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**WO 01/17142 A2**

(54) Title: STRUCTURE AND METHOD FOR SELECTING, CONTROLLING AND SENDING INTERNET-BASED OR LOCAL DIGITAL AUDIO TO AN AM/FM RADIO OR ANALOG AMPLIFIER

(57) Abstract: A system and method that allows a host PC to provide an analog audio signal for a radio or amplifier without interfering with the operation of the host PC. This invention also allows the audio signal to be selected and controlled by a remote device without interfering with the operation of the host PC.

**STRUCTURE AND METHOD FOR SELECTING, CONTROLLING AND  
SENDING INTERNET-BASED OR LOCAL DIGITAL AUDIO TO AN  
AM/FM RADIO OR ANALOG AMPLIFIER**

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**CROSS-REFERENCE TO RELATED APPLICATIONS**

This application claims the benefit and priority of U.S. Provisional  
Application No. 60/151,714 filed on August 31, 1999.

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**BACKGROUND OF THE INVENTION**

**Field of the Invention:**

The present invention relates to a structure and a method for selecting,  
controlling and sending Internet-based or digital audio to an AM/FM radio or  
amplifier.

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**Description of the Drawings:**

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There is an ever-increasing amount of audio content available as digital  
computer files (such as in the MP3 format like those found at [www.mp3.com](http://www.mp3.com)) or as  
streaming digital audio (such as using the streaming digital audio techniques in US  
Patent 5579430). These new types of audio content can be played on a personal  
computer with a sound card, but cannot be played on a radio or stereo that is  
designed to receive and amplify analog audio signals. There are several techniques  
for converting a digital audio source to an analog signal that could be used by analog  
radio or amplifier, but these techniques interfere with the operation of the host PC  
and would require use of the PC to select and control the audio, for example, on an  
analog radio. Thus, there is a need to provide a system which enables Internet-based  
or digital audio to be played, for example, on an analog radio without tying up a  
personal computer.

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**SUMMARY OF THE INVENTION**

Briefly, the present invention relates to a system and method that

allows a host PC to provide an analog audio signal for a radio or amplifier without interfering with the operation of the host PC. This invention also allows the audio signal to be selected and controlled by a remote device without interfering with the operation of the host PC.

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### **BRIEF DESCRIPTION OF THE DRAWINGS**

These and other advantages of the present invention will be readily apparent from the following specification and attached drawing wherein:

FIG. 1 is a block diagram of the system in accordance with the present invention, shown connected to a host personal computer, which, in turn, is connected to the Internet.

FIG. 2 is a front view of a remote device which forms a part of the present invention.

FIG. 3 is a block diagram of the remote device illustrated in FIG. 2.

FIG. 4 is a block diagram of a PC adapter which forms a part of the present invention.

FIG. 5 is a flow chart of a universal serial bus (USB) connection between the host PC and the PC adapter in accordance with the present invention.

FIG. 6 is a block diagram of the PC software components in accordance with the present invention.

FIG. 7 is a flow chart of the audio player in accordance with the present invention.

FIG. 8 is a flow chart of a remote device manager in accordance with the present invention.

FIG. 9 is a flow chart of the USB audio driver in accordance with the present invention.

FIG. 10 is a flow chart of the USB remote device driver in accordance with the present invention.

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### **DETAILED DESCRIPTION**

The present invention is adapted to interface with a host personal computer (PC) which, in turn, is adapted to be connected to the Internet in order to obtain audio sources from the Internet or other digital audio sources from any web server. The system generally identified with the reference numeral 20. The system 20 is illustrated in FIG. 1 and includes a remote device 22, a PC adapter 24 and a host PC 26. The system 20 is adapted to enable various digital audio sources, for example, from the Internet or other digital audio sources, such as digital audio sources on any web server, to be played on an AM/FM radio or stereo amplifier 28 without interfering with the operation of the host PC 10.

