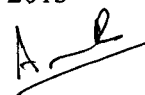


ABSTRACT OF THE DISCLOSURE

A system for controlling the power to a hardware unit is disclosed. The system comprises an audio channel for transmitting signals to the hardware unit; and a control circuit communicably connected to the audio channel. The control circuit transmits a power on signal through the audio channel to switch on the hardware unit and also transmits a power off signal through the audio channel to switch off the hardware unit.

Dated this the 4th day of December 2013



Arun Rajendran

Lead Patent Agent

We Claim:

1. A system for controlling the power to a hardware unit, wherein the system comprises:
 - an audio channel for transmitting signals to the hardware unit; and
 - a control circuit communicably connected to the audio channel, wherein the control circuit:
 - transmits a power on signal through the audio channel to switch on the hardware unit; and
 - transmits a power off signal through the audio channel to the switch off the hardware unit.
2. The system of claim 1, wherein the power on and power off signals are transmitted through the audio channel using an audio port in a portable user device.
3. The system of claim 2, wherein the power on and the power off signals are transmitted in response to switching on and switching off the portable user device respectively.
4. The system of claim 2, wherein the control circuit is configured to:
 - convert a digital signal generated in response to switching on the portable user device to the power on signal, wherein the power on signal is an analog signal; and
 - convert a digital signal in response to switching off the portable user device to the power off signal, wherein the power off signal is an analog signal.
5. The system of claim 1, wherein the control circuit is configured to:
 - transmit an audio signal corresponding to acknowledgment of powering on the hardware unit through the audio channel; and

transmit an audio signal corresponding to acknowledgment of powering off the hardware unit through the audio channel.

6. The system of claim 5, wherein the audio signal corresponding to acknowledgment of powering on the hardware unit and the audio signal corresponding to acknowledgment of powering off the hardware unit are transmitted through the audio channel to an audio port in a portable user device.
7. The system of claim 1, wherein the hardware unit is comprised in a medical device.
8. The system of claim 1, wherein the control unit is further configured to generate an error message in response to not receiving at least one of the audio signal corresponding to acknowledgment of powering on the hardware unit and the audio signal corresponding to acknowledgment of powering off the hardware unit transmitted through the audio channel into the audio port.
9. A portable user device controlling the power in a hardware unit, wherein the portable user device comprises:
 - an audio port communicably connected to the hardware unit over an audio channel;
 - a control circuit communicably connected to the audio port, wherein the control circuit:
 - transmits a power on signal through the audio channel to switch on the hardware unit; and
 - transmits a power off signal through the audio channel to the switch off the hardware unit.
10. The portable user device of claim 9, wherein the power on and the power off signals are transmitted in response to switching on and switching off the portable user device respectively.

11. The portable user device of claim 9, wherein the control circuit is configured to:
- convert a digital signal to the power on signal in response to switching on the portable user device, wherein the power on signal is an analog signal; and
 - convert a digital signal to the power off signal in response to switching off the portable user device, wherein the power off signal is an analog signal.
12. The portable user device of claim 9, wherein the control circuit is configured to:
- transmit an audio signal corresponding to acknowledgment of powering on the hardware unit through the audio channel; and
 - transmit an audio signal corresponding to acknowledgment of powering off the hardware unit through the audio channel.
13. The portable user device of claim 12, wherein the audio port receives the audio signal corresponding to acknowledgment of powering on the hardware unit and the audio signal corresponding to acknowledgment of powering off the hardware unit transmitted through the audio channel.
14. The portable user device of claim 9, wherein the hardware unit is comprised in a medical device.
15. The portable user device of claim 9, wherein the control unit is further configured to generate an error message in response to not receiving at least one of the audio signal corresponding to acknowledgment of powering on the hardware unit and the audio signal corresponding to acknowledgment of powering off the hardware unit transmitted through the audio channel into the audio port.

