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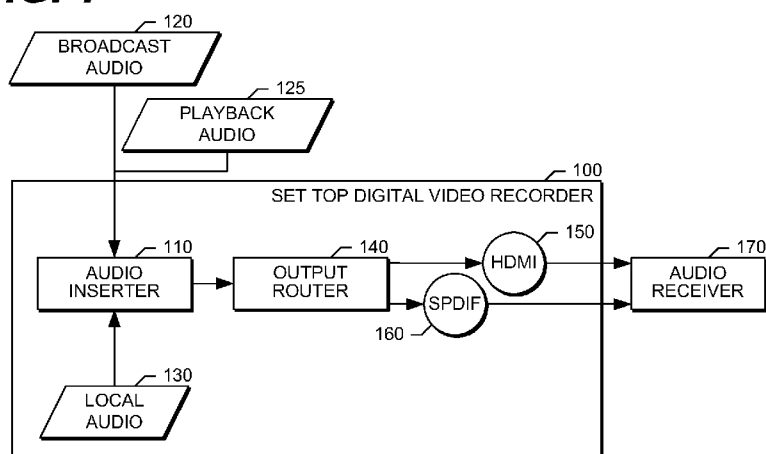
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FIG. 1



(57) Abstract: A method and computing system for seamlessly inserting a local audio clip into a primary audio stream. The method sends the primary audio stream to an audio output port, and determines main parameters for the primary audio stream. The method receives a request to insert an encoded local audio clip, locates an insertion point in the primary audio stream that coincides with an end of a frame boundary, and identifies a best matching encoded local audio clip for the main parameters. The method receives and sends the best matching encoded local audio clip to the audio output port, stores the primary audio stream in a buffer while sending the best matching encoded local audio clip, and resumes the sending of the primary audio stream when the sending of the best matching encoded local audio clip is complete.



A METHOD TO SEAMLESSLY INSERT AUDIO CLIPS INTO A COMPRESSED BROADCAST AUDIO STREAM

BACKGROUND

[0001] A set top digital video recorder (DVR) is a computing device that records digital data streams for broadcast television, cable television, or satellite television. The set top DVR may be a stand-alone or portable device, integrated into a set-top box provided by a cable or satellite provider, or created using components and software in a computer. The set top DVR typically includes a large capacity hard drive for recording and storing the digital data streams for viewing at a later time. The hard drive provides the ability to watch a live digital data stream, watch a recorded digital data stream, or watch a recorded digital data stream while recording a live digital data stream.

[0002] A prior art approach for switching audio output from the broadcast audio of a live digital data stream to the sound effects audio of a recorded digital data stream, and back to the broadcast audio would stop the broadcast audio, reset the Sony Phillips Digital Interface (SPDIF) mode and the High Definition Multimedia Interface (HDMI) mode, play the local audio, reset the SPDIF mode again to compressed mode, and restart the broadcast audio. One disadvantage of this approach is that it typically results in significant delays due to stopping and starting the broadcast audio and changing the SPDIF modes. There is a need for a system and method that enables the insertion of sound effects into broadcast audio in a seamless fashion that preserves the

broadcast audio frame boundaries, thereby preventing the external receiver from resetting due to buffer overflow or underflow.

SUMMARY

[0003] Aspects of the present invention provide a method and computing system for seamlessly inserting a local audio clip into a primary audio stream. The method sends the primary audio stream to an audio output port, and determines main parameters for the primary audio stream. The method receives a request to insert an encoded local audio clip, locates an insertion point in the primary audio stream that coincides with an end of a frame boundary, and identifies a best matching encoded local audio clip for the main parameters. The method receives and sends the best matching encoded local audio clip to the audio output port, stores the primary audio stream in a buffer while sending the best matching encoded local audio clip, and resumes the sending of the primary audio stream when the sending of the best matching encoded local audio clip is complete.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] FIG. 1 is a block diagram that illustrates one embodiment of hardware components for a computing device that performs the present invention.

[0005] FIG. 2 is a block diagram that illustrates another embodiment of the hardware components shown in FIG. 1.

[0006] FIG. 3 is a flow diagram that illustrates a method for seamless switched audio output in a computing device according to an embodiment of the present invention.

