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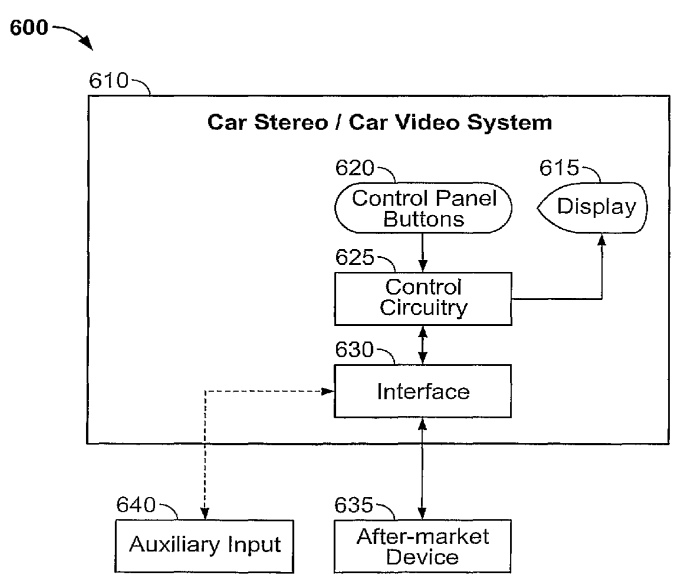
(54) **Title:** MULTIMEDIA DEVICE INTEGRATION SYSTEM



(57) **Abstract:** An multimedia device integration system is provided. One or more after-market audio or video devices, such as a CD player, CD changer, digital media device {e.g., MP3 player, MP4 player, WMV player, Apple iPod, portable music center, or other device) satellite receiver {e.g., XM or Sirius receiver), DAB receiver, video device {e.g., DVD player), cellular telephone, or any other device or combinations thereof, is integrated for use with an existing OEM or after-market car stereo or video system, wherein control commands can be issued at the car stereo or video system and data from the after-market device can be displayed on the car stereo or video system. Control commands generated at the car stereo or video system are received, processed, converted into a format recognizable by the after-market device, and dispatched to the after-market device for execution. Information from the after-market device is converted into a format recognizable by the car stereo or video system, and dispatched to the car stereo or video system for display thereon. One or more auxiliary input sources can be integrated with the car stereo or video system, and selected using the controls of the car stereo or video system. A docking station is provided for docking a portable audio or video device for integration with the car stereo or video system.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INVENTOR: IRA MARLOWE

TITLE: MULTIMEDIA DEVICE INTEGRATION SYSTEM

SPECIFICATION

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to a multimedia device integration system. More specifically, the present invention relates to a multimedia device integration system for integrating after-market components such as satellite receivers, CD players, CD changers, digital media devices (*e.g.*, MP3 players, MP4 players, WMV players, Apple iPod devices, portable media centers, and other devices), Digital Audio Broadcast (DAB) receivers, auxiliary audio sources, video devices (*e.g.*, DVD players), cellular telephones, and other devices for use with factory-installed (OEM) or after-market car stereo and video systems.

RELATED ART

Automobile audio systems have continued to advance in complexity and the number of options available to automobile purchasers. Early audio systems offered a simple AM and/or FM tuner, and perhaps an analog tape deck for allowing cassettes, 8-tracks, and other types of tapes to be played while driving. Such early systems were closed, in that external devices could not be easily integrated therewith.

With advances in digital technology, CD players have been included with automobile audio systems. Original Equipment Manufacturers (OEMs) often produce car stereos having CD players and/or changers for allowing CDs to be played while driving. However, such systems often include proprietary buses and protocols that do not allow after-market audio systems, such as satellite receivers (e.g., XM satellite tuners), digital audio broadcast (DAB) receivers, digital media players (*e.g.*, Apple iPod, MP3, MP4, WMV, etc.), CD changers, auxiliary input sources, video devices (*e.g.*, DVD players), cellular telephones, and the like, to be easily integrated therewith. Thus, automobile purchasers are frequently forced to either entirely replace the OEM audio system, or use same throughout the life of the vehicle or the duration of ownership. Even if the OEM radio is replaced with an after-market radio, the after-market radio also frequently is not operable with an external device.

A particular problem with integrating after-market audio and video systems with existing car stereo and video systems is that signals generated by both systems are in proprietary formats, and are not capable of being processed by the after-market system. Additionally, signals generated by the after-market system are also in a proprietary format that is not recognizable by the car stereo or video system. Thus, in order to integrate after-market systems with existing car stereo and video systems, it is necessary to convert signals between such systems.

It known in the art to provide one or more expansion modules for OEM and after-market car stereos for allowing external audio products to be integrated with the car stereo. However, such expansion modules only operate with and allow integration of external audio products manufactured by the same manufacturer as the OEM / after-market car stereo. For example, a satellite receiver manufactured by PIONEER, Inc., cannot be integrated with an OEM car radio manufactured by TOYOTA or an after-market car radio manufactured by CLARION, Inc. Thus, existing expansion modules only serve the limited purpose of integrating equipment by the same manufacturer as the car stereo. Thus, it would be desirable to provide an integration system that allows any audio device of any manufacture to be integrated with any OEM or after-market radio system. Further, radio-frequency (RF) transmitters and cassette tape adapters have been developed for allowing music from a device external to a car radio, such as a portable CD player, to be played through the car radio using the FM receiver or the cassette deck of the radio. However, such systems are often prone to interference, and do not provide high fidelity.

Moreover, it would be desirable to provide an integration system that not only achieves integration of various audio and video devices that are alien to a given OEM or after-market car stereo or video system, but also allows for information to be exchanged between the after-market device and the car stereo or video system. For example, it would be desirable to provide a system wherein station, track, time, and song information can be retrieved from the after-market device, formatted, and transmitted to the car stereo or video system for display thereby, such as at an LCD panel of the car stereo or on one or more display panels of a car video system. Such information could be transmitted and displayed on both hardwired car stereo and video systems (*e.g.*, radios installed in dashboards or at other locations within the car), or integrated for display on one or more software or graphically-driven radio systems operable with graphical display panels.

Additionally, it would be desirable to provide a multimedia device integration system that allows a user to control more than one device, such as a CD or satellite receiver and one or more auxiliary sources, and to quickly and conveniently switch between same using the existing controls of the car stereo or video system.

Accordingly, the present invention addresses these needs by providing a multimedia device integration system that allows a plurality of after-market devices, such as CD players, CD changers, digital media devices (*e.g.*, MP3 players, MP4 players, Apple iPod, WMV players, portable media centers, and other devices), satellite receivers, DAB receivers, auxiliary input sources, video devices (*e.g.*, DVD players), cellular telephones, or any combination thereof, to be integrated into existing car stereo and video systems while allowing information to be displayed on, and control to be provided from, the car stereo or video system.

SUMMARY OF THE INVENTION

The present invention relates to a multimedia device integration system. One or more after-market audio devices, such as CD players, CD changers, digital media devices (*e.g.*, MP3 players, MP4 players, WMV players, Apple iPod devices, portable media centers, and other devices), satellite receivers (*e.g.*, XM or Sirius receivers), digital audio broadcast (DAB) receiver, or auxiliary input sources, can be connected to and operate with an existing stereo system in an automobile, such as an OEM car stereo system or an after-market car stereo system installed in the automobile. The integration system connects to and interacts with the car stereo at any available port of the car stereo, such as a CD input port, a satellite input, or other known type of connection. If the car stereo system is an after-market car stereo system, the present invention generates a signal that is sent to the car stereo to keep same in an operational state and responsive to external data and signals. Commands generated at the control panel are received by the present invention and converted into a format recognizable by the after-market device. The formatted commands are executed by the after-market device, and audio therefrom is channeled to the car stereo. Information from the after-market device is received by the present invention, converted into a format recognizable by the car stereo, and forwarded to the car stereo for display thereby. The formatted information could include information relating to a CD or MP3 track being played, channel, song, and artist information from a satellite receiver or DAB receiver, or video information from one or more external devices connected to the present invention. The information can be presented as one or more menus, textual, or graphical prompts for display on an LCD display of the radio, allowing interaction with the user at the radio. A docking port may be provided for allowing portable external audio devices to be connected to the interface of the present invention.

In an embodiment of the present invention, a dual-input device is provided for integrating both an external audio device and an auxiliary input with an OEM or after-market car stereo. The user can select between the external audio device and the auxiliary input using the controls of the car stereo. The invention can automatically detect the type of device connected to the auxiliary input, and integrate same with the car stereo.

In another embodiment of the present invention, an interface is provided for integrating a plurality of auxiliary input sources with an existing car stereo system. A user can select between the auxiliary sources using the control panel of the car stereo. One or more after-market audio devices can be integrated with the auxiliary input sources, and a user can switch between the audio device and the auxiliary input sources using the car stereo. Devices connected to the auxiliary input sources are inter-operable with the car stereo, and are capable of exchanging commands and data via the interface.

In another embodiment of the present invention, an interface is provided for integrating an external device for use with a car stereo or video system, wherein the interface is positioned within the car stereo or video system. The system comprises a car stereo or video system; an after-market device external to the car stereo or video system; an interface positioned within the car stereo or video system and connected between the car stereo or video system and the after-market device for exchanging data and audio or video signals between the car stereo or video system and the after-market device; means for processing and dispatching commands for controlling the after-market device from the car stereo or video system in a format compatible with the after-market device; and means for processing and displaying data from the after-market device on a display of the car stereo or video system in a format compatible with the car stereo or video system. The after-market device could comprise one or more of a CD changer, CD player, satellite receiver (*e.g.*, XM or Sirius), digital media device (*e.g.*, MP3, MP4, WMV, or Apple iPod device), video device (*e.g.*, DVD player), cellular telephone, or any combination thereof.

In another embodiment of the present invention, an interface is provided for integrating a cellular telephone for use with a car stereo or video system. The system comprises a car stereo or video system; a cellular telephone external to the car stereo or video system; an interface connected between the car stereo or video system and the cellular telephone for exchanging data and audio or video signals between the car stereo or video system and the cellular telephone; means for processing and dispatching commands for controlling the cellular telephone from the car stereo or video system in a format compatible with the cellular telephone; and means for processing and displaying data from the cellular telephone on a display of the car stereo or video system in a format compatible with the car stereo or video system.

In another embodiment of the present invention, an interface is provided for integrating an external video system for use with a car video system. The system comprises a car video system; an after-market video device external to the car video system; an interface connected between the car video system and the after-market video device for exchanging data, audio, and video signals between the car video system and the after-market video device; means for processing and dispatching commands for controlling the after-market video device from the car video system in a format compatible with the after-market video device; and means for processing and displaying data from the after-market video device on a display of the car video system in a format compatible with the car video system.

The present invention also provides an interface for integrating a plurality of after-market devices for use with a car stereo or video system using a single interface. In one embodiment, the system comprises an interface in electrical communication with a car stereo or video system and an after-market device; a plurality of configuration jumpers in the interface for specifying a first device type corresponding to the car stereo or video system and a second device type corresponding to the after-market device; and a plurality of protocol conversion software blocks stored in memory in the interface for converting signals from the after-market device into a first format compatible with the car stereo or video system and for converting signals from the car stereo or video system into a second format compatible with the after-market device, wherein at least one of the protocol conversion software blocks are selected by the interface using settings of the plurality of configuration jumpers. In another embodiment, the system comprises an interface in electrical communication with a car stereo or video system and an after-market device; first and second wiring harnesses attached to the interface, wherein the first wiring harness includes a first electrical configuration corresponding to the car stereo or video system and the second wiring harness includes a second electrical configuration corresponding to the after-market device; and a plurality of protocol conversion software blocks stored in memory in the interface for converting signals from the after-market device into a first format compatible with the car stereo or video system and for converting signals from the car stereo or video system into a second format compatible with the after-market device, wherein at least one of the protocol conversion software blocks are selected by the interface using the first and second electrical configurations of the first and second wiring harnesses. A plurality of wiring harnesses can be provided for integrating a plurality of devices.

The present invention also provides a method for integrating an after-market device for use with a car stereo or video system, comprising the steps of interconnecting the car stereo or video system and the after-market device with an interface; determining a first device type corresponding to the car stereo or video system and a second device type corresponding to the after-market device; loading a protocol conversion software block from memory in the interface using the first and second device types; converting signals from the after-market device into a first format compatible with the car stereo or video system using the protocol conversion software block; and converting signals from the car stereo or video system into a second format compatible with the after-market device using the protocol conversion software block.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other important objects and features of the invention will be apparent from the following Detailed Description of the Invention, taken in connection with the accompanying drawings, in which:

FIG. 1 is a block diagram showing the multimedia device integration system of the present invention.

FIG. 2a is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein a CD player is integrated with a car radio.

FIG. 2b is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein a MP3 player is integrated with a car radio.

FIG. 2c is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein a satellite or DAB receiver is integrated with a car radio.

FIG. 2d is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein a plurality of auxiliary input sources are integrated with a car radio.