Dated this the 4th day of December 2013



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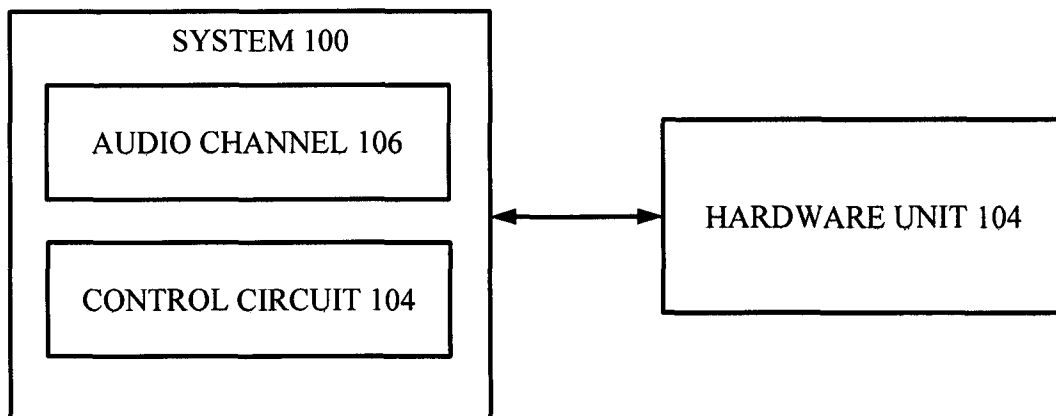