## **SYSTEM COMPONENTS**

### **Remote Device**

The remote device 22 (FIG. 2) may have a 160x160 graphical display screen and control buttons. This display provides information about available audio content, information about how to select audio content, information about audio content that has been selected and other information. The control buttons are used to select and control audio content. As shown in FIG. 3, remote device 22 may connect to the PC adapter 24 over a radio link, for example, a 2-way wireless link.

The remote device 22 may have three buttons and one jogdial. Pressing the middle button brings back the previous screen. Pressing one of the other two buttons causes the content to be saved on host PC 26. Pressing the third button will initiate the purchase of the currently playing audio clip. The jogdial browses the list and pressing its middle button will select and plays the clip.

### **PC Adapter**

The PC adapter 24 connects the host PC 26 over a universal serial bus (USB) port and broadcasts analog radio data to the AM/FM radio and stereo amplifier 28. This analog audio data is converted from digital audio data and transmitted from the host PC over USB connection by the PC software as shown in

FIG. 5. Also, it bridges 2-way data between remote device 22 and the host PC 26. A block diagram of the PC adapter 24 is illustrated in FIG. 4.

The microcontroller component encodes LCD display data and decodes button, dial and other remote control user inputs.

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### **Proxy Server**

The proxy server 29 serves as a digital audio portal site. The proxy server maintains a series of links to available digital audio sources on the Internet and formats information about these sites for display on the remote device 22.

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### **PC Software**

The PC software illustrated in FIG. 5 gets digital audio data from audio files on the local disk and/or internet streaming audio data. This data is organized as a play list. The play list is transferred to the remote device 22. The user selects and plays a clip by using the control buttons on the remote device 22. The remote device 22 then sends these commands to PC software which then plays this clip. The playing process is this: the PC software sends the address of the clip to the audio player. The audio player sends data to the USB audio driver which writes the audio data to USB. The PC adapter 24 will electronically convert the digital data into analog data and broadcast the data over an unused FM channel. This channel is selectable.

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FIG. 6 is a block diagram of the PC software components on the host PC 26 and includes a tuner 30, an audio player 32, a remote device manager 34, universal serial bus (USB) audio driver 36 and a USB remote device driver 38. FIGS 7-10 represent flow charts of the devices. A brief description of the software components is provided below.

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### **Tuner**

The tuner software allows the user to select internet radio stations, local digital audio files, and internet streaming audio to create playlists.

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**Audio Player**

The audio player software plays audio and runs in the background. It functions in a similar way as other popular audio players, like Reaknetwork=s G2 player and Microsoft=s Windows Media Player. FIG. 7 is a flowchart of the audio player.

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**USB Remote Device Driver**

This driver receives data from remote device manager and writes it to remote device 22 through a USB port. Also, it receives data from remote device 22 through the USB port and forwards it to remote device manager. FIG. 10 is a flow chart of the USB remote device driver.

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**Remote Device Manager**

This component sends playlist and other information to the remote device 22, and it processes the commands sent from remote device 22. FIG. 8 is a flow chart of the remote device driver.

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**USB Audio Driver**

This driver receives audio data from audio player and sends it to PC adapter 26 through USB connection. FIG. 9 is a flow chart of the USB audio driver.

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Obviously, many modifications and variations of the present invention are possible in light of the above teachings. Thus, it is to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described above.

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What is claimed and desired to be covered by a Letters Patent is as follows:

**WE CLAIM:**

1. A system for converting audio digital data to audio analog data,  
said system including a host personal computer (PC), configured to receive  
predetermined digital data, the system comprising:  
a PC adapter configured to be operably connected to said PC  
adapter by way of a predetermined digital data bus, said PC adapter also configured  
to be connected to a remote analog device, and including means for receiving said  
digital audio data from said host PC and converting said digital audio data to analog  
audio data for playback by an analog device without interfering with the operation of  
the host PC.
2. The system as recited in claim 1, wherein said analog device is  
located remotely from said PC adapter.
3. The system as recited in claim 2, wherein said analog device is  
coupled to said PC adapter by way of a radio link.
4. The system as recited in claim 1, further including a remote  
device, said remote device including means for selecting said digital data.
5. The system as recited in claim 4, wherein said remote device is  
operatively connected to said PC adapter by way of a radio link.
6. The system as recited in claim 1, wherein said digital data bus is  
a serial bus.
7. The system as recited in claim 6, wherein said serial bus is a  
universal serial bus (USB)