DETAILED DESCRIPTION

[0007] FIG. 1 is a block diagram that illustrates one embodiment of hardware components for a computing device that performs the present invention. As shown in FIG. 1, the computing device is a set top digital video recorder **100** that includes an audio inserter **110** component, an output router **140** component, an HDMI **150** port, and an SPDIF **160** port. The audio inserter **110** component of the computing device **100** includes a digital port that connects to the output router **140** component, and receives audio input from broadcast audio **120**, playback audio **125**, or local audio **130**. In various embodiments, the broadcast audio **120** is sourced via an inband tuner (QAM source) or IP Stream (IPTV source) for the set top digital video recorder **100**. In either of these embodiments, the playback audio **125** is played back from a hard-disk drive or retrieved from a network server. In various other embodiments, the audio inserter **110** receives the local audio **130** from a hard drive or memory of the set top digital video recorder **100**. In either of these embodiments, the local audio **130** is stored in compressed form as a sequence of audio frames (elementary stream format) with each frame consisting of a header followed by blocks of compressed data where the header includes information about the compression method used, sampling rate, etc. In various embodiments, the compression format is Digital Dolby Audio (AC3), Dolby Digital Plus (E-AC-3) Audio, or Advanced Audio coding (AAC).

[0008] When the audio inserter **110** component of the computing device **100** receives broadcast audio **120** or playback audio **125**, the audio inserter **110** sends the broadcast audio **120** or playback audio **125** to the output router **140** component. The output router **140** component then transmits the broadcast audio **120** or playback audio **125**

over its digital port to the HDMI **150** port and to the SPDIF **160** port for the set top digital video recorder **100**. The output of the HDMI **150** port and the SPDIF **160** port is sent to an audio receiver **170**. In one embodiment, the audio receiver **170** is an external device to the set top digital video recorder **100**.

[0009] When the audio inserter **110** component of the computing device **100** receives local audio **130**, the audio inserter **110** replaces the broadcast audio **120** or playback audio **125** and sends the result to the output router **140** component. The output router **140** component then transmits the local audio **130** over its digital port to the HDMI **150** port and to the SPDIF **160** port for the set top digital video recorder **100**. The output of the HDMI **150** port and the SPDIF **160** port is sent to an audio receiver **170**. In one embodiment, the audio receiver **170** is an external device to the set top digital video recorder **100**.

[0010] FIG. **2** is a block diagram that illustrates another embodiment of the hardware components shown in FIG. **1**. In particular, FIG. **2** illustrates the hardware components and software comprising the set top digital video recorder **100** shown in FIG. **1**.

[0011] The set top digital video recorder **100** shown in FIG. **2**, in one embodiment, is a general-purpose computing device that performs the present invention. A bus **205** is a communication medium that connects a processor **210**, data storage device **215** (such as a Serial ATA (SATA) hard disk drive, optical drive, Small Computer System Interface (SCSI) disk, or the like), audio interface **220**, and memory **230** (such as Random Access Memory (RAM), Dynamic RAM (DRAM), non-volatile computer

memory, flash drive, or the like). The audio interface **220** receives audio, such as the broadcast audio **120**, and outputs audio to the audio ports, such as HDMI **150**, and SPDIF **160**.

[0012] The processor **210** performs the disclosed methods by executing the sequences of operational instructions that comprise each computer program resident in, or operative on, the memory **230**. The reader should understand that the memory **230** may include operating system, administrative, and database programs that support the programs disclosed in this application. In one embodiment, the configuration of the memory **230** of the digital video recorder **200** includes the local audio **130**, an audio inserter program **231**, and an output router program **232**. The audio inserter program **231**, and output router program **232** perform the method of the present invention disclosed in detail in FIG. 3. When the processor **210** performs the disclosed methods, it stores intermediate results in the memory **230** or data storage device **215**. In another embodiment, the memory **230** may swap these programs, or portions thereof, in and out of the memory **230** as needed, and thus may include fewer than all of these programs at any one time.

[0013] FIG. 3 is a flow diagram that illustrates a method for seamless switched audio output in a computing device according to an embodiment of the present invention. In particular, FIG. 3, with reference to FIG. 1 and FIG. 2, illustrates the set top digital video recorder **100** seamlessly switching the audio output from broadcast audio **120** to local audio **130**, and back to broadcast audio **120**.

[0014] The process 300 shown in FIG. 3 begins when the set top digital video recorder 100 receives a broadcast audio 120 or playback audio 125 stream (step 302). The audio inserter program 231 then determines whether the set top digital video recorder 100 needs to insert a local audio 130 clip in the broadcast audio 120 or playback audio 125 stream (step 304). If the set top digital video recorder 100 does not receive a request to insert a local audio 130 clip (step 304, N branch), the audio inserter program 231 interfaces with the output router program 232 to send the broadcast audio 120 or playback audio 125 stream to the SPDIF 185 and HDMI 180 ports (step 306). If the set top digital video recorder 100 receives a request to insert a local audio 130 clip (step 304, Y branch), the audio inserter program 231 locates an insertion point (*i.e.*, a start of a subset of frames) in the broadcast audio 120 or playback audio 125 stream (step 308), and then proceeds to identify a local audio 130 clip for insertion. In various embodiments, the process 300 retrieves the local audio 130 clips (step 310) from the memory 230, from the data storage device 215, or from a network (not shown) data storage device. The audio inserter program 231 determines the primary parameters, or main parameters, from the broadcast audio 120 or playback audio 125 stream (step 312). In one embodiment, the audio inserter program 231 makes this determination by examining the program map table (PMT) for the broadcast audio 120 or playback audio 125 stream. In another embodiment, the audio inserter program 231 makes this determination by evaluating the metadata of the encoded broadcast audio 120 or playback audio 125 stream. The audio inserter program 231 then performs a lookup operation to identify the best matching local audio 130 clip based on the previously determined primary parameters, or main parameters (step 314). The audio inserter program 231 may then buffer the broadcast