FIG. 1

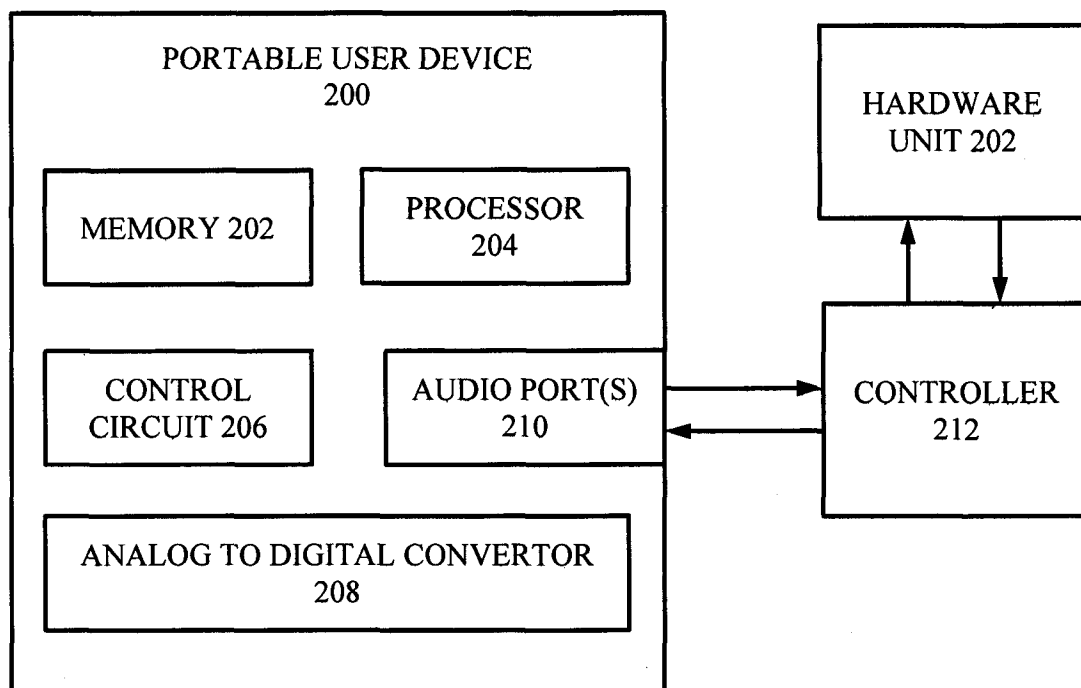


FIG. 2

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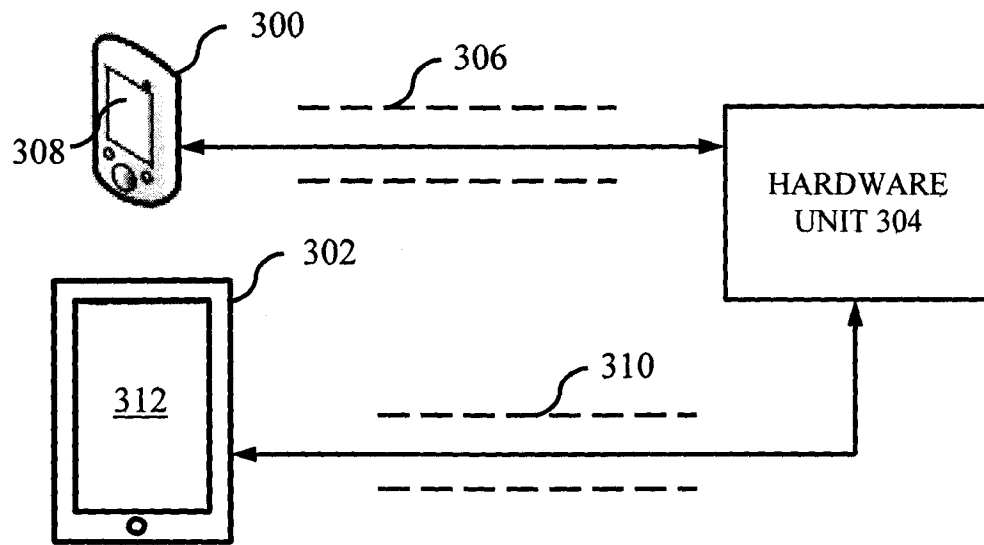


FIG. 3

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TECHNICAL FIELD

[0001] The subject matter disclosed herein relates to a powering on and powering off a hardware unit. More specifically the subject matter relates to transmitting powering on and powering off signals through an audio channel to switch on and off the hardware unit.

BACKGROUND OF THE INVENTION

[0002] Multiple hardware units may operate interactively to perform various functions. These hardware units may require different power sources such as batteries for its operation. Further each hardware unit may need to be separately switched on for executing the functionalities and then switched off. For example a mobile device may be connected to another hardware unit for performing different operations. The hardware unit and the mobile device will have different batteries for supplying power. The mobile device and the hardware unit need to be separately switched on to start its operation for performing the desired function and thereafter switched off. Switching on them separately causes inconvenience to the user and also time delay.

[0003] Thus there is a need for an improved system for supplying power to multiple hardware units and switching on these hardware units.

BRIEF DESCRIPTION OF THE INVENTION

[0004] The above-mentioned shortcomings, disadvantages and problems are addressed herein which will be understood by reading and understanding the following specification.

[0005] As discussed in detail below, embodiments of the invention a system for controlling the power to a hardware unit is disclosed. The system comprises an audio channel for transmitting signals to the hardware unit; and a control circuit communicably connected to the audio channel. The control circuit transmits a power on signal through

the audio channel to switch on the hardware unit and also transmits a power off signal through the audio channel to the switch off the hardware unit.

[0006] In an embodiment a portable user device controlling the power in a hardware unit is disclosed. The portable user device comprises an audio port communicably connected to the hardware unit over an audio channel; and a control circuit communicably connected to the audio port. The control circuit transmits a power on signal through the audio channel to switch on the hardware unit; and transmits a power off signal through the audio channel to the switch off the hardware unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIGURE 1 illustrates a system for controlling the power to a hardware unit in accordance with an embodiment;

[0008] FIGURE 2 illustrates a portable user device for controlling the power in a hardware unit in accordance with an embodiment; and

[0009] FIGURE 3 illustrates a mobile device and a tablet communicating with a hardware unit for controlling the power supplied to the hardware unit in accordance with an embodiment.