8. The system as recited in claim 1, wherein said analog device is  
a radio.
  9. The system as recited in claim 1, wherein said analog device is  
an amplifier.
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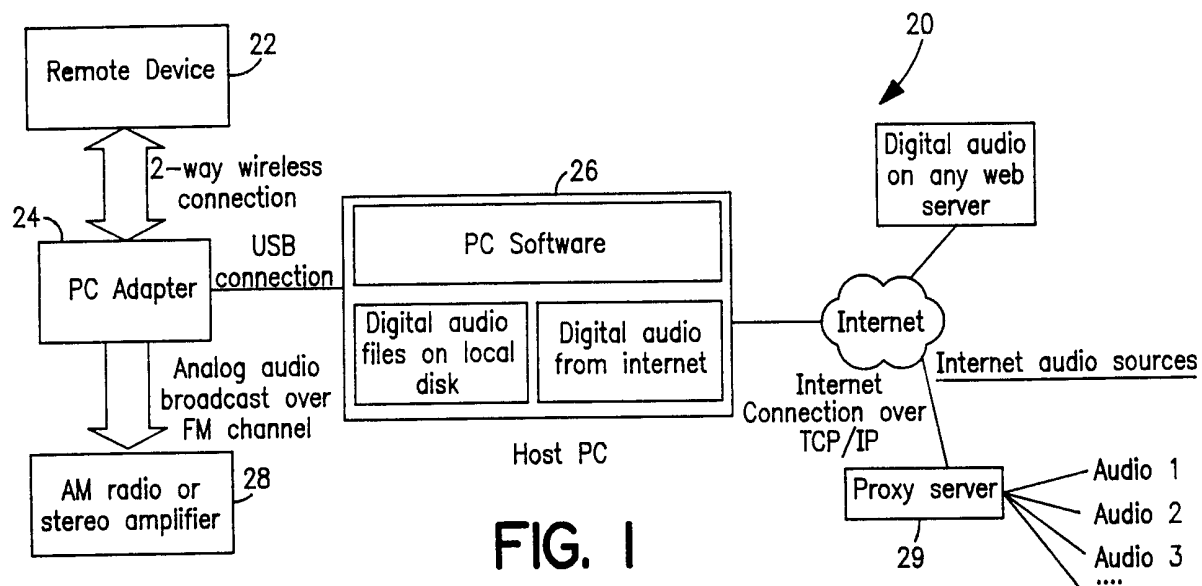