audio **120** or playback audio **125** stream and substitute the selected local audio frames in place of the encoded broadcast audio **120** or playback audio **125** stream (step **316**). The audio inserter program **231** then sends the encoded local audio **130** to the SPDIF **160** and HDMI **150** ports (step **318**). After sending the encoded local audio, the process **300** returns to receive and output a broadcast audio **120** or playback audio **125** stream (step **302**).

[0015] The audio inserter program **231** accepts multichannel broadcast audio **120**, playback audio **125**, and local audio **130** as inputs. The audio inserter program **231** inserts the local audio **130** frames into the broadcast audio **120** or playback audio **125** such that the frame boundaries of the broadcast audio **120** or playback audio **125** are preserved. Thus, for the duration of the local audio **130** clip, the broadcast audio **120** or playback audio **125** frames are dropped, and the local audio **130** frames are inserted. This will result in the start of the first local audio **130** frame coinciding with the end of the broadcast audio **120** or playback audio **125** frame, and the end of the last local audio **130** frame coinciding with the start of a broadcast audio **120** or playback audio **125** frame. The broadcast audio **120** or playback audio **125** stream, in effect, remains muted for the duration of the local audio **130** clip insertion. In one embodiment, the broadcast audio **120** or playback audio **125** stream resumes from the current time. In another embodiment, the broadcast audio **120** or playback audio **125** stream may have been buffered for the duration of local audio clip **130** insertion, hence allowing delayed playing of the buffered frames of the broadcast audio **120** or playback audio **125** stream.

[0016] The audio inserter program **231** ensures that the values of the encoding parameters of the local audio **130** clip match those of the broadcast audio **120** or playback audio **125**. The present invention prevents the external audio receiver **170** from resetting because it detects a new audio stream on its input channels when the local audio **130** clip is inserted. To achieve a perfect match between the local audio **130** clip and the broadcast audio **120** or playback audio **125**, the audio inserter program **231**, or in another embodiment, an external off-line program, would encode each local audio **130** clip with all possible parameter values, and store these various local audio **130** clips for later retrieval. During the matching process, the audio inserter program **231** would then locate the best matching local audio **130** clip, either from memory **230** or data storage device **215**, and use it for insertion in the broadcast audio **120**. Such a brute-force approach (*i.e.*, matching all possible parameters for all possible clips) to achieve a perfect match is very expensive from both a computational and storage perspective. The present invention improves upon two aspects of this brute-force approach to keep the number of local audio **130** clips at a manageable set.

[0017] First, all of the parameters in the broadcast audio **120** or playback audio **125** frame are not equally important for matching, irrespective of the audio compression algorithm employed. For instance, when broadcast audio **120** or playback audio **125** employs the Dolby Digital Audio (AC3) encoding technique, the key parameters are the sampling rate, channel configuration, and bitrate, while the remaining parameters are of secondary importance because many decoders either ignore these parameters or handle discontinuities gracefully. Hence, each local audio **130** clip only needs to be encoded with different permutations of the key parameters. To select the best local

audio **130** clip to insert, the matching process only matches the key parameters between the broadcast audio **120** or playback audio **125** and local audio **130** clip, leaving the remaining secondary parameters in the selected clip to be recomputed and substituted on the fly (or even ignored) within the local audio **130** clip.

[0018] To match the encoding parameters between broadcast audio **120** or playback audio **125** and local audio **130**, the audio inserter program **231** must be able to obtain the encoding parameters from the platform software for the set top digital video recorder **100**. In one embodiment, when the set top digital video recorder **100** employs MPEG-2 Transport Stream as basis, the audio inserter program **231** obtains the encoding parameter values of broadcast audio **120** or playback audio **125** from the program map table (PMT) that carries audio parameters. In another embodiment, the audio inserter program **231** ensures that it has the current values by monitoring for PMT version changes. In yet another embodiment, the audio inserter program **231** obtains the encoding parameter values from the metadata of the encoded broadcast audio **120** or playback audio **125** stream.

[0019] Second, in any practical application the key parameters in the broadcast audio **120** or playback audio **125** are not expected to take every possible value, regardless of the compression algorithm employed. In practice, only a few values are used. Thus, the encoding process only encodes the local audio **130** clip with a subset of the values for the key parameters.

