



US00RE44980E

(19) **United States**  
(12) **Reissued Patent**  
**Sargaison**

(10) **Patent Number:** **US RE44,980 E**  
(45) **Date of Reissued Patent:** **Jul. 1, 2014**

(54) **SYSTEM AND METHOD FOR  
CONTROLLING STATES OF A DEVICE**

(56) **References Cited**

U.S. PATENT DOCUMENTS

(75) Inventor: **Stewart Sargaison**, Foster City, CA  
(US)

3,862,379	A *	1/1975	Pless .....	381/74
4,955,729	A	9/1990	Marx .....	
5,144,678	A	9/1992	Lenz .....	
5,473,676	A	12/1995	Frick .....	
6,035,047	A	3/2000	Lewis .....	
6,069,960	A	5/2000	Mizukami .....	
6,704,428	B1	3/2004	Wurtz .....	
6,985,592	B1	1/2006	Ban .....	
7,010,332	B1	3/2006	Irvin .....	
7,103,188	B1 *	9/2006	Jones .....	381/71.9
2001/0046304	A1 *	11/2001	Rast .....	381/74
2004/0042629	A1	3/2004	Mellone .....	
2004/0258253	A1 *	12/2004	Wurtz .....	381/71.6
2005/0201568	A1	9/2005	Goyal .....	
2006/0215847	A1	9/2006	Holleman .....	

(73) Assignee: **Sony Computer Entertainment Inc.**  
(JP)

(21) Appl. No.: **12/869,740**

(22) Filed: **Aug. 26, 2010**

**Related U.S. Patent Documents**

Reissue of:

(64) Patent No.: **7,418,103**  
Issued: **Aug. 26, 2008**  
Appl. No.: **10/913,066**  
Filed: **Aug. 6, 2004**

FOREIGN PATENT DOCUMENTS

EP 1199867 A1 4/2002

\* cited by examiner

(51) **Int. Cl.**  
**H04R 1/10** (2006.01)

(52) **U.S. Cl.**  
USPC ..... **381/74; 381/370; 381/72; 381/371;**  
**381/384; 381/309; 381/11; 381/1; 455/280;**  
**439/620**

(58) **Field of Classification Search**  
USPC ..... **381/58, 74, 71.6, 123, 370, 72, 371,**  
**381/309, 1, 11; 455/280; 439/620**

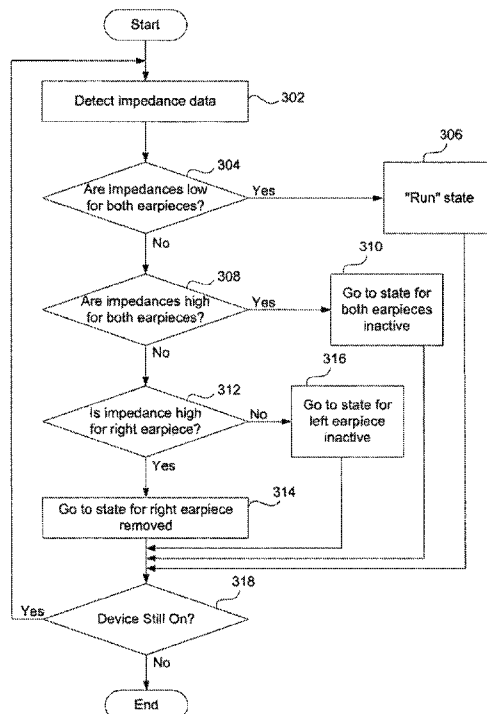
See application file for complete search history.

*Primary Examiner* — Disler Paul  
(74) *Attorney, Agent, or Firm* — Carr & Ferrell LLP

(57) **ABSTRACT**

A system and method for automatically changing a state of a device coupled to a headphone device is provided. The system comprises a means for detecting if at least one earpiece of the headphone device is activated or deactivated. Based on an activation state or a change in an activation state of the at least one earpiece, a state change may occur in the device. The state change is determined by a preset of a control module.

