determine that this evidence is strongly probative in establishing that the asserted objective evidence is tied to the invention recited in the proposed substitute claims.

Similarly, Patent Owner's evidence of praise in the form of the Technical Achievement Award from the Academy of Motion Picture Arts and Sciences and the Emmy award from the Academy of Television Arts and Sciences awarded to Patent Owner also has probative value in establishing that the asserted objective evidence is tied to the invention disclosed and claimed in the substitute claims. For example, the Emmy award specifically praises the digital recording of microphone signals in the wireless transmitter to provide *backup* recording of the original microphone signal. PO Resp. 59 (citing Ex. 2106). That is, the Emmy award praises the

"replacing" feature recited by the proposed substitute claims. We determine that this evidence is probative in establishing that the asserted objective evidence is tied to the invention disclosed in the substitute claims.

Petitioner contends that Patent Owner "presents no nexus argument, referring only to '[t]he invention.'" Pet. Opp. to MTA 26 (citing PO MTA 30). Petitioner specifically argues that Mr. Wexler and Mr. Sarokin praise unclaimed features. *Id.* at 28–29; PO Resp. 28–29. Petitioner further argues that the Technical Achievement Award and Emmy focus on "digital modulation technology," and "merely mention[] the ability to also record audio in the transmitter bodypack as one feature of the system." *Id.* (citing Ex. 2102, 1); *see* PO Resp. 29–30.

A presumption of nexus exists for objective considerations when the objective evidence is tied to a specific product and that product is the invention disclosed and claimed in the patent. *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1329 (Fed. Cir. 2016). Proposed substitute claims 15 and 26 recite the "replacing" limitation, which is supported by the '307 patent specification and is the key feature included in Patent Owner's product. *See* Section III.C. Accordingly, we determine that there is a presumption of a nexus for Patent Owner's evidence of secondary evidence, and the evidence cited by Patent Owner further supports a finding of a nexus. We are not persuaded by Petitioner's argument that the testimony of Mr. Wexler and Mr. Sarokin, and the Technical Achievement Award and Emmy, are directed to unclaimed features. As discussed above, both Mr. Wexler and Mr. Sarokin specifically identify the "replacing" limitation as a basis for the praise. *See* Ex. 2104 ¶ 6; Ex. 2103 ¶¶ 3, 4, 6. The Emmy similarly discusses providing a backup recording to the original recording, and identifies the "replacing" limitation. *See* PO Resp. 59.

Accordingly, considering the totality of evidence before us, we determine that Patent Owner has established a nexus between the evidence of industry praise and long-felt need and the "replacing" limitation of the proposed substitute claims.

b. Long-Felt Need

"Evidence of a long-felt but unresolved need can weigh in favor of the non-obviousness of an invention because it is reasonable to infer that the need would not have persisted had the solution been obvious." *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1056 (Fed. Cir. 2016). Patent Owner asserts that there was a long-felt need for a "wireless, wearable, transmitting and recording device that could reliably capture sound data from actors recording a movie or television show." PO Resp. 52.

Patent Owner argues that the "claimed invention of the '307 patent satisfied this long felt need." *Id.* at 53. As support, Patent Owner submits the declarations of Mr. Sarokin and Mr. Wexler. PO Resp. 52–56 (citing Exs. 2103, 2104). For example, Mr. Sarokin explains that "[f]or the first time radio mic transmitters were now transceivers. Not only could they transmit audio, they could also receive time code sync signals and remote control commands. Zaxcom combined this incredible capability with a built in digital recorder, making his digital transmitters full synchronous recording systems. This capability solved the major limitation of radio mics." Ex. 2103 ¶ 6. Mr. Sarokin goes on to explain that "Zaxcom also integrated all of their equipment so a sound mixer could hit a single button on a Zaxcom recorder and all the radios in use would playback from a certain take or time code start point so the scene could be re-mixed without any radio drop outs." *Id.* Mr. Wexler also explains that "[i]n the past, prior to Zaxcom's invention, the audio would be lost forever in these situations

[where there has been a dropout]. With Zaxcom recording transmitters, the audio will always be available directly from the transmitter." Ex. 2104 ¶ 6.

Petitioner asserts that Patent Owner has failed to provide evidence of long-felt need, specifically arguing that Patent Owner "presents no evidence of the field requesting such a device at any time, much less before the '307 patent, and no evidence of efforts to meet such a request." Pet. Opp. to MTA 27; *see* Pet. Reply 26–27. More specifically, Petitioner argues that Patent Owner "only generally discusses RF dropouts and talent moving out of range, without discussing the significance of the problem, if any, before 2005." Pet. Opp. to MTA at 27–28; Pet. Reply 27. Petitioner also argues that Patent Owner fails to show "the claimed features—without unclaimed features in the specification—filled the need." Pet. Reply. 26.

Considering the totality of the evidence, we determine that Patent Owner has demonstrated that a long-felt need existed for a "wireless, wearable, transmitting and recording device that could reliably capture sound data from actors recording a movie or television show." As discussed above, we credit the testimony of Mr. Sarokin and Mr. Wexler, who both identify repairing dropouts as a long-felt need. PO Resp. 52–56 (citing Ex. 2103 ¶ 6; Ex. 2104 ¶ 6). As also discussed above, we credit the testimony of Mr. Sarokin, who explains that "[b]y 2005 my sound cart was fully digital . . . I purchased 12 TRX 900 transmitters . . . Zaxcom combined this incredible capability [of transmitting audio, receiving time code sync signals, and remote control commands] with a built in digital recorder, making his digital transmitters full synchronous recording systems." Ex. 2103 ¶ 6. Mr. Sarokin explains that "[t]his capability solved the major limitation of radio mics." *Id.* We also credit the testimony of Mr. Wexler in explaining how the "replacing" limitation solved the long-felt need of

repairing dropouts. PO Resp. 52–56 (citing Ex. 2104 ¶ 6). As such, we are not persuaded by Petitioner's arguments that Patent Owner does not provide evidence of a long-felt need, and that claimed features solved that long-felt need.

We, however, agree with Petitioner that Patent Owner's evidence demonstrating that "the need was long felt based on the date when the problem to be solved was identified and efforts were made to solve the problem" is not strong. Pet. Opp. to MTA Reply 26–27 (citing *Texas Instruments Inc. v. U.S. Int'l Trade Comm'n*, 988 F.2d 1165, 1178 (Fed. Cir. 1993). Although Mr. Sarokin generally alleges that there was a long-felt need as of 2005, we are not persuaded by the evidence of a date of the identified problem, and efforts to solve that problem. As such, the lack of evidence on these points does not provide additional weight in favor of Patent Owner.

In sum, the evidence provided by Patent Owner establishes there was a persistent need, recognized by those of ordinary skill in the art, for a wireless, wearable, transmitting and recording device that could reliably capture sound data from actors recording a movie or television show." We determine that the evidence of long-felt need weighs in favor of nonobviousness.

c. Industry Praise

Evidence that the industry praised a claimed invention or a product that embodies the patent claims weighs against an assertion that the same claim would have been obvious. *WBIP*, 829 F.3d at 1334. As evidence of industry praise, Patent Owner relies upon the Declarations of Mr. Sarokin and Mr. Wexler. PO Resp. 52–59; PO Sur-Reply 31. Patent Owner further relies on the evidence of the awards for its products: the Technical

Achievement Award from the Academy of Motion Picture Arts and Sciences and the Emmy award from the Academy of Television Arts and Sciences. *Id.*

For example, Mr. Wexler states that "[w]ith Zaxcom's brilliant invention . . . I could always deliver a track to post production even . . . where there were failures of the RF transmission" and "nothing else even came close." PO Resp. 57 (citing Ex. 2104 ¶ 7). Mr. Sarokin further explains that he "can say without the slightest qualification that the work of Zaxcom as described and claimed in the '307 patent has revolutionized the sound for picture industry" and Mr. Sarokin "can't emphasize enough the revolution these recording radios brought on." *Id.* at 53 (quoting Ex. 2103 ¶ 3); Ex. 2103 ¶ 6. Mr. Sarokin further explains that "[n]o other company has anything remotely close" and "[t]here is nothing even remotely comparable." Ex. 2103 ¶¶ 6, 8.

Also probative is Patent Owner's evidence of the received awards. Patent Owner asserts the Emmy award specifically praises features of the proposed substitute claims including the digital recording of microphone signals in the wireless transmitter "to provide *backup recording* of the original microphone signal." PO Resp. 59 (quoting Ex. 2106) (emphasis added). Patent Owner further relies on, and we credit, the testimony of Mr. DeFilippis, a member of the committee who granted the award, who explains that "Mr. Sanders also received the Emmy award from the Academy of Television Arts and Sciences for the Zaxcom, Inc. digital recording wireless products that embody the claimed invention of the '307 patent." Ex. 2086 ¶ 76; *see* PO Sur-Reply 32–33. Patent Owner further asserts that "Glenn Sanders and the co-inventor of the '307 patent, Howard Stark, received the Technical Achievement Award from the Academy of

Motion Picture Arts and Sciences for the digital recording wireless products that embody the claimed invention of the '307 patent." PO Resp. 57–58 (citing Ex. 2101; Ex. 2102; Ex. 2087 ¶¶ 9, 10). Patent Owner further provides a press release for the Emmy that praises Patent Owner's "digital wireless transmission system for microphones *and a production tool that married wireless transmission with a recording device* located within the actor's body pack." Ex. 2107 (emphasis added).

Petitioner argues that the evidence of industry praise submitted by Patent Owner is directed to features that are "unclaimed, known in the art, or both." PO Opp. to MTA 28. Specifically, Petitioner argues that Mr. Wexler and Mr. Sarokin praise features directed to digital recording, wireless transmission, and time code signals, features that Petitioner alleges are not present in the claims. *Id.* at 28–29.

Although we agree with Petitioner that Patent Owner provides some evidence of industry praise toward features not recited by proposed substitute claims 15–28, we are persuaded that Patent Owner provides evidence of industry praise towards the "replacing" limitation that specifically addresses dropouts. *See* PO Resp. 52–58. The evidence of features that are not recited by proposed substitute claims 15–28 weighs neither for nor against nonobviousness. However, the testimonial evidence by Mr. Sarokin and Mr. Wexler praising Patent Owner's dropout correction features, as recited by the "replacing" limitation, weighs in favor of nonobviousness. Furthermore, the awards evidence that praises Patent Owner's digital recording devices that "married wireless transmission with a recording device located within the actor's body pack" also strongly weighs in favor of nonobviousness.

In sum, we determine that Patent Owner's evidence of industry praise weighs in favor of nonobviousness.

d. Failure of Others

Patent Owner asserts that others tried and failed to provide a device with similar features to the '307 patent, namely, "a wireless, wearable, local, transmitter/recorder, that stores the locally generated audio and transmits the same audio to a remote recorder so that the audio data from the local and remote devices can later be combined to fix dropouts."[10] PO Sur-Reply 30; *see* PO Resp. 56–57. More specifically, Patent Owner relies on the Declaration of Mr. Sarokin who states:

> Zaxcom would have no competition for almost 8 years. It was 2009 before SONY engineers were able to figure out the algorithms pioneered by Zaxcom. By the time Sony came out with their first digital radio Zaxcom was already on their 3rd generation . . .
>
> NO ONE else has recording capability, NO ONE else has systems integration. NO ONE else has reduced bandwidth digital radios, and NO ONE else has micro sized digital radios period.

PO Sur-Reply 30 (citing Ex. 2103 ¶¶ 5, 7); *see* PO Resp. 56–57.

Petitioner argues that Patent Owner provides no relevant evidence that others tried and failed to create the claimed technology, and that those failures were attributable to the claimed features. Pet. Reply 27–28 (citing *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1313 (Fed. Cir. 2006)). According to Petitioner, Patent Owner's evidence of the failure of others at

[10] Although Patent Owner presents the failure of others arguments as directed to the original claims of the '307 patent, we understand these arguments also to apply to the proposed substitute claims for the same reasons discussed above.

most demonstrates an attempt at digital modulation. *Id.* (citing PO Resp. 56).

We agree with Petitioner. We find Patent Owner's evidence of the failure of others to be conclusory and without adequate support for the proposition that others failed. Mr. Sarokin describes a lack of competition and states, without evidentiary support, that "it was 2009 before SONY engineers *were able to figure out* the algorithms." Ex. 2103 ¶ 5 (emphasis added). The submitted evidence, by itself, is insufficient for us to find that Sony, or any other industry competitor, failed in developing a competing product as other business or economic factors may have come into play. The lack of a competing product is insufficient evidence of whether others tried and failed at development. Accordingly, we do not find Patent Owner's evidence of the failure of others to weigh in favor of nonobviousness.

4. Weighing the Objective Indicia of Nonobviousness

"The objective indicia of non-obviousness play an important role as a guard against the statutorily proscribed hindsight reasoning in the obviousness analysis." *WBIP*, 829 F.3d at 1328. Indeed, the Federal Circuit has held that such evidence "may often be the most probative and cogent evidence in the record." *Id.* (quoting *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983)). We determine that Patent Owner has provided strong evidence of the nonobviousness of proposed substitute claims 15–28. Specifically, we find that the factors of long-felt need and industry praise weigh heavily towards nonobviousness. We do, however, agree with Petitioner that the evidence of the failure of others does not weigh towards nonobviousness. In sum, we are persuaded by Patent Owner that

the objective indicia of nonobviousness weighs towards a conclusion of nonobviousness.

5. Conclusion

Factual inquiries for an obviousness determination include secondary considerations based on objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Weighing all four *Graham* factors, we conclude that Petitioner has not shown by a preponderance of the evidence that substitute claims 15–28 would have been obvious over the combination of Strub and Wood (with or without Nagai or Gleissner) because we determine that Petitioner's proposed combination of the teachings of the references presents a weak case of obviousness, whereas the objective indicia of nonobviousness weigh heavily in favor of nonobviousness.

G. Patentability of substitute claims over Lee alone or Lee in combination with Nagai

Petitioner contends that substitute claims 15–28 are unpatentable under 35 U.S.C. § 102 as anticipated by Lee or 35 U.S.C. § 103 as obvious over Lee and Nagai. Pet. Opp. to MTA. 11–13; Pet. 48–76. For the same reasons discussed above, we determine that Patent Owner has produced evidence sufficient to demonstrate conception and diligence to constructive reduction to practice to antedate Lee. *See* Section II.H.2. Thus, we are not persuaded that Petitioner has shown by a preponderance of the evidence that substitute claims 15–28 are anticipated by Lee or would have been obvious over the combination of Lee and Nagai.

H. Conclusion

Based on the foregoing, we grant Patent Owner's Contingent Motion to Amend.

IV. MOTION TO EXCLUDE

Petitioner moves to exclude Exhibit 2105, the declaration of Mr. Donavan Dear, because Patent Owner did not make him available for cross-examination. Paper 30. Patent Owner does not oppose the motion. Paper 35. Accordingly, Petitioner's motion to exclude Exhibit 2105 is granted.

V. CONCLUSION

Based on the information presented, we conclude that Petitioner has shown, by a preponderance of the evidence, that claims 1–14 of the '307 patent are unpatentable. We also grant Patent Owner's Motion to Amend to replace claims 1–14 with proposed substitute claims 15–28.

In summary:

Reference(s)	**Basis**	**Claims**	**Claims Shown Unpatentable**	**Claims Not shown Unpatentable**
Strub, and Nagai or Gleissner	§ 103	1–11	1–11	
Strub	§ 102	12–14	12–14	
Lee and Nagai	§ 103	1–14		1–14
Overall Outcome			1–14	

Motion to Amend Outcome	**Claims**
Original Claims Cancelled by Amendment	1–14
Substitute Claims Proposed in the Amendment	15–28
Substitute Claims: Motion to Amend Granted	15–28

VI. ORDER

After due consideration of the record before us, and for the foregoing reasons, it is:

ORDERED that claims 1–14 of the ’307 patent are held unpatentable;

FURTHER ORDERED that Petitioner’s Motion to Exclude is granted;

FURTHER ORDERED Patent Owner’s Contingent Motion to Amend is granted as to proposed substitute claims 15–28, and claims 1–14 are cancelled and replaced by proposed substitute claims 15–28; and

FURTHER ORDERED that because this is a final written decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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Sanders et al.