FIG. 1

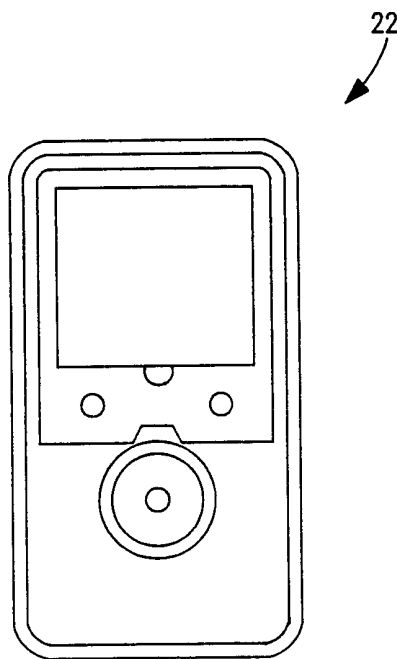
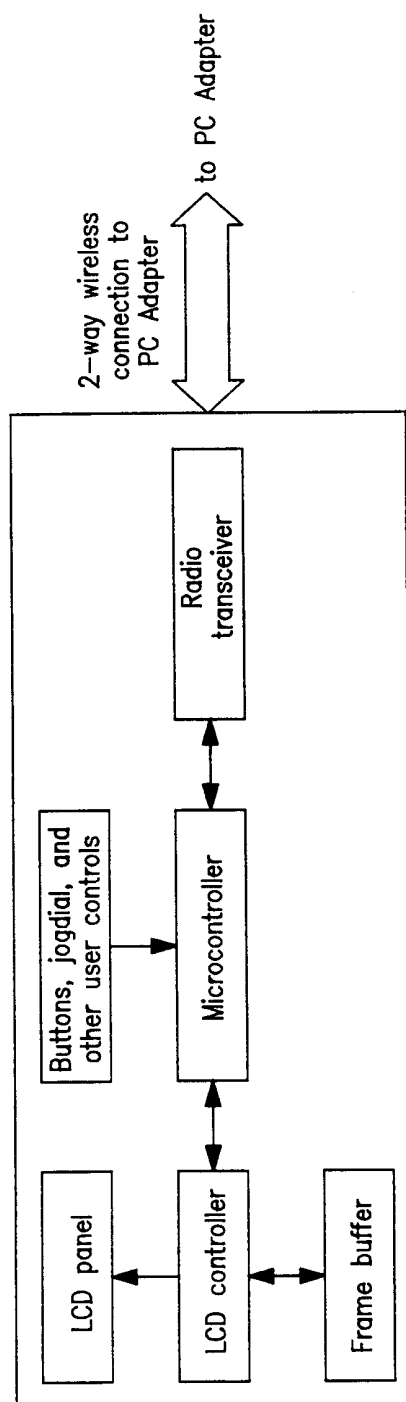


FIG. 2



Remote Device

FIG. 3

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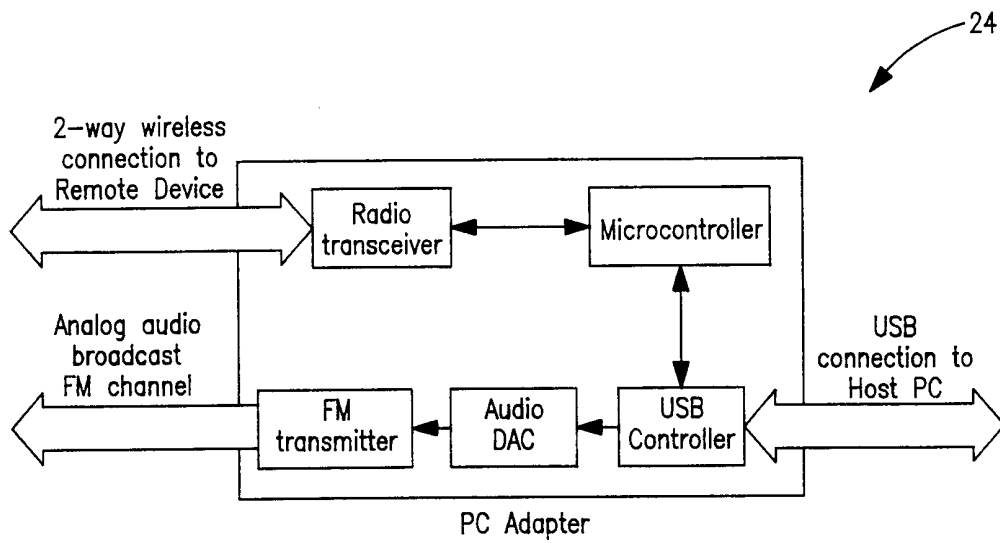