FIG. 2e is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein a CD player and a plurality of auxiliary input sources are integrated with a car radio.

FIG. 2f is a block diagram showing an alternate embodiment of the present invention, wherein a satellite or DAB receiver and a plurality of auxiliary input source are integrated with a car radio.

FIG. 2g is a block diagram showing an alternate embodiment of the present invention, wherein a MP3 player and a plurality of auxiliary input sources are integrated with a car radio.

FIG. 2h is a block diagram showing an alternate embodiment of the present invention, wherein a plurality of auxiliary interfaces and an audio device are integrated with a car stereo.

FIG. 3a is a circuit diagram showing a device according to the present invention for integrating a CD player or an auxiliary input source with a car radio.

FIG. 3b is a circuit diagram showing a device according to the present invention for integrating both a CD player and an auxiliary input source with a car radio, wherein the CD player and the auxiliary input are switchable by a user.

FIG. 3c is a circuit diagram showing a device according to the present invention for integrating a plurality of auxiliary input sources with a car radio.

FIG. 3d is a circuit diagram showing a device according to the present invention for integrating a satellite or DAB receiver with a car radio.

FIG. 4a is a flowchart showing processing logic according to the present invention for integrating a CD player with a car radio.

FIG. 4b is a flowchart showing processing logic according to the present invention for integrating a MP3 player with a car radio.

FIG. 4c is a flowchart showing processing logic according to the present invention for integrating a satellite receiver with a car radio.

FIG. 4d is a flowchart showing processing logic according to the present invention for integrating a plurality of auxiliary input sources with a car radio.

FIG. 4e is a flowchart showing processing logic according to the present invention for integrating a CD player and one or more auxiliary input sources with a car radio.

FIG. 4f is a flowchart showing processing logic according to the present invention for integrating a satellite or DAB receiver and one or more auxiliary input sources with a car radio.

FIG. 4g is a flowchart showing processing logic according to the present invention for integrating a MP3 player and one or more auxiliary input sources with a car stereo.

FIG. 5 is a flowchart showing processing logic according to the present invention for allowing a user to switch between an after-market audio device and one or more auxiliary input sources.

FIG. 6 is a flowchart showing processing logic according to the present invention for determining and handling various device types connected to the auxiliary input ports of the invention.

FIG. 7a is a perspective view of a docking station according to the present invention for retaining an audio device within a car.

FIG. 7b is an end view of the docking station of **FIG. 7a**.

FIGS. 8a-8b are perspective views of another embodiment of the docking station of the present invention, which includes the multimedia device integration system of the present invention incorporated therewith.

FIG. 9 is a block diagram showing the components of the docking station of **FIGS. 8a-8b**.

FIG. 10 is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein the interface is incorporated within a car stereo or car video system.

FIG. 11a is a diagram showing an alternate embodiment of the multimedia device integration system of the present invention for integrating a cellular telephone for use with a car stereo or video system; **FIG. 11b** is a flowchart showing processing logic for integrating a cellular telephone for use with a car stereo or video system.

FIG. 12a is a diagram showing an alternate embodiment of the multimedia device integration system of the present invention for integrating an after-market video device for use with a car video system; **FIG. 12b** is a flowchart showing processing logic for integrating an after-market video device for use with a car video system.

FIG. 13a is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein configuration jumpers and protocol conversion software blocks are provided for integrating after-market devices of various types using a single interface.

FIG. 13b is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein wiring harnesses and protocol conversion software blocks are provided for integrating after-market devices of various types using a single interface.

FIG. 14 is a flowchart showing processing logic of the multimedia device integration system of the present invention for integrating after-market devices of various types using a single interface.

FIG. 15 is a flowchart showing processing logic of the multimedia device integration system of the present invention for allowing a user to specify one or more after-market device types for integration using a single interface.

FIG. 16 is a flowchart showing processing logic of the multimedia device integration system of the present invention for allowing a user to quickly navigate through a list of songs on one or more after-market devices using the controls of a car stereo or video system.

FIG. 17 is a diagram showing an another embodiment of the present invention, wherein a plurality of external devices are integrated using a single interface.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a multimedia device integration system. One or more after-market devices, such as a CD player, CD changer, digital media player (*e.g.*, MP3 player, MP4 player, WMV player, Apple iPod, portable media center, or other device), satellite receiver, digital audio broadcast (DAB) receiver, video device (*e.g.*, DVD player), cellular telephone, or the like, can be integrated with an existing car radio or car video device, such as an OEM or after-market car stereo or video system. Control of the after-market device is enabled using the car stereo or car video system, and information from the after-market device, such as channel, artist, track, time, song, and other information information, is retrieved form the after-market device, processed, and forwarded to the car stereo or car video system for display thereon. The information channeled to the car stereo or video system can include video from the external device, as well as graphical and menu-based information. A user can review and interact with information via the car stereo. Commands from the car stereo or video system are received, processed by the present invention into a format recognizable by the after-market device device, and transmitted thereto for execution. One or more auxiliary input channels can be integrated by the present invention with the car stereo or video system. The user can switch between one or more after-market devices and one or more auxiliary input channels using the control panel buttons of the car stereo or video system.

As used herein, the term "integration" or "integrated" is intended to mean connecting one or more external devices or inputs to an existing car stereo or video system via an interface, processing and handling signals, audio, and/or video information, allowing a user to control the devices via the car stereo or video system, and displaying data from the devices on the car stereo or video system. Thus, for example, integration of a CD player with a car stereo system allows for the CD player to be remotely controlled via the control panel of the stereo system, and data from the CD player to be sent to the display of the stereo. Of course, control of after-market devices can be provided at locations other than the control panel of the car stereo or video system without departing from the spirit or scope of the present invention. Further, as used herein, the term "inter-operable" is intended to mean allowing the external audio or video device to receive and process commands that have been formatted by the interface of the present invention, as well as allowing a car stereo or video system to display information that is generated by the external audio or video device and processed by the present invention. Additionally, by the term "inter-operable," it is meant allowing a device that is alien to the environment of an existing OEM or after-market car stereo or video system to be utilized thereby.

Also, as used herein, the terms "car stereo" and "car radio" are used interchangeably and are intended to include all presently existing car stereos, radios, video systems, such as physical devices that are present at any location within a vehicle, in addition to software and/or graphically- or display-driven receivers. An example of such a receiver is a software-driven receiver that operates on a universal LCD panel within a vehicle and is operable by a user via a graphical user interface displayed on the universal LCD panel. Further, any future receiver, whether a hardwired or a software/graphical receiver operable on one or more displays, is considered within the definition of the terms "car stereo" and "car radio," as used herein, and is within the spirit and scope of the present invention. Moreover, the term "car" is not limited to any specific type of automobile, but rather, includes all automobiles. Additionally, by the term "after-market," it is meant any device not installed by a manufacturer at the time of sale of the car.

FIG. 1 is a block diagram showing the multimedia device integration (or interface) system of the present invention, generally indicated at **20**. A plurality of devices and auxiliary inputs can be connected to the interface **20**, and integrated with an OEM or after-market car radio **10**. A CD player or changer **15** can be integrated with the radio **10** via interface **20**. A satellite radio or DAB receiver **25**, such as an XM or Sirius radio satellite receiver or DAB receiver known in the art, could be integrated with the radio **10**, via the interface **20**. Further, an MP3 player **30** could also be integrated with the radio **10** via interface **20**. The MP3 player **30** could be any known digital media device, such as an Apple iPod or any other digital media device. Moreover, a plurality of auxiliary input sources, illustratively indicated as auxiliary input sources **35** (comprising input sources 1 through *n*, *n* being any number), could also be integrated with the car radio **10** via interface **20**. Optionally, a control head **12**, such as that commonly used with after-market CD changers and other similar devices, could be integrated with the car radio **10** via interface **20**, for controlling any of the car radio **10**, CD player/changer **15**, satellite/DAB receiver **25**, MP3 player **30**, and auxiliary input sources **35**. Thus, as can be readily appreciated, the interface **20** of the present invention allows for the integration of a multitude of devices and inputs with an OEM or after-market car radio or stereo.

FIG. 2a is a block diagram of an alternate embodiment of the multimedia device interface system of the present invention, wherein a CD player/changer **15** is integrated with an OEM or after-market car radio **10**. The CD player **15** is electrically connected with the interface **20**, and exchanges data and audio signals therewith. The interface **20** is electrically connected with the car radio **10**, and exchanges data and audio signals therewith. In a preferred embodiment of the present invention, the car radio **10** includes a display **13** (such as an alphanumeric, electroluminescent display) for displaying information, and a plurality of control panel buttons **14** that normally operate to control the radio **10**. The interface **20** allows the CD player **15** to be controlled by the control buttons **14** of the radio **10**. Further, the interface **20** allows information from the CD player **15**, such as track, disc, time, and song information, to be retrieved therefrom, processed and formatted by the interface **20**, sent to the display **13** of the radio **10**.

Importantly, the interface **20** allows for the remote control of the CD player **15** from the radio **10** (e.g., the CD player **15** could be located in the trunk of a car, while the radio **10** is mounted on the dashboard of the car). Thus, for example, one or more discs stored within the CD player **15** can be remotely selected by a user from the radio **10**, and tracks on one or more of the discs can be selected therefrom. Moreover, standard CD operational commands, such as pause, play, stop, fast forward, rewind, track forward, and track reverse (among other commands) can be remotely entered at the control panel buttons **14** of the radio **10** for remotely controlling the CD player **15**.

FIG. 2b is a block diagram showing an alternate embodiment of the present invention, wherein an MP3 player **30** is integrated with an OEM or after-market car radio **10** via interface **20**. As mentioned earlier, the interface **20** of the present invention allows for a plurality of disparate audio devices to be integrated with an existing car radio for use therewith. Thus, as shown in **FIG. 2b**, remote control of the MP3 player **30** via radio **10** is provided for via interface **20**. The MP3 player **30** is electronically interconnected with the interface **20**, which itself is electrically interconnected with the car radio **10**. The interface **20** allows data and audio signals to be exchanged between the MP3 player **30** and the car radio **10**, and processes and formats signals accordingly so that instructions and data from the radio **10** are processable by the MP3 player **30**, and vice versa. Operational commands, such as track selection, pause, play, stop, fast forward, rewind, and other commands, are entered via the control panel buttons **14** of car radio **10**, processed by the interface **20**, and formatted for execution by the MP3 player **30**. Data from the MP3 player, such as track, time, and song information, is received by the interface **20**, processed thereby, and sent to the radio **10** for display on display **13**. Audio from the MP3 player **30** is selectively forwarded by the interface **20** to the radio **10** for playing.

FIG. 2c is a block diagram showing an alternate embodiment of the present invention, wherein a satellite receiver or DAB receiver **25** is integrated with an OEM or after-market car radio **10** via the interface **20**. Satellite/DAB receiver **25** can be any satellite radio receiver known in the art, such as XM or Sirius, or any DAB receiver known in the art. The satellite/DAB receiver **25** is electrically interconnected with the interface **20**, which itself is electrically interconnected with the car radio **10**. The satellite/DAB receiver **25** is remotely operable by the control panel buttons **14** of the radio **10**. Commands from the radio **10** are received by the interface **20**, processed and formatted thereby, and dispatched to the satellite/DAB receiver **25** for execution thereby. Information from the satellite/DAB receiver **25**, including time, station, and song information, is received by the interface **20**, processed, and transmitted to the radio **10** for display on display **13**. Further, audio from the satellite/DAB receiver **25** is selectively forwarded by the interface **20** for playing by the radio **10**.

FIG. 2d is a block diagram showing an alternate embodiment of the present invention, wherein one or more auxiliary input sources **35** are integrated with an OEM or after-market car radio **10**. The auxiliary inputs **35** can be connected to analog sources, or can be digitally coupled with one or more audio devices, such as after-market CD players, CD changers, MP3 players, satellite receivers, DAB receivers, and the like, and integrated with an existing car stereo. Preferably, four auxiliary input sources are connectable with the interface **20**, but any number of auxiliary input sources could be included. Audio from the auxiliary input sources **35** is selectively forwarded to the radio **10** under command of the user. As will be discussed herein in greater detail, a user can select a desired input source from the auxiliary input sources **35** by depressing one or more of the control panel buttons **14** of the radio **10**. The interface **20** receives the command initiated from the control panel, processes same, and connects the corresponding input source from the auxiliary input sources **35** to allow audio therefrom to be forwarded to the radio **10** for playing. Further, the interface **20** determines the type of audio devices connected to the auxiliary input ports **35**, and integrates same with the car stereo **10**.