DETAILED DESCRIPTION OF THE INVENTION

[0010] In the following detailed description, reference is made to the accompanying drawings that form a part hereof, and in which is shown by way of illustration specific embodiments that may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the embodiments, and it is to be understood that other embodiments may be utilized and that logical, mechanical, electrical and other changes may be made without departing from the scope of the embodiments. It should be understood that the various embodiments are not limited to the arrangements and instrumentality shown in the drawings. The following detailed description is, therefore, not to be taken as limiting the scope of the invention.

[0011] As used herein, an element or step recited in the singular and proceeded with the word “a” or “an” should be understood as not excluding plural of said elements or steps, unless such exclusion is explicitly stated. Furthermore, references to “one embodiment” of the present invention are not intended to be interpreted as excluding the existence of additional embodiments that also incorporate the recited features. Moreover, unless explicitly stated to the contrary, embodiments “comprising” or “having” an element or a plurality of elements having a particular property may include additional such elements not having that property.

[0012] A system for controlling the power to a hardware unit is disclosed. The system comprises an audio channel for transmitting signals to the hardware unit; and a control circuit communicably connected to the audio channel. The control circuit transmits a power on signal through the audio channel to switch on the hardware unit and also transmits a power off signal through the audio channel to switch off the hardware unit.

[0013] Various embodiments of the invention provide FIG. 1 illustrating a system 100 for controlling the power to a hardware unit in accordance with an embodiment. The system 100 is used to send power sequence signals to a hardware unit 102 for switching on and switching off the hardware unit 102. A hardware unit such as the hardware unit 102 may be a medical imaging device, any medical device or any hardware device. The system 100 includes a control circuit 104 transmits a power on signal through an audio channel 106 to the hardware unit 102. The control circuit 104 generates the power on signal in response to a signal received from a device (not shown in FIG. 1) that is switched on. The device may be communicably connected to the system 100. In another embodiment the system 100 may be integral part of the device. The power on signal transmitted may be an analog signal. The control unit 104 may include multiple processor(s), micro-processors, power circuitry and other circuitry components for generating, controlling and transmitting signals for instance power sequence signals (e.g. power on and power off signals). The power on signal received is decoded and the hardware unit 102 is switched on. The power on signal may be processed by a processor

(such as a micro-processor) in the hardware unit 102. The device connected to the system 100 and the hardware unit 102 may communicate with each other to perform any desired functions. In another scenario the hardware unit 102 commences performing its functionalities when switched on.

[0014] The control circuit 104 is also configured to send a power off signal in response to receiving a signal received from the device that is switched off. The power off and the power on signals are power sequence signals. The signal received from the device indicates that the device is switched off. The power off signal is transmitted to the hardware unit 102 through the audio channel 106. The power off signal is processed by the processor in the hardware unit 102 for switching it off. Thus when the device is switched off simultaneously the hardware unit 102 is also switched off.

[0015] FIG. 2 illustrates a portable user device 200 for controlling the power in a hardware unit 202 in accordance to an embodiment. The portable user device 200 may be a medical imaging device (e.g. an ultrasound imaging device), a medical device, a mobile device and so on. The portable user device 200 includes a memory 202 for example a Random Access Memory (RAM) and a Read Only Memory (ROM) and a processor 204. The memory 202 may be used to store different applications and data associated with these applications for controlling and performing various desired functionalities of the portable user device 200. The processor 204 processes the data to run different applications to perform the desired functionalities. When the portable user device 200 is switched on a signal indicating this is received by a control circuit 206. The control circuit 206 processes the signal to generate a power on signal. The power on signal may be an analog signal converted into a digital signal by an analog to digital convertor 208. The power on signal is transmitted through an audio port 210 to the hardware unit 202. The power on signal passes through an audio channel to the hardware unit 202. The hardware unit 202 may be wired connected to the audio port 210. It may be appreciated that other techniques (for example wireless connection) may be utilized for transmitting signals to the hardware unit 202 from the portable user device 200.