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(54) **VIRTUAL WIRELESS MULTITRACK RECORDING SYSTEM**

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H04H 40/00	(2009.01)

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(52) **U.S. Cl.**

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(58) **Field of Classification Search**

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USPC 455/3.01, 3.06, 3.05, 66.1, 41.1
See application file for complete search history.

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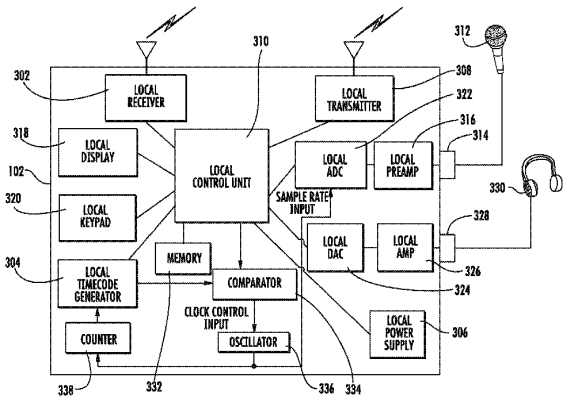
(57) **ABSTRACT**

Disclosed are systems and methods for wirelessly recording multi-track audio files without the data corruption or loss of data that typically occurs with wireless data transmission. In some aspects of the present invention, each performer is equipped with a local audio device capable of locally recording the respective performer's audio while also transmitting it to a master recorder. The locally recorded audio may then be used to repair or replace any audio lost or corrupted during transmission to the master recorder. Such repair or replacement may be performed electronically or via playback of the locally recorded audio. In other aspects of the present invention, a master recorder is not required since all locally recorded audio may be combined or otherwise processed post-recording. Locally recorded audio may include identifiers to aid in post-recording identification of such audio. A multi-memory unit is also provided to facilitate manipulation and processing of audio files.

14 Claims, 13 Drawing Sheets



(51) **Int. Cl.**

H04M 11/10	(2006.01)
G06F 17/30	(2006.01)
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D06M 10/00	(2006.01)
D06M 10/04	(2006.01)
A61B 17/00	(2006.01)
A61F 2/00	(2006.01)
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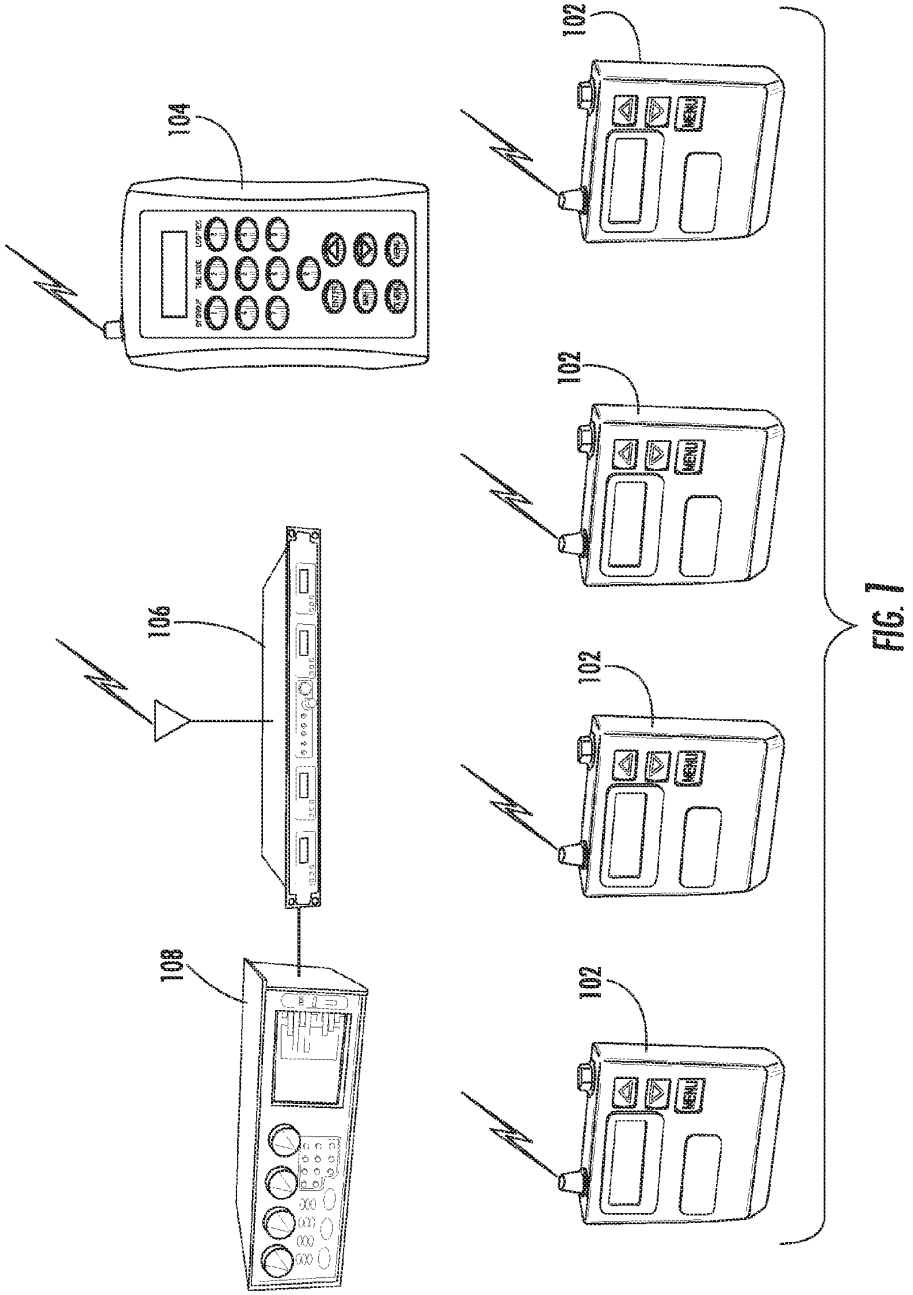


FIG. 1

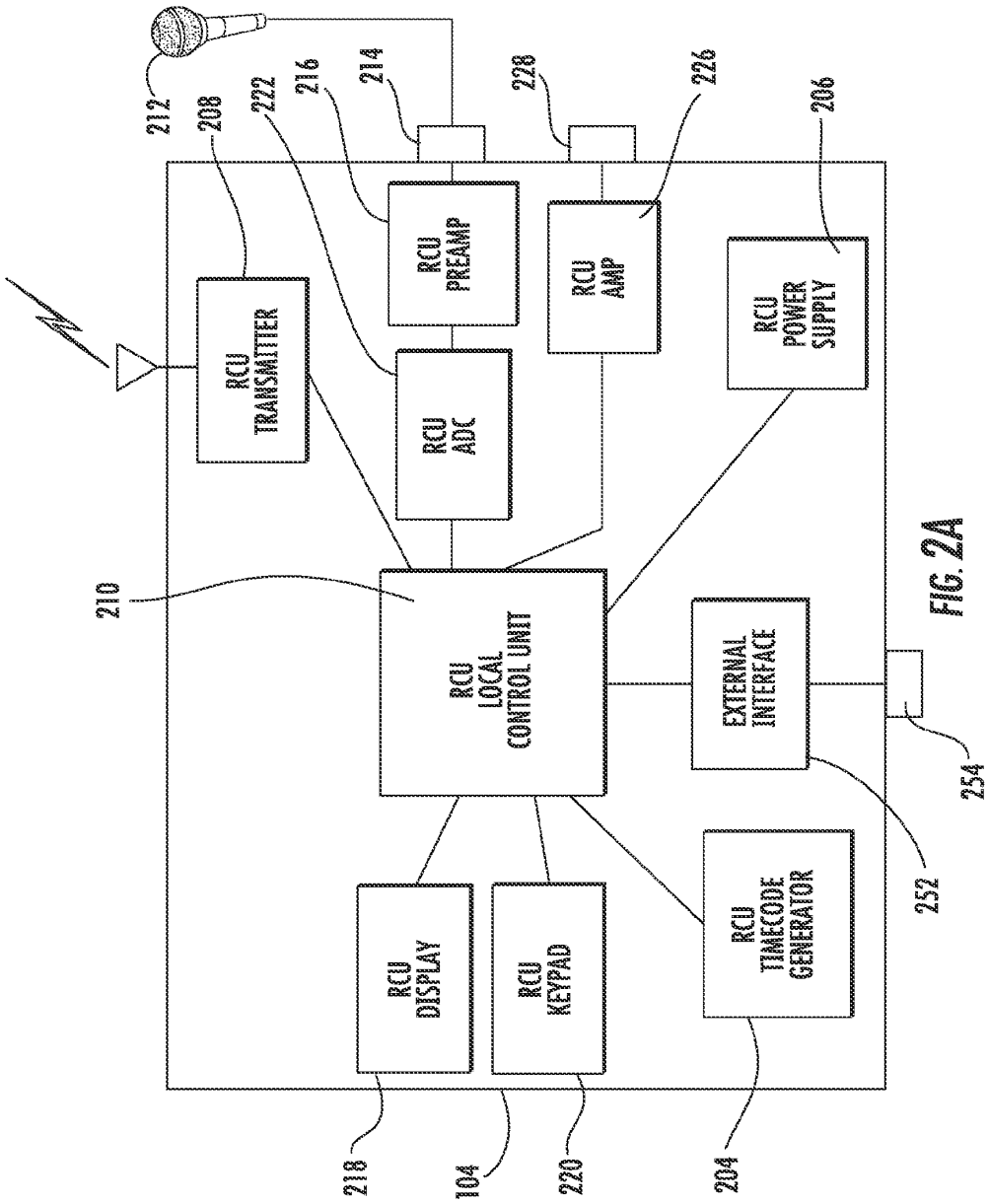

212
208
222
216
214
228
226
206
RCU TRANSMITTER
RCU PREAMP
RCU ADC
RCU AMP
RCU POWER SUPPLY
210
RCU LOCAL CONTROL UNIT
EXTERNAL INTERFACE
254
252
RCU DISPLAY
RCU KEYPAD
RCU TIMECODE GENERATOR
218
104
220
204

FIG. 2A

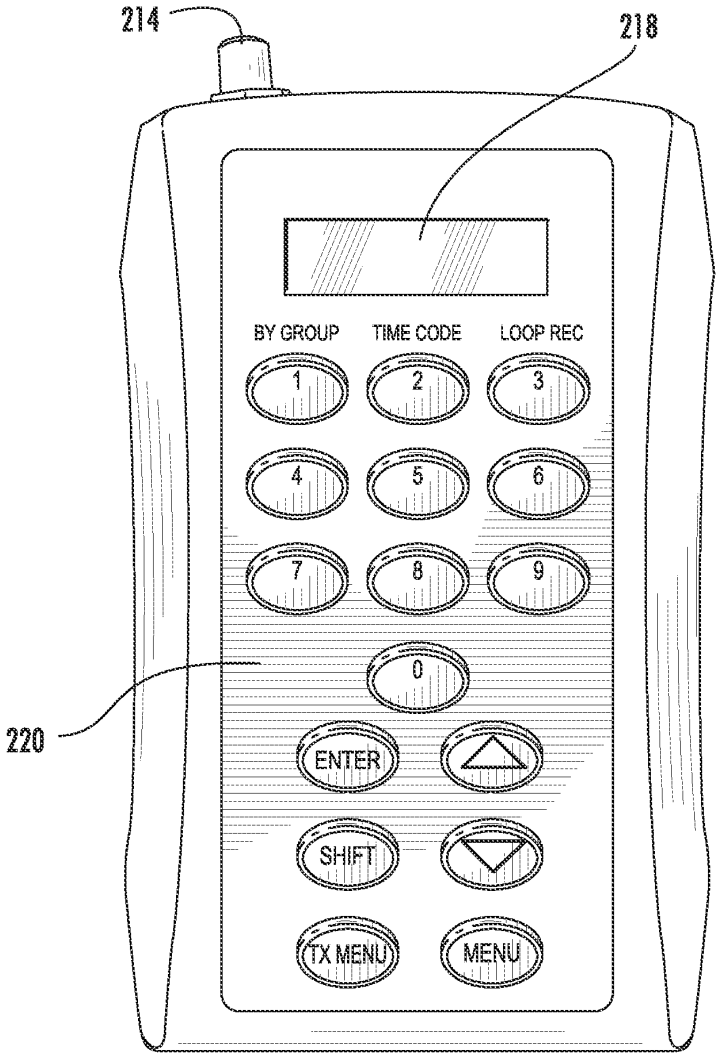

214
218
220
BY GROUP
TIME CODE
LOOP REC
1
2
3
4
5
6
7
8
9
0
ENTER
SHIFT
TX MENU
MENU

FIG. 2B

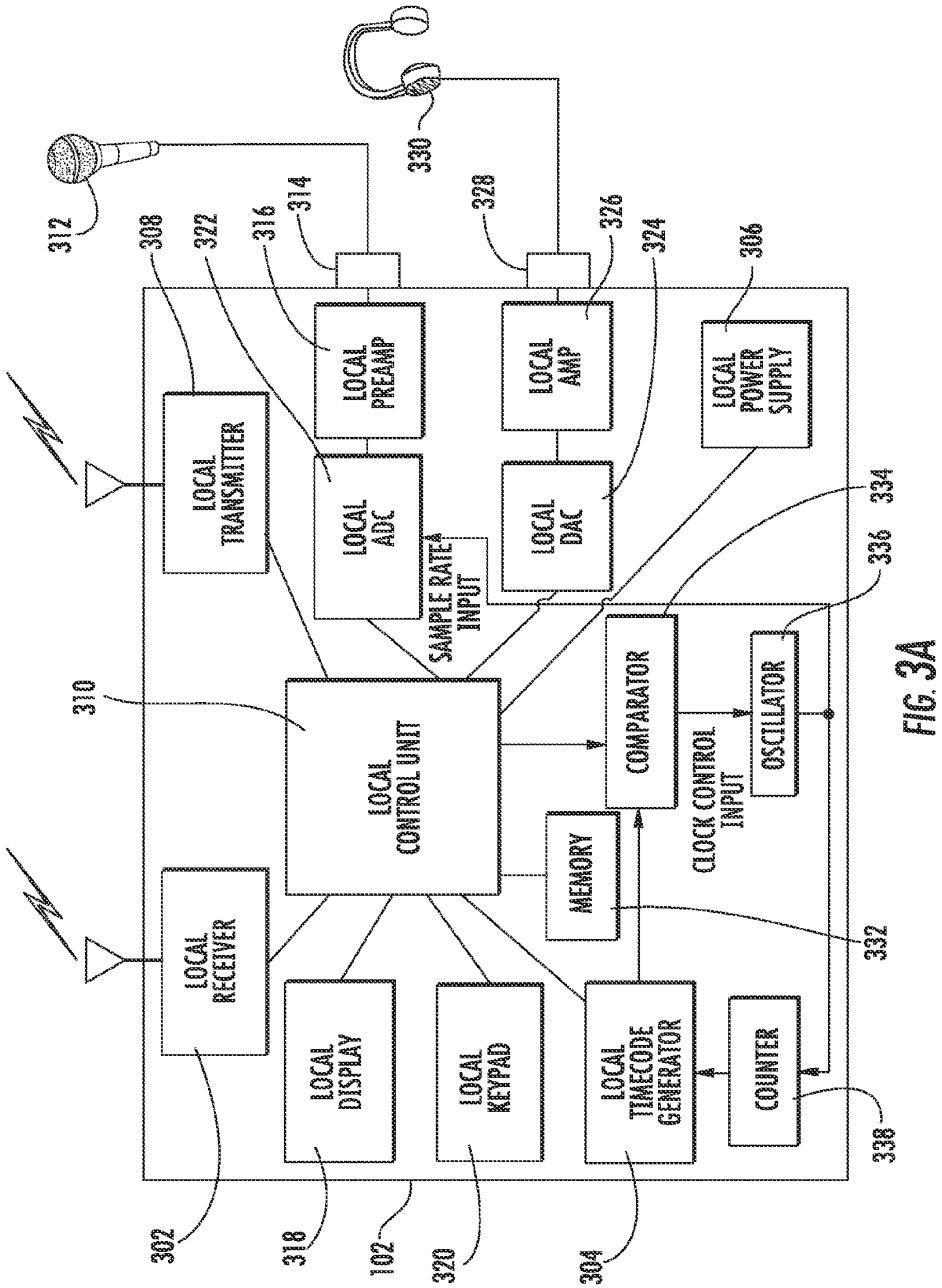

LOCAL CONTROL UNIT
LOCAL TRANSMITTER
LOCAL RECEIVER
LOCAL PREAMP
LOCAL ADC
LOCAL AMP
LOCAL DAC
LOCAL POWER SUPPLY
SAMPLE RATE INPUT
COMPARATOR
OSCILLATOR
CLOCK CONTROL INPUT
MEMORY
LOCAL DISPLAY
LOCAL KEYPAD
LOCAL TIMECODE GENERATOR
COUNTER
310
312
330
308
322
316
314
328
326
324
306
334
336
332
338
302
318
102
320
304