As mentioned previously, the present invention allows one or more external audio devices to be integrated with an existing OEM or after-market car stereo, along with one or more auxiliary input sources, and the user can select between these sources using the controls of the car stereo. Such "dual input" capability allows operation with devices connected to either of the inputs of the device, or both. Importantly, the device can operate in "plug and play" mode, wherein any device connected to one of the inputs is automatically detected by the present invention, its device type determined, and the device automatically integrated with an existing OEM or after-market car stereo. Thus, the present invention is not dependent any specific device type to be connected therewith to operate. For example, a user can first purchase a CD changer, plug same into a dual interface, and use same with the car stereo. At a point later in time, the user could purchase an XM tuner, plug same into the device, and the tuner will automatically be detected and integrated with the car stereo, allowing the user to select from and operate both devices from the car stereo. It should be noted that such plug and play capability is not limited to a dual input device, but is provided for in every embodiment of the present invention. The dual-input configuration of the preset invention is illustrated in **FIGS. 2e-2h** and described below.

FIG. 2e is a block diagram showing an alternate embodiment of the present invention, wherein an external CD player/changer **15** and one or more auxiliary input sources **35** are integrated with an OEM or after-market car stereo **10**. Both the CD player **15** and one or more of the auxiliary input sources **35** are electrically interconnected with the interface **20**, which, in turn, is electrically interconnected to the radio **10**. Using the controls **14** of the radio **10**, a user can select between the

CD player **15** and one or more of the inputs **35** to selectively channel audio from these sources to the radio. The command to select from one of these sources is received by the interface **20**, processed thereby, and the corresponding source is channeled to the radio **10** by the interface **20**. As will be discussed later in greater detail, the interface **20** contains internal processing logic for selecting between these sources.

FIG. 2f is a block diagram of an alternate embodiment of the present invention, wherein a satellite receiver or DAB receiver and one or more auxiliary input sources are integrated by the interface **20** with an OEM or after-market car radio **10**. Similar to the embodiment of the present invention illustrated in **FIG. 2e** and described earlier, the interface **20** allows a user to select between the satellite/DAB receiver **25** and one or more of the auxiliary input sources **35** using the controls **14** of the radio **10**. The interface **20** contains processing logic, described in greater detail below, for allowing switching between the satellite/DAB receiver **25** and one or more of the auxiliary input sources **35**.

FIG. 2g is a block diagram of an alternate embodiment of the present invention, wherein a MP3 player **30** and one or more auxiliary input sources **35** are integrated by the interface **20** with an OEM or after-market car radio **10**. Similar to the embodiments of the present invention illustrated in **FIGS. 2e** and **2f** and described earlier, the interface **20** allows a user to select between the MP3 player **30** and one or more of the auxiliary input sources **35** using the controls **14** of the radio **10**. The interface **20** contains processing logic, as will be discussed later in greater detail, for allowing switching between the MP3 player **30** and one or more of the auxiliary input sources **35**.

FIG. 2h is a block diagram showing an alternate embodiment of the present invention, wherein a plurality of auxiliary interfaces **40** and **44** and an audio device **17** are integrated with an OEM or after-market car stereo **10**. Importantly, the present invention can be expanded to allow a plurality of auxiliary inputs to be connected to the car stereo **10** in a tree-like fashion. Thus, as can be seen in **FIG. 2h**, a first auxiliary interface **40** is connected to the interface **20**, and allows data and audio from the ports **42** to be exchanged with the car radio **10**. Connected to one of the ports **42** is another auxiliary interface **44**, which, in turn, provides a plurality of input ports **46**. Any device connected to any of the ports **42** or **46** can be integrated with the car radio **10**. Further, any device connected to the ports **42** or **46** can be inter-operable with the car radio **10**, allowing commands to be entered from the car radio **10** (*e.g.*, such as via the control panel **14**) for commanding the device, and information from the device to be displayed by the car radio **10**. Conceivably, by configuring the interfaces **40**, **44**, and successive interfaces in a tree configuration, any number of devices can be integrated using the present invention.

The various embodiments of the present invention described above and shown in **FIGS. 1** through **2h** are illustrative in nature and are not intended to limit the spirit or scope of the present invention. Indeed, any conceivable audio device or input source, in any desired combination, can be integrated by the present invention into existing car stereo systems. Further, it is conceivable that not only can data and audio signals be exchanged between the car stereo and any external device, but also video information that can be captured by the present invention, processed thereby, and transmitted to the car stereo for display thereby and interaction with a user thereat.

Various circuit configurations can be employed to carry out the present invention. Examples of such configurations are described below and shown in **FIGS. 3a-3d**.

FIG. 3a is an illustrative circuit diagram according to the present invention for integrating a CD player or an auxiliary input source with an existing car stereo system. A plurality of ports **J1C1, J2A1, X2, RCH,** and **LCH** are provided for allowing connection of the interface system of the present invention between an existing car radio, an after-market CD player or changer, or an auxiliary input source. Each of these ports could be embodied by any suitable electrical connector known in the art. Port **J1C1** connects to the input port of an OEM car radio, such as that manufactured by TOYOTA, Inc. Conceivably, port **J1C1** could be modified to allow connection to the input port of an after-market car radio. Ports **J2A1, X2, RCH,** and **LCH** connect to an after-market CD changer, such as that manufactured by PANASONIC, Inc., or to an auxiliary input source.

Microcontroller **U1** is in electrical communication with each of the ports **J1C1, J2A1,** and **X2,** and provides functionality for integrating the CD player or auxiliary input source connected to the ports **J2A1, X2, RCH,** and **LCH**. For example, microcontroller **U1** receives control commands, such as button or key sequences, initiated by a user at control panel of the car radio and received at the connector **J1C1**, processes and formats same, and dispatches the formatted commands to the CD player or auxiliary input source via connector **J2A1**. Additionally, the microcontroller **U1** receives information provided by the CD player or auxiliary input source via connector **J2A1**, processes and formats same, and transmits the formatted data to the car stereo via connector **J1C1** for display on the display of the car stereo. Audio signals provided at the ports **J2A1, X2, RCH** and **LCH** is selectively channeled to the car radio at port **J1C1** under control of one or more user commands and processing logic, as will be discussed in greater detail, embedded within microcontroller **U1**.

In a preferred embodiment of the present invention, the microcontroller **U1** comprises the 16F628 microcontroller manufactured by MICROCHIP, Inc. The 16F628 chip is a CMOS, flash-based, 8-bit microcontroller having an internal, 4 MHz internal oscillator, 128 bytes of EEPROM data memory, a capture/compare/PWM, a USART, 2 comparators, and a programmable voltage reference. Of course, any suitable microcontroller known in the art can be substituted for microcontroller **U1** without departing from the spirit or scope of the present invention.

A plurality of discrete components, such as resistors **R1** through **R13**, diodes **D1** through **D4**, capacitors **C1** and **C2**, and oscillator **Y1**, among other components, are provided for interfacing the microcontroller **U1** with the hardware connected to the connectors **J1C1, J2A1, X2, RCH**, and **LCH**. These components, as will be readily appreciated to one of ordinary skill in the art, can be arranged as desired to accommodate a variety of microcontrollers, and the numbers and types of discrete components can be varied to accommodate other similar controllers. Thus, the circuit shown in **FIG. 3a** and described herein is illustrative in nature, and modifications thereof are considered to be within the spirit and scope of the present invention.

FIG. 3b is a diagram showing an illustrative circuit configuration according to the present invention, wherein one or more after-market CD changers / players and an auxiliary input source are integrated with an existing car stereo, and wherein the user can select between the CD changer/player and the auxiliary input using the controls of the car stereo. A plurality of connectors are provided, illustratively indicated as ports **J4A**, **J4B**, **J3**, **J5L1**, **J5R1**, **J1**, and **J2**. Ports **J4A**, **J4B**, and **J3** allow the audio device interface system of the present invention to be connected to one or more existing car stereos, such as an OEM car stereo or an after-market car stereo. Each of these ports could be embodied by any suitable electrical connector known in the art. For example, ports **J4A** and **J4B** can be connected to an OEM car stereo manufactured by BMW, Inc. Port **J3** can be connected to a car stereo manufactured by LANDROVER, Inc. Of course, any number of car stereos, by any manufacturer, could be provided. Ports **J1** and **J2** allow connection to an after-market CD changer or player, such as that manufactured by ALPINE, Inc., and an auxiliary input source. Optionally, ports **J5L1** and **J5R1** allow integration of a standard analog (line-level) source. Of course, a single standalone CD player or auxiliary input source could be connected to either of ports **J1** or **J2**.

Microcontroller **DD1** is in electrical communication with each of the ports **J4A**, **J4B**, **J3**, **J5L1**, **J5R1**, **J1**, and **J2**, and provides functionality for integrating the CD player and auxiliary input source connected to the ports **J1** and **J2** with the car stereo connected to the ports **J4A** and **J4B** or **J3**. For example, microcontroller **DD1** receives control commands, such as button or key sequences, initiated by a user at control panel of the car radio and received at the connectors **J4A** and **J4B** or **J3**, processes and formats same, and dispatches the formatted commands to the CD player and auxiliary input source via connectors **J1** or **J2**. Additionally, the microcontroller **DD1** receives information provided by the CD player and auxiliary input source via connectors **J1** or **J2**, processes and formats same, and transmits the formatted data to the car stereo via connectors **J4A** and **J4B** or **J3** for display on the display of the car stereo. Further, the microcontroller **DD1** controls multiplexer **DA3** to allow selection between the CD player/changer and the auxiliary input. Audio signals provided at the ports **J1, J2, J5L1** and **J5R1** is selectively channeled to the car radio at ports **J4A** and **J4B** or **J3** under control of one or more user commands and processing logic, as will be discussed in greater detail, embedded within microcontroller **DD1**.

In a preferred embodiment of the present invention, the microcontroller **DD1** comprises the 16F872 microcontroller manufactured by MICROCHIP, Inc. The 16F872 chip is a CMOS, flash-based, 8-bit microcontroller having 64 bytes of EEPROM data memory, self-programming capability, an ICD, 5 channels of 10 bit Analog-to-Digital (A/D) converters, 2 timers, capture/compare/PWM functions, a USART, and a synchronous serial port configurable as either a 3-wire serial peripheral interface or a 2-wire inter-integrated circuit bus. Of course, any suitable microcontroller known in the art can be substituted for microcontroller **DD1** without departing from the spirit or scope of the present invention. Additionally, in a preferred embodiment of the present invention, the multiplexer **DA3** comprises the CD4053 triple, two-channel analog multiplexer/demultiplexer manufactured by FAIRCHILD SEMICONDUCTOR, Inc. Any other suitable multiplexer can be substituted for **DA3** without departing from the spirit or scope of the present invention.

A plurality of discrete components, such as resistors **R1** through **R18**, diodes **D1** through **D3**, capacitors **C1-C11**, and **G1-G3**, transistors **Q1-Q3**, transformers **T1** and **T2**, amplifiers **LCH:A** and **LCH:B**, oscillator **XTAL1**, among other components, are provided for interfacing the microcontroller **DD1** and the multiplexer **DA3** with the hardware connected to the connectors **J4A, J4B, J3, J5L1, J5R1, J1,** and **J2**. These components, as will be readily appreciated to one of ordinary skill in the art, can be arranged as desired to accommodate a variety of microcontrollers and multiplexers, and the numbers and types of discrete components can be varied to accommodate other similar controllers and multiplexers. Thus, the circuit shown in **FIG. 3b** and described herein is illustrative in nature, and modifications thereof are considered to be within the spirit and scope of the present invention.

FIG. 3c is a diagram showing an illustrative circuit configuration for integrating a plurality of auxiliary inputs using the controls of the car stereo. A plurality of connectors are provided, illustratively indicated as ports **J1**, **RCH1**, **LCH1**, **RCH2**, **LCH2**, **RCH3**, **LCH3**, **RCH4**, and **LCH4**. Port **J1** allows the multimedia device integration system of the present invention to be connected to one or more existing car stereos. Each of these ports could be embodied by any suitable electrical connector known in the art. For example, port **J1** could be connected to an OEM car stereo manufactured by HONDA, Inc., or any other manufacturer. Ports **RCH1, LCH1, RCH2, LCH2, RCH3, LCH3, RCH4,** and **LCH4** allow connection with the left and right channels of four auxiliary input sources. Of course, any number of auxiliary input sources and ports/connectors could be provided.

Microcontroller **U1** is in electrical communication with each of the ports **J1, RCH1, LCH1, RCH2, LCH2, RCH3, LCH3, RCH4,** and **LCH4**, and provides functionality for integrating one or more auxiliary input sources connected to the ports **RCH1, LCH1, RCH2, LCH2, RCH3, LCH3, RCH4,** and **LCH4** with the car stereo connected to the port **J1**. Further, the microcontroller **U1** controls multiplexers **DA3** and **DA4** to allow selection amongst any of the auxiliary inputs using the controls of the car stereo. Audio signals provided at the ports **RCH1, LCH1, RCH2, LCH2, RCH3, LCH3, RCH4,** and **LCH4** are selectively channeled to the car radio at port **J1** under control of one or more user commands and processing logic, as will be discussed in greater detail, embedded within microcontroller **U1**. In a preferred embodiment of the present invention, the microcontroller **U1** comprises the 16F872 microcontroller discussed earlier. Additionally, in a preferred embodiment of the present invention, the multiplexers **DA3** and **DA4** comprises the CD4053 triple, two-channel analog multiplexer/demultiplexer, discussed earlier. Any other suitable microcontroller and multiplexers can be substituted for **U1, DA3,** and **DA4** without departing from the spirit or scope of the present invention.