**40 Claims, 6 Drawing Sheets**



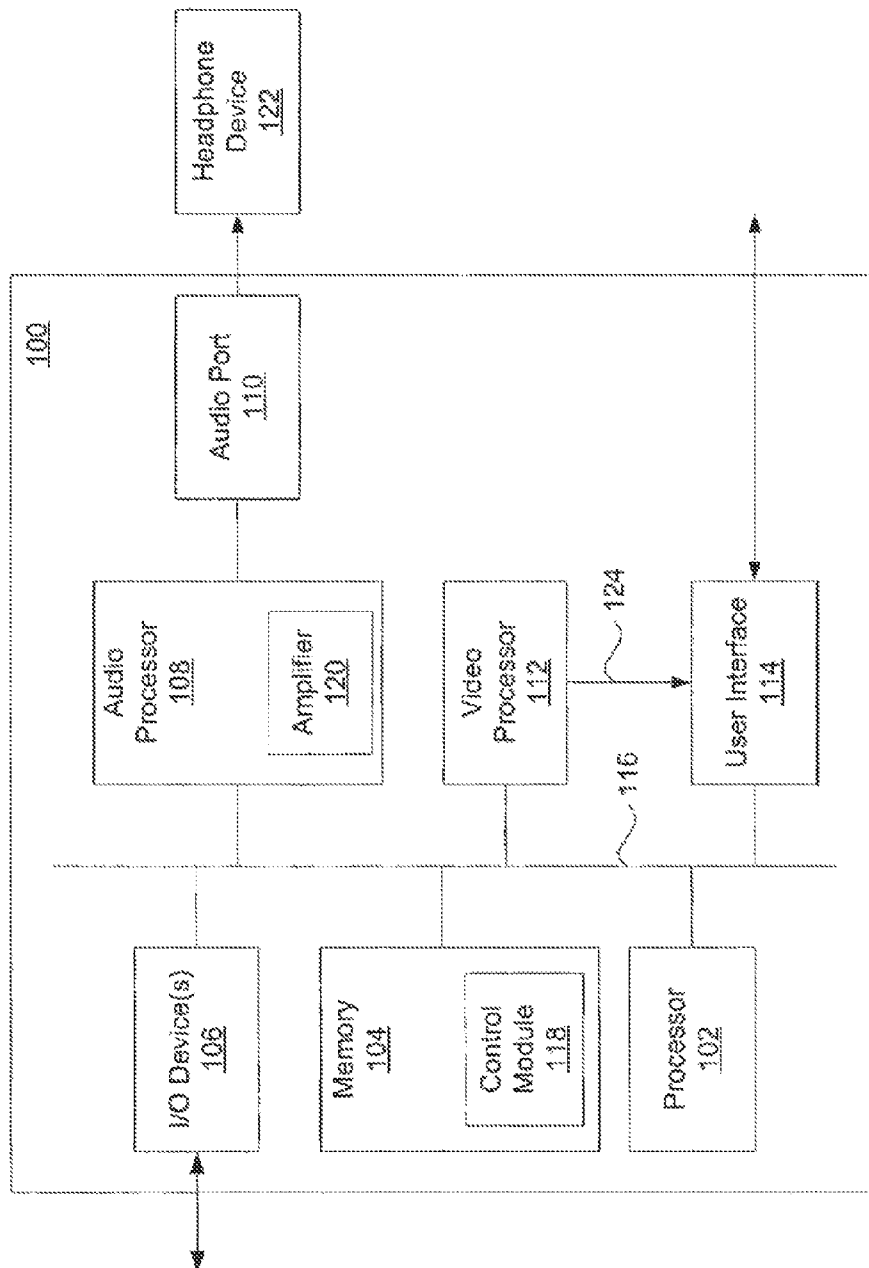


FIG. 1

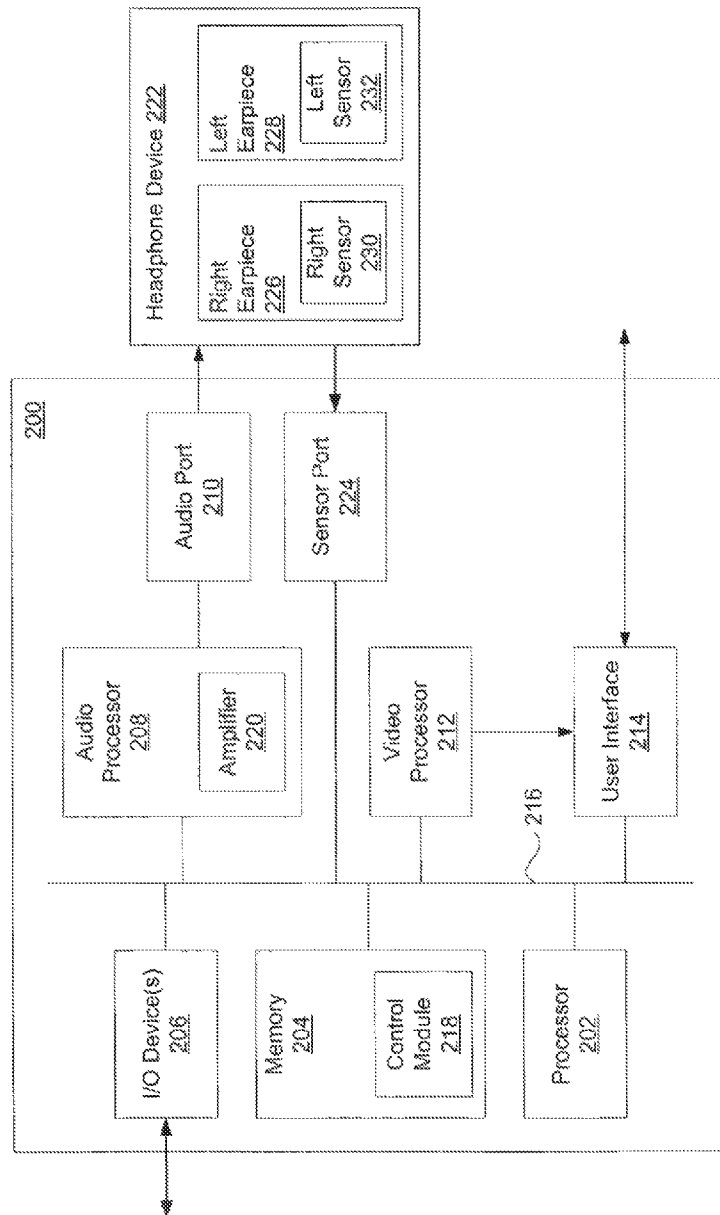


FIG. 2

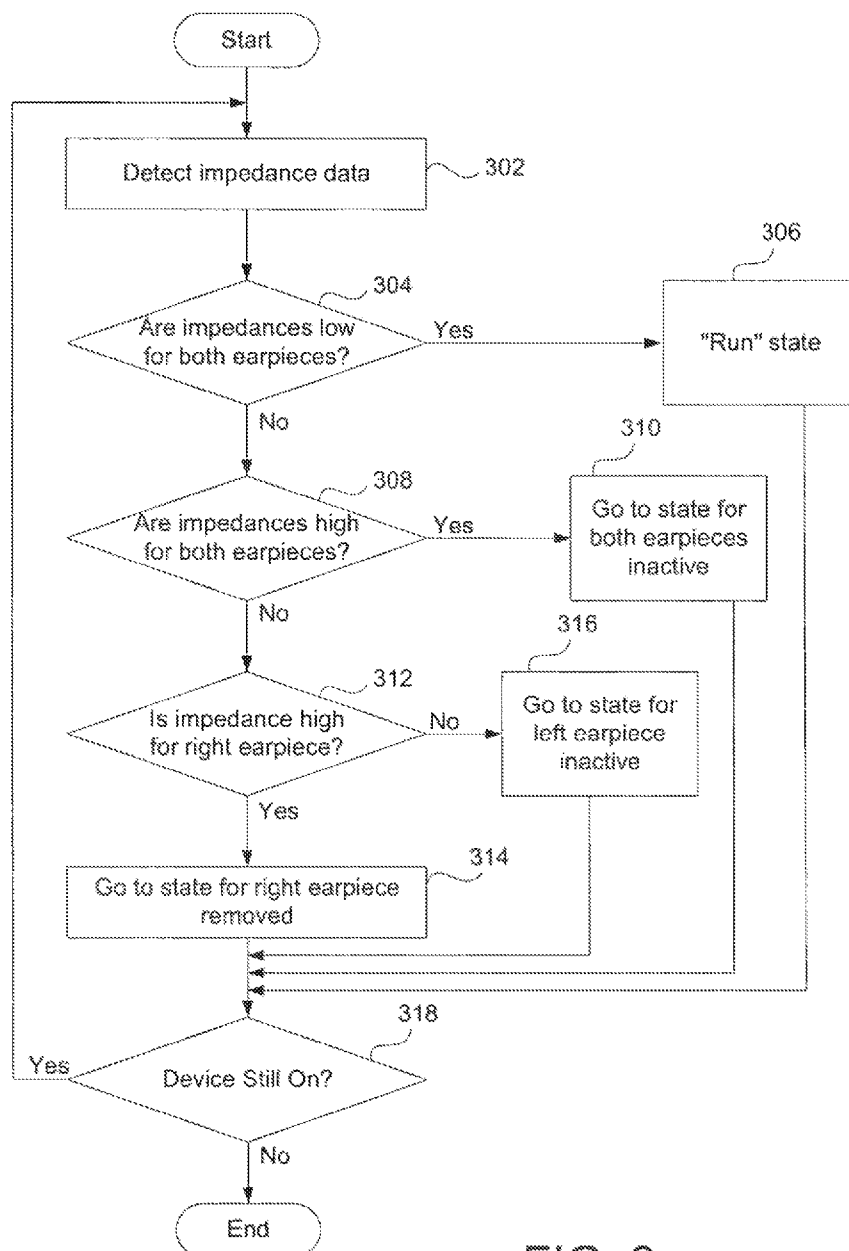


FIG. 3

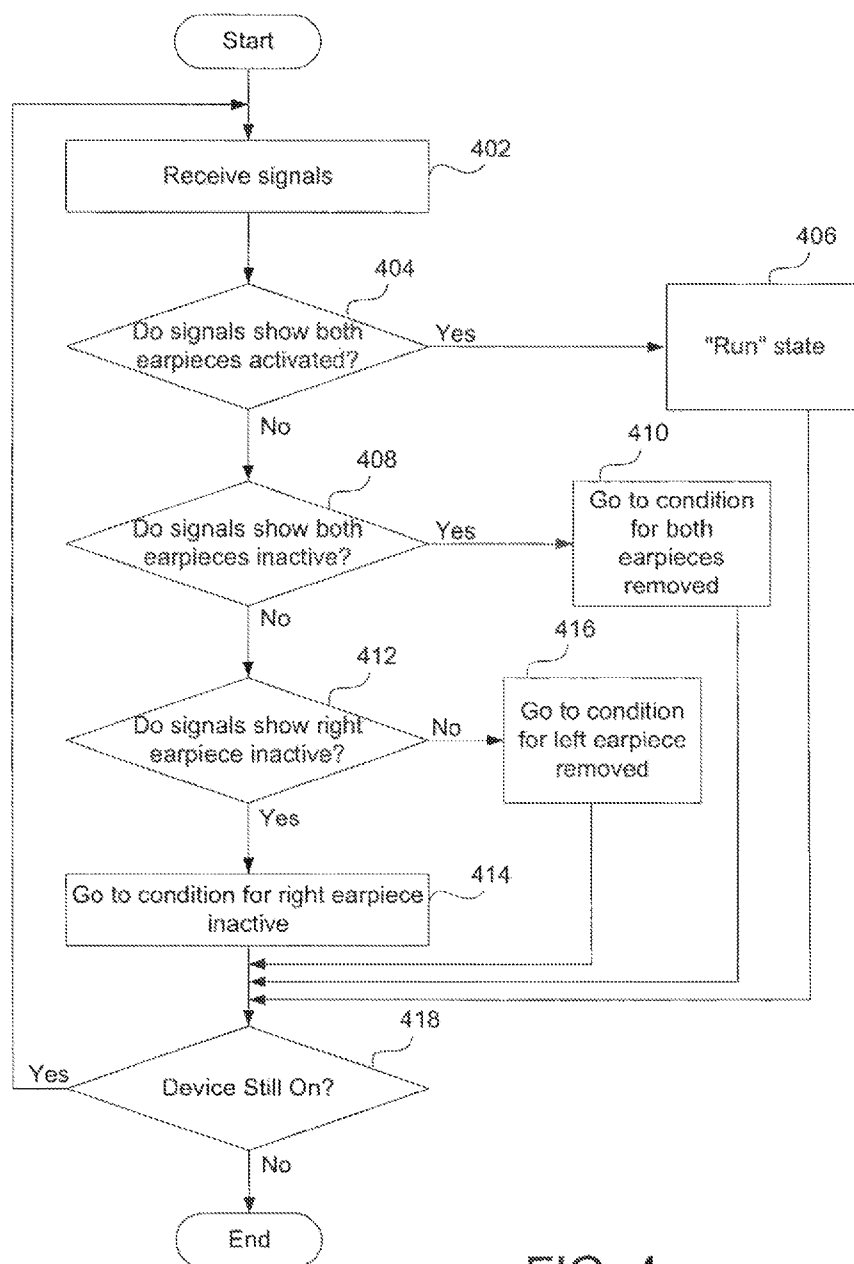


FIG. 4

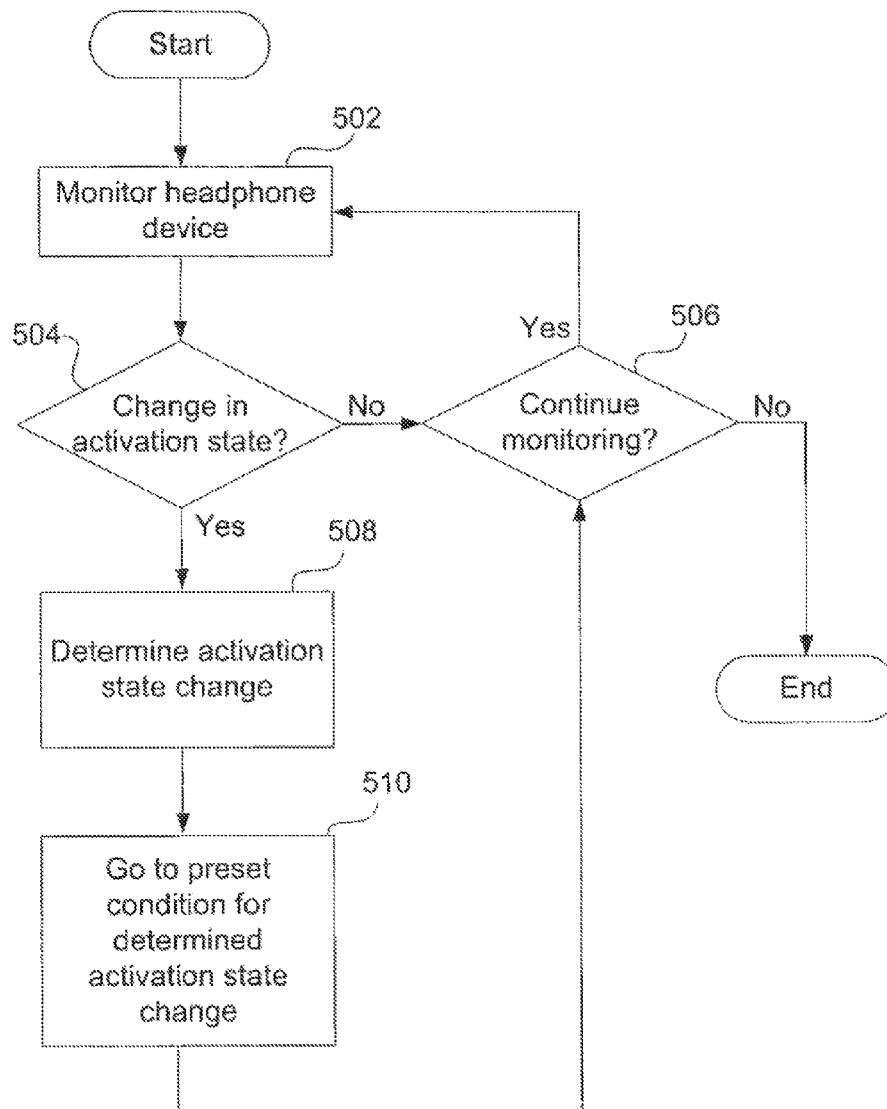


FIG. 5



CURRENT STATE	1 EARPIECE REMOVED STATE	BOTH EARPIECES REMOVED STATE	NO EARPIECES REMOVED STATE
Run	Pause Volume Adjust Fast Forward Reverse	Pause Power Save	 (Stay in Run)
Pause	Power Save (after x time)	Power Save	Run
Power Save	Run	 (Stay in Power Save)	Run