FIG. 3A

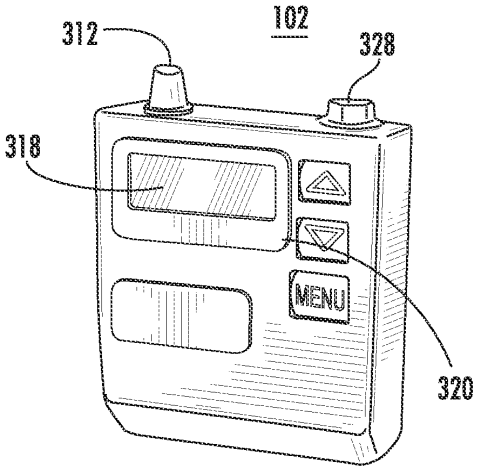


FIG. 3B

FIG. 4A

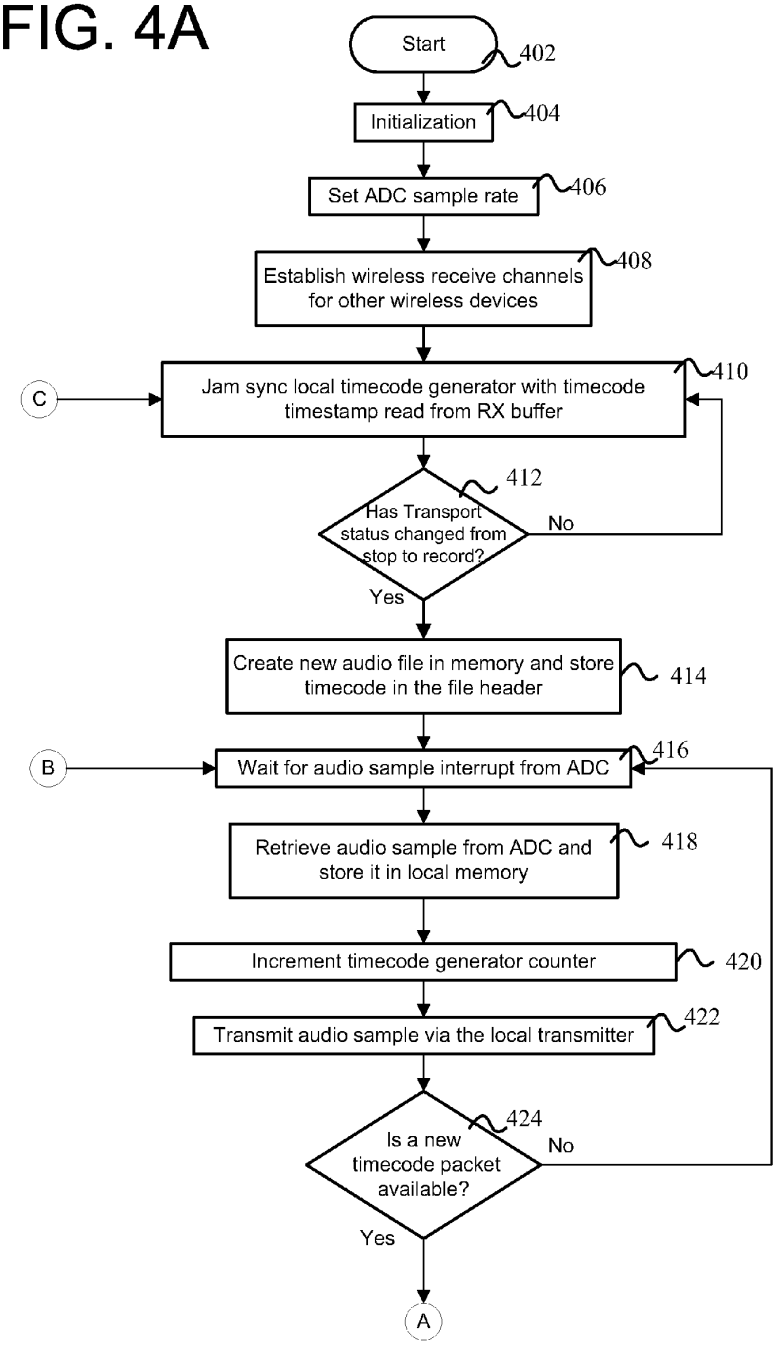

400
Start
402
Initialization
404
Set ADC sample rate
406
Establish wireless receive channels for other wireless devices
408
C
Jam sync local timecode generator with timecode timestamp read from RX buffer
410
412
Has Transport status changed from stop to record?
No
Yes
Create new audio file in memory and store timecode in the file header
414
B
Wait for audio sample interrupt from ADC
416
Retrieve audio sample from ADC and store it in local memory
418
Increment timecode generator counter
420
Transmit audio sample via the local transmitter
422
424
Is a new timecode packet available?
No
Yes
A

FIG. 4B

400

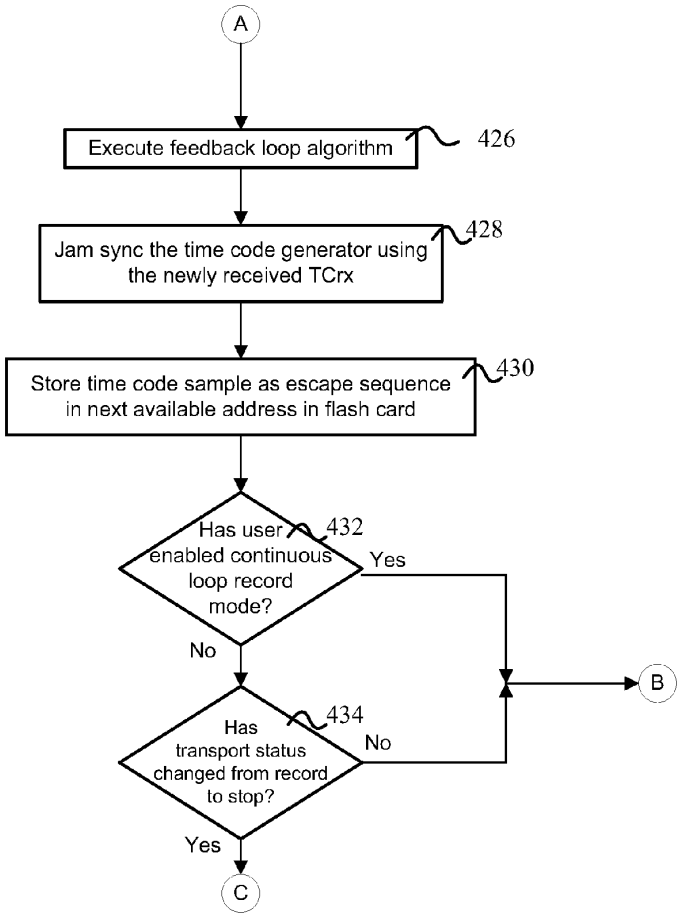

A
Execute feedback loop algorithm
426
Jam sync the time code generator using the newly received TCrx
428
Store time code sample as escape sequence in next available address in flash card
430
Has user enabled continuous loop record mode?
432
Yes
No
B
Has transport status changed from record to stop?
434
No
Yes
C

FIG. 5

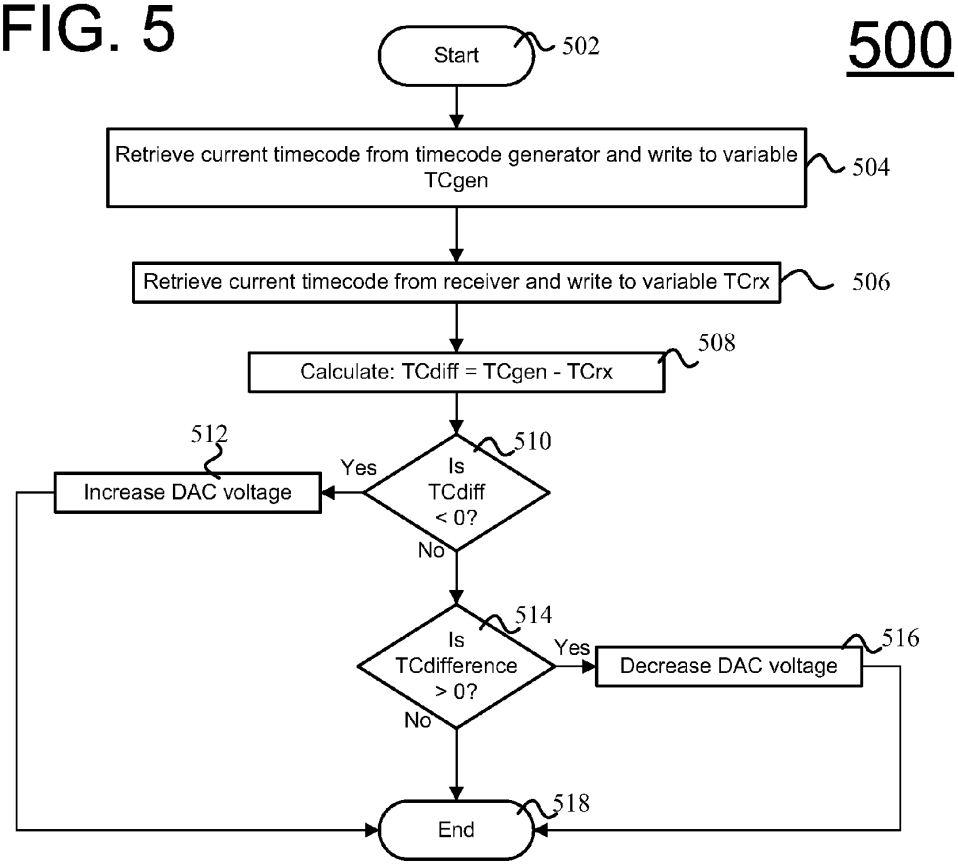

500
Start
502
Retrieve current timecode from timecode generator and write to variable TCgen
504
Retrieve current timecode from receiver and write to variable TCrx
506
Calculate: TCdiff = TCgen - TCrx
508
Is TCdiff < 0?
510
Yes
Increase DAC voltage
512
No
Is TCdifference > 0?
514
Yes
Decrease DAC voltage
516
No
End
518

FIG. 6

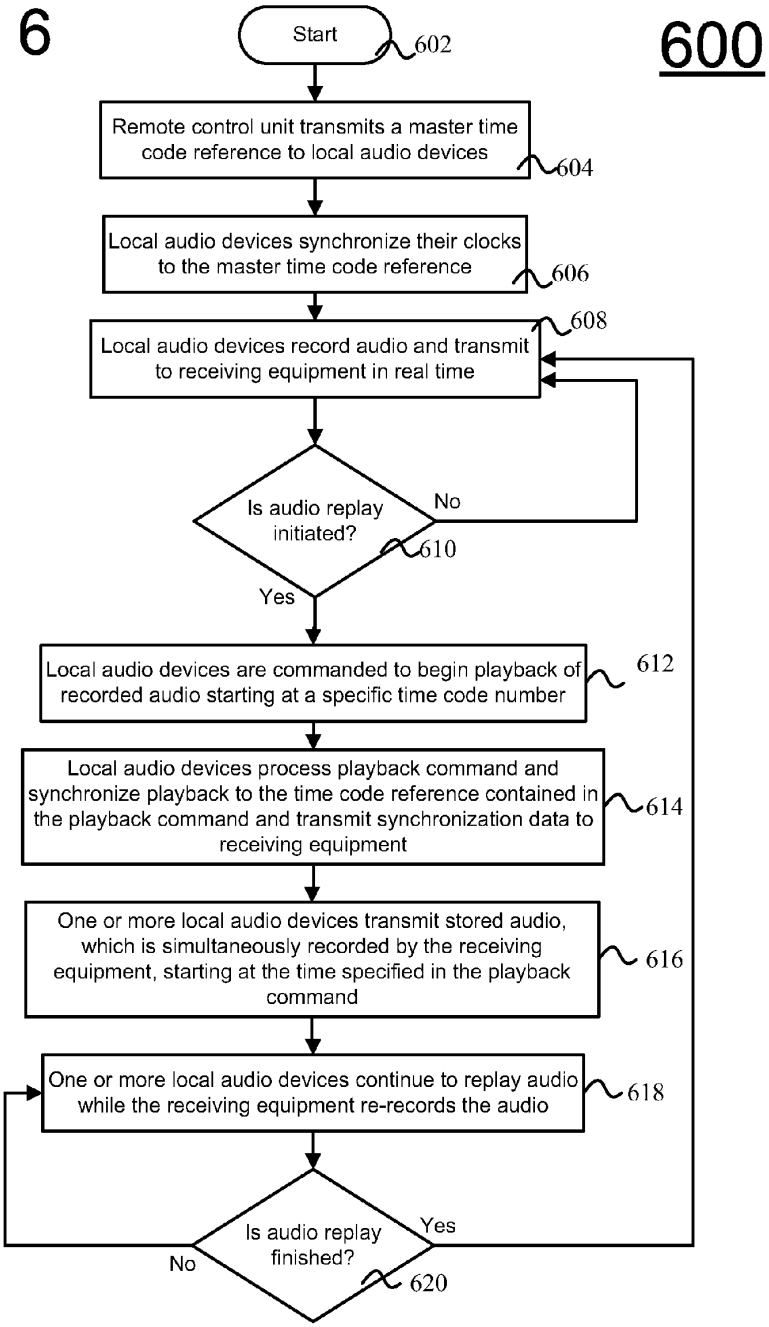
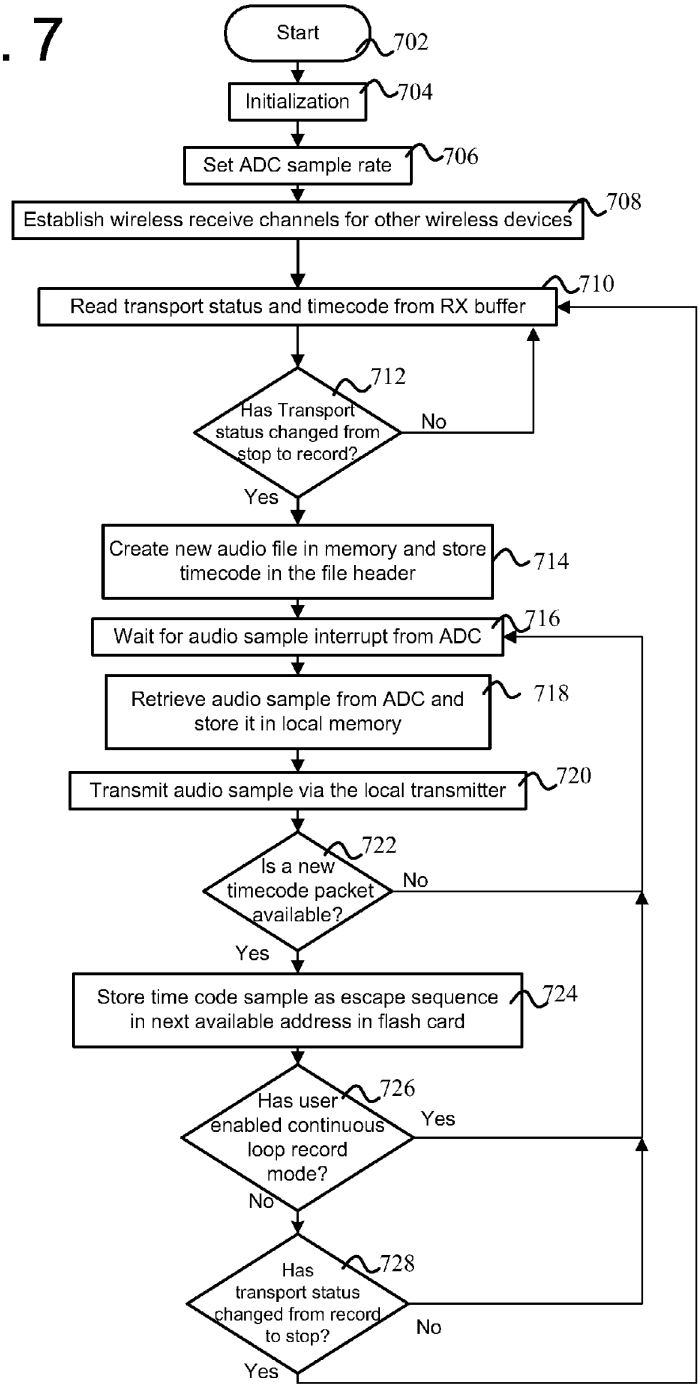