A plurality of discrete components, such as resistors **R1** through **R15**, diodes **D1** through **D3**, capacitors **C1-C5**, transistors **Q1-Q2**, amplifiers **DA1:A** and **DA1:B**, and oscillator **Y1**, among other components, are provided for interfacing the microcontroller **U1** and the multiplexers **DA3** and **DA4** with the hardware connected to the ports **J1, RCH1, LCH1, RCH2, LCH2, RCH3,**

LCH3, RCH4, and **LCH4**. These components, as will be readily appreciated to one of ordinary skill in the art, can be arranged as desired to accommodate a variety of microcontrollers and multiplexers, and the numbers and types of discrete components can be varied to accommodate other similar controllers and multiplexers. Thus, the circuit shown in **FIG. 3c** and described herein is illustrative in nature, and modifications thereof are considered to be within the spirit and scope of the present invention.

FIG. 3d is an illustrative circuit diagram according to the present invention for integrating a satellite receiver with an existing OEM or after-market car stereo system. Ports **J1** and **J2** are provided for allowing connection of the integration system of the present invention between an existing car radio and a satellite receiver. These ports could be embodied by any suitable electrical connector known in the art. Port **J2** connects to the input port of an existing car radio, such as that manufactured by KENWOOD, Inc. Port **1** connects to an after-market satellite receiver, such as that manufactured by PIONEER, Inc.

Microcontroller **U1** is in electrical communication with each of the ports **J1** and **J2**, and provides functionality for integrating the satellite receiver connected to the port **J1** with the car stereo connected to the port **J2**. For example, microcontroller **U1** receives control commands, such as button or key sequences, initiated by a user at control panel of the car radio and received at the connector **J2**, processes and formats same, and dispatches the formatted commands to the satellite receiver via connector **J2**. Additionally, the microcontroller **U1** receives information provided by the satellite receiver via connector **J1**, processes and formats same, and transmits the formatted data to the car stereo via connector **J2** for display on the display of the car stereo. Audio signals provided at the port **J1** is selectively channeled to the car radio at port **J2** under control of one or more user commands and processing logic, as will be discussed in greater detail, embedded within microcontroller **U1**.

In a preferred embodiment of the present invention, the microcontroller **U1** comprises the 16F873 microcontroller manufactured by MICROCHIP, Inc. The 16F873 chip is a CMOS, flash-based, 8-bit microcontroller having 128 bytes of EEPROM data memory, self-programming capability, an ICD, 5 channels of 10 bit Analog-to-Digital (A/D) converters, 2 timers, 2 capture/compare/PWM functions, a synchronous serial port that can be configured as a either a 3-wire serial peripheral interface or a 2-wire inter-integrated circuit bus, and a USART. Of course, any suitable microcontroller known in the art can be substituted for microcontroller **U1** without departing from the spirit or scope of the present invention.

A plurality of discrete components, such as resistors **R1** through **R7**, capacitors **C1** and **C2**, and amplifier **A1**, among other components, are provided for interfacing the microcontroller **U1** with the hardware connected to the connectors **J1** and **J2**. These components, as will be readily appreciated to one of ordinary skill in the art, can be arranged as desired to accommodate a variety of microcontrollers, and the numbers and types of discrete components can be varied to accommodate other similar controllers. Thus, the circuit shown in **FIG. 3d** and described herein is illustrative in nature, and modifications thereof are considered to be within the spirit and scope of the present invention.

FIGS. 4a through **6** are flowcharts showing processing logic according to the present invention. Such logic can be embodied as software and/or instructions stored in a read-only memory circuit (*e.g.*, and EEPROM circuit), or other similar device. In a preferred embodiment of the present invention, the processing logic described herein is stored in one or more microcontrollers, such as the microcontrollers discussed earlier with reference to **FIGS. 3a-3d**. Of course, any other suitable means for storing the processing logic of the present invention can be employed.

FIG. 4a is a flowchart showing processing logic, indicated generally at **100**, for integrating a CD player or changer with an existing OEM or after-market car stereo system. Beginning in step **100**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **104** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **106** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the car stereo. If a negative determination is made, step **106** is re-invoked.

If a positive determination is made in step **106**, a CD handling process, indicated as block **108**, is invoked, allowing the CD player/changer to exchange data and audio signals with any existing car stereo system. Beginning in step **110**, a signal is generated by the present invention indicating that a CD player/changer is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. If the car radio is an OEM car radio, the CD player presence signal need not be generated. Further, the signal need not be limited to a CD player device presence signal, but rather, could be any type of device presence signal (*e.g.*, MP3 player device presence signal, satellite receiver presence signal, video device presence signal, cellular telephone presence signal, or any other type of device presence signal). Concurrently with step **110**, or within a short period of time before or after the execution of step **110**, steps **112** and **114** are invoked. In step **112**, the audio channels of the CD player/changer are connected (channeled) to the car stereo system, allowing audio from the CD player/changer to be played through the car stereo. In step **114**, data is retrieved by the present invention from the CD player/changer, including track and time information, formatted, and transmitted to the car stereo for display by the car stereo. Thus, information produced by the external CD player/changer can be quickly and conveniently viewed by a driver by merely viewing the display of the car stereo. After steps **110**, **112**, and **114** have been executed, control passes to step **116**.

In steps **116**, the present invention monitors the control panel buttons of the car stereo for CD operational commands. Examples of such commands include track forward, track reverse, play, stop, fast forward, rewind, track program, random track play, and other similar commands. In step **118**, if a command is not detected, step **116** is re-invoked. Otherwise, if a command is received, step **118** invokes step **120**, wherein the received command is converted into a format recognizable by the CD player/changer connected to the present invention. For example, in this step, a command issued from a GM car radio is converted into a format recognizable by a CD player/changer manufactured by ALPINE, Inc. Any conceivable command from any type of car radio can be formatted for use by a CD player/changer of any type or manufacture. Once the command has been formatted, step **122** is invoked, wherein the formatted command is transmitted to the CD player/changer and executed. Step **110** is then re-invoked, so that additional processing can occur.

FIG. 4b is a flowchart showing processing logic, indicated generally at **130**, for integrating an MP3 player with an existing car stereo system. Examples of MP3 players that can be integrated by the present invention include, but are not limited to, the Apple iPod and other types of digital media devices. Beginning in step **132**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **134** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **136** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the car stereo. If a negative determination is made, step **136** is re-invoked.

If a positive determination is made in step **136**, an MP3 handling process, indicated as block **138**, is invoked, allowing the MP3 player to exchange data and audio signals with any existing car stereo system. Beginning in step **140**, a signal is generated by the present invention indicating that an MP3 player is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. In step **142**, the audio channels of the MP3 player are connected (channeled) to the car stereo system, allowing audio from the MP3 player to be played through the car stereo. In step **144**, data is retrieved by the present invention from the MP3 player, including track, time, title, and song information, formatted, and transmitted to the car stereo for display by the car stereo. Thus, information produced by the MP3 player can be quickly and conveniently viewed by a driver by merely viewing the display of the car stereo. After steps **140**, **142**, and **144** have been executed, control passes to step **146**.

In steps **146**, the present invention monitors the control panel buttons of the car stereo for MP3 operational commands. Examples of such commands include track forward, track reverse, play, stop, fast forward, rewind, track program, random track play, and other similar commands. In step **148**, if a command is not detected, step **146** is re-invoked. Otherwise, if a command is received, step **148** invokes step **150**, wherein the received command is converted into a format recognizable by the MP3 player connected to the present invention. For example, in this step, a command issued from a HONDA car radio is converted into a format recognizable by an MP3 player manufactured by PANASONIC, Inc. Any conceivable command from any type of car radio can be formatted for use by an MP3 player of any type or manufacture. Once the command has been formatted, step **152** is invoked, wherein the formatted command is transmitted to the MP3 player and executed. Step **140** is then re-invoked, so that additional processing can occur.

FIG. 4c is a flowchart showing processing logic, indicated generally at **160**, for integrating a satellite receiver or a DAB receiver with an existing car stereo system. Beginning in step **162**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **164** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **166** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the car stereo. If a negative determination is made, step **166** is re-invoked.

If a positive determination is made in step **166**, a satellite/DAB receiver handling process, indicated as block **168**, is invoked, allowing the satellite/DAB receiver to exchange data and audio signals with any existing car stereo system. Beginning in step **170**, a signal is generated by the present invention indicating that a satellite or DAB receiver is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. In step **172**, the audio channels of the satellite/DAB receiver are connected (channeled) to the car stereo system, allowing audio from the satellite receiver or DAB receiver to be played through the car stereo. In step **174**, data is retrieved by the present invention from the satellite/DAB receiver, including channel number, channel name, artist name, song time, and song title, formatted, and transmitted to the car stereo for display by the car stereo. The information could be presented in one or more menus, or via a graphical interface viewable and manipulable by the user at the car stereo. Thus, information produced by the receiver can be quickly and conveniently viewed by a driver by merely viewing the display of the car stereo. After steps **170**, **172**, and **174** have been executed, control passes to step **176**.

In steps **176**, the present invention monitors the control panel buttons of the car stereo for satellite/DAB receiver operational commands. Examples of such commands include station up, station down, station memory program, and other similar commands. In step **178**, if a command is not detected, step **176** is re-invoked. Otherwise, if a command is received, step **178** invokes step **180**, wherein the received command is converted into a format recognizable by the satellite/DAB receiver connected to the present invention. For example, in this step, a command issued from a FORD car radio is converted into a format recognizable by a satellite receiver manufactured by PIONEER, Inc. Any conceivable command from any type of car radio can be formatted for use by a satellite/DAB receiver of any type or manufacture. Once the command has been formatted, step **182** is invoked, wherein the formatted command is transmitted to the satellite/DAB receiver and executed. Step **170** is then re-invoked, so that additional processing can occur.

FIG. 4d is a flowchart showing processing logic, indicated generally at **190**, for integrating a plurality of auxiliary input sources with a car radio. Beginning in step **192**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **194** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **196** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the car stereo. If a negative determination is made, step **196** is re-invoked.

If a positive determination is made in step **196**, an auxiliary input handling process, indicated as block **198**, is invoked, allowing one or more auxiliary inputs to be connected (channeled) to the car stereo. Further, if a plurality of auxiliary inputs exist, the logic of block **198** allows a user to select a desired input from the plurality of inputs. Beginning in step **200**, a signal is generated by the present invention indicating that an external device is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. Then, in step **202**, the control panel buttons of the car stereo are monitored.

In a preferred embodiment of the present invention, each of the one or more auxiliary input sources are selectable by selecting a CD disc number on the control panel of the car radio. Thus, in step **204**, a determination is made as to whether the first disc number has been selected. If a positive determination is made, step **206** is invoked, wherein the first auxiliary input source is connected (channeled) to the car stereo. If a negative determination is made, step **208** is invoked, wherein a second determination is made as to whether the second disc number has been selected. If a positive determination is made, step **210** is invoked, wherein the second auxiliary input source is connected (channeled) to the car stereo. If a negative determination is made, step **212** is invoked, wherein a third determination is made as to whether the third disc number has been selected. If a positive determination is made, step **214** is invoked, wherein the third auxiliary input source is connected (channeled) to the car stereo. If a negative determination is made, step **216** is invoked, wherein a fourth determination is made as to whether the fourth disc number has been selected. If a positive determination is made, step **218** is invoked, wherein the fourth auxiliary input source is connected (channeled) to the car stereo. If a negative determination is made, step **200** is re-invoked, and the process disclosed for block **198** repeated. Further, if any of steps **206, 210, 214**, or **218** are executed, then step **200** is re-invoked and block **198** repeated.

The process disclosed in block **198** allows a user to select from one of four auxiliary input sources using the control buttons of the car stereo. Of course, the number of auxiliary input sources connectable with and selectable by the present invention can be expanded to any desired number. Thus, for example, 6 auxiliary input sources could be provided and switched using corresponding selection key(s) or keystroke(s) on the control panel of the radio. Moreover, any desired keystroke, selection sequence, or button(s) on the control panel of the radio, or elsewhere, can be utilized to select from the auxiliary input sources without departing from the spirit or scope of the present invention.

FIG. 4e is a flowchart showing processing logic, indicated generally at **220**, for integrating a CD player and one or more auxiliary input sources with a car radio. Beginning in step **222**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **224** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **226** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the cars stereo. If a negative determination is made, step **226** is re-invoked.

If a positive determination is made in step **226**, then step **228** is invoked, wherein a signal is generated by the present invention indicating that an external device is present, and the signal is continuously transmitted to the car stereo.

Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. Then, in step **230**, a determination is made as to whether a CD player is present (*i.e.*, whether an external CD player or changer is connected to the multimedia device integration system of the present invention). If a positive determination is made, steps **231** and **232** are invoked. In step **231**, the logic of block **108** of **FIG. 4a** (the CD handling process), described earlier, is invoked, so that the CD player/changer can be integrated with the car stereo and utilized by a user. In step **232**, a sensing mode is initiated, wherein the present invention monitors for a selection sequence (as will be discussed in greater detail) initiated by the user at the control panel of the car stereo for switching from the external CD player/changer to one or more auxiliary input sources. Step **234** is then invoked, wherein a determination is made as to whether such a sequence has been initiated. If a negative determination is made, step **234** re-invokes step **228**, so that further processing can occur. Otherwise, if a positive determination is made (*i.e.*, the user desires to switch from the external CD player/changer to one of the auxiliary input sources), step **236** is invoked, wherein the audio channels of the CD player/changer are disconnected from the car stereo. Then, step **238** is invoked, wherein the logic of block **198** of **FIG. 4d** (the auxiliary input handling process), discussed earlier, is executed, allowing the user to select from one of the auxiliary input sources. In the event that a negative determination is made in step **230** (no external CD player/changer is connected to the present invention), then step **238** is invoked, and the system goes into auxiliary mode. The user can then select from one or more auxiliary input sources using the controls of the radio.

FIG. 4f is a flowchart showing processing logic, indicated generally at **240**, for integrating a satellite receiver or DAB receiver and one or more auxiliary input sources with a car radio. Beginning in step **242**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **244** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **246** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the car stereo. If a negative determination is made, step **246** is re-invoked.

If a positive determination is made in step **246**, then step **248** is invoked, wherein a signal is generated by the present invention indicating that an external device is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. Then, in step **250**, a determination is made as to whether a satellite receiver or DAB receiver is present (*i.e.*, whether an external satellite receiver or DAB receiver is connected to the multimedia device integration system of the present invention). If a positive determination is made, steps **251** and **252** are invoked. In step **251**, the logic of block **168** of **FIG. 4c** (the satellite/DAB receiver handling process), described earlier, is invoked, so that the satellite receiver can be integrated with the car stereo and utilized by a user. In step **252**, a sensing mode is initiated, wherein the present invention monitors for a selection sequence (as will be discussed in greater detail) initiated by the user at the control panel of the car stereo for switching from the external satellite receiver to one or more auxiliary input sources. Step **254** is then invoked, wherein a determination is made as to whether such a sequence has been initiated. If a negative determination is made, step **254** re-invokes step **258**, so that further processing can occur. Otherwise, if a positive determination is made (*i.e.*, the user desires to switch from the external satellite/DAB receiver to one of the auxiliary input sources), step **256** is invoked, wherein the audio channels of the satellite receiver are disconnected from the car stereo. Then, step **258** is invoked, wherein the logic of block **198** of **FIG. 4d** (the auxiliary input handling process), discussed earlier, is executed, allowing the user to select from one of the auxiliary input sources. In the event that a negative determination is made in step **250** (no external satellite/DAB receiver is connected to the present invention), then step **258** is invoked, and the system goes into auxiliary mode. The user can then select from one or more auxiliary input sources using the controls of the radio.

FIG. 4g is a flowchart showing processing logic according to the present invention for integrating an MP3 player and one or more auxiliary input sources with a car stereo. Beginning in step **262**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **264** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **266** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the car stereo. If a negative determination is made, step **266** is re-invoked.

If a positive determination is made in step **266**, then step **268** is invoked, wherein a signal is generated by the present invention indicating that an external device is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. Then, in step **270**, a determination is made as to whether an MP3 player is present (*i.e.*, whether an external MP3 player is connected to the multimedia device integration system of the present invention). If a positive determination is made, steps **271** and **272** are invoked. In step **271**, the logic of block **138** of **FIG. 4b** (the MP3 handling process), described earlier, is invoked, so that the MP3 player can be integrated with the car stereo and utilized by a user. In step **272**, a sensing mode is initiated, wherein the present invention monitors for a selection sequence (as will be discussed in greater detail) initiated by the user at the control panel of the car stereo for switching from the external MP3 player to one or more auxiliary input sources. Step **274** is then invoked, wherein a determination is made as to whether such a sequence has been initiated. If a negative determination is made, step **274** re-invokes step **278**, so that further processing can occur. Otherwise, if a positive determination is made (*i.e.*, the user desires to switch from the external MP3 player to one of the auxiliary input sources), step **276** is invoked, wherein the audio channels of the MP3 player are disconnected from the car stereo. Then, step **278** is invoked, wherein the logic of block **198** of **FIG. 4d** (the auxiliary input handling process), discussed earlier, is executed, allowing the user to select from one of the auxiliary input sources. In the event that a negative determination is made in step **270** (no external MP3 player is connected to the present invention), then step **278** is invoked, and the system goes into auxiliary mode. The user can then select from one or more auxiliary input sources using the controls of the radio.

As mentioned previously, to enable integration, the present invention contains logic for converting command signals issued from an after-market or OEM car stereo into a format compatible with one or more external audio devices connected to the present invention. Such logic can be applied to convert any car stereo signal for use with any external device. For purposes of illustration, a sample code portion is shown in **Table 1**, below, for converting control signals from a BMW car stereo into a format understandable by a CD changer:

Table 1

```
;       ============================================
;       Radio requests changer to STOP (exit PLAY mode)
;       Decoding 6805183801004C message
;       ============================================

Encode_RD_stop_msg:

        movlw 0x68
        xorwf BMW_Recv_buff,W
        skpz
        return

        movlw 0x05
        xorwf BMW_Recv_buff+1,W
        skpz
        return

        movlw 0x18
        xorwf BMW_Recv_buff+2,W
        skpz
        return

        movlw 0x38
        xorwf BMW_Recv_buff+3,W
        skpz
        return

        movlw 0x01
        xorwf BMW_Recv_buff+4,W
        skpz
        return

        tstf  BMW_Recv_buff+5
        skpz
        return

        movlw 0x4C
        xorwf BMW_Recv_buff+6,W
```

```
        skpz
        return

        bsf   BMW_Recv_STOP_msg
        return
```

The code portion shown in **Table 1** receives a STOP command issued by a BMW stereo, in a format proprietary to BMW stereos. Preferably, the received command is stored in a first buffer, such as BMW_Recv_buff. The procedure "Encode_RD_stop_msg" repetitively applies an XOR function to the STOP command, resulting in a new command that is in a format compatible with the after-market CD player. The command is then stored in an output buffer for dispatching to the CD player.

Additionally, the present invention contains logic for retrieving information from an after-market audio device, and converting same into a format compatible with the car stereo for display thereby. Such logic can be applied to convert any data from the external device for display on the car stereo. For purposes of illustration, a sample code portion is shown in **Table 2**, below, for converting data from a CD changer into a format understandable by a BMW car stereo:

Table 2

```
;      ======================================
;      Changer replies with STOP confirmation
;      Encoding 180A68390002003F0001027D message
;      ======================================

Load_CD_stop_msg:
       movlw 0x18
       movwf BMW_Send_buff

       movlw 0x0A
       movwf BMW_Send_buff+1

       movlw 0x68
       movwf BMW_Send_buff+2

       movlw 0x39
```

```
                movwf BMW_Send_buff+3

                movlw 0x00              ;current  status_XX=00,  power
off
                movwf BMW_Send_buff+4

                movlw 0x02              ;current  status_YY=02,  power
off
                movwf BMW_Send_buff+5

                clrf  BMW_Send_buff+6   ;separate field, always =0

                movfw BMW_MM_stat       ;current status_MM , magazine
config
                movwf BMW_Send_buff+7

                clrf  BMW_Send_buff+8   ;separate field, always =0

                movfw BMW_DD_stat       ;current  status_DD  ,  current
disc
                movwf BMW_Send_buff+9

                movfw BMW_TT_stat       ;current  status_TT  ,  current
track
                movwf BMW_Send_buff+10

                xorwf BMW_Send_buff+9,W ;calculate check sum
                xorwf BMW_Send_buff+8,W
                xorwf BMW_Send_buff+7,W
                xorwf BMW_Send_buff+6,W
                xorwf BMW_Send_buff+5,W
                xorwf BMW_Send_buff+4,W
                xorwf BMW_Send_buff+3,W
                xorwf BMW_Send_buff+2,W
                xorwf BMW_Send_buff+1,W
                xorwf BMW_Send_buff,W

                movwf BMW_Send_buff+11  ;store check sum
                movlw D'12'             ;12 bytes total
                movwf BMW_Send_cnt
                bsf   BMW_Send_on       ;ready to send
                return
```

The code portion shown in **Table 2** receives a STOP confirmation message from the CD player, in a format proprietary to the CD player. Preferably, the received command is stored in a first buffer, such as BMW_Send_buff. The procedure "Load_CD_stop_msg" retrieves status information, magazine information, current disc, and current track information from the CD changer, and constructs a response containing this information. Then, a checksum is calculated and stored in another buffer. The response and checksum are in a format compatible with the BMW stereo, and are ready for dispatching to the car stereo.

The present invention also includes logic for converting signals from an OEM car stereo system for use with a digital media device such as an MP3, MP4, or Apple iPod player. Shown below are code samples for allowing commands and data to be exchanged between a Ford car stereo and an Apple iPod device:

Table 3

```
//decoding Ford "play" command :41-C0-80-CA-01+

        if ( ACP_rx_ready == ON ) {
                ACP_rx_ready = OFF;
                ACP_rx_taddr = ACP_rx_buff[1];
                ACP_rx_saddr = ACP_rx_buff[2];
                ACP_rx_data1 = ACP_rx_buff[3];
                ACP_rx_data2 = ACP_rx_buff[4];
                ACP_rx_data3 = ACP_rx_buff[5];
                if ( (ACP_rx_saddr == 0x80) ) {
                        switch ( ACP_rx_taddr ) {
                                case 0xC0:
                                        if ( ACP_rx_data1 == 0xCA)
{
                                                if ( ACP_rx_data2
== 0x01 ) {

      flags.ACP_play_req = 1;
                                                }
                                                break;
                                        }
                                        break;
                        }
                }
```

In the code portion shown in **Table 3**, a "Play" command selected by a user at the controls of a Ford OEM car stereo is received, and portions of the command are stored in one or more buffer arrays. Then, as shown below in **Table 4**, the decoded portions of the command stored in the one or more buffer arrays are used to construct a "Play/Pause" command in a format compatible with the Apple iPod device, and the command is sent to the Apple iPod for execution thereby:

Table 4

```
// encoding iPod "play/pause" command 0xFF 0x55 0x03 0x02 0x00
0x01 0xFA

        if ( iPod_play_req == ON ) {
                iPod_play_req = OFF;
                iPod_tx_data[0] = 0x55;
                iPod_tx_data[1] = 0x03;
                iPod_tx_data[2] = 0x02;
                iPod_tx_data[3] = 0x00;
                iPod_tx_data[4] = 0x01;
                iPod_tx_counter = 5;
                iPod_tx_ready = ON;
        }
```

While the code portions shown in **Tables 1-2** are implemented using assembler language, and the code portions shown in **Tables 3-4** are implemented using the C programming language, it is to be expressly understood that any low or high level language known in the art could be utilized without departing from the spirit or scope of the invention. It will be appreciated that various other code portions can be developed for converting signals from any after-market or OEM car stereo for use by an after-market external audio device, and vice versa.

FIG. 5 is a flowchart showing processing logic, indicated generally at **300** for allowing a user to switch between an after-market audio device, and one or more auxiliary input sources. As was discussed earlier, the present invention allows a user to switch from one or more connected audio devices, such as an external CD player/changer, MP3 player, satellite receiver, DAB receiver, or the like, and activate one or more auxiliary input sources. A selection sequence, initiated by the user at the control panel of the car stereo, allows such switching. Beginning in step **302**, the buttons of the control panel are monitored. In step **304**, a determination is made as to whether a "Track Up" button or sequence has been initiated by the user. The "Track Up" button or sequence can for a CD player, MP3 player, or any other device. If a negative determination is made, step **306** is invoked, wherein the sensed button or sequence is processed in accordance with the present invention and dispatched to the external audio device for execution. Then, step **302** is re-invoked, so that additional buttons or sequences can be monitored.

In the event that a positive determination is made in step **304**, step **308** is invoked, wherein the present invention waits for a predetermined period of time while monitoring the control panel buttons for additional buttons or sequences. In a preferred embodiment of the present invention, the predetermined period of time is 750 milliseconds, but of course, other time durations are considered within the spirit and scope of the present invention. In step **310**, a determination is made as to whether the user has initiated a "Track Down" button or sequence at the control panel of the car stereo within the predetermined time period. These sequences can be used for a CD player, MP3 player, or any other device. If a negative determination is made, step **312** is invoked. In step **312**, a determination is made as to whether a timeout has occurred (*e.g.*, whether the predetermined period of time has expired). If a negative determination is made, step **308** is re-invoked. Otherwise, is a positive determination is made, step **312** invokes step **306**, so that any buttons or key sequences initiated by the user that are not a "Track Down" command are processed in accordance with the present invention and dispatched to the audio device for execution.