[0020] Although the disclosed embodiments describe a fully functioning method for seamless switched audio output in a computing device, the reader should understand

that other equivalent embodiments exist. Since numerous modifications and variations will occur to those reviewing this disclosure, the method for seamless switched audio output in a computing device is not limited to the exact construction and operation illustrated and disclosed. Accordingly, this disclosure intends all suitable modifications and equivalents to fall within the scope of the claims.

We claim:

1. A method, comprising:

receiving a primary audio stream at a computing device, the primary audio stream including a sequence of audio frames;

sending the audio frames of the primary audio stream to an audio output port of the computing device;

determining main parameters for the primary audio stream;

receiving a request at the computing device to insert an encoded local audio clip in the primary audio stream, the encoded local audio clip comprising a sequence of local audio frames;

locating an insertion point in the primary audio stream, the insertion point coinciding with an end of a frame boundary;

identifying a best matching encoded local audio clip that is a best match for the main parameters determined for the primary audio stream;

receiving the best matching encoded local audio clip at the computing device;

sending audio frames of the best matching encoded local audio clip to the audio output port of computing device;

storing audio frames of the primary audio stream in a buffer while sending the audio frames of the best matching encoded local audio clip; and

resuming the sending of the audio frames of the primary audio stream when the sending of the audio frames of the best matching encoded local audio clip is complete.

2. The method of claim 1, wherein the primary audio stream comprises at least one of a broadcast audio stream and a playback audio stream.

3. The method of claim 1, wherein the computing device is a set top digital video recorder.

4. The method of claim 1, wherein the determining of the main parameters further comprises:

examining a program map table for the primary audio stream.

5. The method of claim 1, wherein the determining of the main parameters further comprises:

evaluating metadata of the primary audio stream.

6. The method of claim 1, wherein the identifying of the best matching encoded local audio clip further comprises:

comparing the main parameters to a number of encoded versions of the encoded local audio clip; and

selecting the best matching encoded local audio clip from the number of encoded versions of the encoded local audio clip.

7. The method of claim 1, wherein the receiving of the best matching encoded local audio clip further comprises:

retrieving the best matching encoded local audio clip from a data storage device connected to the computing device.

8. The method of claim 1, wherein the audio output port comprises at least one of a SPDIF port and an HDMI port.

9. The method of claim 1, wherein the resuming of the sending of the audio frames of the primary audio stream further comprises:

sending the audio frames of the primary audio stream that are stored in the buffer.

10. A computing system, comprising:

a memory device resident in the computing system; and

a processor disposed in communication with the memory device, the processor configured to:

receive a primary audio stream at a computing device, the primary audio stream including a sequence of audio frames;

send the audio frames of the primary audio stream to an audio output port of the computing device;

determine main parameters for the primary audio stream;

receive a request at the computing device to insert an encoded local audio clip in the primary audio stream, the encoded local audio clip comprising a sequence of local audio frames;

locate an insertion point in the primary audio stream, the insertion point coinciding with an end of a frame boundary;

identify a best matching encoded local audio clip that is a best match for the main parameters determined for the primary audio stream;

receive the best matching encoded local audio clip at the computing device;

send audio frames of the best matching encoded local audio clip to the audio output port of computing device;

store audio frames of the primary audio stream in a buffer while sending the audio frames of the best matching encoded local audio clip; and

resume the sending of the audio frames of the primary audio stream when the sending of the audio frames of the best matching encoded local audio clip is complete.

11. The computing system of claim 10, wherein the primary audio stream comprises at least one of a broadcast audio stream and a playback audio stream.
12. The computing system of claim 10, wherein to determine the main parameters, the processor is further configured to:

examine a program map table for the primary audio stream.

13. The computing system of claim 10, wherein to determine the main parameters, the processor is further configured to:

evaluate metadata of the primary audio stream.

14. The computing system of claim 10, wherein to identify the best matching encoded local audio clip, the processor is further configured to:

compare the main parameters to a number of encoded versions of the encoded local audio clip; and

select the best matching encoded local audio clip from the number of encoded versions of the encoded local audio clip.

15. The computing system of claim 10, wherein to receive the best matching encoded local audio clip, the processor is further configured to:

retrieve the best matching encoded local audio clip from a data storage device connected to the computing system.

16. The computing system of claim 10, wherein the audio output port comprises at least one of a SPDIF port and an HDMI port.

17. The computing system of claim 10, wherein to resume the sending of the audio frames of the primary audio stream, the processor is further configured to:

send the audio frames of the primary audio stream that are stored in the buffer.