FIG. 6

1

## SYSTEM AND METHOD FOR CONTROLLING STATES OF A DEVICE

**Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.**

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

The present invention relates generally to portable devices having headphones, and more particularly to state changes in the portable devices.

#### 2. Description of Related Art

Many portable consumer devices utilize a headphone in order to provide private and personalized audio to a user. In a stereo embodiment, these headphones typically include a right earpiece and a left earpiece coupled to a right and left channel of audio, respectively. Alternatively, the right and left earpieces may share a single channel of audio.

Conventionally, state changes in a portable device, such as a MP3 player or cell phone, must be manually initiated by a user. For example, if the user needs to place the device into a pause mode from a play mode, the user, typically, will need to physically access the device and make a selection (e.g., push a pause button) to pause the device. This may be troublesome when, for example, the device is located in a place that is hard to reach (e.g., deep in a pocket), the user only has a single hand or no hands free (e.g., holding items in both hands), or the user cannot safely access the device (e.g., while driving a car).

In alternative embodiments, the user may need to find a remote of the device and make a selection on the remote in order to change the state. Disadvantageously, this embodiment requires the user to physically locate and operate on the remote device in order to enable state changes.

Therefore, there is a need for a system and method for automatically changing states of a device without having to the physically access the device.

### SUMMARY OF THE INVENTION

The present invention provides a system and method for automatically changing a state of a device coupled to a headphone device based on activation states of earpieces of the headphone device. The system of the present invention comprises a means for detecting if at least one earpiece of the headphone device is activated or deactivated (i.e., an activation state). The means for detecting, in exemplary embodiments, may be an amplifier, a micro-switch, or a thermo sensor. In the case where the means for detecting is an amplifier, the amplifier located within the device detects impedance or impedance changes. The impedance will change when a micro-switch located in the earpiece is opened (i.e., earpiece is not in or against the ear, and thus no audio signal is traveling to the earpiece) from a closed state (i.e., earpiece is in or against the ear, and thus an audio signal is traveling to the earpiece) or vice-versa. Based on a change in the activation state of the at least one earpiece, a state change may occur in the device. The state change is determined by a preset of a control module.

In an alternative embodiment, a sensor in each earpiece detects the activation state (or activation state change) and generates a corresponding signal. This signal is sent to the device where a control module will determine if a device state

2

change is needed. In further embodiments, the sensor is a thermo sensor which detects a temperature change when an earpiece is inserted or placed against an ear and when the same earpiece is removed from the ear.

The method of the present invention comprises detecting an activation state or a change in activation state of at least one earpiece of the headphone device. A change in activation state may, in exemplary embodiments, be detected by monitoring impedance changes to each earpiece, by monitoring an opening or closing of a micro-switch within the earpiece, or by monitoring a temperature change in the earpiece. If a change is detected, the device determines a state change, if one is needed, for the device based the change in activation state and on a preset. The preset may be manufacturer supplied or configured by a user. The device then implements the preset state change.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1. is an exemplary embodiment of a system for controlling states of a device;

FIG. 2 is an alternative embodiment of a system for controlling states of a device;

FIG. 3 is a flowchart for controlling states in accordance with the embodiment of FIG. 1;

FIG. 4 is a flowchart for controlling states in accordance with the embodiment of FIG. 2;

FIG. 5 is a flowchart of an alternative method for controlling states according to embodiments of the present invention; and

FIG. 6 is a table illustrating possible state changes from a current state, according to exemplary embodiments of the present invention.

### DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

FIG. 1. shows an exemplary embodiment of a device **100** configured for automated state changes. The device **100** may be any handheld or portable device which utilizes a headphone. Alternatively, the device **100** may be a non-portable device utilizing headphones (e.g., a home stereo system). The device **100** comprises a processor **102**, a memory **104**, at least one input/output device **106**, an audio processor **108** coupled to an audio port **110**, a video processor **112**, and a user interface **114** all coupled via a bus **116**. Alternative embodiments of the device **100** may comprise more, less, or other components. For example, if the device **100** is a compact disc player, the video processor **112** may not be necessary.

The I/O device **106** allows the user to input audio data and, in some embodiments, video data into the device **100** from an external source. For example, the I/O device **106** may be a disc drive capable of reading data from a compact disc (CD) or digital video disc (DVD). Alternatively, the I/O device **106** may be an interface for downloading of audio and video data from a digital source (e.g., downloading audio from the Internet). Numerous other I/O devices **106** are contemplated and known to those skilled in the art.

In some embodiments, digital audio and video data loaded into the device **100** may be stored in the memory **104**. Alternatively, a separate database (not shown) may be provided within the device **100** for storing the digital data.

The memory **104** further comprises a control module **118**. The control module **118** controls states of the device **100**. For example, if the device **100** is a portable audio or video device, the states of the device **100** may include play, stop, pause, reverse, and forward. Thus, when a user activates one of the



3

states through the user interface 114 (e.g., presses the “play” button), the control module 118, in exemplary embodiments, sends instructions to the processor 102 to enable play of audio and/or video. In alternative embodiments, the control module 118 may be located elsewhere in the device 100.

The audio processor 108 processes the digital audio data received from the I/O device 106, the memory [114] 104, or the optional database for output to the user. In exemplary embodiments, the audio processor 108 will convert the digital audio data into analog signals. In further embodiments, these analog signals are amplified by an amplifier 120 before being transmitted through the audio port 110 to a coupled headphone device 122.

Similarly, the video processor 112 processes the digital video data received from the I/O device 106, the memory [114] 104, or the optional database for output to the user. In the present embodiment, video output is through the user interface 114, which may comprise, for example, a touch-sensitive display screen. In alternative embodiments, the video processor 112 may be coupled to a monitor or similar display device. A dedicated line 124 may, in some embodiments, be provided for transfer of the processed video data from the video processor 112 to the user interface 114.