[0016] The power on signal is received at a controller 212, where it is checked if this signal matches with a signal received from a power source of the hardware unit 202 for switching on then the hardware unit 202 is switched on. The controller 212 checks the power on signal based on different parameters such as voltage level, frequency, amplitude and so on. If the parameters of the power on signal matches with parameters of the signal received from the power source of the hardware unit 202 then it is switched on. The controller 212 may be a micro-controller powered by a power source of the hardware unit 202. In an embodiment the controller 212 may switch on the power source to in turn switch on the hardware unit 202. The controller 212 as shown in FIG. 2 may be external to the hardware unit 202. In an embodiment the controller 212 may be an integral part of the hardware unit 202. Once the hardware unit 202 is switched on an audio signal is generated by the controller 212 and sends to the portable user device 200 through the audio port(s) 210. The audio signal indicates acknowledgement on powering on the hardware unit 202. In an embodiment the audio signal is transmitted through a port (i.e. the audio port(s) 210 where the microphone can be connected) to be received at the portable user device 200. The control circuit 206 processes the audio signal to identify that the hardware unit 202 is switched on now.

[0017] When the portable user device 200 is switched off the control circuit 206 generates a power off signal. The power off signal is generated by converting a digital signal to an analog signal using the analog to digital convertor 208. The power off signal in the analog form is send through the audio port(s) 210 to the controller 212. The controller 212 processes this signal to switch off the hardware unit 202. The controller 212 may be configured to check if this signal matches with a signal received from a power source of the hardware unit 202 for switching off then the hardware unit 202 is switched off. The controller 212 checks the power on signal based on different parameters such as voltage level, frequency, amplitude and so on. If the parameters of the power on signal matches with parameters of the signal received from the power source of the hardware unit 202 then it is switched off. In an embodiment the controller 212 may switch off the power source to in turn switch off the hardware unit 202. Once the hardware unit 202 is switched off an audio signal is generated by the controller 212

and sends to the portable user device 200 through the audio port(s) 210. The audio signal indicates acknowledgement on powering off the hardware unit 202. In an embodiment the audio signal is transmitted through the port (i.e. the audio port(s) 210 where the microphone can be connected) to be received at the portable user device 200. The control circuit 206 processes the audio signal to identify that the hardware unit 202 is switched off now.

[0018] During powering on and powering off the hardware unit 202 in case audio signals indicating these states (i.e. power off and power on) are not received at the portable user device 200, then an error message is generated by the controller 212. In an embodiment if an audio signal indicating a powering on or a powering off of the hardware unit 202 is not received the power on and power off signals respectively are send through the audio port(s) 210 to the controller 212 and finally to the hardware unit 202. The controller 212 may be powered by a power source providing power to the hardware unit 202. The power source may be a battery or a rechargeable battery or any other power sources. If the number of turns of the power on and power off signals exceeds a threshold limit respective error messages are generated by the controller 212. The controller 212 communicates the error messages to the portable user device 200 for presenting to a user. Thereafter the portable user device 200 is switched off. In another embodiment if the power on and power off signals exceeds a threshold limit then a signal is send to the control circuit 206 by the controller 212. Then the control circuit 206 interacts with the processor 204 to generate the error messages to be presented in the portable user device 200.