FIG. 4

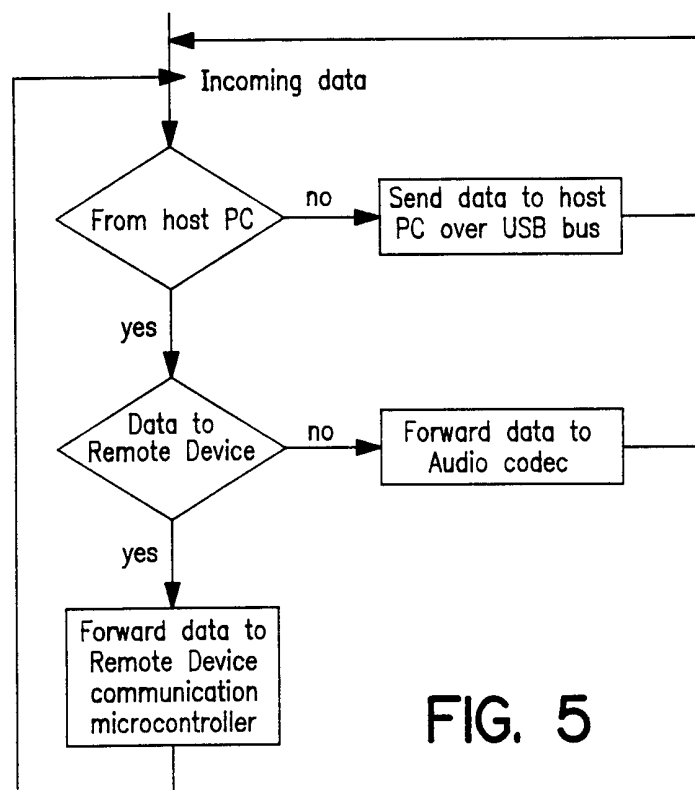


FIG. 5

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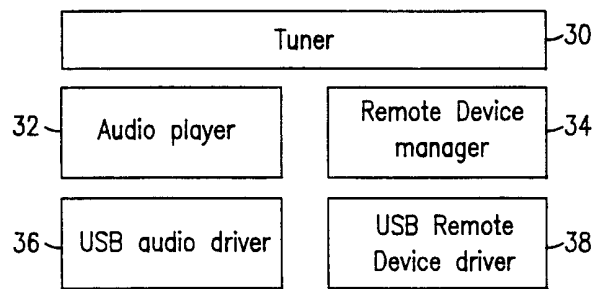