600
Start
602
Remote control unit transmits a master time code reference to local audio devices
604
Local audio devices synchronize their clocks to the master time code reference
606
Local audio devices record audio and transmit to receiving equipment in real time
608
Is audio replay initiated?
610
No
Yes
Local audio devices are commanded to begin playback of recorded audio starting at a specific time code number
612
Local audio devices process playback command and synchronize playback to the time code reference contained in the playback command and transmit synchronization data to receiving equipment
614
One or more local audio devices transmit stored audio, which is simultaneously recorded by the receiving equipment, starting at the time specified in the playback command
616
One or more local audio devices continue to replay audio while the receiving equipment re-records the audio
618
Is audio replay finished?
620
Yes
No

FIG. 7


700
Start
702
Initialization
704
Set ADC sample rate
706
Establish wireless receive channels for other wireless devices
708
Read transport status and timecode from RX buffer
710
712
Has Transport status changed from stop to record?
No
Yes
Create new audio file in memory and store timecode in the file header
714
Wait for audio sample interrupt from ADC
716
Retrieve audio sample from ADC and store it in local memory
718
Transmit audio sample via the local transmitter
720
722
Is a new timecode packet available?
No
Yes
Store time code sample as escape sequence in next available address in flash card
724
726
Has user enabled continuous loop record mode?
Yes
No
728
Has transport status changed from record to stop?
No
Yes

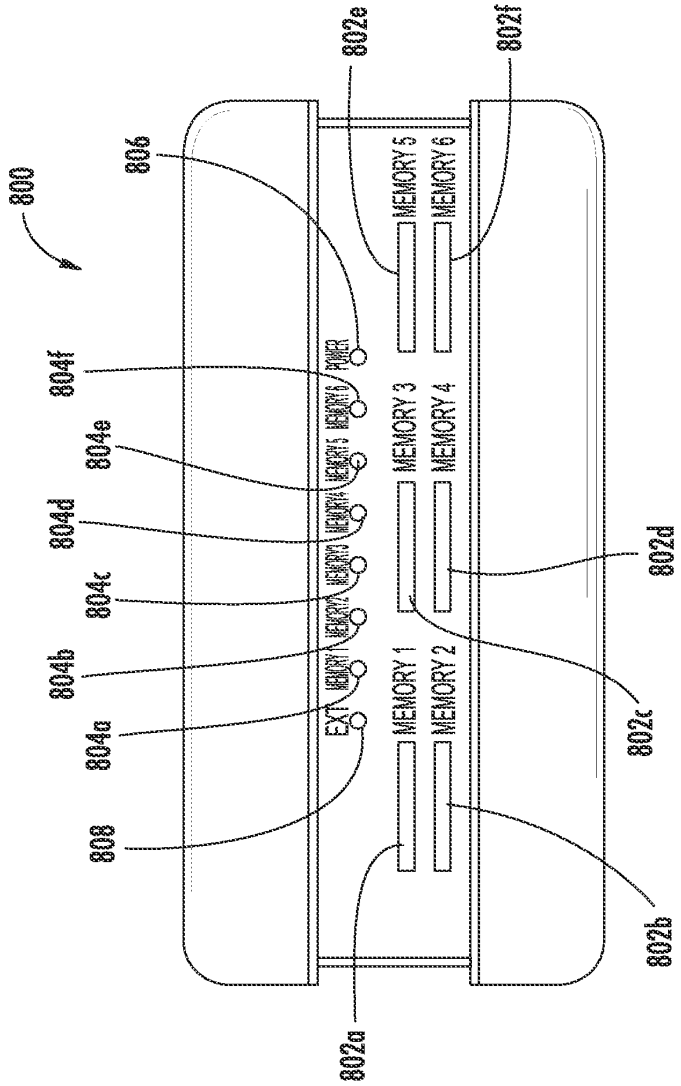

800
806
802e
802f
804f
804e
804d
804c
804b
804a
808
802a
802b
802c
802d
MEMORY 1
MEMORY 2
MEMORY 3
MEMORY 4
MEMORY 5
MEMORY 6
EXT MEMORY
MEMORY
MEMORY
MEMORY
MEMORY
MEMORY / POWER

FIG. 8

FIG. 9

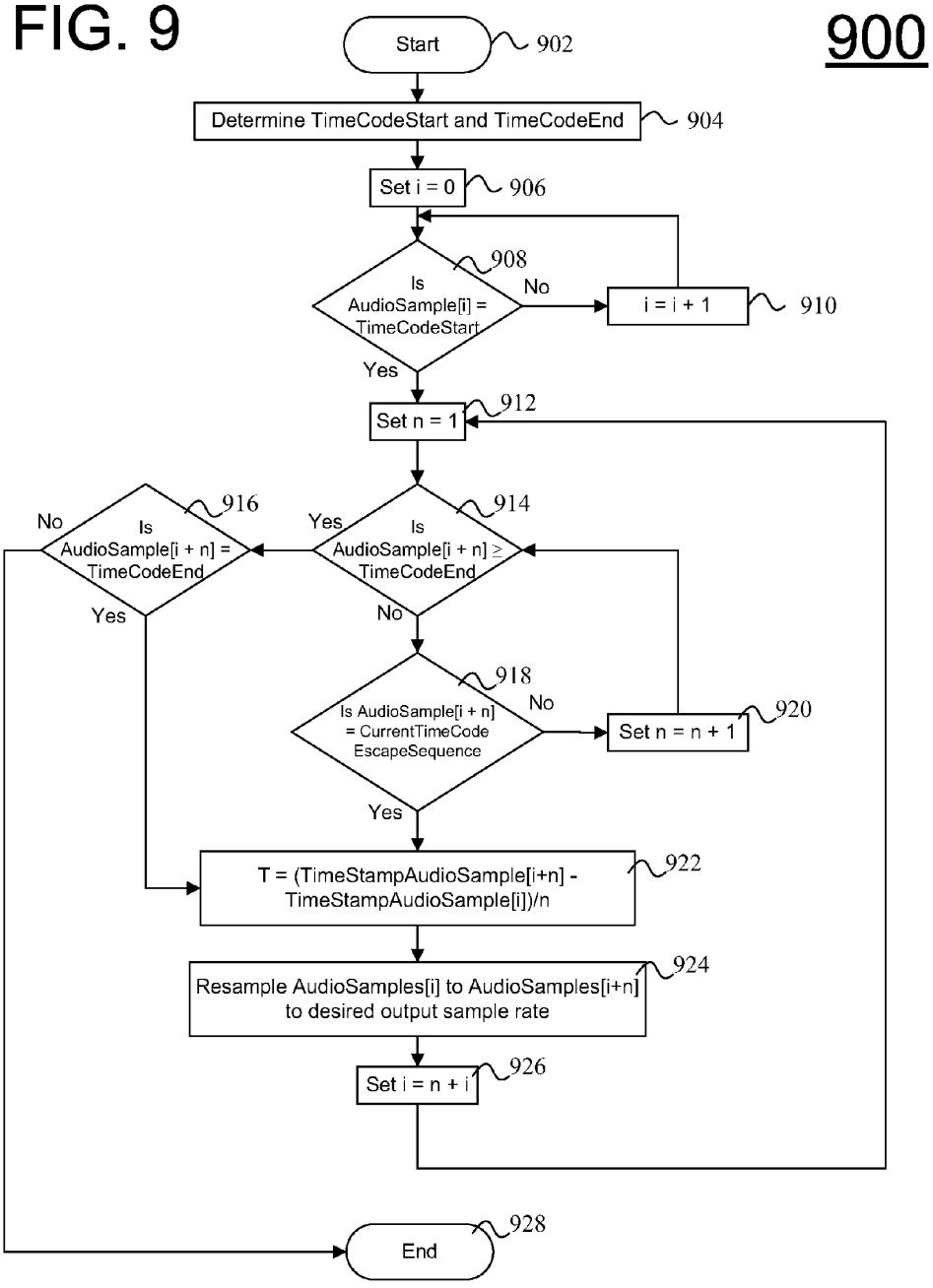
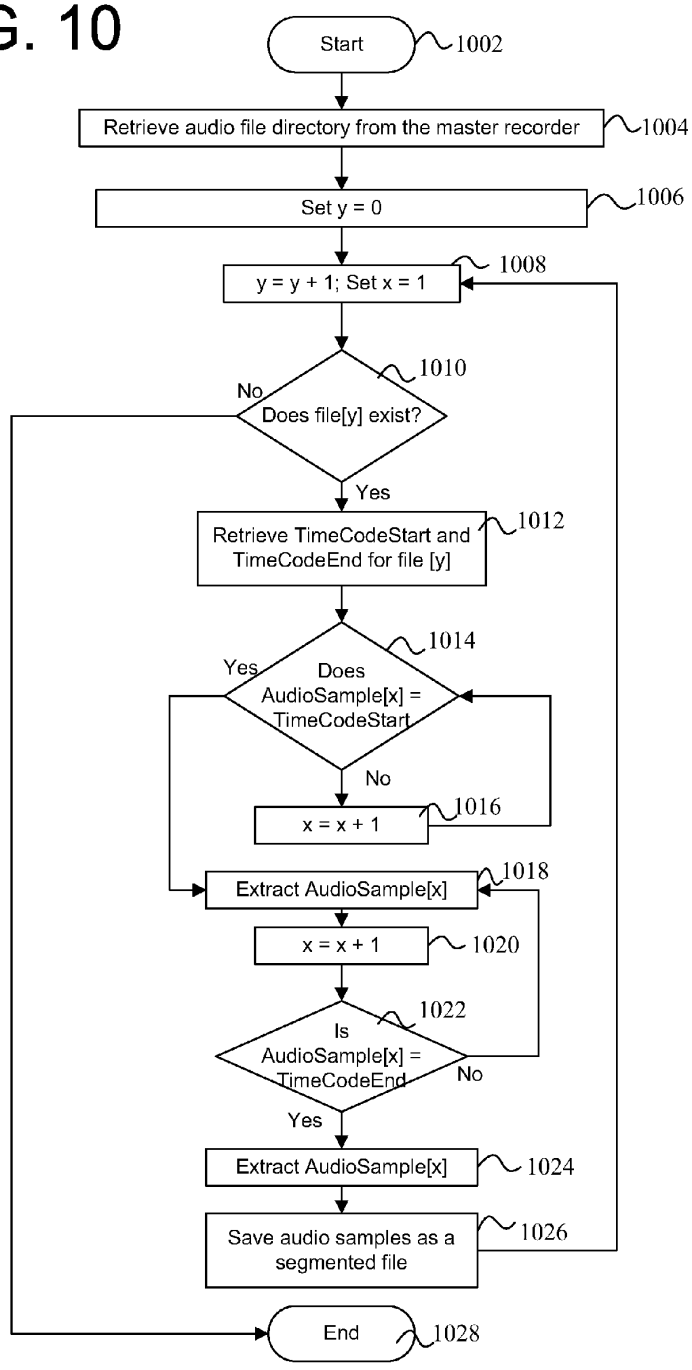

900
Start
902
Determine TimeCodeStart and TimeCodeEnd
904
Set i = 0
906
Is AudioSample[i] = TimeCodeStart
908
No
i = i + 1
910
Yes
Set n = 1
912
Is AudioSample[i + n] ≥ TimeCodeEnd
914
Yes
Is AudioSample[i + n] = TimeCodeEnd
916
No
Yes
No
Is AudioSample[i + n] = CurrentTimeCode EscapeSequence
918
No
Set n = n + 1
920
Yes
T = (TimeStampAudioSample[i+n] - TimeStampAudioSample[i])/n
922
Resample AudioSamples[i] to AudioSamples[i+n] to desired output sample rate
924
Set i = n + i
926
End
928

FIG. 10


1000
Start
1002
Retrieve audio file directory from the master recorder
1004
Set y = 0
1006
y = y + 1; Set x = 1
1008
Does file[y] exist?
1010
No
Yes
Retrieve TimeCodeStart and TimeCodeEnd for file [y]
1012
Does AudioSample[x] = TimeCodeStart
1014
Yes
No
x = x + 1
1016
Extract AudioSample[x]
1018
x = x + 1
1020
Is AudioSample[x] = TimeCodeEnd
1022
No
Yes
Extract AudioSample[x]
1024
Save audio samples as a segmented file
1026
End
1028

VIRTUAL WIRELESS MULTITRACK RECORDING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of and is a continuation of the U.S. patent application entitled "Virtual Wireless Multitrack Recording System," having Ser. No. 12/772,471, filed May 3, 2010, and currently pending, which is a continuation of the U.S. patent application entitled "Virtual Wireless Multitrack Recording System", having Ser. No. 11/404,735, filed Apr. 14, 2006, now U.S. Pat. No. 7,929,902, which is a continuation-in-part of the U.S. patent application entitled "Virtual Wireless Multitrack Recording System", having Ser. No. 11/181,062, filed Jul. 14, 2005, now U.S. Pat. No. 7,711,443, each of which is incorporated by reference in its entirety as if fully set forth herein.

COPYRIGHT NOTICE

BACKGROUND OF THE INVENTION

Embodiments of the present invention generally relate to systems and methods for recording and processing audio received from one or more wireless devices. More specifically, the present invention relates to systems and methods for recording and processing audio having one or more tracks received from one or more wireless devices operating in either an asynchronous or synchronous mode.

Many systems and methods have been created to record performance audio. Some such systems include a multi-track audio recorder wired to one or more microphones. Typically, one or more performers performing on a sound stage are recorded by one or more microphones that are directly wired to the multi-track recorder. The multi-track recorder combines the single track of audio received from each microphone to create one multi-track audio file. In many such systems, the received audio and/or the multi-track audio is timestamped with a time reference signal such as a Society of Motion Picture and Television Engineers ("SMPTE") timecode signal containing information regarding the hour, minute, second, frame, type of timecode (i.e., nondrop or drop frame), and user-definable information. Such information allows audio to be more easily matched and/or combined with simultaneously recorded video.

Other such systems include a multi-track audio recorder and an associated audio receiver that receive audio wirelessly from one or more wireless transmitters. Such wireless transmitters may take the form of body packs that are worn by each performer. Typically, the audio receiver receives each performer's audio from the performer's respective body pack via an analog or digital wireless transmission and transmits it to the audio recorder. The audio recorder then combines the wireless transmissions received from all body packs to create one multi-track audio file.

Due to the occurrence of wireless transmission errors such as dropouts, some existing wireless systems include audio receivers having two or more redundant receiver circuits. The incorporation of additional, redundant receiver circuits provides a better opportunity to avoid missed audio transmissions. For example, the use of two receiver circuits may allow a second receiver to receive audio that may have not been received by a first receiver circuit and vice versa. However, although such redundancy accounts may correct wireless transmission errors, such redundancy does not prevent loss of data due to interference (i.e., a distortion of the received audio signal due to receipt of multiple wireless signals). Upon the occurrence of interfering signals, audio created during a performance (e.g., a live performance) may simply be lost due to the inability of the receiver to receive a clean audio signal.

BRIEF SUMMARY OF THE INVENTION

Briefly stated, in one aspect of the present invention, a system for recording audio is provided. This system includes at least one master timecode generator for generating a plurality of master timecodes, and at least one local audio device including at least one local audio device receiver for receiving at least one of the group consisting of digital commands, master timecodes, and audio data; at least one audio input port for receiving local audio from an audio input device; at least one memory; and at least one control unit electrically coupled to the local audio device receiver, the audio input device, and the memory for creating local audio data and storing the local audio data in the memory; wherein the local audio data includes stamped local audio data and unstamped local audio data; wherein the stamped local audio data includes at least two first timestamps to reference at least a portion of the local audio data to at least two of the master timecodes; and wherein the unstamped local audio data does not include a reference to the master timecodes.