In the event that a positive determination is made in step **310** (a "Track Down" button or sequence has been initiated within the predetermined time period), then step **314** is invoked. In step **314**, the audio channels of the audio device are disconnected, and then step **316** is invoked. In step **316**, the logic of block **198** of **FIG. 4d** (the auxiliary input handling process), discussed earlier, is invoked, so that the user can select from one of the auxiliary input sources in accordance with the present invention. Thus, at this point in time, the system has switched, under user control, from the audio device to a desired auxiliary input. Although the foregoing description of the process **300** has been described with reference to "Track Up" and "Track Down" buttons or commands initiated by the user, it is to be expressly understood that any desired key sequence, keystroke, button depress, or any other action, can be sensed in accordance with the present invention and utilized for switching modes.

When operating in auxiliary mode, the present invention provides an indication on the display of the car stereo corresponding to such mode. For example, the CD number could be displayed as "1", and the track number displayed as "99," thus indicating to the user that the system is operating in auxiliary mode and that audio and data is being supplied from an auxiliary input source. Of course, any other indication could be generated and displayed on the display of the car stereo, such as a graphical display (*e.g.*, an icon) or textual prompt.

FIG. 6 is a flowchart showing processing logic, indicated generally at **320**, for determining and handling various device types connected to the auxiliary input ports of the invention. The present invention can sense device types connected to the auxiliary input ports, and can integrate same with the car stereo using the procedures discussed earlier. Beginning in step **322**, the control panel buttons of the car stereo are monitored for a button or sequence initiated by the user corresponding to an auxiliary input selection (such as the disc number method discussed earlier with reference to **FIG. 4d**). In response to an auxiliary input selection, step **324** is invoked, wherein the type of device connected to the selected auxiliary input is sensed by the present invention. Then, step **326** is invoked.

In step **326**, a determination is made as to whether the device connected to the auxiliary input is a CD player/changer. If a positive determination is made, step **328** is invoked, wherein the logic of block **108** of **FIG. 4a** (the CD handling process), discussed earlier, is executed, and the CD player is integrated with the car stereo. If a negative determination is made in step **326**, then step **330** is invoked. In step **330**, a determination is made as to whether the device connected to the auxiliary input is an MP3 player. If a positive determination is made, step **334** is invoked, wherein the logic of block **138** if **FIG. 4b** (the MP3 handling process), discussed earlier, is executed, and the MP3 player is integrated with the car stereo. If a negative determination is made in step **330**, then step **336** is invoked. In step **336**, a determination is made as to whether the device connected to the auxiliary input is a satellite receiver or a DAB receiver. If a positive determination is made, step **338** is invoked, wherein the logic of block **168** of **FIG. 4c** (the satellite/DAB receiver handling process), discussed earlier, is executed, and the satellite receiver is integrated with the car stereo. If a negative determination is made in step **336**, step **322** is re-invoked, so that additional auxiliary input selections can be monitored and processed accordingly. Of course, process **320** can be expanded to allow other types of devices connected to the auxiliary inputs of the present invention to be integrated with the car stereo.

The present invention can be expanded for allowing video information generated by an external device to be integrated with the display of an existing OEM or after-market car stereo. In such a mode, the invention accepts RGB (red/green/blue) input signals from the external device, and converts same to composite signals. The composite signals are then forwarded to the car stereo for display thereby, such as on an LCD panel of the stereo. Additionally, the present invention can accept composite input signals from an external device, and convert same to RGB signals for display on the car stereo. Further, information from the external device can be formatted and presented to the user in one or more graphical user interfaces or menus capable of being viewed and manipulated on the car stereo.

FIG. 7a is a perspective view of a docking station **400** according to the present invention for retaining an audio device within a car. Importantly, the present invention can be adapted to allow portable audio devices to be integrated with an existing car stereo. The docking station **400** allows such portable devices to be conveniently docked and integrated with the car stereo. The docking station **400** includes a top portion **402** hingedly connected at a rear portion **408** to a bottom portion **404**, preferably in a clam-like configuration. A portable audio device **410**, such as the SKYFI radio distributed by DELPHI, Inc., is physically and electrically connected with the docking portion **412**, and contained within the station **100**. A clasp **406** can be provided for holding the top and bottom portions in a closed position to retain the device **410**. Optionally, a video device could also be docked using the docking station **400**, and tabs **413** can be provided for holding the docking station **400** in place against a portion of a car. Conceivably, the docking station **400** could take any form, such as a sleeve-like device for receiving and retaining a portable audio device and having a docking portion for electrically and mechanically mating with the audio device.

FIG. 7b is an end view showing the rear portion **408** of the docking station **400** of **FIG. 7a**. A hinge **414** connects the top portion and the bottom portions of the docking station **400**. A data port **416** is provided for interfacing with the audio device docked within the station **400**, and is in electrical communication therewith. In a preferred embodiment of the present invention, the data port **416** is an RS-232 serial or USB data port that allows for the transmission of data with the audio device, and which connects with the multimedia device integration system of the present invention for integrating the audio device with an OEM or after-market car stereo. Any known bus technology can be utilized to interface with any portable audio or video device contained within the docking station **400**, such as FIREWIRE, D2B, MOST, CAN, USB/USB2, IE Bus, T Bus, I Bus, or any other bus technology known in the art. It should be noted that the present invention can be operated without a docking station, *i.e.*, a portable audio or video device can be plugged directly into the present invention for integration with a car stereo or video system.

FIGS. 8a-8b are perspective views of another embodiment of the docking station of the present invention, indicated generally at **500**, which includes the multimedia device integration system of the present invention, indicated generally at **540**, incorporated therewith. As shown in **FIG. 8a**, the docking station **500** includes a base portion **530**, a bottom member **515** interconnected with the base portion **530** at an edge thereof, and a top member **510** hingedly interconnected at an edge to the base portion **530**. The top member **510** and the bottom member **515** define a cavity for docking and storing a portable audio device **520**, which could be a portable CD player, MP3 player, satellite (*e.g.*, XM, SIRIUS, or other type) tuner, or any other portable audio device. The docking station **500** would be configured to accommodate a specific device, such as an IPOD from Apple Computer, Inc., or any other portable device.

The multimedia device integration system **540**, in the form of a circuit board, is housed within the base portion **530** and performs the integration functions discussed herein for integrating the portable device **520** with an existing car stereo or car video system. The integration system **540** is in communication with the portable device **520** via a connector **550**, which is connected to a port on the device **520**, and a cable **555** interconnected between the connector **550** and the integration system **540**. The connector **550** could be any suitable connector and can vary according to the device type. For example, a MOLEX, USB, or any other connector could be used, depending on the portable device. The integration system **540** is electrically connected with a car stereo or car video system by cable **560**. Alternatively, the integration system could wirelessly communicate with the car stereo or car video system. A transmitter could be used at the integration system to communicate with a receiver at the car stereo or car video system. Where automobiles include Bluetooth systems, such systems can be used to communicate with the integration system. As can be readily appreciated, the docking station **500** provides a convenient device for docking, storing, and integrating a portable device for use with a car stereo. Further, the docking station **500** could be positioned at any desired location within a vehicle, including, but not limited to, the vehicle trunk.

As shown in **FIG. 8b**, the top member **510** can be opened in the general direction indicated by arrow **A** to allow for access to the portable audio device **520**. In this fashion, the device **520** can be quickly accessed for any desired purpose, such as for inserting and removing the device **520** from the docking station **500**, as well as for providing access to the controls of the device **520**.

FIG. 9 is a block diagram showing the components of the docking station of **FIGS. 8a-8b**. The docking station **500** houses both a portable audio or video device **520** and a multimedia device integration system (or interface) **540**. The shape and configuration of the docking station **500** can be varied as desired without departing from the spirit or scope of the present invention.

The integration system of the present invention provides for control of a portable audio or video device, or other device, through the controls of the car stereo or video system system. As such, controls on the steering wheel, where present, may also be used to control the portable audio device or other device. Further, in all embodiments of the present invention, communication between the after-market device and a car stereo or video system can be accomplished using known wireless technologies, such as Bluetooth.

FIG. 10 is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, indicated generally at **600**, wherein the interface **630** is incorporated within a car stereo or car video system **610**. The interface **630** is in electrical communication with the control panel buttons **620**, display **615**, and associated control circuitry **625** of the car stereo or video system **610**. The interface **630** could be manufactured on a separate printed circuit board positioned within the stereo or video system **610**, or on one or more existing circuit boards of the stereo or video system **610**. An after-market device **635** can be put into electrical communication with the interface **630** via a port or connection on the car stereo or video system **610**, and integrated for use with the car stereo or video system **610**.

The device **635** can be controlled using the control panel buttons **620** of the car stereo or video system **610**, and information from the device **635** is formatted by the interface **630** and displayed in the display **615** of the car stereo or video system **610**. Additionally, control commands generated at the car stereo or car video device **610** are converted by the interface **630** into a format (protocol) compatible with the multimedia device **635**, and are dispatched thereto for execution. A plurality of multimedia devices could be intergrated using the interface **630**, as well as one or more auxiliary input sources **640**. The after-market device **635** could comprise any audio, video, or telecommunications device, including, but not limited to, a CD player, CD changer, digital media player (*e.g.*, MP3 player, MP4 player, WMV player, Apple iPod, or any other player), satellite radio (*e.g.*, XM, Sirius, Delphi, etc.), video device (*e.g.*, DVD player), cellular telephone, or any other type of device or combinations thereof. Additionally, one or more interfaces could be connected to the interface **630** ("daisy-chained") to allow multiple products to be integrated. The device **600** could include one or more of the circuits disclosed in **FIGS. 3a-3d** and modified depending upon the type of the after-market device **635**.

FIG. 11a is a diagram showing an alternate embodiment of the present invention, indicated generally at **645**, wherein a cellular telephone **670** is intergrated for use with a car stereo. The telephone **670** is in electrical communication with the interface **665**, which receives data from the cellular telephone and formats same for displaying on the display **650** of the car stereo or video system **660**. Commands for controlling the telephone **670** can be entered using the control panel buttons **655** of the car stereo or video system **660**. The commands are processed by the interface **665**, converted into a format (protocol) compatible with the telephone **670**, and transmitted to the telephone **670** for processing thereby. Additionally, audio from the telephone **670** can be channeled to the car stereo or video system **660** via the interface **665** and played through the speakers of the car stereo or video system **660**. For example, if the telephone **670** is provided with the ability to download songs or music, such songs or music can be selected using the car stereo or video system **660** and played therethrough using the interface **665**. It should be noted that control of the cellular telephone could be provided using one or more displays (*e.g.*, LCD) of a car video system. Moreover, control of the cellular telephone **670** is not limited to the use of buttons on the car stereo or video ststem **660**, and indeed, a software or graphically-driven menu or interface can be used to control the cellular telephone. The device **645** could include one or more of the circuits disclosed in **FIGS. 3a-3d** and modified for use with the cellular telephone **670**.

FIG. 11b is a flowchart showing processing logic, indicated generally at **647**, for integrating a cellular telephone with a car radio. Beginning in step **649**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **651** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **653** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the car stereo. If a negative determination is made, step **649** is re-invoked.

If a positive determination is made in step **653**, a cellular telephone handling process, indicated as block **661**, is invoked. Beginning in step **654**, a signal is generated by the present invention indicating that a cellular telephone is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. In step **657**, the audio channels of the cellular telephone are connected (channeled) to the car stereo system, allowing audio from the cellular telephone to be played through the car stereo. In step **659**, data is retrieved by the present invention from the cellular telephone, such as song information corresponding to one or more songs downloaded onto the cellular telephone. After steps **654**, **657**, and **659** have been executed, control passes to step **663**.

In steps **663**, the present invention monitors the control panel buttons of the car stereo for cellular telephone operational commands. In step **664**, if a command is not detected, step **663** is re-invoked. Otherwise, if a command is received, step **663** invokes step **667**, wherein the received command is converted into a format recognizable by the cellular telephone connected to the present invention. Once the command has been formatted, step **669** is invoked, wherein the formatted command is transmitted to the cellular telephone and executed. Step **654** is then re-invoked, so that additional processing can occur.