FIG. 6

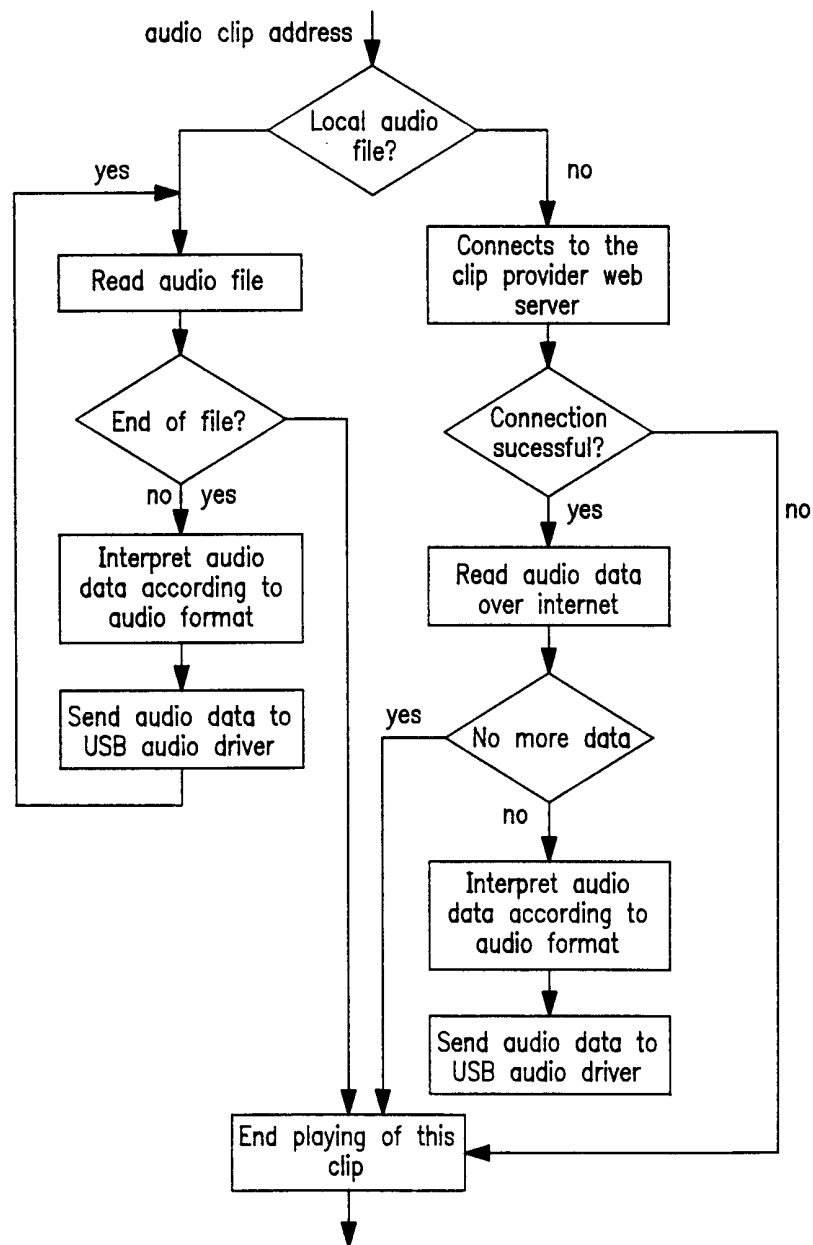


FIG. 7

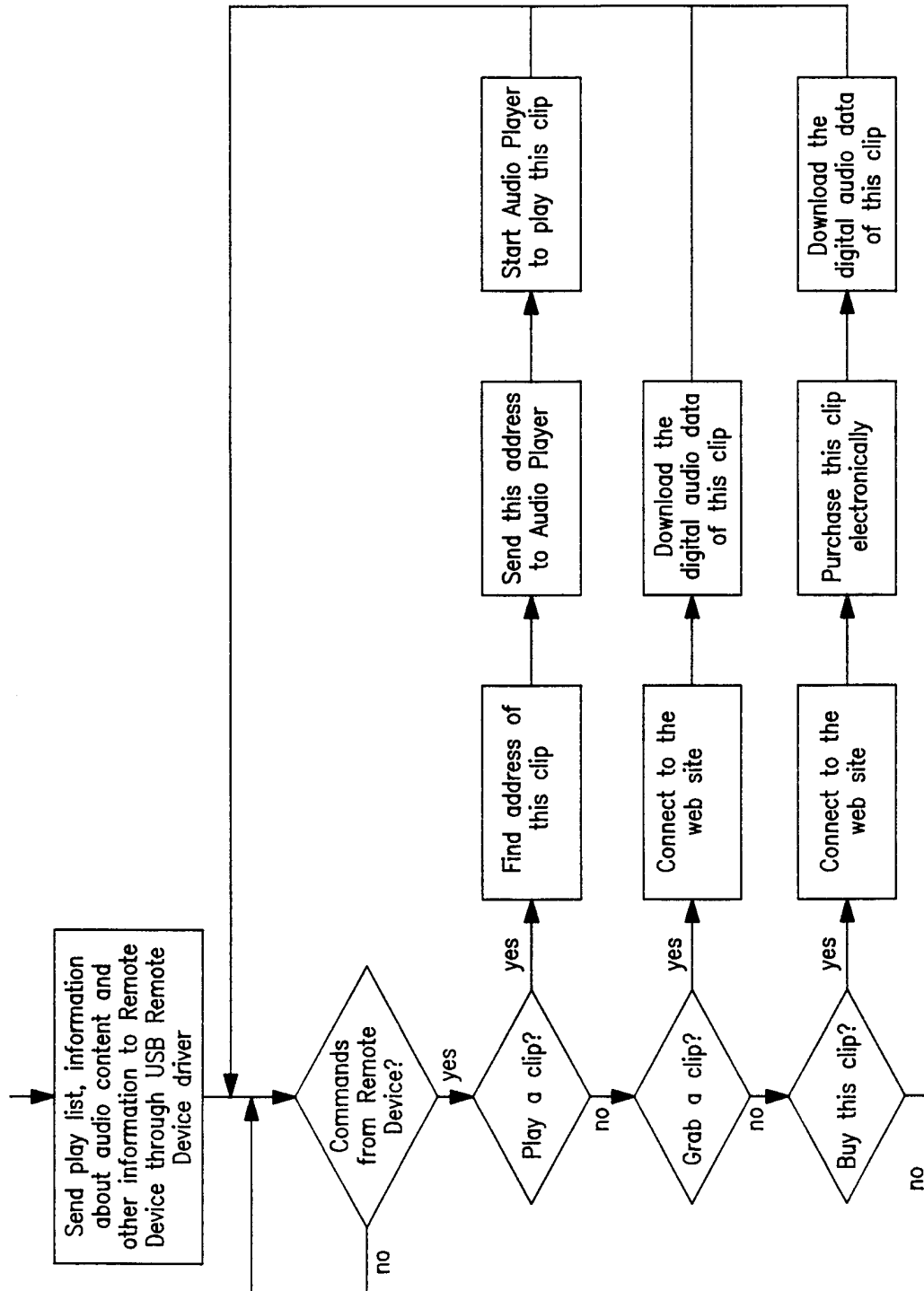


FIG. 8