In another aspect of the present invention, disclosed is a system for recording audio. This system includes at least one master timecode generator for generating a plurality of master timecodes, and at least one local audio device including at least one local audio device receiver for receiving at least one of the group consisting of digital commands and the master timecodes; at least one audio input port for receiving local audio from an audio input device; at least one memory; at least one local timecode generator for generating a plurality of local timecodes; and at least one control unit electrically coupled to the local audio device receiver, the audio input device, the memory, and the local timecode generator for creating stamped local audio data and storing the stamped local audio data in the memory; wherein the stamped local audio data includes at least one local timestamp to reference at least a portion of the stamped local audio data to at least one of the local timecodes; and wherein the stamped local audio data includes at least one identifier selected from the group consisting of track identifiers, local audio device identifiers, performer identifiers, and combinations thereof.

In another aspect of the present invention, a method of wirelessly recording local audio is provided. This method includes locally receiving the local audio generated by at least one performer during an audio event; wirelessly transmitting the local audio to at least one of the group consisting of a recorder, a receiver, and combinations thereof; locally recording the local audio as local audio data in at least one memory of at least one local audio device; and remotely recording the transmitted local audio via at least one of the group consisting of a recorder, a receiver, and combinations thereof as remote audio data; wherein the local audio data is retrieved during or subsequent to the audio event and is combined with the remote audio data; and wherein the local audio data includes at least one identifier selected from the group consisting of

track identifiers, local audio device identifiers, performer identifiers and combinations thereof.

In another aspect of the present invention, a method for recording local audio is provided. The method includes locally receiving local audio generated by at least two performers during an audio event; and locally recording local audio as local audio data in at least one memory of at least one local audio device; wherein the local audio data for each of the performers is retrieved from the local audio devices subsequent to the audio event and is combined to create a single multi-track audio file; and wherein the local audio data includes at least one identifier selected from the group consisting of track identifiers, local audio device identifiers, performer identifiers, and combinations thereof.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The foregoing summary, as well as the following detailed description of preferred embodiments of the invention, will be better understood when read in conjunction with the appended drawings. For the purpose of illustrating the invention, there are shown in the drawings embodiments that are presently preferred. It should be understood, however, that the invention is not limited to the precise arrangements and instrumentalities shown. In the drawings:

FIG. **1** depicts the components of a recording system in accordance with one embodiment of the present invention including, inter alia, local audio devices, a remote control unit, a receiver, and a recorder.

FIG. **2**A depicts a block diagram of the internal components of a remote control unit in accordance with one embodiment of the present invention.

FIG. **2**B depicts an external view of a remote control unit in accordance with one embodiment of the present invention.

FIG. **3**A depicts a block diagram of the internal components of a local audio device in accordance with one embodiment of the present invention.

FIG. **3**B depicts an external view of a remote control unit in accordance with one embodiment of the present invention.

FIGS. **4**A and **4**B depict a process for operation of a recording system in a synchronous timecode generator mode in accordance with one embodiment of the present invention.

FIG. **5** depicts a process for modifying the speed of a local timecode generator as necessary to maintain its synchronization with a master timecode generator in accordance with one embodiment of the present invention.

FIG. **6** depicts a process for recording audio and for replaying and re-recording segments of missed audio in accordance with one embodiment of the present invention.

FIG. **7** depicts a process for operation of a recording system in asynchronous timecode generator mode in accordance with one embodiment of the present invention.

FIG. **8** depicts an external view of a multi-memory unit in accordance with one embodiment of the present invention.

FIG. **9** depicts a process for interpolating timestamps for unstamped audio samples based upon the timestamps of stamped audio samples, and resampling the audio samples to include the interpolated timestamps in accordance with one embodiment of the present invention.

FIG. **10** depicts a process for segmenting a single large audio file into multiple smaller files that correlate to a master directory of files in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring first to FIG. **1**, depicted is recording system **100** in accordance with one embodiment of the present invention. Recording system **100** wirelessly records audio events, such as performances, movie takes, etc. having one or more performers. In one aspect of the present invention, all of the components of recording system **100** are synchronized to allow each component to accurately stamp its recorded audio with the time at which it occurred such that the timestamps (i.e., information stored with an audio sample or audio file conveying the time at which the audio sample or first audio sample of the file occurred) created by each individual component of recording system **100** are highly accurate as compared to the timestamps created by all other components of recording system **100**. This accuracy allows multiple individually recorded audio tracks to be combined into one or more multi-track audio files electronically post-recording. Furthermore, this accuracy allows recording system **100** to automatically correct for any audio data lost during an original recording due to wireless transmission problems such as dropout, interference, etc. This automatic correction may be performed either electronically or via synchronized playback of the individually recorded audio tracks. In another aspect of the present invention, the audio recorded by recording system **100** may be recorded asynchronously. In this scenario, the audio is synchronized and/or mixed post-recording to automatically correct for any audio data lost due to wireless transmission problems such as dropout, interference, etc.

In the embodiment of the present invention depicted in FIG. **1**, recording system **100** includes local audio devices **102**, remote control unit ("RCU") **104**, receiver **106**, and recorder **108**. In one embodiment, RCU **104** includes an RF transmitter capable of transmitting one or more of a time reference signal, digital commands, and audio to one or more other components of recording system **100**. Additionally, RCU **104** may be equipped with the capability of remotely controlling local audio devices **102**, receiver **106**, and recorder **108** to perform tasks including, but not limited to, initiating audio playback of all local audio devices **102** starting at the same time reference, as well as recording thereof by receiver **106** and recorder **108**.

Both live and replayed audio transmitted by local audio devices **102** may be received at receiver **106** and recorded by audio recorder **108**. Receiver **106** and recorder **108** may be virtually any commercially available receiver and recorder. Receiver **106** receives the wireless RF signals (e.g., modulated RF carrier signals) generated by all active local audio devices **102** and converts the signals to a format capable of being recorded by a commercially available recording device including, but not limited to, Zaxcom, Inc.'s DEVA® multitrack recorder. In some embodiments, such commercially available recording devices record audio with a locally generated SMPTE-compatible timecode signal.

The ability to synchronize the local timestamps at each local audio device **102** and recorder **108** using the methods of the present invention as discussed in greater detail below allows any audio that is not recorded by recorder **108** during an event due to transmission errors to be recovered by replaying the missed audio and recording the replayed audio in the correct time sequence with respect to the other audio samples. In other words, since the audio samples are stored locally in each local audio device **102** with timestamps that are synchronized with the timestamps of recorder **108**, whenever audio is not recorded at recorder **108**, it may simply be replayed at local audio devices **102** starting at the timecode of the missed audio. Since the local audio device and recorder timestamps are synchronized, the replayed audio may be inserted in the proper time sequence with respect to the other recorded audio samples based upon the synchronized timestamp data. Synchronization is essential to ensure that each performer's audio

is synchronized with all other performers' audio and to ensure that the newly recorded replayed audio is in the correct sequence with respect to the previously recorded live audio. Such synchronization must maintain a high accuracy for each performer's timestamps with respect to all other performers' timestamps to prevent the occurrence of phasing artifacts when the multiple audio recordings are combined to create one single recording.

In some embodiments of the present invention, receiver **106** automatically senses an error in transmission caused by, for example, a communication loss, interference, etc. In some embodiments of the present invention, the error in transmission is sensed by comparing a calculated checksum to the transmitted checksum to determine if data was lost during transmission. An error is determined if the calculated and transmitted checksums do not match. Upon sensing a transmission error, receiver **106** may transmit a request to RCU **104** requesting playback of the audio recorded locally on local audio devices **102** beginning at a timecode prior to the occurrence of the transmission error. In response, RCU **104** transmits a digital command to all local audio devices **102** to playback the audio stored in the respective memory **332** (FIG. **3**) that occurred subsequent to the timecode requested by receiver **106** in the manner described below with respect to FIG. **6**.

Alternatively, playback may be requested manually by a user of a recording system such as recording system **100**. In this scenario, upon hearing that a transmission error (i.e., a loss of audio data) has occurred, the user manually prompts RCU **104** to transmit a digital command to all local audio devices **102** to playback the audio stored in memory **332** (FIG. **3**) that occurred subsequent to a time reference entered at RCU **104** by the user. Such prompting may occur after the audio event ends or immediately upon hearing the transmission error. If the latter option is chosen, prompting playback of a specific segment of the audio event may index the local audio devices to store the requested data in a protected memory location until the end of the audio event to avoid disrupting the recording. In this scenario, all requested audio shall be replayed after the performance ends. In embodiments of the present invention in which data is recorded in a loop (i.e., when memory is full, new data overwrites previously recorded data), writing the data to a protected memory location removes it from the loop and protects it from being overwritten.

FIG. **2**A depicts a block diagram of one embodiment of RCU **104** in accordance with the present invention. In this embodiment, RCU **104** includes, inter alia, RCU timecode generator **204**, RCU power supply **206**, RCU transmitter **208**, RCU local control unit **210**, RCU audio input device **212**, RCU audio input device port **214**, RCU preamp **216**, RCU display **218**, RCU keypad **220**, RCU ADC **222**, RCU amp **226**, timecode input port **228**, external interface **252**, and external interface port **254**.

RCU transmitter **208** allows RCU **104** to transmit a master time reference signal, digital commands, audio, and the like to other devices such as local audio devices **102**, receiver **106**, and recorder **108**. In one aspect of the present invention, the time reference signal is a SMPTE timecode signal containing information regarding the hour, minute, second, frame, type of timecode (i.e., nondrop or drop frame), and user-definable information (e.g., the transport status of recorder **108**, the name of a scene, the name of a take, a local audio device identifier that identifies the local audio device that recorded the respective audio, a track identifier that identifies the track of audio which may include the actor or actress recording the respective audio, etc.). This master time reference signal provides a time reference for all local audio devices **102**, which may use this information for a variety of purposes such as jam synchronizing their respective local timecode generators **304** (FIG. **3**A), adjusting the speed of the local timecode generators **304** (FIG. **3**A), timestamping locally recorded audio, etc. The master time reference signal may be generated on board remote control unit **104** via a mechanism such as RCU timecode generator **204**. Or, alternatively, the master time reference signal may be generated by an independent timecode generator that transmits timecodes to remote control unit **104** wirelessly or via a cable or the like connected from the independent timecode generator to timecode input port **228**. In the latter scenario, the timecodes received via timecode input port **228** are buffered and/or amplified by RCU amp **226** prior to transmission to RCU local control unit **210**.

When recording system **100** is operating in a synchronous mode, transmission of the master time reference signal ensures that all of the components of recording system **100** store all locally recorded audio with timestamps that are highly accurate as compared to the timestamps of all other local audio devices **102** and/or all other components of recording system **100**. The timestamps are then used during playback and recording to ensure that the replayed audio from all local audio devices **102** is synchronized with previously recorded audio and with the audio replayed by all other local audio devices **102**. In contrast, when recording system **100** is operating in an asynchronous mode, transmission of the master time reference signal allows the files containing recorded audio to be timestamped with the master time reference information to allow the recorded audio to be accurately synchronized post-recording.

RCU transmitter **208** also allows audio generated locally at RCU **104** to be transmitted to the other components of recording system **100**. Such audio may be received from an audio input device such as RCU audio input device **212** via audio input device port **214**. RCU audio input device **212** may be any type of commercially available audio input device such as a microphone and audio input device port **214** may be any commercially available audio input device port that is compatible with RCU audio input device **212** and the internal components of RCU **104**. The received audio as well as any digital signals (e.g., microphone input level, line input level, etc.) are then buffered and/or amplified by RCU preamp **216** and are converted from analog to digital by RCU ADC **222** such that the audio may be read in digital form by RCU local control unit **210**. This audio may then be processed and sent via RCU transmitter **208** in either analog or digital form. If the audio is to be sent in analog form, RCU local control unit **210** may be equipped with an on-board DAC or an independent DAC may be incorporated in RCU **104** without departing from the scope of the present invention. Or, alternatively, analog audio received from RCU audio input device **212** may be passed directly to RCU transmitter **208** for transmission in analog form to the other components of the recording system. In such embodiments, RCU transmitter **208** may be equipped with a frequency modulation ("FM") modulator or the like. Furthermore, in such embodiments, although the analog audio is passed through to RCU transmitter **208**, the audio signal may be additionally converted to digital form for local recording of the received audio. In yet another alternate embodiment, audio may be transmitted and recorded in analog form thereby eliminating RCU ADC **222**.

In the aforementioned embodiments in which the audio signal for a particular track of audio is converted to digital form for local recording of the received audio, identifiers such as a local audio device identifier that identifies the local audio device that recorded the respective audio, a track identifier

that identifies the track of audio which may include the actor or actress recording the respective audio, etc. may be recorded with the recorded audio to allow the audio tracks to be easily and quickly identified post-recording and/or post-production. In some embodiments of the present invention, such identification information is stored in the local, nonvolatile memory of the local audio device as a text file, however, the present invention is not so limited. In another aspect of the present invention, such identification information is encoded in the audio file such that it may be decoded post-recording and/or post-production using methods known in the art. Additionally, such identification information may be integral to a timecode or completely distinct therefrom. Furthermore, such identification information may be programmed for each local audio device remotely via a remote control unit such as RCU **104**.

In some embodiments of the present invention, RCU local control unit **210** may be a digital signal processor such as Texas Instruments part number TMS320C5509A. However, the present invention is not so limited. Any combination of hardware and software may be substituted for any component described herein without departing from the scope of the present invention.

RCUs **104** may be handheld units such as RCU **104** depicted in FIG. **2**B. In such an embodiment, display **218** may be a small liquid crystal display ("LCD") or the like and keypad **220** may include a plurality of buttons that allow a user to perform local RCU functions including, but not limited to, those that relate to RCU transmitter frequency, group identification ("ID") code, unit ID code, and timecode generator mode. For example, the RCU transmitter frequency may be adjustable in predetermined frequency steps. In most cases, this frequency will be set to match the receiving frequency of other devices in the recording system (e.g., local audio devices). Or, when multiple local audio devices are incorporated into a group with an RCU, the RCU as well as other components of the recording system (e.g., local audio devices) may be assigned a group ID to ensure that the RCU is controlling the correct group of local audio devices. Similarly, the unit ID identifies the specific one of multiple local audio devices that a user wishes to control. Setting the unit ID ensures that the control signals transmitted by the RCU are received by the correct local audio device. Also, timecode generator mode allows the RCU to either generate its own timecodes or to receive timecodes from an external timecode generator.

In addition to allowing a user to modify local RCU settings, RCU keypad **220** and display **218** also allow the RCU to remotely control individual local audio devices. The user may perform a variety of functions for the local audio device including, but not limited to, transmitter and receiver frequencies, transmitter enable, microphone gain, high pass filter, record mode select, time code entry, playback control, audio bank storage, and status request.

For example, local audio device transmitter and receiver frequencies may be adjustable in predetermined frequency steps. Alternatively, the local audio device transmitter may be remotely enabled and disabled. Microphone gain may be adjusted, which in turn adjusts the current setting of a preamp such as local preamp **316**. Adjustment of the high pass filter may be incorporated to enable and disable, or otherwise adjust, the high pass audio filter of the audio input device such as audio input device **312**.

In addition, record mode select allows recording modes such as endless loop record mode or timed record mode to be remotely adjusted. Timecodes may also be set remotely for each local audio device. Playback control allows one or more local audio devices to be commanded remotely to playback audio starting at a specific timecode. Completion of playback may be automatically or manually determined. Functions such as audio bank storage allow a remote user to manually store chunks of audio data in safe locations of the local audio device memory (i.e., in locations in which the audio data will not be overwritten). Finally, status of the local audio device may be requested. The status may be provided via display **218** or via spoken language generated by local audio device **102** and transmitted to a receiver or receiver/recorder combination for recording with the recorded audio.

The RCU may also allow a user to program data at each local audio device such as track identifiers, local audio device identifiers, and the like. In such scenarios, such identifiers are recorded with the respective audio to allow the track, local audio device, etc. of the recorded audio to be identified post-recording. That is, each segment of recorded audio may be associated with a specific take, track, or the like, as well as a specific local audio device. Such association allows each portion of recorded audio (e.g., a track of audio) to be quickly and easily identified post-production and/or post-recording without confusion.