[0019] FIG. 3 illustrates a mobile device 300 and a tablet device 302 communicably coupled to a hardware unit 304 in accordance with an embodiment. The mobile device 300 may send power on signals through its audio port for switching on the hardware unit 304. Similarly the mobile device 300 may also send power off signals through the audio port to switch off the hardware unit 304. The power on signals and the power of signals are transmitted through an audio channel 306. The process of switching off and switching on the hardware unit 306 is described in detail in conjunction with FIG. 2. The

mobile device 300 may be connected to the hardware unit 304 which may be a medical imaging device such as an ultrasound device. The mobile device may be wired or wireless connected to the hardware unit 304. Images captured by the medical imaging device may be presented through a display screen 308 of the mobile device 300. The mobile device 300 may be a personal mobile of a user or any other mobile devices that may include an application for presenting the images captured. In the case of ultrasound imaging the application may be specific for this imaging technique and accordingly ultrasound images may be processed and presented to the user. Once switched on the hardware unit 304 can communicate with the mobile device 300 using different communication techniques such as bluetooth®, wi-fi, USB and so on. The hardware unit 304 and the mobile device 300 communicate with each other to perform different functionalities for instance medical imaging.

[0020] In another scenario the tablet device 302 may be wired or wirelessly connected to the hardware unit 304. The tablet device 302 may send power on signals through its audio port for switching on the hardware unit 304. Similarly the tablet device 302 may also send power off signals through the audio port to switch off the hardware unit 304. The power on signals and the power of signals are transmitted through an audio channel 310. Images captured by the medical imaging device may be presented through a display screen 312 of the tablet device 302. The tablet device 300 may be a personal tablet of a user or any other tablet devices that may include an application for presenting the images captured. In the case of ultrasound imaging the application may be specific for this imaging technique and accordingly ultrasound images may be processed and presented to the user. In an embodiment the tablet device 302 may be connected to the hardware unit 304 and embodied as a single portable unit that can used by the user. For example if the hardware unit 304 is specific for ultrasound imaging, then the tablet device 302 and the hardware unit 304 may be embodied as a portable ultrasound imaging device. Once switched on the hardware unit 304 can communicate with the tablet device 302 using different communication techniques such as bluetooth®, wi-fi, USB and so on. The hardware unit 304 and the tablet device 302 communicate with each other to perform different functionalities for instance medical imaging.

[0021] The various embodiments and/or components, for example, the modules, or components and controllers therein, also may be implemented as part of one or more computers or processors. The computer or processor may include a computing device, an input device, a display unit and an interface, for example, for accessing the Internet. The computer or processor may include a microprocessor. The microprocessor may be connected to a communication bus. The computer or processor may also include a memory. The memory may include Random Access Memory (RAM) and Read Only Memory (ROM). The computer or processor further may include a storage device, which may be a hard disk drive or a removable storage drive such as a floppy disk drive, optical disk drive, and the like. The storage device may also be other similar means for loading computer programs or other instructions into the computer or processor.

[0022] As used herein, the term “computer” or “module” may include any processor-based or microprocessor-based system including systems using microcontrollers, reduced instruction set computers (RISC), application specific integrated circuits (ASICs), logic circuits, and any other circuit or processor capable of executing the functions described herein. The above examples are exemplary only, and are thus not intended to limit in any way the definition and/or meaning of the term “computer”.

[0023] The computer or processor executes a set of instructions that are stored in one or more storage elements, in order to process input data. The storage elements may also store data or other information as desired or needed. The storage element may be in the form of an information source or a physical memory element within a processing machine.

[0024] The methods controlling the power supplied to the hardware unit using a portable user device can be performed using a processor or any other processing device. The method steps can be implemented using coded instructions (e.g., computer readable instructions) stored on a tangible computer readable medium. The tangible computer readable medium may be for example a flash memory, a read-only memory (ROM), a random access memory (RAM), any other computer readable storage medium and any storage media. Although the method of controlling the power supplied to the hardware

unit using a portable user device is described, other methods of implementing the method can be employed. For example, the order of execution of each method steps may be changed, and/or some of the method steps described may be changed, eliminated, divide or combined. Further the method steps may be sequentially or simultaneously executed for controlling the power supplied to the hardware unit using the portable user device.

[0025] This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any computing system or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal language of the claims.