FIG. 12a is a diagram showing an alternate embodiment of the present invention, indicated generally at **675**, wherein an after-market video device **695** is integrated for use with a car video system **685**. The after-market video device **695** could comprise a portable DVD player, digital video (DV) camera, digital camera, or any other video device. The interface **690** receives output video signals from the device **695**, and converts same for display on one or more displays **680** (*e.g.*, LCD seat-back displays in a minivan, fold-down displays mounted on the roof of a vehicle, vehicle navigation displays, etc.) of the car video system **685**. The interface **690** could convert between composite and red/green/blue (RGB) video signals, and vice versa, using commercially-available video format conversion chips such as the TDA8315, TDA4570, TDA3567, TDA3566A, and TDA3569A video conversion chips manufactured by Philips Corp., and the AL251 and AL250 video conversion chips manufactured by Averlogic Technologies, Inc., or any other suitable video conversion chips. Commands issued by a user using the car video system **685** or display(s) **680** for controlling the device **695** are received by the interface **690**, converted into a format compatible with the device **695**, and transmitted thereto for processing. The device **675** could include one or more of the circuits disclosed in **FIGS. 3a-3d** and modified for use with the video device **695**.

FIG. 12b is a flowchart showing processing logic, indicated generally at **671**, for integrating an after-market video device with a car video system. Beginning in step **673**, a determination is made as to whether the existing car video system is powered on. If a negative determination is made, step **674** is invoked, wherein the present invention enters a standby mode and waits for the car video system to be powered on. If a positive determination is made, step **677** is invoked, wherein a second determination is made as to whether the car video system is in a state responsive to signals external to the car video system. If a negative determination is made, step **673** is re-invoked.

If a positive determination is made in step **677**, an after-market video device handling process, indicated as block **687**, is invoked. Beginning in step **679**, a signal is generated by the present invention indicating that an external device is present, and the signal is continuously transmitted to the car video system. Importantly, this signal prevents the car video system from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. In step **681**, the audio and video channels of the after-market device are connected (channeled) to the car video system, allowing audio and video from the after-market device to be played through the car video system. In step **684**, the display(s) of the car video system are updated with data from the after-market device. After steps **679**, **681**, and **684** have been executed, control passes to step **683**.

In step **683**, the present invention monitors the car video system for after-market video device operational commands. In step **689**, if a command is not detected, step **683** is re-invoked. Otherwise, if a command is received, step **689** invokes step **691**, wherein the received command is converted into a format recognizable by the after-market video device connected to the present invention. Once the command has been formatted, step **693** is invoked, wherein the formatted command is transmitted to the after-market video device and executed. Step **679** is then re-invoked, so that additional processing can occur.

FIG. 13a is a block diagram showing an alternate embodiment of the multimedia device integration system **710** of the present invention, wherein configuration jumpers **720** and protocol conversion software blocks **724** are provided for integrating after-market devices of various types using a single interface. The jumpers **720** can be set to a plurality of different settings, each of which corresponds to an after-market device of a specific type (*e.g.*, CD changer, CD player, digital media player, satellite radio, video device, cellular telephone, etc.) or from a specific manufacturer. Additionally, the jumpers **720** can be used to specify one or more device or manufacturer types for the car stereo or video system **705**. The settings of the configuration jumpers **720** correspond to one or more protocol conversion software blocks **724** stored in memory (*e.g.*, programmable flash memory, ROM, EEPROM, etc.) **725** of the interface **710**. Each of the software blocks **724** controls the interface circuitry **715** and contains instructions for converting data from the device **707** into a format compatible with the car stereo or video system **705**, and vice versa. For example, a first block could contain software for allowing communication between an Apple iPod and an in-dash car stereo manufactured by Sony, and a second block could contain software for allowing communication between a DVD player and a car video system. Any desired number of blocks could be stored in the memory **725** and can be selected as desired by the user via configuration jumpers **720**. As such, a single interface **710** can be used for integrating numerous devices of various types and manufactures for use with one or more car stereo or video systems. The device **710** could include one or more of the circuits shown in **FIGS. 3a-3d**, with modifications depending upon the device types of the devices **705** and **707.**

FIG. 13b is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein wiring harnesses **727** and **728** and protocol conversion software blocks **729** are provided for integrating multimedia devices of various types using a single interface **726**. In this embodiment, the electrical configurations (pinouts) of each of the harnesses **727** and **728** correspond to car stereo / video systems and after-market devices of specific types and made by specific manufacturers (*e.g.*, harness **727** could correspond to a BMW car stereo, and harness **728** could correspond to an ALPINE satellite tuner). The electrical configurations (pinouts) of the harnesses are utilized by the interface **726** to retrieve a specific protocol conversion software block **729** that allows communication between the devices. The interface **726** could be provided with a plurality of protocol conversion software blocks pre-loaded into memory in the interface, and could be provided with any desired harnesses. The interface **726** could include one or more of the circuits shown in **FIGS. 3a-3d**, with modification depending upon the device types of the devices attached to the wiring harnesses **727** and **728**.

FIG. 14 is a flowchart showing processing logic, indicated generally at **730**, of the multimedia device integration system of the present invention for integrating after-market devices of various types using a single interface. In step **735**, the interface determines types of devices that are connected thereto, including the car stereo or video system and one or more after-market devices to be integrated therewith. This could be achieved by the configuration jumper settings or the harness types connected to the interface and discussed with respect to **FIGS. 13a** and **13b**. Then, in step **740**, a protocol conversion software block is selected from blocks of conversion software (*e.g.*, from the blocks **725** and **729** shown in **FIGS. 13a** and **13b**). In step **745**, instructions are converted using the selected conversion block to allow the car stereo or video system to operate with the multimedia device.

FIG. 15 is a flowchart showing processing logic, indicated generally at **750**, of the multimedia device integration system of the present invention for allowing a user to specify one or more after-market device types for integration using a single interface. In step **770**, a user is provided with one or more lists of devices to be integrated, which are displayed on the display **760** of the car stereo or video device **755**. Then, in step **775**, using the buttons **765** of the car video device, the user can specify the type of multimedia device to be integrated (*e.g.*, by scrolling through the lists). Additionally, the device type could be specified using a graphical or software menu displayed on the car stereo or car video system. In step **780**, a determination is made as to whether a timeout has occurred (*e.g.*, the user has not selected a device type within a predetermined period of time). If a positive determination is made, step **785** occurs, wherein a protocol conversion software block is selected from memory corresponding to the last device type displayed by the car stereo or video system. If a negative determination is made, step **790** is invoked, wherein a determination is made as to whether the user has specified a device type. If a negative determination is made, step **775** is re-invoked so that the user can specify a device type. If a positive determination is made, step **795** is invoked, wherein a protocol conversion software block is selected from memory corresponding to the device specified by the user. In step **800**, the protocol conversion software block is mapped to a logical address in memory. Then, in step **805**, instructions to be exchanged between the car stereo or video system and the after-market device are converted using the software block to allow communication between the devices using compatible formats. Accordingly, the logic of **FIG. 15** allows a single interface having multiple protocol conversion software blocks to be used integrate a plurality of after-market devices with a car stereo or video system.

FIG. 16 is a flowchart showing processing logic of the multimedia device integration system of the present invention, indicated generally at **810**, for allowing a user to quickly navigate through a list of songs on one or more after-market devices using the controls of a car stereo or video system (fast navigation technique). This method allows a user to quickly select a song from a list of songs available on an after-market device for playing on the car stereo or video system, and could be applied for use with any type of after-market device, including, but not limited to, a digital media player such as an MP3 player or Apple iPod player. Beginning in step **812**, a user is provided with a list of alphanumeric characters on a display of the car stereo or video system. This list could include the letters A through Z, as well as the numbers 0 through 9. In step **814**, the user can specify a desired alphanumeric character, which can be specified by scrolling through the list using one or more controls of the car stereo or video system and pressing a button once the desired character has been highlighted, or optionally, if an alphanumeric keypad (or touchscreen interface) is provided on the car stereo or video system, the user can directly enter the desired alphanumeric character.

When the desired alphanumeric character has been specified, in step **816** a remote database is queried using the alphanumeric character. The remote database could comprise a list of songs stored in one or more after-market devices integrated by the present invention for use with the car stereo or video system. In step **818**, a list of potentially matching songs is retrieved from the database and presented on the display of the car stereo or video system for perusal by the user. For example, if the user specified the letter "A," the list could include all songs in the remote database having titles (or artists) beginning with the letter "A." In step **820**, a determination is made as to whether a desired song appears in the list and is immediately viewable by the user, without requiring the user to scroll through the list. If a positive determination is made, step **822** is invoked, wherein the desired song is selected by the user and retrieved from the after-market device for playing on the car stereo or video system.

In the event that a negative determination is made in step **820**, step **824** is invoked, wherein the user can specify an additional alphanumeric character using the car stereo or video system. For example, if the user initially specified the letter "A" and the desired song is not visible in the list of songs without scrolling, the user can refine the query by adding an additional alphanumeric character. Thus, for example, the user can specify the letters "AN" to search for songs having titles (or artists) beginning with the letters "AN." In step **826**, the remote database of the after-market device is queried using the specified letters. In step **828**, a list of potential matches is presented to the user at the car stereo or video system. In step **830**, a determination is made as to whether the desired song appears in the list and is immediately viewable without requiring the user to scroll through the list. If a positive determination is made, step **822** is invoked, wherein the user can select the desired song for retrieval from the after-market device and playing on the car stereo or video system. If a negative determination is made, step **832** is invoked, wherein a determination is made as to whether a threshold number of alphanumeric characters has been specified by the user. For example, a maximum threshold of 3 alphanumeric characters could be specified, or any other desired number. If a negative determination is made, steps **824-832** are re-invoked in the manner disclosed herein to allow the user to specify additional alphanumeric characters for querying the remote database. If a positive determination is made (threshold met), then processing terminates and the user must scroll through the list of retrieved songs or repeat the processing disclosed in **FIG. 16** to begin a new query.

FIG. 17 is a diagram showing an another embodiment of the present invention, indicated generally at **850**, wherein a plurality of external devices are integrated using a single interface **852**. Any desired number or combination of devices can be integrated for use with a car stereo or video system using the interface **852**. The interface **852** houses a plurality of ports **858** for connecting any desired number of external devices, and a port **856** for connection with a car stereo or video system. The ports **858** and **856** could be any suitable type of input port, and could vary depending upon the types of devices to be integrated. Additionally, the interface **852** includes integration electronics **854**, which could include any desired electronics disclosed herein for integrating a plurality of external devices.

As shown in **FIG. 17**, a CD player **860**, a digital media device **862**, a satellite tuner **864**, a video device **866**, a cellular phone **868**, and an auxiliary input **870** are connected to the interface **852** and integrated for use with a car stereo or video system. The CD player **860** could comprise any desired CD player or changer. The digital media device **862** could comprise any portable digital media device, such as an Apple iPod, MP3 player, MP4, player, WMV player, portable music center, or any other desired device. The satellite tuner **864** could comprise any desired satellite tuner, such as an XM or Sirius tuner. The video device **866** could comprise any desired video device, such as a DVD player. The cellular phone **868** could comprise any cellular telephone capable of downloading and storing music or video files. The auxiliary input **870** could comprise any desired external device. Any desired number of interfaces **852** could be interconnected ("daisy-chained"). Further, the interface **852** could form part of an existing car stereo or video system. Control of the external devices connected to the interface **852** is provided through the car stereo or video system.

Having thus described the invention in detail, it is to be understood that the foregoing description is not intended to limit the spirit and scope thereof.

CLAIMS

What is claimed is:

1. A multimedia device integration system comprising:

a car stereo system;

an after-market device external to the car stereo system;

an interface positioned within the car stereo system and connected between the car stereo system and the after-market device for exchanging data and audio signals between the car stereo system and the after-market device;

means for processing and dispatching commands for controlling the after-market device from the car stereo system in a format compatible with the after-market device; and

means for processing and displaying data from the after-market device on a display of the car stereo system in a format compatible with the car stereo system.

2. The apparatus of claim 1, wherein the after-market device comprises a CD player, CD changer, digital media player, Digital Audio Broadcast (DAB) receiver, satellite receiver, or a cellular telephone.

3. The apparatus of claim 2, wherein the digital media player comprises an MP3 player, an MP4 player, WMV player, or an Apple iPod.

4. The apparatus of claim 1, further comprising one or more auxiliary input sources connected to the interface.

5. A multimedia device integration system comprising:

a car stereo system;

a cellular telephone external to the car stereo system;

an interface connected between the car stereo system and the cellular telephone for exchanging data and audio signals between the car stereo system and the cellular telephone;

means for processing and dispatching commands for controlling the cellular telephone from the car stereo system in a format compatible with the cellular telephone; and

means for processing and displaying data from the cellular telephone on a display of the car stereo system in a format compatible with the car stereo system.

6. The apparatus of claim 5, further comprising songs or music downloadable through the cellular telephone.

7. The apparatus of claim 6, wherein the songs or music are playable through the car stereo system using the interface.

8. A multimedia device integration system comprising:

a car video system;

a cellular telephone external to the car video system;

an interface connected between the car video system and the cellular telephone for exchanging data, audio, and video signals between the car video system and the cellular telephone;

means for processing and dispatching commands for controlling the cellular telephone from the car video system in a format compatible with the cellular telephone; and

means for processing and displaying data from the cellular telephone on a display of the car video system in a format compatible with the car video system.