18. A computing device, comprising:

an audio inserter component configured to:

receive a primary audio stream that includes a sequence of audio frames;

determine main parameters for the primary audio stream;

receive a request to insert an encoded local audio clip in the primary audio stream, the encoded local audio clip comprising a sequence of local audio frames;

locate an insertion point in the primary audio stream, the insertion point coinciding with an end of a frame boundary;

identify a best matching encoded local audio clip that is a best match for the main parameters determined for the primary audio stream; and

receive the best matching encoded local audio clip;

store audio frames of the primary audio stream in a buffer while sending the audio frames of the best matching encoded local audio clip; and

an output router component configured to:

send the audio frames of the primary audio stream to an audio output port;

send audio frames of the best matching encoded local audio clip to the audio output port;

resume the sending of the audio frames of the primary audio stream when the sending of the audio frames of the best matching encoded local audio clip is complete.

19. The computing device of claim 18, wherein the primary audio stream comprises at least one of a broadcast audio stream and a playback audio stream.
20. The computing device of claim 18, wherein to determine the main parameters, the audio inserter component is further configured to:
- examine a program map table for the primary audio stream.
21. The computing device of claim 18, wherein to determine the main parameters, the audio inserter component is further configured to:
- evaluate metadata of the primary audio stream.
22. The computing device of claim 18, wherein to identify the best matching encoded local audio clip, the audio inserter component is further configured to:
- compare the main parameters to a number of encoded versions of the encoded local audio clip; and
 - select the best matching encoded local audio clip from the number of encoded versions of the encoded local audio clip.
23. The computing device of claim 18, wherein to resume the sending of the audio frames of the primary audio stream, the output router component is further configured to:
- send the audio frames of the primary audio stream that are stored in the buffer.

AMENDED CLAIMS

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1. A method, comprising:

receiving a primary audio stream at a computing device, the primary audio stream including a sequence of audio frames;

sending the audio frames of the primary audio stream to an audio output port of the computing device;

determining at least one parameter for the primary audio stream;

receiving a request at the computing device to insert an encoded local audio clip in the primary audio stream, the encoded local audio clip comprising a sequence of local audio frames;

locating an insertion point in the primary audio stream, the insertion point coinciding with an end of a frame boundary;

identifying a best matching encoded local audio clip that is a best match for the at least one parameter determined for the primary audio stream;

receiving the best matching encoded local audio clip at the computing device;

sending audio frames of the best matching encoded local audio clip to the audio output port of computing device;

storing audio frames of the primary audio stream in a buffer while sending the audio frames of the best matching encoded local audio clip; and

resuming the sending of the audio frames of the primary audio stream when the sending of the audio frames of the best matching encoded local audio clip is complete.

2. The method of claim 1, wherein the primary audio stream comprises at least one of a broadcast audio stream and a playback audio stream.

3. The method of claim 1, wherein the computing device is a set top digital video recorder.

4. The method of claim 1, wherein the determining of the at least one parameter further comprises:

examining a program map table for the primary audio stream.

5. The method of claim 1, wherein the determining of the at least one parameter further comprises:

evaluating metadata of the primary audio stream.

6. The method of claim 1, wherein the identifying of the best matching encoded local audio clip further comprises:

comparing the at least one parameter to a number of encoded versions of the encoded local audio clip; and

selecting the best matching encoded local audio clip from the number of encoded versions of the encoded local audio clip.

7. The method of claim 1, wherein the receiving of the best matching encoded local audio clip further comprises:

retrieving the best matching encoded local audio clip from a data storage device connected to the computing device.

8. The method of claim 1, wherein the audio output port comprises at least one of a SPDIF port and an HDMI port.

9. The method of claim 1, wherein the resuming of the sending of the audio frames of the primary audio stream further comprises:

sending the audio frames of the primary audio stream that are stored in the buffer.

10. A computing system, comprising:
- a memory device resident in the computing system; and
 - a processor disposed in communication with the memory device, the processor configured to:
 - receive a primary audio stream at a computing device, the primary audio stream including a sequence of audio frames;
 - send the audio frames of the primary audio stream to an audio output port of the computing device;
 - determine at least one parameter for the primary audio stream;
 - receive a request at the computing device to insert an encoded local audio clip in the primary audio stream, the encoded local audio clip comprising a sequence of local audio frames;
 - locate an insertion point in the primary audio stream, the insertion point coinciding with an end of a frame boundary;
 - identify a best matching encoded local audio clip that is a best match for the at least one parameter determined for the primary audio stream;
 - receive the best matching encoded local audio clip at the computing device;
 - send audio frames of the best matching encoded local audio clip to the audio output port of computing device;
 - store audio frames of the primary audio stream in a buffer while sending the audio frames of the best matching encoded local audio clip; and
 - resume the sending of the audio frames of the primary audio stream when the sending of the audio frames of the best matching encoded local audio clip is complete.
11. The computing system of claim 10, wherein the primary audio stream comprises at least one of a broadcast audio stream and a playback audio stream.

12. The computing system of claim 10, wherein to determine the at least one parameter, the processor is further configured to:

examine a program map table for the primary audio stream.