Although many specific features and functions for the RCU have been delineated herein, other features and functions may be added or eliminated without departing from the scope of the present invention.

Additionally, handheld embodiments may include any one of a variety of commercially available batteries to function with the power supply **206** without departing from the scope of the present invention. Power supply **206** may be virtually any power component or combination thereof that is compatible with the other components of RCU **104** including, but not limited to, a Texas Instruments TPS62000DGS Power Module alone or in combination with a Linear Technology LTC3402 Synchronous Boost Converter.

However, non-handheld embodiments of RCU **104** are also envisioned such as tabletop models, personal computer ("PC") models, etc. Also, RCU **104** may be optionally equipped with external interface **252** (FIG. **2**A) to facilitate connection of RCU **104** to a PC, laptop PC, dumb terminal, or the like via external interface port **254**. Such an interface allows a user to control the components of recording system **100** via a graphical user interface or other software that may operate on a larger user interface. Such an interface may provide more features and functions than that available on a portable, handheld device such as programming and execution of complex playback scenarios, automatic initiation of complex playback scenarios based upon detected audio transmission errors, etc.

Turning next to FIG. **3**A, depicted is a block diagram of one embodiment of local audio device **102** in accordance with the present invention. In one aspect of the present invention, local audio devices **102** are digital, wireless audio transceivers. Such audio devices may be manufactured in the form of body-packs, such as those typically worn by news announcers, performers, and the like. In the depicted embodiment, local audio device **102** includes, inter alia, local receiver **302**, local timecode generator **304**, local power supply **306**, local transmitter **308**, local control unit **310**, local audio input device **312**, local audio input device port **314**, local preamp **316**, local display **318**, local keypad **320**, local ADC **322**, local DAC **324**, local amp **326**, local audio output device port **328**, local audio output device **330**, memory **332**, comparator **334**, oscillator **336**, and counter **338**.

Local transmitter **308** also allows audio generated locally at local audio device **102** to be transmitted to the other components of recording system **100**. Such audio may be received

from an audio input device such as local audio input device **312** via local audio input device port **314**. Local audio input device **312** may be any type of commercially available audio input device such as a microphone and local audio input device port **314** may be any commercially available audio input device port that is compatible with local audio input device **312** and the internal components of local audio device **102**. The received audio as well as any digital signals (e.g., microphone input level, line input level, etc.) are then buffered and/or amplified by local preamp **316** and are converted from analog to digital by local ADC **322** such that the audio may be read in digital form by local control unit **310**. This audio may then be processed and sent via local transmitter **308** in either analog or digital form. If the audio is to be sent in analog form, local control unit **310** may be equipped with an on-board DAC or an independent DAC may be incorporated in local audio device **102** without departing from the scope of the present invention. Or, alternatively, analog audio received from local audio input device **312** may be passed directly to local transmitter **308** for transmission in analog form to the other components of the recording system. In such embodiments, local transmitter **308** may be equipped with a frequency modulation ("FM") modulator or the like. Furthermore, in such embodiments, although the analog audio is passed through to local transmitter **308**, the audio signal may be additionally converted to digital form for local recording of the received audio. In yet another alternate embodiment, audio may be transmitted and recorded in analog form thereby eliminating local ADC **322**.

In some embodiments of the present invention, local control unit **310** may be a digital signal processor such as Texas Instruments part number TMS320C5509A. However, the present invention is not so limited. Any combination of hardware and software may be substituted for any component described herein without departing from the scope of the present invention.

Similarly, local receiver **302** allows audio received from other components of recording system **100** to be played locally at local audio device **102**. Such audio may be received in either analog or digital form at local receiver **302**. However, if the audio is to be received in analog form, local control unit **310** may be equipped with an on-board ADC or an independent ADC may be incorporated in local audio device **102** without departing from the scope of the present invention to allow local control unit **310** to receive the audio in digital form. Thereafter, the audio may be processed or relayed directly to local DAC **324**, which converts the audio data back to analog form. The analog audio may then be amplified by local amp **326** prior to transmission through local audio output device port **328** to local audio output device **330**. Local audio output device **330** may be any type of commercially available audio output device such as headphones, speakers, and the like, and local audio output device port **328** may be any commercially available audio output device port that is compatible with local audio output device **330** and the internal components of local audio device **102**. Local receiver **302** may be virtually any receiver compatible with the other components of local audio device **102** including, but not limited to, a Micrel Semiconductor MICRF505 RadioWire® transceiver.

Memory **332** of local audio device **102** locally stores audio processed by local control unit **310** in one or more audio files. In one aspect of the present invention, local control unit **310** receives recordable audio from local audio input device **312**, which may be worn by the performer and connects to local audio device **102** at local audio input device port **314**. However, in alternate embodiments, local control unit **310** may also receive audio from other components of recording system **100** via local receiver **302**. The locally stored audio files may include identification data such as local audio device identifiers, track identifiers, performer identifiers, and the like as discussed in greater detail above. Furthermore, the locally stored audio files include timestamps (e.g., timestamps may be stored in the header of the audio file) that indicate when, during the audio event, each segment of audio occurred. The timestamps may be generated based upon timecodes created by local timecode generator **304** or based upon master timecodes. Such master timecodes may be received using a plurality of methods or components including, but not limited to, wirelessly from a master timecode source through local receiver **302**, from a timecode source connected to local audio input device port **314**, and from local audio input device **312** wherein the master timecodes are received from an ultrasonic signal. Local timecode generator **304** may be synchronized with the master timecode generator during recording of the audio event as described in further detail below with respect to FIG. **5**. Or, alternatively, the timestamps may be synchronized post-recording as described in further detail below with respect to FIGS. **9** and **10**. Simultaneous with the local recording of audio received from local audio input device **312**, this audio may also be transmitted through local transmitter **308** to receiver **106** and/or recorder **108** to allow recording of the audio event. In this scenario, receiver **106** and/or recorder **108** may simultaneously record a multi-track recording of all of the single tracks of audio received from local audio devices **102**, which are worn by the performers of the audio event.

Memory **332** may be virtually any type of commercially available removable or non-removable memory including, but not limited to, flash memory cards, compact flash memory cards, Universal Serial Bus ("USB") thumbdisks, and the like. Use of removable memories **332** facilitates removal and insertion of these memories into a PC or the like for electronic combination or mixing of the recorded audio data. Such electronic mixing may be performed via commercially available software such as Pro Tools or the like and may be performed in addition to or in lieu of live wireless recording of the audio event.

Local audio devices **102** also receive non-audio information (e.g., time reference signals, digital commands, audio, etc.) from other components of recording system **100** via local receiver **302**. During synchronous operation of recording system **100**, a portion of the received data may be used to synchronize local timecode generator **304** to the master timecode generator integral to one of the components of recording system **100** (e.g., RCU **104**, recorder **108**, etc.) using a process such as that described below with respect to FIGS. **4**A, **4**B, and **5** or an equivalent thereof. Alternatively, during asynchronous operation of recording system **100**, the received data may include master timecodes from the master timecode generator that may be used to timestamp individual audio samples and/or files such that the audio received at multiple local audio devices **102** may be synchronized post-recording using one of the methods discussed below with respect to FIGS. **9** and **10** or an equivalent thereof.

As described in further detail below with respect to FIG. **5**, local audio devices **102** operating in the synchronous mode may require one or more of comparator **334**, oscillator **336**, and counter **338**. In one aspect of the present invention, oscillator **336** is a 48 kilohertz ("kHz") voltage controlled oscillator. However, alternate embodiments of oscillator **336** may be substituted without departing from the scope of the present invention including but not limited to a high speed clock divided to produce 48 kHz. In the embodiment of the present invention depicted in FIG. **3**A, oscillator **336** feeds the sample

rate input of local ADC **322**, as well as counter **338**, which provides a time reference for local timecode generator **304**. In this configuration, if local ADC **322** is set to operate at 48 kHz, varying the voltage applied to the clock control input of oscillator **336** will proportionately vary the output of oscillator **336** and, consequently, the sample rate of local ADC **322** and the rate at which local timecode generator **304** keeps time.

When local audio devices **102** such as those depicted in FIG. **3**A are used in conjunction with recorders **108** that incorporate a single clock to both regulate the speed of the master timecode generator and control the internal recorder ADC sample rate, comparators **334** help maintain synchronization of local audio devices **102** with each other and with recorder **108** by varying the speed of the respective local timecode generators **304** and the sampling rate of the respective local ADCs **322**. As per an algorithm or hardwired logic that duplicates the sequence depicted in FIG. **5**, or an equivalent thereof, comparators **334** compare the timecodes generated by the master timecode generator with timecodes generated by the locally timecode generator and, if necessary, increase or decrease the speed of the respective local timecode generator **304** and the sampling rate of the respective local ADC **322** such that these speeds are synchronized with the speed of the master timecode generator and the ADC of recorder **108**. That is, comparators **334** generate, through software or hardware, the voltage that is applied to the clock control input of the respective oscillator **336** that proportionately varies the sample rate of local ADC **322** and the rate at which local timecode generator **304** keeps time as necessary to maintain synchronization with the sample rate of the ADC of recorder **108** and the master timecode generator, respectively. In this manner, all local audio devices **102** and recorder **108** sample at virtually identical sample rates allowing a wireless recorder **108**, or a wireless recorder/receiver combination, to accurately combine multiple independent tracks of audio, wherein each independent track of audio is received from one of the performer's local audio device **102**.

Whenever playback of locally recorded audio is required (e.g., to remedy recording errors caused by transmission losses), RCU **104** transmits a digital command to all local audio devices **102** to playback the audio data stored in the respective memories **332** starting with and subsequent to a specific time reference as indicated by a specific timecode. The digital command is received by local receivers **302**, which transmit or relay the command to their respective local control unit **310**. Thereafter, local control units **310** access the data stored in the respective memory **332** and cause this data to be played or transmitted sequentially via local transmitter **308** starting with the data associated with the requested timecode. The use of timecodes and synchronization of local and master timecode generators, as well as local and recorder audio sampling rates, as discussed herein allows multiple local audio devices **102** to replay audio with the exact timing that occurred during the audio event.

Local audio devices **102** may be bodypacks such as the local audio device **102** depicted in FIG. **3**B. In such an embodiment, display **318** may be a small liquid crystal display ("LCD") or the like and keypad **320** may include a plurality of buttons that allow a user to perform functions including, but not limited to, those that relate to transmitter frequency, receiver frequency, microphone gain, high pass filter, group ID code, unit ID code, transmitter encryption code, and transmitter operating mode. For example, transmitter and receiver frequencies may be adjustable in predetermined frequency steps. Microphone gain may be adjusted, which in turn adjusts the current setting of a preamp such as local preamp **316**. Adjustment of the high pass filter may be incorporated to enable and disable, or otherwise adjust, the high pass audio filter of the audio input device such as audio input device **312**.

When multiple local audio devices are incorporated in to a group, each local audio device in the group as well as other components of the recording system (e.g., an RCU) may be assigned a group ID. Similarly, the unit ID identifies each specific local audio device within the group of local audio devices.

For local audio devices transmitting encrypted audio and data, the transmitter encryption code is set to match the encryption code of all receiving devices (e.g., an RCU, recorder, or receiver). Correctly setting this code allows the receiving device to properly decrypt the received transmission, while preventing unauthorized users from recording the data.

The operating mode of each local audio device can encompass any one of a number of modes. For example, the operating modes may include USA or European modes, as well as stereo modes. Selection of a specific mode may alter settings such as transmitter bandwidth, audio sampling parameters, and the like.

Although many specific features and functions for the local audio devices have been delineated herein, other features and functions may be added or eliminated without departing from the scope of the present invention.

Additionally, handheld embodiments may include any one of a variety of commercially available batteries to function with the power supply **306** without departing from the scope of the present invention. Power supply **306** may be virtually any power component or combination thereof that is compatible with the other components of local audio device **102** including, but not limited to, a Texas Instruments TPS62000DGS Power Module alone or in combination with a Linear Technology LTC3402 Synchronous Boost Converter.

Alternate embodiments of local audio device **102** are envisioned in which local receiver **302** are eliminated. In one such embodiment, local transmitter **308** is enabled whenever an audio event requiring recording is occurring. Local timecode generator **304** may be designed to generate timecodes whenever local transmitter **308** is enabled. When local transmitter **308** is not operating, the current value of local timecode generator **304** is stored in non-volatile memory to allow local timecode generator **304** to continue counting from the last generated timecode when the local transmitter **308** is re-enabled. Such embodiments include a timecode generator capable of generating unique timecodes for several years without a repeated timecode.

During recording, each local audio device **102** transmits data to one or more receivers and/or recorders. During recording, the receivers and/or recorders automatically detect corrupted audio data received from local audio devices **102** and maintain a list of same. The list of corrupted audio data contains references to the respective local audio device **102** from which the corrupted audio data was received to allow such data to be recovered post-recording.

Post-recording, memories **332** may be removed from each local audio device **102** such that locally recorded data may be retrieved and used to repair the corruption of the audio file generated by the receiver/recorders that occurred due to the receipt of corrupted audio data. Such data recovery may be performed using the multi-memory unit of the present invention or an equivalent. In one embodiment, the multi-memory unit may connect directly to the receivers and/or recorders to allow this equipment to directly retrieve the required audio

data. In another embodiment, memories **332** may be connected directly to the receivers/recorders for retrieval of the audio data, thereby eliminating the need for any extraneous equipment such as a personal computer. Identifiers such as local audio device identifiers, track identifiers, performer identifiers, and the like may be decoded from the audio data to allow the file manipulator to more quickly and easily manipulate the audio data.

Since the timecodes generated locally by each local audio device **102** may vary with respect to each other, the receivers, and/or the recorders, the present invention provides a method for ensuring that audio data retrieved from memories **332** is inserted in the proper time sequence with respect to the audio file(s) generated by the receiver/recorders. To achieve this, during recording, the receiver(s) and/or recorders generate or populate a cross-reference table, database, or the like that correlates the timecodes of the audio files generated by the receiver/recorders, as well as the timecodes of all audio data received from all local audio devices **102**. That is, the cross-reference mechanism correlates each timecode generated by a receiver or recorder to each timecode generated by each local audio device. In this manner, the timecodes of audio retrieved from memories **332** may be cross-referenced to determine the correlating timecode of the audio file generated by the receiver/recorders. Thereafter, the retrieved audio may optionally be re-stamped with the timecode of the receiver/recorder and inserted in its proper place within the receiver/recorder audio file. In this manner, audio may be wirelessly recorded with zero data loss.

Referring now to FIG. **4**A, illustrated is a flow diagram of one embodiment of a process for operation of a recording system such as recording system **100** in synchronous timecode generator mode in accordance with one embodiment of the present invention. Process **400** begins at **402**. For example, at **402**, one or more performers may each don a local audio device, such as local audio device **102** as described with respect to FIGS. **1**, **3**A, and **3**B. Also, a sound engineer or other personnel may be equipped with a control unit such as RCU **104**. Process **402** then proceeds to **404**.

At **404**, initialization occurs. During initialization, the local control unit such as local control unit **310** or other form of central processing unit is reset. Thereafter, the local transmitter, local receiver, ADC, DAC, and local timecode generator clock are initialized. The process then optionally proceeds to **406**, at which the sampling rate of the ADC is set. Alternatively, the sampling rate may be set via hardware or via software executed as part of a separate algorithm. In some embodiments of the present invention, a sample rate of 48 kHz is incorporated.

Next, at **408**, wireless receive channels are established between the local audio device and one or more wireless devices such as RCUs (e.g., RCU **104**), receivers, and audio recorders. To establish the channel, the local receiver of the audio device receives one or more data packets from the remote wireless device and stores the packets in a designated buffer. For example, when establishing wireless communication with a RCU, the local audio device may receive one or more data packets containing information such as a master timecodes, transport status (i.e., transport mode of an audio recorder), and the like. These packet(s) are then stored in an RX buffer (i.e., a reserved segment of memory used to hold data while it is being processed). Process **400** then proceeds to **410**.