In the embodiment of FIG. 1, the device 100 determines whether one or both earpieces of the headphone device 122 are activated by monitoring each earpiece (i.e., a right earpiece and a left earpiece) relative to the user’s ear. For example, if the headphone device 122 is an earbud type headphone, the device determines if one or both earbuds are in the ear (i.e., activated). Alternatively, if the headphone device 122 is an over-the-ear type, the device determines if one or both earpieces are positioned against the ear.

Based on results of the determination, the device 100 may alter its state or behavior based upon user set preferences. For example, if the device 100 is a portable audio device (e.g., MP3 player), removing one earpiece may trigger a behavior that halves volume to the other earpiece still activated. This user preference may be set on an assumption that the user removes the earpiece to listen to another person speaking, thus reducing the volume in the remaining earpiece is useful. In a further embodiment, if the user removes both earpieces, then the device 100 may enter a “pause” state or behavior. If within a certain amount of time, the user reactivates one or both of the earpieces, then the device 100 may resume play, otherwise, the device 100 may enter a “shut down” state. Exemplary state changes will be discussed in more detail in connection with FIG. 6.

In the embodiment of FIG. 1, the device 100 determines whether the earpiece is activated by monitoring impedance and/or changes in impedance of each earpiece. In exemplary embodiments, each earpiece of the headphone device 122 comprises a micro-switch. The micro-switch automatically closes upon insertion of the earpiece into or against the ear. When the micro-switch is closed, the earpiece will draw current, resulting in a low impedance. However, when the micro-switch is opened (i.e., the earpiece is removed from the ear), the earpiece will not draw current, thus resulting in a high impedance. The current draw, impedance change, or impedance state (i.e., high or low), in exemplary embodiments, are detected by the amplifier 120. Once detected, the audio processor 108 forwards the data to the processor 102, which in turn may request the control module 118 to determine a device state change based on the user set preferences. In alternative embodiments, other circuitry in the device 100 may detect the current draw or impedance change.

In exemplary embodiments, the current, impedance, and/or impedance change is constantly monitored. Alternatively, the

4

changes may be monitored periodically. In some embodiments, the signals (i.e., activation state change signals) are only generated when an activation state change occurs, while in other embodiments, the signals (i.e., activation state signals) are generated at a preset time period. In a further embodiment, other circuitry or another device may monitor or detect the current, impedance, and/or impedance change.

Referring now to FIG. 2, an alternative embodiment of a device 200 configured for automated state changes is shown. The embodiment of FIG. 2 comprises similar elements as that of FIG. 1 including a processor 202, a memory 204, at least one input/output device 206, an audio processor 208 coupled to an audio port 210, a video processor 212, and a user interface 214 all coupled in communication via a bus 216. Similarly, the memory comprises a control module 218, and the audio processor 208 comprises an amplifier 220. The audio processor 208 processes audio data and sends the processed analog audio signals to a headphone device 222 via the audio port 210.

However, in the embodiment of FIG. 2, determination of whether one or both earpieces are activated is performed at the headphone device 222. Signals representing activation states or activation state changes in one or both of the earpieces (i.e., right earpiece 226 and left earpiece 228) of the headphone device 222 are then sent to a sensor port 224, which essentially acts as a signal-in-port on the device 100. The signals are then routed to the processor 202 and/or the control module 218. In one embodiment, the headphone device is wireless and signals are transmitted in a wireless manner (e.g., infrared or radio frequency).

According to one embodiment, a state or state change signal is generated indicating if a micro-switch of one or both earpieces is open (i.e., activated) or closed (i.e., deactivated). In exemplary embodiments, a right sensor 230 of the right earpiece 226 and a left sensor 232 of the left earpiece 228 generate the activation state or activation state change signals. Furthermore, embodiments of the right and left sensors 230 and 232 may comprise the micro-switch in each earpiece. Thus, when the earpiece is inserted in, or positioned next to, the user’s ear, the micro-switch will close. However, when the earpiece is removed from the ear, the micro-switch will open. When the micro-switch opens or closes, circuitry in the headphone device 222 will sense the activation state or activation state change. For example, the circuitry may sense a change in voltage draw or impedance associated with one of the earpieces. The circuitry will then generate the activation state change signal. In some embodiments, the signals (i.e., activation state change signals) are only generated when an activation state change occurs, while in other embodiments, the signals (i.e., activation state signals) are generated at a preset time period.

In an alternative embodiment, the headphone device may generate an activation state or activation state change signal when circuitry within the earpiece senses a temperature change. In this embodiment, the sensors 230 and 232 are thermal sensors. Because the ear is typically at a higher temperature than an environment that the headphone device 222 is used within, inserting the earpiece into, or positioning the earpiece against, the ear will cause a temperature change (i.e., increased temperature) in at least a portion of the earpiece that is detectable by the sensor 230 or 232. Similarly, removal of the earpiece will cause a temperature drop that is detected by the sensor 230 or 232. Temperature changes cause the circuitry in the headphone device to generate and send the activation state or activation state change signal to the sensor port 224 in the device 200. In a further embodiment, the sensor 230 or 232 may be replaced by a skin-resistance sensor. Thus,

5

when the earpiece is placed in or against the ear, the skin-resistance sensor senses a change which causes the generation of the activation state change signal. In some embodiments, the signals (i.e., activation state change signals) are only generated when an activation state change occurs, while in other embodiments, the signals (i.e., activation state signals) are generated at a preset time period.

Although FIG. 2 shows the right and left sensors 230 and 232 contained within the right and left earpiece 226 and 228, respectively, alternative embodiments may comprise the right and left sensors 230 and 232 located elsewhere in the headphone device 222. In these embodiments, the right and left sensors 230 and 232 are coupled to the right and left earpieces 226 and 228, respectively. In a further embodiment, a single sensor may be coupled to both the right and left earpieces 226 and 228 for monitoring the activation of both earpieces.

FIG. 3 is a flowchart [300] of an exemplary method for controlling states of a device in accordance with the embodiment of FIG. 1. In step 302, the amplifier 120 (FIG. 1) detects impedance from a circuit supplying voltage and current to each earpiece of the headphone device 122 (FIG. 1). If the micro-switch in the earpiece is open (i.e., the earpiece is not positioned in or against the ear), no current is drawn, thus the impedance is high. However, if the micro-switch in the earpiece is closed (i.e., the earpiece is positioned in or against the ear), current is being drawn, and the impedance will be low. Thus, in step 304, the processor 102 (FIG. 1) determines if the impedance detected by the amplifier 120 is low for both earpieces. If the impedances are low, the processor 102 instructs the control module 118 (FIG. 1) to place or keep the device 100 in the "play" device state or mode in step 306.