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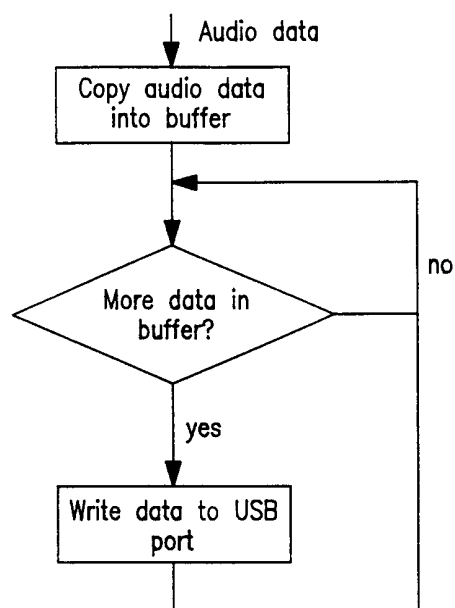


FIG. 9

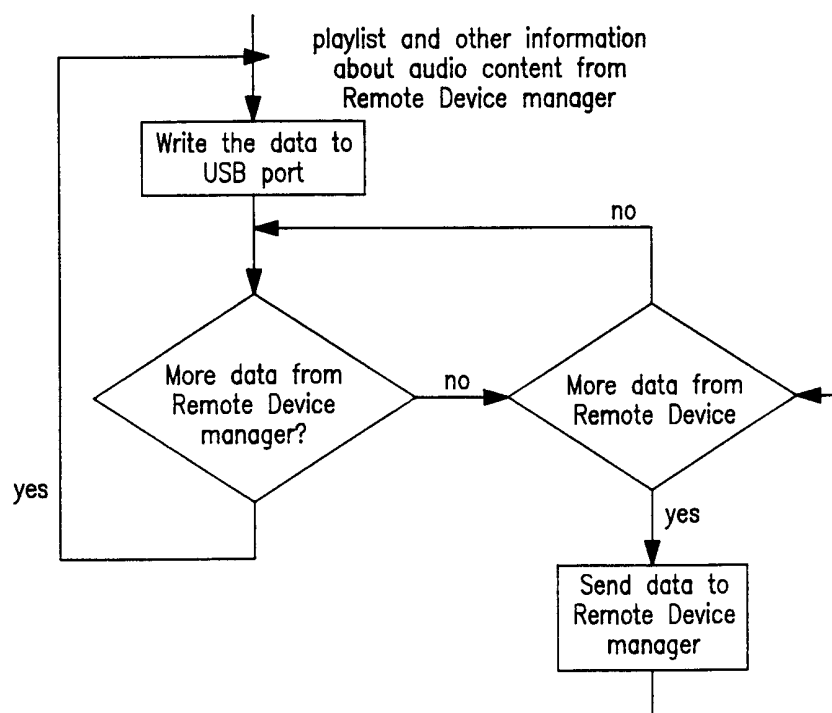


FIG. 10