At **410**, the local control unit reads the master timecode contained in the RX buffer and jam synchronizes the local timecode generator with the master timecode. The jam sync synchronizes the local audio device with the RCU while allowing the local audio device to supply its own timecode. Local supply of synchronized timecodes ensures proper timing during periods in which the master timecodes cannot be read (e.g., the RCU is temporarily unstable, wireless communication dropouts, etc.). Local supply of timecodes also allows local identifiers such as local track identifiers, local audio device identifiers, and the like to be added to the respective local audio device timecode. Such identifiers allow the locally recorded audio to be distinguished from audio recorded by other local audio devices. Such ability to distinguish is particularly useful to quickly and easily identify the audio tracks post-recording.

Next, at **412**, process **400** queries the transport status stored in the RX buffer. If at **412**, the transport status is stop, process **400** returns to **410**. However, if at **412**, the transport status is record, process **400** proceeds to **414**. At **414**, a new audio file is created in memory (e.g., on a flash card) and the newly created file is timestamped. In one aspect of the present invention, timestamping includes storing the timecode in the file header. Process **400** then proceeds to **416**.

At **416**, the local control unit waits for an audio sample interrupt from the ADC. Once an audio sample interrupt occurs, process **400** proceeds to **418**. At **418**, the audio sample is retrieved from the ADC and stored in the local memory. In one aspect of the present invention, the audio sample is stored in the next available address of the local memory. Next, at **420**, the timecode generator counter is incremented, thereby indicating that the time period for one sample of audio has elapsed.

Process **400** then proceeds to **422**, at which the local control unit transmits the audio sample through the local transmitter to the other wireless devices such as RCUs, receivers, audio recorders, and the like. For example, audio from multiple local audio devices may be transmitted to a multi-track recorder for recording of the audio event while each local audio device locally records its performer's audio. At **424**, process **400** queries the RF buffer of the local receiver to determine the availability of a new master timecode packet. If at **424**, a new master timecode packet has not been received from the RF receiver, process **400** returns to **416**. However, if at **424**, a new master timecode packet has been received, process **400** proceeds to **426** as depicted in FIG. **4**B.

At **426**, process **400** executes a feedback loop algorithm, which modifies the speed of the local timecode generator as necessary to maintain its synchronization with the master timecode generator (e.g., a timecode generator contained within the RCU or master recorder). This algorithm may be implemented using any one of a variety of methods. In one embodiment of the present invention, a feedback loop algorithm, such as process **500** depicted in FIG. **5**, modulates a low-pass filtered feedback error voltage that is supplied by the local control unit directly to the local oscillator. The local oscillator then controls the sample rate of the ADC and the speed of the local timecode generator by supplying the feedback error voltage to the ADC's sample rate input and the local timecode generator's clock control input. Alternatively, a comparator independent of the local control unit may perform the comparison of the master timecodes and the local timecodes and may vary the sample rate of the ADC and the speed of the local timecode generator by directly supplying the feedback error voltage to the oscillator. A variety of hardware and software equivalents of this function may be substituted without departing from the scope of the present invention.

Referring now to FIG. **5**, the feedback loop algorithm begins at **502**. At **504**, the current local timecode is retrieved from the timecode generator such as local timecode generator

304 and is written to the variable TCgen. Process 500 proceeds to 506. At 506, the current master timecode is retrieved from the RX buffer of the local receiver and is written to the variable TCrx and process 500 proceeds to 508. At 508, variable TCdiff is calculated by subtracting TCrx from TCgen. Process 500 then proceeds to 510, at which process 500 compares TCdiff to zero. If, at 510, TCdiff is less than zero, process 500 proceeds to 512, at which the feedback error voltage supplied to the local oscillator's DAC by the local control unit is increased above the previously supplied feedback error voltage. The local oscillator's DAC then supplies the new feedback error voltage to the local oscillator, which, in turn, supplies a new clock input voltage to the local timecode generator and a new sample rate input to the ADC. In this manner, the speed of the local timecode generator and the sample rate of the ADC are increased to maintain synchronization with the master timecode generator. However, alternate embodiments of the present invention are envisioned in which only one of either the speed of the local timecode generator or the sample rate of the ADC is modified.

Alternatively, if at 510 TCdiff is not less than zero, process 500 proceeds to 514, at which TCdiff is analyzed to determine if it is greater than zero. If yes, process 500 proceeds to 516 and the feedback error voltage supplied to the local oscillator's DAC by the local control unit is decreased below the previously supplied feedback error voltage. The local oscillator's DAC then supplies the new feedback error voltage to the local oscillator, which, in turn, supplies a new clock input voltage to the local timecode generator and a new sample rate input to the ADC. In this manner, the speed of the local timecode generator and the sample rate of the ADC are decreased to maintain synchronization with the master timecode generator. However, alternate embodiments of the present invention are envisioned in which only one of either the speed of the local timecode generator or the sample rate of the ADC is modified. Furthermore, alternate embodiments are envisioned in which an inverse relationship occurs (e.g., DAC voltage is increased when TCDiff is greater than zero and it is decreased when TCDiff is less than zero).

If TCdiff is neither less than zero as determined at 510 or greater than zero as determined at 514, then TCdiff is equal to zero. In this scenario, the local and master timecode generators are synchronized and, therefore, no adjustment is made to the speed of the local timecode generator. At this point, process 500 ends at 518.

Although FIG. 5 depicts one method of performing a feedback loop, many variations of this feedback loop may be substituted without departing from the scope of the present invention. For example, the feedback loop may be implemented as a digital phased locked loop that re-samples the audio in a manner that simulates a hardwired feedback loop. Also, the feedback loop may include a low pass filter.

Referring back to FIG. 4B, after execution of the feedback loop algorithm at 426, process 400 proceeds to 428. At 428, the local timecode generator is jam synchronized with the newly received master timecode read from the RX buffer. Next, process 400 optionally proceeds to 430, at which a timecode is stored as an escape sequence in the next available address of the local memory. The escape sequence stores a master timecode in addition to the locally generated timestamp. This escape sequence may be used post-processing to resample the audio based upon interpolated master timecode data. Process 400 then proceeds to 432. At 432, process 400 queries the continuous loop record mode. If at 432 the continuous loop record mode is enabled, process 400 returns to 416 to wait for an audio sample interrupt from the ADC as discussed above. However, if at 432, the continuous loop record mode has not been enabled, process 400 proceeds to 434. At 434, process 400 queries the transport status. If at 434 the transport status is record, process 400 returns to 416 to wait for an audio sample interrupt from the ADC as discussed above. However, if at 434, the transport status is stop, process 400 returns to 410, at which process 400 continuously jam synchronizes the local timecode generator with the master timecodes received in the RX buffer until the transport status changes from stop to record at 412.

Turning next to FIG. 6, illustrated is a flow diagram of one embodiment of a process for recording audio and for replaying and re-recording segments of missed audio in accordance with embodiments of the present invention. Process 600 begins at 602. For example, at 602, one or more performers may each don a local audio device, such as local audio device 102 as described with respect to FIG. 2A. Process 600 then proceeds to 604.

At 604, a master unit, such as RCU 104, receiver 106, or recorder 108 transmits master timecodes to each local audio device, and process 600 proceeds to 606. At 606, each local audio device synchronizes (e.g., jam syncs) its respective on board local timecode generator with the master timecodes received from the master unit, thereby synchronizing all local audio device timecode generators with the master timecode generator contained within the master unit. Process 600 then proceeds to 608. At 608, local audio devices begin locally recording audio received from an audio input device. This audio is stored in the memory of the respective local audio device with timestamps generated by the local timecode generator. Identifiers such as track identifiers, local audio device identifiers, and the like may also be stored in the memory of the respective local audio device to allow the locally recorded audio to be associated by track, local audio device, or the like post-recording. Each local audio device also simultaneously transmits its received audio to recorders or receiver/recorder combinations such as receivers 106 and recorders 108 in real time. Such audio may be transmitted alone or in combination with its respective timecodes. The audio received from each of the local audio devices (e.g., the local audio device of each performer) may be combined to create one or more multitrack audio files that are stored with master timestamps generated by the receiver/recorder's internal master timecode generator. In some embodiments of the present invention, local timecodes generated by the respective local audio device are stored with the multi-track audio files in addition to the master timestamps.

Process 600 then proceeds to 610. At 610, process 600 queries the initiation of audio replay. The initiation of audio replay may be manual or automatic. For example, if a user detects a loss of audio, the user may manually initiate audio replay beginning at the specific timecode reference at which the transmission error occurred. Alternatively, if a loss of audio is automatically detected by the receiving equipment, a playback request may be sent from the receiving equipment to the controlling unit such as a remote control unit. In response, such controlling unit may command the local audio devices to replay or retransmit the missed audio to the receiving equipment beginning at the timecode at which the loss of data occurred or at a conveniently close time thereto (e.g., zero to ten seconds prior to the loss of data).

If, at 610, audio replay is not initiated either manually or automatically, process 600 returns to 608. However, if, at 610, audio replay is initiated, process 600 proceeds to 612. At 612, a controlling unit, such as RCU 104, sends a signal to the local audio devices requesting playback of the stored audio starting at a specific timecode.

Next, at **614**, each local audio device processes the playback command and synchronizes playback to the timecode contained in the playback command. In addition, at least one local audio device transmits the synchronization data to the receiving equipment (e.g., receiver **106**, recorder **108**, etc.) to synchronize recording of the replayed audio. Process **600** then proceeds to **616**. However, in alternate embodiments of the present invention, the receiving equipment and the local audio devices may simultaneously receive the synchronization and time reference data from the transmitting equipment (e.g., the controlling unit).

At **616**, one or more local audio devices transmit, or replay, its respective stored audio starting with the audio that corresponds to the time specified by the timecode. The receiving equipment simultaneously records the replayed audio from each of the local audio devices and stores it within the previously recorded audio according to its timecode data. That is, due to the highly accurate synchronization of all of the components of the recording system, the receiving equipment may insert the replayed audio data that was not recorded during the audio event due to wireless transmission errors into the original recording at the nearly the exact time at which the missed audio originally occurred, thereby compensating for any transmission losses. Process **600** then proceeds to **618**. At **618**, one or more local audio devices continue to replay audio while the receiving equipment records the audio.

At **620**, process **600** queries the status of audio replay. If, at **620**, the audio has been fully replayed, process **600** proceeds to **608**. At **608**, the local audio devices may record a new audio event or may replay a different segment of recorded data. Otherwise, if, at **620**, all requested audio has not been replayed or re-recorded, process **600** returns to **618**.

Referring now to FIG. **7**, illustrated is a flow diagram of one embodiment of a process for operation of a recording system such as recording system **100** in asynchronous timecode generator mode in accordance with one embodiment of the present invention. Process **700** begins at **702**. For example, at **702**, one or more performers may each don a local audio device, such as local audio device **102** as described with respect to FIGS. **1**, **3**A, and **3**B. Also, a sound engineer or other personnel may be equipped with a control unit such as RCU **104**. Process **702** then proceeds to **704**.

At **704**, initialization occurs. During initialization, the local control unit such as local control unit **310** or other form of central processing unit is reset. Thereafter, the local transmitter, local receiver, ADC, DAC, and clock are initialized. The process then proceeds to **706**, at which the sampling rate of the ADC is set. In some embodiments of the present invention, a sample rate of 48 kHz is incorporated.

Next, at **708**, wireless receive channels are established between the local audio device and one or more wireless devices such as RCUs (e.g., RCU **104**), receivers, and audio recorders. To establish the channel, the local receiver of the audio device receives one or more data packets from the remote wireless device and stores the packets in a designated buffer. For example, when establishing wireless communication with a RCU, the local audio device may receive one or more data packets containing information such as a timecode, transport status (i.e., transport mode of an audio recorder), and the like. These packet(s) are then stored in an RX buffer. Process **700** then proceeds to **710**.

At **710**, the local control unit reads the transport status and the master timecode contained in the RX buffer. Next, at **712**, process **700** queries the transport status. If at **712**, the transport status is stop, process **700** returns to **710**. However, if at **712**, the transport status is record, process **700** proceeds to **714**. At **714**, a new audio file is created in memory (e.g., on a flash card) and the timecode is stored in the header of the newly created file. Such timecode may optionally include identification information such as track identifiers, local audio device, identifiers, and the like. Or, alternatively, such identification information may be stored in the newly created file in a location other than the timecode. For example, such identification information may be stored in the data stream in the header of the newly created file. However, the present invention is not so limited. Process **700** then proceeds to **716**.

At **716**, the local control unit waits for an audio sample interrupt from the ADC. Once an audio sample interrupt occurs, process **700** proceeds to **718**. At **718**, the audio sample is retrieved from the ADC and stored in the local memory. In one aspect of the present invention, the audio sample is stored in the next available address of the local memory. Process **700** then proceeds to **720**, at which the local control unit transmits the audio sample through the local transmitter to the other wireless devices such as receivers, audio recorders, and the like.

At **722**, process **700** queries the RF buffer of the local receiver to determine the availability of a new master timecode packet. If at **722**, a new master timecode packet has not been received from the RF receiver, process **700** returns to **716**. However, if at **722**, a new master timecode packet has been received, process **700** optionally proceeds to **724**. At **724**, the timecode is stored as an escape sequence in the next available address of the local memory. Process **700** then proceeds to **726**. At **726**, process **700** queries the continuous loop record mode. If at **726** the continuous loop record mode is enabled, process **700** returns to **716** to wait for an audio sample interrupt from the ADC as discussed above. However, if at **726**, the continuous loop record mode has not been enabled, process **700** proceeds to **728**. At **728**, process **700** queries the transport status. If at **728** the transport status is record, process **700** returns to **716** to wait for an audio sample interrupt from the ADC as discussed above. However, if at **728**, the transport status is stop, process **700** returns to **710**, at which process **700** continuously reads the transport status and master timecodes from the RX buffer until the transport status changes from stop to record at **712**.

Operation of the present invention in asynchronous mode allows one or more components of local audio devices such as local audio devices **102** (e.g., local timecode generator, comparator, counter, etc.) to be eliminated in embodiments in which the local audio devices utilize master timecodes generated by the master timecode generator rather than locally generated timecodes.

Referring next to FIG. **8**, depicted is multi-memory unit **800** for reading and/or reformatting audio files recorded on a plurality of local audio device memories (e.g., memories **332**). In its simplest form, such as the embodiment depicted in FIG. **8**, multi-memory unit **800** includes a plurality of individual memory ports **802***a*-**802***f*(e.g., flash memory card drives, compact flash memory card drives, USB thumbdisk ports, etc.). Also optionally included is a plurality of memory status displays **804***a*-**804***f* to indicate to a user which memory ports **802** are in use. Similarly, power status display **806** and external connection status display **808** may be optionally included to indicate the presence of power and an external connection (e.g., a personal computer), respectively. Multi-memory unit **800** may be equipped with an integral user interface or may be connected to an external interface (e.g., a personal computer) to allow the audio files contained on each memory to be manipulated and/or read.

In one aspect of the present invention, the memory of each local audio device such as local audio device **102** may be removed after completion of a performance, videotaping, etc.

Each memory may then be inserted into a corresponding one of memory ports **802**. Thereafter, all of the individual audio files may be combined to provide one or more comprehensive audio files. Or, alternatively, each audio file may be individually reformatted or otherwise manipulated prior to creation of one or more comprehensive audio files.

In embodiments of the present invention in which the recording system recorded the audio event in asynchronous mode, or in which long periods (e.g., 8 hours) of recording occurred, multi-memory unit **800** may be used to resample the audio samples to ensure that each audio file's timestamps are properly synchronized. One example of such as process is illustrated in the flowchart of FIG. **9**.

In some embodiments of the present invention, multi-memory unit **800** may allow identification information such as track identifiers, local audio device identifiers, and the like to be added to each portion of audio stored in memory **332**. In such embodiments, multi-memory unit **800** may have the ability to modify the timecode(s) associated with each portion of audio recorded on each memory **332** to add, modify, or delete the desired identification information. Or, alternatively, multi-memory unit **800** may have the ability to add such identification information to each portion of audio stored in memory **332** in a location other than the timecode (e.g., in a file header).