13. The computing system of claim 10, wherein to determine the at least one parameter, the processor is further configured to:

evaluate metadata of the primary audio stream.

14. The computing system of claim 10, wherein to identify the best matching encoded local audio clip, the processor is further configured to:

compare the at least one parameter to a number of encoded versions of the encoded local audio clip; and

select the best matching encoded local audio clip from the number of encoded versions of the encoded local audio clip.

15. The computing system of claim 10, wherein to receive the best matching encoded local audio clip, the processor is further configured to:

retrieve the best matching encoded local audio clip from a data storage device connected to the computing system.

16. The computing system of claim 10, wherein the audio output port comprises at least one of a SPDIF port and an HDMI port.

17. The computing system of claim 10, wherein to resume the sending of the audio frames of the primary audio stream, the processor is further configured to:

send the audio frames of the primary audio stream that are stored in the buffer.

18. A computing device, comprising:
- an audio inserter component configured to:
 - receive a primary audio stream that includes a sequence of audio frames;
 - determine at least one parameter for the primary audio stream;
 - receive a request to insert an encoded local audio clip in the primary audio stream, the encoded local audio clip comprising a sequence of local audio frames;
 - locate an insertion point in the primary audio stream, the insertion point coinciding with an end of a frame boundary;
 - identify a best matching encoded local audio clip that is a best match for the at least one parameter determined for the primary audio stream; and
 - receive the best matching encoded local audio clip;
 - store audio frames of the primary audio stream in a buffer while sending the audio frames of the best matching encoded local audio clip; and
 - an output router component configured to:
 - send the audio frames of the primary audio stream to an audio output port;
 - send audio frames of the best matching encoded local audio clip to the audio output port;
 - resume the sending of the audio frames of the primary audio stream when the sending of the audio frames of the best matching encoded local audio clip is complete.
19. The computing device of claim 18, wherein the primary audio stream comprises at least one of a broadcast audio stream and a playback audio stream.
20. The computing device of claim 18, wherein to determine the at least one parameter, the audio inserter component is further configured to:
- examine a program map table for the primary audio stream.

21. The computing device of claim 18, wherein to determine the at least one parameter, the audio inserter component is further configured to:
- evaluate metadata of the primary audio stream.
22. The computing device of claim 18, wherein to identify the best matching encoded local audio clip, the audio inserter component is further configured to:
- compare the at least one parameter to a number of encoded versions of the encoded local audio clip; and
 - select the best matching encoded local audio clip from the number of encoded versions of the encoded local audio clip.
23. The computing device of claim 18, wherein to resume the sending of the audio frames of the primary audio stream, the output router component is further configured to:
- send the audio frames of the primary audio stream that are stored in the buffer.
24. The method of claim 1, wherein determining the at least one parameter for the primary audio stream comprises determining at least one main parameter for the primary audio stream, wherein the main parameter further comprises at least one of the sampling rate, channel configuration, and bit rate.
25. The method of claim 1, further comprising:
- encoding a local audio clip with the at least one parameter determined for the primary audio stream.

26. The computing system of claim 10, wherein the processor is further configured to:

encode a local audio clip with the at least one parameter determined for the primary audio stream.

27. The computing device of claim 18, wherein the audio inserter component is further configured to:

encode a local audio clip with the at least one parameter determined for the primary audio stream.