However, if in step 304, the processor 102 determines that impedance is not low for both earpieces, the processor 102 checks if impedance is high for both earpieces in step 308. If impedance is high for both earpieces, then the control module 118 will place the device 100 into a predetermined (i.e., preset or user preference) device state for when both earpieces are deactivated (i.e., removed from the ear) in step 310.

If in step 308, impedances are not high for both earpieces, then in step 312, the processor 102 determines if the impedance is high for the right earpiece. If the right earpiece is high in impedance, the control module 118 will go to a predetermined device state for when the right earpiece is deactivated in step 314. Alternatively, if the impedance is not high for the right earpiece, the control module 118 will go to a predetermined state for when the left earpiece is deactivated in step 316.

If the device 100 remains on in step 318, then the method returns to monitoring the impedance data in step 302. However, if the device 100 turns off, then the method ends. In exemplary embodiments, the monitoring process may be continuous. Alternatively, the device 100 may monitor at set periods. These set periods may be defined by the manufacturer or by the user.

It should be noted that FIG. 3 illustrates only one embodiment of the method for controlling states in the device 100. Alternative embodiments may comprise more, less, or similar steps which accomplish the same results. For example, step 312 may determine if impedance is high for a left earpiece instead of for a right earpiece. Alternatively, the device 100 may require the processor 202 to determine which of the earpieces has either a high or a low impedance. In a further example, steps 304, 308, and 312 may be embodied within one step of the processor 102. This single step comprises detecting impedance strength or change in impedance for each of the earpieces.

6

Referring now to FIG. 4, a flowchart [400] of an exemplary method for controlling states according to the embodiment of FIG. 2 is shown. In step 402, the sensor [224] port 224 (FIG. 2) receives state signals from the headphone device 222 (FIG. 2) and forwards the signals to the processor 202 (FIG. 2). These state signals indicate whether one or both of the earpieces of the headphone device 222 are activated. In one embodiment, the earpieces comprise a thermo sensor which senses temperature changes (i.e., when the earpiece is inserted, temperature is high, and when the earpiece is removed, the temperature is low), and triggers the generation of the state signals accordingly. In alternative embodiments, the earpieces may comprise skin-resistance sensors. In yet further embodiments, other circuitry associated with the earpieces may sense impedance changes for each earpiece.

Thus, in step 404, the processor 202 determines if the state signal shows both earpieces activated. If both earpieces are activated (i.e., inserted in the ears), the processor 202 instructs the control module 218 (FIG. 2) to place or keep the device 200 in the "play" state or mode in step 406.

However, if in step 404, the processor 202 determines that both earpieces are not activated, the processor 202 checks if both earpieces are deactivated in step 408. If both earpieces are deactivated (i.e., removed from the ears), then the control module 218 will place the device 200 into a predetermined (i.e., preset or user preference) device state for when both earpieces are deactivated in step 410.

If in step 408, both earpieces are not deactivated, then in step 412, the processor 202 determines if the right earpiece is deactivated. If the right earpiece is deactivated, the control module 218 will go to a predetermined device state for when the right earpiece is deactivated in step 414. Alternatively, if the right earpiece is activated, the control module 218 will go to a predetermined device state for when the left earpiece is deactivated in step 416.

If the device 200 remains on in step 418, then the method returns to receiving state signals in step 402. However, if the device 200 turns off, then the method ends.

It should be noted that FIG. 4 illustrates only one embodiment of the method for controlling states in the device 200. Alternative embodiments may comprise more, less, or similar steps which accomplish the same results. For example, step 412 may determine if the left earpiece is activated instead of the right. Alternatively, the device 200 may require the processor 202 to determine which of the earpieces are activated or deactivated. In a further example, steps 404, 408, and 412 may be embodied within one step of the processor 202. This single step comprises determining which earpieces are activated or deactivated based on the received state signals.

Referring now to FIG. 5, an alternative method for controlling device states is shown. In step 502, the device 100 (FIG. 1) or 200 (FIG. 2) monitors the headphone device 122 (FIG. 1) or 222 (FIG. 2). In accordance to the embodiment of FIG. 1, the amplifier 120 (FIG. 1) or similar component of the device 100 monitors and detects current or impedance data for each earpiece of the headphone device 122 (FIG. 1). With respect to the embodiment of FIG. 2, the device 200 receives signals from the headphone device 222 (FIG. 2) at a sensor port 224 (FIG. 2). The signals are generated by sensors 230 and 232 (FIG. 2) in the headphone device 222, and may represent an activation/deactivation state of each earpiece 226 and 228 (FIG. 2) or a change in the activation/deactivation state.

Based on the data received while monitoring the headphone device 122 or 222, the device 100 or 200 determines if a change in the activation state has occurred in step 504. This determination may occur in the processor 102 (FIG. 1) or 202

(FIG. 2) or other component of the device 100 or 200. Thus, the device 100 or 200 determines if, for example, the impedance changed for one of the earpieces. If no change in activation state is present, then the device 100 or 200 determines if the monitoring process should continue in step 506. If for example, the device 100 or 200 turns off, then the monitoring process should end. However, if the device 100 or 200 determines that the monitoring process should continue, then the method returns to step 502. The monitoring process may occur continuously or periodically depending on presets of the device 100 or 200.

If an activation state change is detected in step 504, then the device 100 or 200 determines what activation state change occurred. For example, the device 200 may receive an activation state change signal that indicates that the right earpiece 226 is removed from the ear. Alternatively, the device 100 may determine that the impedance is now high to the right earpiece of the headphone device 122, thus indicating that the right earpiece is no longer activated.

Based on the activation state change determined in step 508, the device 100 or 200 will change the device state accordingly. Thus is step 510, the device 100 or 200 will review presets in the control module 118 (FIG. 1) or 218 (FIG. 2) to determine what the device state should be, then implement the device state change if necessary. Subsequently, the device 100 or 200 determines if the monitoring process should continue in step 506.

Referring now to FIG. 6, a table illustrating possible states and state changes from a current state according to exemplary embodiments of the present invention is shown. The device states are predetermined or preset in the device 100 (FIG. 1) or 200 (FIG. 2). The user may set their own preset preferences, or alternatively, presets may be enabled by the manufacturer, which may be changed by the user. In alternative embodiments, other states may be utilized in addition to, or instead, of those shown. For example, alternative device states may comprise adjusting the bass, adjusting the tremble, changing audio balance in the earpieces (e.g., if the right earpiece is removed, all audio is shifted over to the left earpiece), and so forth.

If the current state is "run" or "play" and one earpiece is removed, then depending on the preset, the device 100 or 200 may enter a pause, adjust volumes, fast forward, or reverse state, for example. In one embodiment, the preset may be different for each earpiece. For example, the preset may send the device 100 or 200 into a "fast forward" state if the right earpiece is removed, and send the device 100 or 200 into a "reverse" state if the left earpiece is removed. In an alternative embodiment, the preset enables the same state change to occur when either of the earpieces is removed.