Referring now to FIG. **9**, illustrated is a flow diagram of one embodiment of a process for interpolating timestamps for unstamped audio samples (i.e., audio samples that are not associated with a master timecode timestamp) based upon the timestamps of stamped audio samples (i.e., audio samples that are associated with a master timecode timestamp), and resampling the audio samples to include the interpolated timestamps in accordance with embodiments of the present invention. After recording of an audio event, the audio data stored in the memory of the local audio device (e.g., memory **332**) will typically be stored as an audio sample stream wherein approximately one out of every one thousand to one hundred thousand samples includes a timestamp generated by a remote master timecode generator. However, the interval between timestamped audio samples may be greater than the aforementioned interval if the wireless timecode link was less reliable than a standard wireless link.

The resampling process depicted in FIG. **9**, and equivalents thereof, analyze the occurrence of the relatively sparse timestamped audio samples to generate a linear interpolation or a best fit curve. This curve is then used to interpolate timestamps for the unstamped audio samples. After the timestamp of each audio sample has been interpolated, the audio samples may then be re-sampled such that the audio samples are now synchronized with samples generated by the master timecode generator. In one aspect of the present invention, the audio samples are resampled based upon the calculated curve to simulate the condition of an ADC whose sample rate input was driven directly by the master timecode generator's source.

If all of the audio from all local audio devices is resampled in this manner, each resulting resampled audio file appears as if it was originally sampled with an accurate audio sample clock derived from the master timecode source. This resampling allows each audio file to include a single timestamp that marks the master timecode of the first audio sample of the audio file. Furthermore, since the audio files now appear as if they have been sampled by an extremely accurate audio sample clock, each audio sample's timestamp may be accurately calculated based solely on the audio sample rate and the timestamp of the first audio sample of the audio file. This condition allows the audio files to be formatted and/or stored as a standard timecoded broadcast .WAV file, thereby allowing them to be read, edited, etc. using standard, commercially-available editing systems. That is, the files may be processed in the same manner as if the audio file had been generated by a standard multi-track audio recorder. Such condition allows the present invention to be easily integrated with other industry standard recording equipment.

One such resampling process is illustrated in FIG. **9**. Process **900** begins at **902**. For example, at **902**, one or more local audio device memories may be removed from its respective local audio device and may be inserted into a multi-memory unit **800**, or an equivalent thereof. Process **902** then proceeds to **904**.

At **904**, process **900** determines the desired starting and ending timecodes and stores this data in the variables TimeCodeStart and TimeCodeEnd, respectively. The desired starting and ending timecodes may be input by a user or may be suggested or automatically determined by the algorithm. Process **900** then proceeds to **906**. At **906**, a variable, i, is initialized to a value of zero. The variable i corresponds to the position of audio samples or data points in a data array represented by the variable AudioSample[i]. Process **900** then proceeds to **908**.

At **908**, process **900** begins an iterative search for the audio file that matches the desired starting timecode of the output file by comparing the value of TimeCodeStart with the value of the timecode of AudioSample[i]. If, at **908**, the value of TimeCodeStart is equal to the value of the AudioSample[i] timecode, process **900** proceeds to **912**. However, if at **908** the value of TimeCodeStart is not equal to the value of the AudioSample[i] timecode, process **900** proceeds to **910**. At **910**, the variable i is increased by a value of one thereby allowing the value located in the next position of the audio sample array to be compared to the value of TimeCodeStart when process **900** returns to **908**.

If the value of TimeCodeStart is equal to the value of the AudioSample[i] timecode, process **900** proceeds to **912**. At **912**, a variable, n, is initialized to a value of one. The variable n is added to the variable i to allow process **900** to continue to traverse the audio sample array while maintaining the location of the audio sample at the starting timecode, which is represented by the variable AudioSample[i]. Process **900** then proceeds to **914**. At **914**, the value of the AudioSample[i+n] timecode is compared to the value of TimeCodeEnd. If at **914**, the value of the AudioSample[i+n] timecode is greater than or equal to the value of TimeCodeEnd, process **900** proceeds to **916**. At **916**, the value of the AudioSample[i+n] timecode is again compared to the value of TimeCodeEnd. If at **914**, the value of the AudioSample[i+n] timecode is greater than the value of TimeCodeEnd, process **900** proceeds to **928**, at which process **900** terminates. However, if at **916**, the value of the AudioSample[i+n] timecode is equal to the value of TimeCodeEnd, process **900** proceeds to **922**.

Conversely, if at **914**, the value of the AudioSample[i+n] timecode is less than the value of TimeCodeEnd, process **900** proceeds to **918**. At **918**, the value of the AudioSample[i+n] timecode is compared to the value of CurrentTimeCodeEscapeSequence. If, at **918**, the value of the AudioSample[i+n] timecode is not equal to the value of TimeCodeEscapeSequence, process **900** proceeds to **920** where the variable n is increased by one and process **900** returns to **914**. However, if at **918**, the value of the AudioSample[i+n] timecode is equal to the value of TimeCodeEscapeSequence, process **900** proceeds to **922**.

At **922**, the average time period "T" that elapsed between the audio samples that occurred between AudioSample[i] and AudioSample[i+n] may be calculated by subtracting the

value of the timecode of AudioSample[i] from the value of the timecode of AudioSample[i+n] and dividing by n, wherein n is now equivalent to the number of audio samples that occurred between the current timestamped audio sample and the previous timestamped audio sample. Process **900** then proceeds to **924**. At **924**, AudioSamples[i] through AudioSamples[i+n] are re-sampled at any desired sample rate based upon the value of T as calculated in **922**, or any other desired sample rate, using an audio resampling algorithm (e.g., linear interpolation). Process **900** then proceeds to **926**, at which the variable i is set to a value equal to the current value of i plus the current value of n and process **900** returns to **912**. The iterative process continues until the value of the AudioSample[i+n] timecode is greater than the value of TimeCodeEnd, whereby process **900** proceeds to **928**, at which process **900** terminates.

A similar interpolation algorithm, such as the algorithm depicted in FIG. **10**, may be incorporated to break down single large audio files (e.g., an audio file recording the filming of multiple movie takes over a continuous eight hour period as a single eight-hour audio file) into smaller, more useful files (e.g., one audio file per take). These smaller files will allow the audio recorded locally by the local audio devices to be more easily matched or synchronized with the individual audio files recorded by a master recorder such as recorder **108**.

In one use of an embodiment of the present invention, multiple local audio devices store audio samples with wirelessly-received timecode and transport status samples continuously for the entire duration of the work day (e.g., an 8 hour period). In a typical scenario, while the local audio devices are recording continuously, a technician intermittently records segments of the eight-hour audio event. For example, in a film setting, each segment would typically represent a movie 'take' and might range from one to five minutes in duration. Consequently, the master recorder generates individual audio files (i.e., at least one audio file for each recorded segment such as a movie take), whereas each local audio device generates one massive audio file. Therefore, there is a need for a method of segmenting each large local audio file into smaller audio files that correspond to the segments recorded by the master recorder.

The segmentation method (i.e., the method of segmenting the large local audio devices' files to match the multiple, smaller master recorder's audio file) requires knowledge of which portions of the single local audio device audio file are important and which portions can be discarded. This information can be inferred from the transport status of the master recorder since it is typically operated by someone with this knowledge. Therefore, when the transport status of the master recorder changes from stop to record, it can be inferred that a new master recorder audio file begins, and, subsequently, when the transport status of the master recorder changes from record to stop, it can be inferred that the same master recorder audio file has ended. In addition, when the transport status of the master recorder remains in the stop mode, it can be inferred that the audio recorded by the local audio device during this time period may be discarded. This audio may be discarded post-processing as per algorithms such as that depicted in FIG. **10** or during live recording.

In embodiments of the present invention in which such data is discarded during live recording, the transport status and master timecode of the master recorder are wirelessly transmitted to the local audio devices. This information may be processed by the local audio devices to allow them to create a new audio file with the current master timecode of the master recorder whenever the received transport status and master timecode indicate that the transport status has changed from stop to record. Similarly, the local audio devices may end the newly created audio file when the received transport status indicates that it has changed from record to stop. In this scenario, the resulting local audio device files will automatically be segmented and will each be marked with a master timestamp at the beginning of each file.

However, in embodiments of the present invention in which unimportant audio is not discarded during live recording and, therefore, one or more large audio files are created, the large audio files may be segmented as per a process such as process **1000** as illustrated in FIG. **10**. Process **1000** begins at **1002** at which one or more local audio devices have continuously recorded a lengthy quantity of audio data. Process **1000** then proceeds to **1004**.

At **1004**, a copy of the audio file directory containing the segmented audio files that correspond to the same time period as the local audio device's single large audio file is obtained from the master recorder. Process **1000** then proceeds to **1006**. At **1006**, a variable y is initialized to a value of zero. The variable y corresponds to the number of each file contained in the audio file directory copied from the master recorder. Process **1000** then proceeds to **1008**, at which the variable y is increased by one and a variable x is initialized to a value of one. The variable x corresponds to the position of each audio sample within a particular file. Process **1000** then proceeds to **1010**, at which the copied audio file directory is queried to determine if a file[y] (i.e., the file named with the number that corresponds to the value of y) exists in the audio file directory. If no, process **1000** proceeds to **1028** and terminates.

If file[y] does exist, process **1000** proceeds to **1012**, at which process **1000** determines the starting and ending timecodes for file[y] and stores them in the variables TimeCodeStart and TimeCodeEnd, respectively. Process **1000** then proceeds to **1014**, at which process **1000** compares the value of TimeCodeStart to the value of the timecode associated with AudioSample[x] stored in the memory of the local audio device. If at **1014** the value of TimeCodeStart is not equal to the value of the timecode associated with AudioSample[x], process **1000** proceeds to **1016**. At **1016**, the variable x is increased by one and process **1000** returns to **1014**. In this manner, TimeCodeStart is compared to each consecutive AudioSample[x] until the AudioSample timestamped with a value equal to TimeCodeStart is found. In some embodiments of the present invention, process **1000**, or an equivalent thereof, is performed after process **900**, or an equivalent thereof, to ensure that each of the audio samples has a timestamp (e.g., an interpolated timestamp).

When the AudioSample[x] having a timecode equivalent to TimeCodeStart is found at **1014**, process **1000** proceeds to **1018**. At **1018**, AudioSample[x] is extracted and process **1000** proceeds to **1020**, at which the variable x is increased by one and process **1000** proceeds to **1022**. At **1022**, process **1000** compares the value of TimeCodeEnd to the value of the timecode associated with AudioSample[x]. If at **1022**, the value of TimeCodeEnd is not equal to the value of the AudioSample[x] timecode, process **1000** returns to **1018**, whereupon audio samples are consecutively extracted until the timecode of the current AudioSample[x] equals TimeCodeEnd. If, at **1022**, the value of TimeCodeEnd is equal to the value of the timecode of AudioSample[x], process **1000** proceeds to **1024**, at which the final AudioSample[x] of the segmented audio file is extracted and the audio file is saved at **1026**.

Process **1000** then proceeds to **1008**, at which the variable y is increased by one and process **1000** proceeds to **1010** at which the audio file directory is queried to determine the

existence of file [y]. If file[y] exists, process **1000** proceeds to **1012** and it continues thereafter as described above. However, if at **1010**, it is determined that file[y] does not exist, process **1000** proceeds to **1028**, at which it terminates.

Although several processes have been disclosed herein as software, it is appreciated by one of skill in the art that the same processes, functions, etc. may be performed via hardware or a combination of hardware and software. Similarly, although the present invention has been disclosed with respect to wireless systems, these concepts may be applied to hardwired systems and hybrid hardwired and wireless systems without departing from the scope of the present invention.

It will be appreciated by those skilled in the art that changes could be made to the embodiments described above without departing from the broad inventive concept thereof. It is understood, therefore, that this invention is not limited to the particular embodiments disclosed, but it is intended to cover modifications within the spirit and scope of the present invention as defined by the appended claims.

We claim:

1. An apparatus or system for locally recording locally generated audio, said locally generated audio also being wirelessly transmitted to, and remotely recorded by, a remote recorder as remotely recorded audio data comprising:

at least one local audio device wearable by a creator of said locally generated audio including:

at least one local audio device receiver for receiving at least one of the group consisting of digital data, time data, and audio data;

at least one audio input port for receiving said locally generated audio from an audio input device, said audio input device wearable by a creator of said locally generated audio;

at least one memory; and

at least one control unit electrically coupled to said local audio device receiver, said audio input device, and said memory for creating local audio data and storing said local audio data in said memory;

wherein said local audio data may be retrieved after said locally recording and combined with said remotely recorded audio data.

2. A system according to claim **1**, wherein said local audio data includes at least one identifier selected from the group consisting of track identifiers, local audio device identifiers, performer identifiers, and combinations thereof.

3. An apparatus or system according to claim **1** wherein said at least one local audio device is at least one bodypack.

4. An apparatus or system according to claim **1** wherein said creator of said locally generated audio is a live performer.

5. An apparatus or system according to claim **1** wherein said at least one local audio device further includes:

At least one audio output port.

6. An apparatus or system according to claim **5** wherein said locally generated audio is transmitted from said at least one local audio output port directly or indirectly to a remote recorder.

7. An apparatus or system according to claim **1** wherein said audio input device is a microphone.

8. An apparatus or system according to claim **1** wherein said at least one memory is removable from said at least one local audio device.

9. An apparatus or system according to claim **1** wherein said at least one memory is a memory card.

10. An apparatus or system according to claim **1** wherein said time data includes at least one of the group consisting of hour data, minute data, second data, and combinations thereof.

11. An apparatus or system according to claim **1** wherein said digital data includes setting data for said at least one local audio device.

12. A method of locally recording locally generated audio, said locally generated audio also being wirelessly transmitted to, and remotely recorded by, a remote recorder as remotely recorded audio data comprising the steps of:

locally receiving said local audio generated by at least one performer during an audio event; and

transmitting said local audio, directly or indirectly, to at least one of the group consisting of a recorder, a receiver, and combinations thereof;

locally recording said local audio as local audio data in at least one memory of at least one local audio device wearable by a creator of said local audio;

remotely recording said transmitted local audio via at least one of the group consisting of a recorder, a receiver, and combinations thereof as remotely recorded audio data;

wherein said local audio data is retrieved during or subsequent to said audio event and is combined with said remotely recorded audio data.

13. A method according to claim **12**, said method further comprising the step of:

locally receiving or generating master time data;

wherein said master time data includes at least one of the group consisting of hour data, minute data, second data, and combinations thereof.

14. A method according to claim **12**, further comprising:

manipulating said local audio data contained in at least a portion of said memory;

wherein said manipulation includes at least one of the group consisting of adding said track identifier to at least a portion of said memory, deleting said track identifier from at least a portion of said memory, altering said track identifier associated with at least a portion of said memory, adding said local audio device identifier to at least a portion of said memory, deleting said local audio device identifier from at least a portion of said memory, altering said local audio device identifier associated with at least a portion of said memory, adding said performer identifier to at least a portion of said local audio data, deleting said performer identifier from at least a portion of said local audio data, altering said performer identifier associated with at least a portion of said local audio data, and combinations thereof.

* * * * *

CERTIFICATE OF COMPLIANCE

This brief complies with the type-volume limitations of Fed. Cir. R. 32(a). This brief contains 13,172 words (including all text in images), excluding the parts of the brief exempted by Federal Rule of Appellate Procedure 32(f) and Fed. Cir. R. 32(b). This brief complies with the typeface requirements of Federal Rule of Appellate Procedure 32(a)(5) and the type style requirements of Federal Rule of Appellate Procedure 32(a)(6). This brief has been prepared in a proportionally spaced typeface using Microsoft Word 2016 in fourteen (14) point Times New Roman font.

Dated: May 26, 2020

/s/ Rita C. Chipperson
Rita C. Chipperson
One of the Attorneys for Appellant

CERTIFICATE OF SERVICE

I, Rose E. Olejniczak, being duly sworn according to law and being over the age of 18, upon my oath deposes and states that:

Counsel Press was retained by Chipperson Law Group, P.C. and Flachsbart & Greenspoon, LLC, Attorneys for Appellant Zaxcom, Inc., to print this document. I am an employee of Counsel Press.

On May 26, 2020, Flachsbart & Greenspoon authorized me to electronically file the foregoing Brief of Appellant with the Clerk of the Federal Circuit using the CM/ECF System, which will serve e-mail notice of such filing on the following attorneys:

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Upon acceptance by the Court of the e-filed document, I will cause six paper copies of the brief to be filed with the Court, via Federal Express, within the time provided in the Court's rules.

/s/ Rose E. Olejniczak
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