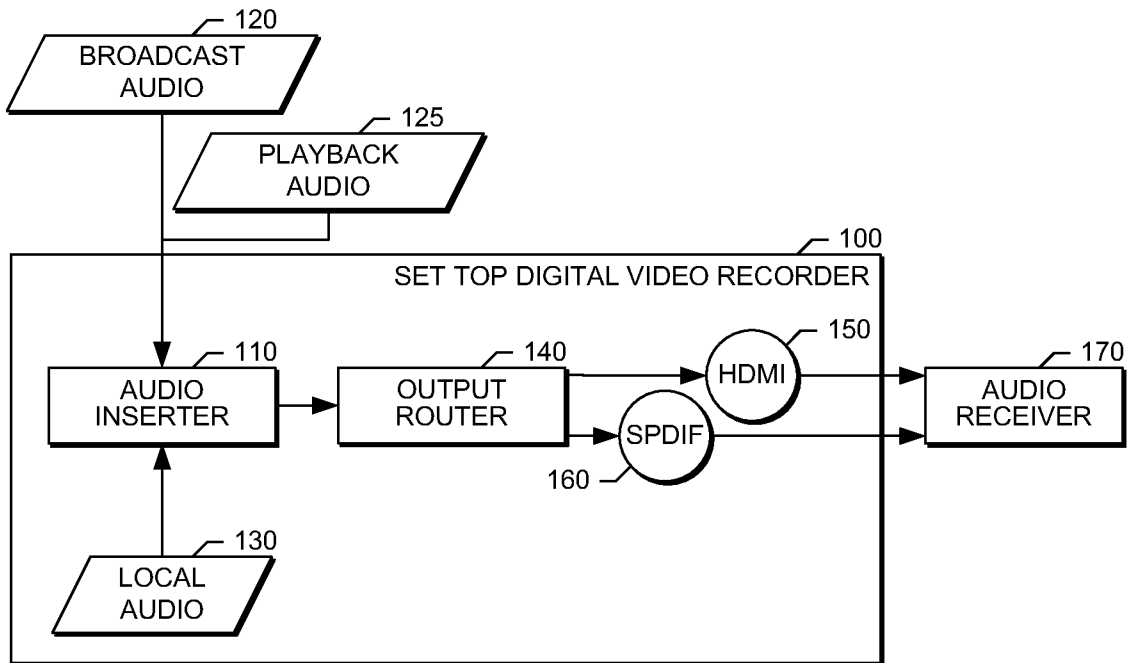
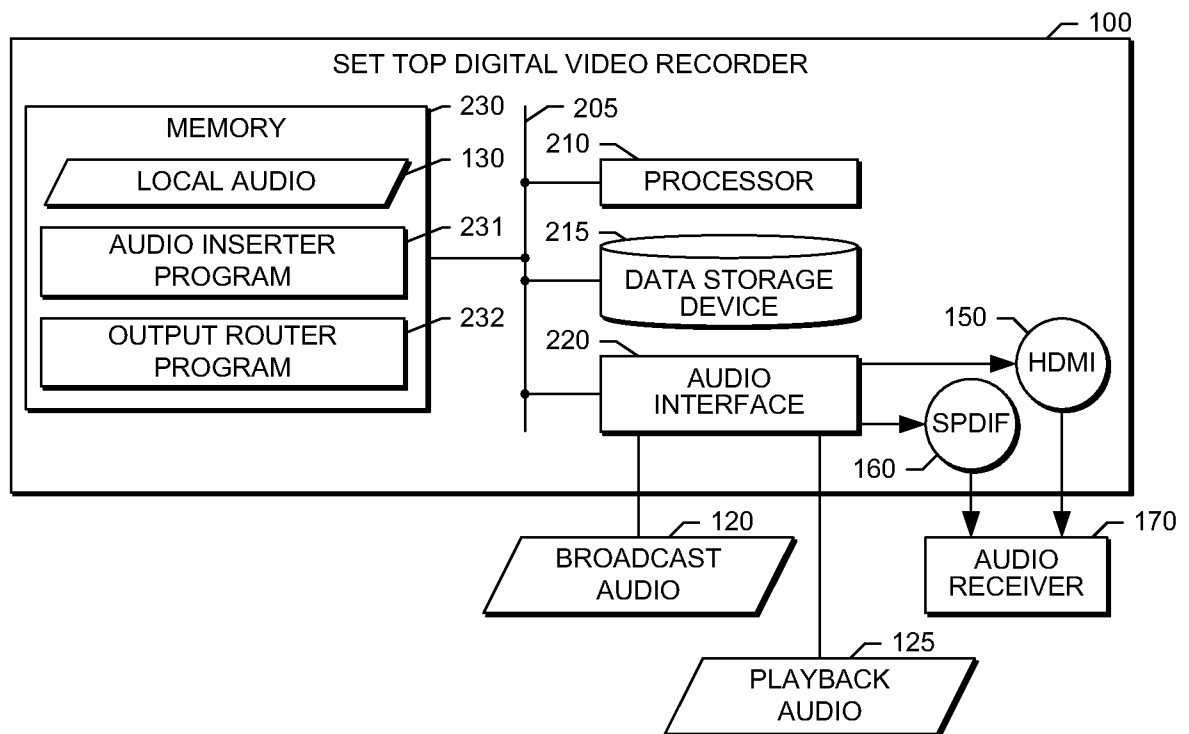
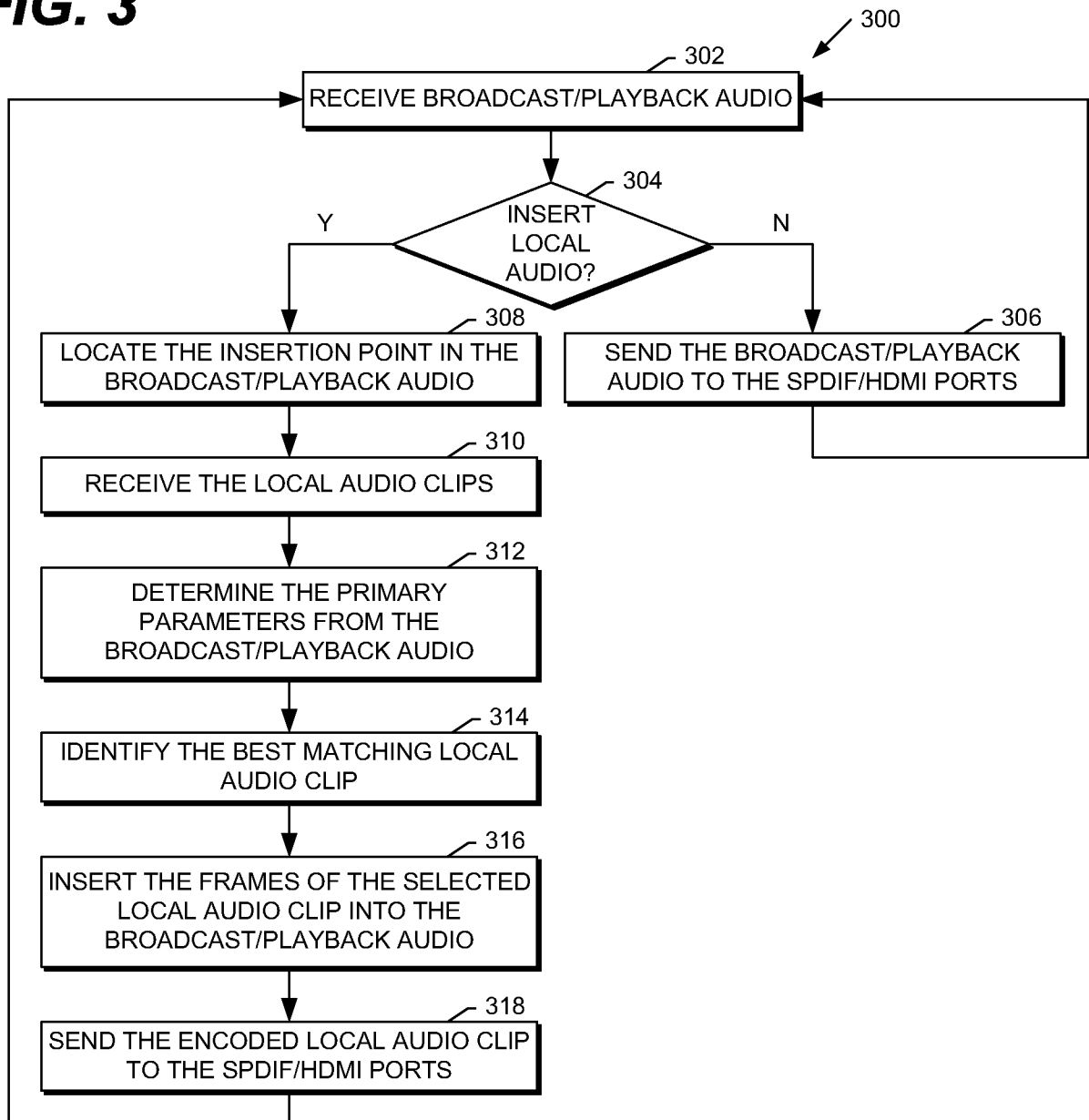
FIG. 1**FIG. 2**