From the current "run" state, the removal of both earpieces may cause the device 100 or 200 to enter a "pause" state or a "power save" state. The "power save" state may, in exemplary embodiments, place the device 100 or 200 into a "standby" mode where a display or monitor darkens and components of the device 100 or 200 power down. In a further embodiment, the removal of both earpieces may turn off the device 100 or 200.

If the current state is a "pause" state caused by the removal of one or both earpieces, the device 100 or 200 may enter the "power save" state after a preset amount of time spent in the "pause" state. For example, the user may remove one earpiece to answer a phone call, if after 2 minutes (time interval being another present) the earpiece is not activated, then the device 100 or 200 will enter the "power save" state. Similarly, if the device 100 is in a "pause" state cause by the removal of both

earpieces and after a preset amount of time, at least one earpiece is not activated, the device 100 or 200 may enter the "power save" state.

In an alternative preset, if the device 100 or 200 is in a "pause state" caused by one earpiece being inactive, the removal of the second earpiece will place the device 100 or 200 into the "power save" state. In yet a further embodiment, the removal of the second earpiece may cause the device 100 or 200 to shut down.

If both earpieces are activated from a current "pause" state, the device 100 or 200 will enter the "run" state.

If the current device state of the device 100 or 200 is a "power save" state caused by having both earpieces removed, the activation of one or both earpieces will cause the device 100 or 200 to enter the "run" state. Similarly, if the device 100 or 200 is in a "power save" state caused by the removal of one earpiece, the activation of the removed earpiece will cause the device 100 or 200 to enter the "run" state.

Although FIG. 6 shows that in the "power save" state, the removal of both earpieces maintains the state, an alternative embodiment may place the device 100 or 200 into a "shut off" state.

The present invention has been described above with references to exemplary embodiments. It will be apparent to those skilled in the art that various modifications may be made and other embodiments can be used without departing from the broader scope of the present invention. Therefore, these and other variations upon the specific embodiments are intended to be covered by the present invention.

What is claimed is:

1. A system for automated state changes in an audio-output enabled device coupled to a headphone device, the headphone device including a right [ear piece] earpiece and a left [ear piece] earpiece, the system comprising:

a processor in the audio-output enabled device, the processor configured to process digital audio data for output to the right earpiece and the left earpiece of the headphone device;

sensors for detecting if the right earpiece and the left earpiece of the headphone device are each in an activated or deactivated state; and

a control module [configured for determining] stored in memory and executable by a processor to determine a device state change based on the activated or deactivated state of each earpiece and a current playback state of the audio-enabled device, the device state change including a playback state of the digital audio data.

2. The system of claim 1 wherein the sensors comprise an amplifier configured to monitor impedance of each earpiece.

3. The system of claim 1 wherein the sensors are thermo sensors located within each earpiece of the headphone device.

4. The system of claim 1 wherein the sensors are circuitry located within each earpiece of the headphone device.

5. The system of claim 1 wherein the sensors generate a state change signal.

6. The system of claim 1 wherein the sensors are coupled to a sensor port configured to receive signals.

7. The system of claim 1 wherein the control module comprises presets for the state changes.

8. The system of claim 1 further comprising a touch sensitive user interface configured to allow a user to enter presets into the control module.

9. A method for automatically changing a state of an audio-output enabled device coupled to a headphone device, the headphone device including a right [ear piece] earpiece and a left earpiece, the method comprising:

9

processing digital audio data for output to the right earpiece and the left earpiece of the headphone device; receiving activation state data for both the right earpiece and the left earpiece of the headphone device; and based on the received activation state data for each earpiece and a current state of the audio-output enabled device, implementing a device state change based on a preset if an activation state change occurred, the device state change including a playback state of the digital audio data.

10. The method of claim 9 wherein determining if activation state change occurred comprises determining if an impedance change occurred in each earpiece.

11. The method of claim 9 further comprising customizing the preset via a touch sensitive user interface.

12. The method of claim 9 wherein the activation state data comprises impedance data.

13. The method of claim 9 wherein the activation state data comprises activation state signals received from the headphone device.

14. The method of claim 9 wherein the activation state data comprises activation state change signals received from the headphone device.

15. A *non-transitory* computer readable storage medium having embodied thereon a program, the program being executable by a processor to perform a method for automatically changing a state of an audio-output enabled device coupled to a headphone device, the headphone device including a right earpiece and a left earpiece, the method comprising:

processing digital audio data for output to the right earpiece and the left earpiece of the headphone device; receiving activation state data for both the right earpiece and the left earpiece of the headphone device; and based on the received activation state data for each earpiece and a current state of the audio-output enabled device, implementing a device state change based on a preset if an activation state change occurred, the device state change including a playback state of the digital audio data.

16. A method for automatically changing a state of an audio-output enabled device coupled to a headphone device, the headphone device including a right earpiece and a left earpiece, the method comprising:

receiving activation state data from both the right earpiece and the left earpiece of the headphone device; determining an activation state for each earpiece of the headphone device; and implementing a device state change based on a preset according to the activation state of each earpiece and a current state of the audio-output enabled device, the device state change including a playback state of digital audio data stored on the audio-output enabled device.

17. A headphone device for use with a system for automated state changes in an audio-output enabled device, comprising:

a right earpiece;  
a left earpiece; and  
a first sensor coupled to the right earpiece and a second sensor coupled to the left earpiece, each of the sensors configured to:  
determine an activation state of the right earpiece and the left earpiece;  
generate activation state data for changing the device state of the audio-output enabled device based on a current state of the device, the device state change

10

including a playback state of digital audio data stored on the audio-output enabled device.

18. The headphone device of claim 17 wherein at least one sensor is a thermo sensor.

19. The headphone device of claim 17 further comprising a micro-switch in the right and left earpieces, the micro-switch closing upon activation of the right and left earpieces.

20. The system of claim 1, wherein the playback state is selected from a group consisting of play, stop, rewind, fast forward, and pause.

21. The method of claim 9, wherein the playback state is selected from a group consisting of play, stop, rewind, fast forward, and pause.

22. The *non-transitory* computer-readable storage medium of claim 15, wherein the playback state is selected from a group consisting of play, stop, rewind, fast forward, and pause.

23. The method of claim 16, wherein the playback state is selected from a group consisting of play, stop, rewind, fast forward, and pause.

24. The headphone device of claim 17, wherein the playback state is selected from a group consisting of play, stop, rewind, fast forward, and pause.