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2010/057574

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04N5/926 G11B20/10
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G11B H04N G06F G09F H04H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, COMPENDEX, INSPEC, IBM-TDB, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/107169 A1 (LOWE FREDERICK [US]) 3 June 2004 (2004-06-03) paragraphs [0006] - [0020], [0032] - [0108], [0120] - [0121]; figures 1-4,6 -----	1-23
X	US 2009/265022 A1 (KIROVSKI DARKO [US] ET AL) 22 October 2009 (2009-10-22) the whole document -----	1-23
X	WO 2007/075434 A2 (GOOGLE INC [US]; STEELBERG RYAN [US]; STEELBERG CHAD [US]) 5 July 2007 (2007-07-05) paragraphs [0038], [0039], [0063], [0069] - [0073] -----	1-23
X	US 5 029 014 A (LINDSTROM JAMES E [US]) 2 July 1991 (1991-07-02) the whole document ----- -/-	1,10,18



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

17 February 2011

Date of mailing of the international search report

28/02/2011

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2010/057574

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2002/099552 A1 (RUBIN DARRYL [US] ET AL) 25 July 2002 (2002-07-25) the whole document -----	1-23

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2010/057574

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004107169 A1	03-06-2004	US 2005185918 A1	25-08-2005
US 2009265022 A1	22-10-2009	NONE	
WO 2007075434 A2	05-07-2007	AU 2006329831 A1	05-07-2007
		CA 2634036 A1	05-07-2007
		CN 101366278 A	11-02-2009
		EP 1969849 A2	17-09-2008
		JP 2009520277 T	21-05-2009
		US 2007157261 A1	05-07-2007
US 5029014 A	02-07-1991	NONE	
US 2002099552 A1	25-07-2002	NONE	