25. *A method for controlling the state of a headphone device, the method comprising:*

*detecting impedance data for all states of at least one sensor for two earpieces in the headphone device;*  
*determining that the detected impedance data is low for both earpieces; and*  
*executing instructions stored in memory relating to a run state for the headphone device until the headphone device is deactivated or an impedance state that is not low for both earpieces is detected.*

26. *A method for controlling the state of a headphone device, the method comprising:*

*detecting impedance data for all states of at least one sensor for two earpieces in the headphone device;*  
*determining that the detected impedance data is high for both earpieces; and*  
*executing instructions stored in memory relating to a pre-determined state for the headphone device when both earpieces are inactive and until the headphone device is deactivated or an impedance state that is not high for both earpieces is detected.*

27. *A method for controlling the state of a headphone device, the method comprising:*

*detecting impedance data for all states of at least one sensor for two earpieces in the headphone device;*  
*determining that the detected impedance data is high for one of the two earpieces; and*  
*executing instructions stored in memory relating to a pre-determined state for the headphone device when the one of the two earpieces is inactive and until the headphone device is deactivated or an impedance state that is not high for the one of the two earpieces is detected.*

28. *A method for controlling the state of a headphone device, the method comprising:*

*detecting impedance data for all states of at least one sensor for two earpieces in the headphone device;*  
*determining that the detected impedance data is low for one of the two earpieces; and*  
*executing instructions stored in memory relating to a pre-determined state for the headphone device when the one of the two earpieces is inactive and until the headphone device is deactivated or an impedance state that is not low for the one of the two earpieces is detected.*

11

29. A method for controlling the state of a headphone device, the method comprising:

receiving signals for all states of at least one sensor corresponding to the earpieces of the headphone device;  
determining that the signals indicate both earpieces of the headphone device to be activated; and  
entering into a run state in response to the determination that both earpieces of the headphone device are activated and remaining in the run state until the headphone device is deactivated or the signals indicate that both earpieces of the headphone device are not activated.

30. A method for controlling the state of a headphone device, the method comprising:

receiving signals for all states of at least one sensor corresponding to the earpieces of the headphone device;  
determining that the signals indicate both earpieces of the headphone device to be inactive;  
entering into a predetermined state in response to the determination that both earpieces of the headphone device are deactivated and remaining in the predetermined state until the headphone device is deactivated or the signals indicate that both earpieces of the headphone device are not deactivated.

31. A method for controlling the state of a headphone device, the method comprising:

receiving signals for all states of at least one sensor corresponding to the earpieces of the headphone device;  
determining that the signals indicate one of the two earpieces of the headphone device to be inactive;  
entering into a predetermined state in response to the determination that one of the two earpieces of the headphone device is deactivated and remaining in the predetermined state until the headphone device is deactivated or the signals indicate that the one of the two earpieces of the headphone device are not deactivated.

32. A method for controlling the state of a headphone device, the method comprising:

receiving signals for all states of at least one sensor corresponding to the earpieces of the headphone device;  
determining that the signals indicate one of the two earpieces of the headphone device to be active;  
entering into a predetermined state in response to the determination that one of the two earpieces of the headphone device is activated and remaining in the predetermined state until the headphone device is deactivated or the signals indicate that the one of the two earpieces of the headphone device is not activated.

33. A system comprising:

a processor; and  
a memory, the memory storing a program and the program executable by a processor to perform a method for controlling the state of a headphone device, the method comprising:

detecting impedance data for all states of at least one sensor for two earpieces in the headphone device;  
determining that the detected impedance data is low for both earpieces; and  
entering a run state for the headphone device until the headphone device is deactivated or an impedance state that is not low for both earpieces is detected.

34. A system comprising:

a processor; and  
a memory, the memory storing a program and the program executable by a processor to perform a method for controlling the state of a headphone device, the method comprising:

12

detecting impedance data for all states of at least one sensor for two earpieces in the headphone device;  
determining that the detected impedance data is high for both earpieces; and

entering a predetermined state for the headphone device when both earpieces are inactive and until the headphone device is deactivated or an impedance state that is not high for both earpieces is detected.

35. A system comprising:

a processor; and  
a memory, the memory storing a program and the program executable by a processor to perform a method for controlling the state of a headphone device, the method comprising:

detecting impedance data for all states of at least one sensor for two earpieces in the headphone device;  
determining that the detected impedance data is high for one of the two earpieces; and  
entering a predetermined state for the headphone device when the one of the two earpieces is inactive and until the headphone device is deactivated or an impedance state that is not high for the one of the two earpieces is detected.

36. A system comprising:

a processor; and  
a memory, the memory storing a program and the program executable by a processor to perform a method for controlling the state of a headphone device, the method comprising:

detecting impedance data for all states of at least one sensor for two earpieces in the headphone device;  
determining that the detected impedance data is low for one of the two earpieces; and  
entering a predetermined state for the headphone device when the one of the two earpieces is inactive and until the headphone device is deactivated or an impedance state that is not low for the one of the two earpieces is detected.

37. A system comprising:

a processor; and  
a memory, the memory storing a program and the program executable by a processor to perform a method for controlling the state of a headphone device, the method comprising:

receiving signals for all states of at least one sensor corresponding to the earpieces of the headphone device;  
determining that the signals indicate both earpieces of the headphone device to be activated; and  
entering a run state in response to the determination that both earpieces of the headphone device are activated and remaining in the run state until the headphone device is deactivated or the signals indicate that both earpieces of the headphone device are not activated.

38. A system comprising:

a processor; and  
a memory, the memory storing a program and the program executable by a processor to perform a method for controlling the state of a headphone device, the method comprising:

receiving signals for all states of at least one sensor corresponding to the earpieces of the headphone device;  
determining that the signals indicate both earpieces of the headphone device to be inactive;  
entering a predetermined state in response to the determination that both earpieces of the headphone device are deactivated and remaining in the predetermined state

13

*until the headphone device is deactivated or the signals indicate that both earpieces of the headphone device are not deactivated.*

39. *A system comprising:*

*a processor; and*

*a memory, the memory storing a program and the program executable by a processor to perform a method for controlling the state of a headphone device, the method comprising:*

*receiving signals for all states of at least one sensor corresponding to the earpieces of the headphone device;*

*determining that the signals indicate one of the two earpieces of the headphone device to be inactive;*

*entering into a predetermined state in response to the determination that one of the two earpieces of the headphone device is deactivated and remaining in the predetermined state until the headphone device is deactivated or the signals indicate that the one of the two earpieces of the headphone device are not deactivated.*

14

40. *A system comprising:*

*a processor; and*

*a memory, the memory storing a program and the program executable by a processor to perform a method for controlling the state of a headphone device, the method comprising:*

*receiving signals for all states of at least one sensor corresponding to the earpieces of the headphone device;*

*determining that the signals indicate one of the two earpieces of the headphone device to be active;*

*entering into a predetermined state in response to the determination that one of the two earpieces of the headphone device is activated and remaining in the predetermined state until the headphone device is deactivated or the signals indicate that the one of the two earpieces of the headphone device is not activated.*

\* \* \* \* \*