9. The apparatus of claim 8, further comprising songs or music downloadable through the cellular telephone.

10. The apparatus of claim 9, wherein the songs or music are playable through the car video system using the interface.

11. A multimedia device integration system comprising:

a car video system;

an after-market video device external to the car video system;

an interface connected between the car video system and the after-market video device for exchanging data, audio, and video signals between the car video system and the after-market video device;

means for processing and dispatching commands for controlling the after-market video device from the car video system in a format compatible with the after-market video device; and means for processing and displaying data from the after-market video device on a display of the car video system in a format compatible with the car video system.

12. The apparatus of claim 11, wherein the after-market video device comprises a DVD player.

13. The appataus of claim 11, wherein the interface is positioned within the car video system.

14. A multimedia device integration system comprising:

an interface in electrical communication with a car stereo system and an after-market device;

a plurality of configuration jumpers in the interface for specifying a first device type corresponding to the car stereo system and a second device type corresponding to the after-market device; and

a plurality of protocol conversion software blocks stored in memory in the interface for converting signals from the after-market device into a first format compatible with the car stereo system and for converting signals from the car stereo system into a second format compatible with the after-market device, wherein at least one of the protocol conversion software blocks are selected by the interface using settings of the plurality of configuration jumpers.

15. The system of claim 14, wherein the plurality of protocol conversion software blocks allow a plurality of after-market devices to integrated with the car stereo system.

16. The system of claim 14, wherein the plurality of configuration jumpers are settable by a user.

17. A multimedia device integration system comprising:

an interface in electrical communication with a car video system and an after-market device;

a plurality of configuration jumpers in the interface for specifying a first device type corresponding to the car video system and a second device type corresponding to the after-market device; and

a plurality of protocol conversion software blocks stored in memory in the interface for converting signals from the after-market device into a first format compatible with the car video system and for converting signals from the car video system into a second format compatible with the after-market device, wherein at least one of the protocol conversion software blocks are selected by the interface using settings of the plurality of configuration jumpers.

18. The system of claim 17, wherein the plurality of protocol conversion software blocks allow a plurality of after-market devices to integrated with the car video system.

19. The system of claim 17, wherein the plurality of configuration jumpers are settable by a user.

20. A multimedia device integration system comprising:

an interface in electrical communication with a car stereo system and an after-market device;

first and second wiring harnesses attached to the interface, wherein the first wiring harness includes a first electrical configuration corresponding to the car stereo system and the second wiring harness includes a second electrical configuration corresponding to the after-market device; and

a plurality of protocol conversion software blocks stored in memory in the interface for converting signals from the after-market device into a first format compatible with the car stereo system and for converting signals from the car stereo system into a second format compatible with the after-market device, wherein at least one of the protocol conversion software blocks are selected by the interface using the first and second electrical configurations of the first and second wiring harnesses.

21. The system of claim 20, further comprising a plurality of wiring harnesses corresponding to additional device types and connectable to the interface.

22. A multimedia device integration system comprising:

an interface in electrical communication with a car video system and an after-market device;

first and second wiring harnesses attached to the interface, wherein the first wiring harness includes a first electrical configuration corresponding to the car video system and the second wiring harness includes a second electrical configuration corresponding to the after-market device; and

a plurality of protocol conversion software blocks stored in memory in the interface for converting signals from the after-market device into a first format compatible with the car video system and for converting signals from the car video system into a second format compatible with the after-market device, wherein at least one of the protocol conversion software blocks are selected by the interface using the first and second electrical configurations of the first and second wiring harnesses.

23. The system of claim 22, further comprising a plurality of wiring harnesses corresponding to additional device types and connectable to the interface.

24. A method for integrating an after-market device for use with a car stereo system comprising:

interconnecting the car stereo system and the after-market device with an interface;

determining a first device type corresponding to the car stereo system and a second device type corresponding to the after-market device;

loading a protocol conversion software block from memory in the interface using the first and second device types;

converting signals from the after-market device into a first format compatible with the car stereo system using the protocol conversion software block;

converting signals from the car stereo system into a second format compatible with the after-market device using the protocol conversion software block; and

exchanging converted signals between the car stereo system and the after-market device.

25. The method of claim 24, wherein the step of determining the first and second device types comprises determining jumper settings of the interface, wherein the jumper settings correspond to the first and second device types.

26. The method of claim 24, wherein the step of determining the first and second device types comprises determining electrical configurations of wiring harnesses attached to the interface, wherein the electrical configurations correspond to the first and second device types.

27. The method of claim 24, wherein the step of determining the first and second device types comprises allowing the user to specify a device type of the after-market device using the car stereo system.

28. A method for integrating an after-market device for use with a car video system comprising:

interconnecting the car video system and the after-market device with an interface;

determining a first device type corresponding to the car video system and a second device type corresponding to the after-market device;

loading a protocol conversion software block from memory in the interface using the first and second device types;

converting signals from the after-market device into a first format compatible with the car video system using the protocol conversion software block;

converting signals from the car video system into a second format compatible with the after-market device using the protocol conversion software block; and

exchanging converted signals between the car video system and the after-market device.

29. The method of claim 28, wherein the step of determining the first and second device types comprises determining jumper settings of the interface, wherein the jumper settings correspond to the first and second device types.

30. The method of claim 28, wherein the step of determining the first and second device types comprises determining electrical configurations of wiring harnesses attached to the interface, wherein the electrical configurations correspond to the first and second device types.

31. The method of claim 28, wherein the step of determining the first and second device types comprises allowing the user to specify a device type of the after-market device using the car video system.

32. A method for retrieving a song from an after-market device from a car stereo system comprising:

allowing a user to specify an alphanumeric character using controls of the car stereo system;

querying a database of songs in the after-market device using the alphanumeric character;

displaying a list of potentially matching songs in the after-market device on a dsplay of the car stereo system; and

allowing the user to select a desired song from the list of potentially matching songs for playing the desired song on the car stereo system.

33. The method of claim 32, further comprising allowing the user to specify one or more additional alphanumeric characters using the controls of the car stereo system.

34. The method of claim 33, further comprising querying the remote database using the one or more additional alphanumeric characters and displaying a second list of potentially matching songs on the display of the car stereo system.

35. The method of claim 32, wherein the step of allowing the user to specify the alphanumeric character comprises providing the user with a list of alphanumeric characters on the display of the car stereo and allowing the user to select a desired character from the list of alphanumeric characters.

36. A multimedia device integration system comprising:

a car audiovisual system;

a plurality of after-market devices external to the car audiovisual system;

an interface connected between the car audiovisual system and the plurality of after-market devices for exchanging data, audio, and video signals between the car audiovisual system and the plurality of after-market devices;

means for processing and dispatching commands for controlling the plurality of after-market devices from the car audiovisual system in at least one format compatible with at least one of the plurality of after-market devices; and

means for processing and displaying data from the plurality of after-market devices on a display of the car audiovisual system in a format compatible with the car audiovisual system.

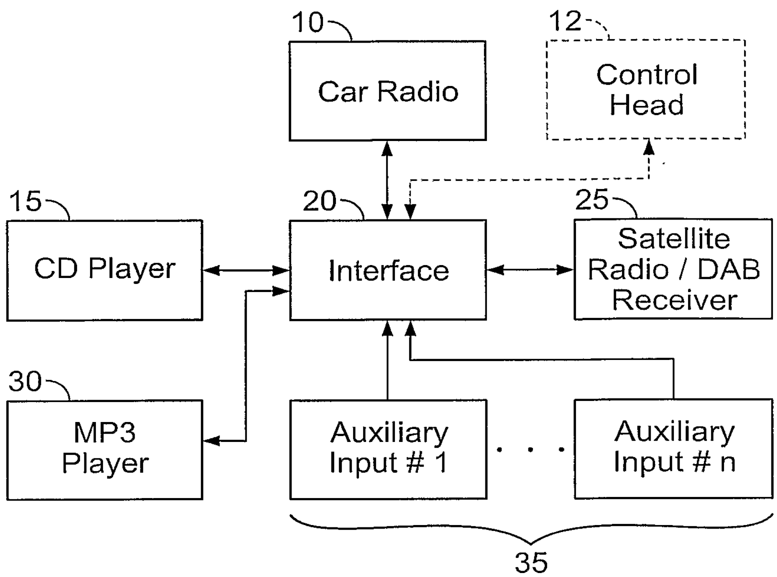

10
Car Radio
12
Control Head
15
CD Player
20
Interface
25
Satellite Radio / DAB Receiver
30
MP3 Player
Auxiliary Input # 1
Auxiliary Input # n
35

FIG. 1

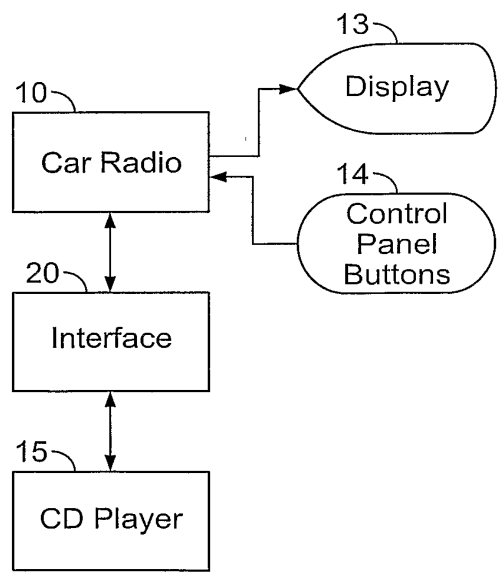

13
Display
10
Car Radio
14
Control Panel Buttons
20
Interface
15
CD Player

FIG. 2A

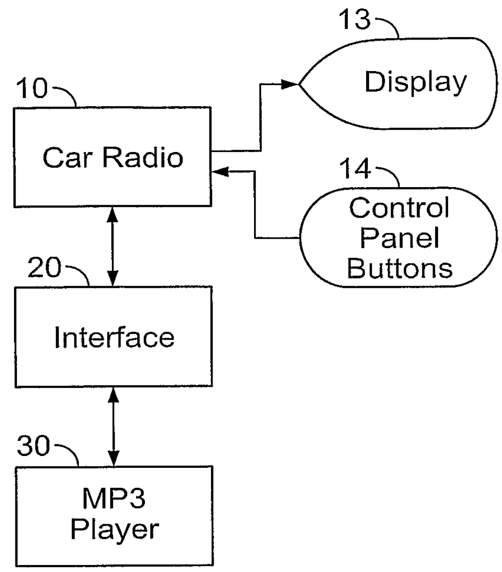

13
Display
10
Car Radio
14
Control
Panel
Buttons
20
Interface
30
MP3
Player

FIG. 2B

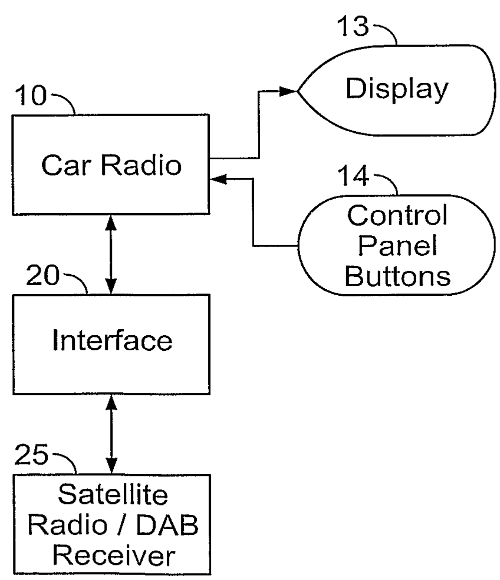

13
Display
10
Car Radio
14
Control
Panel
Buttons
20
Interface
25
Satellite
Radio / DAB
Receiver

FIG. 2C

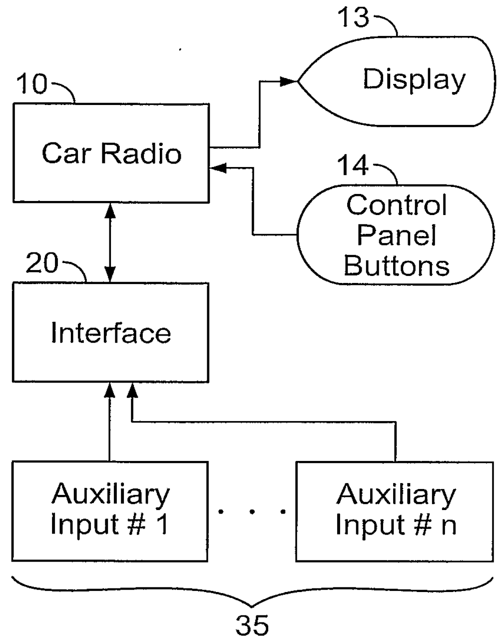

13
Display
10
Car Radio
14
Control Panel Buttons
20
Interface
Auxiliary Input # 1
Auxiliary Input # n
35

FIG. 2D

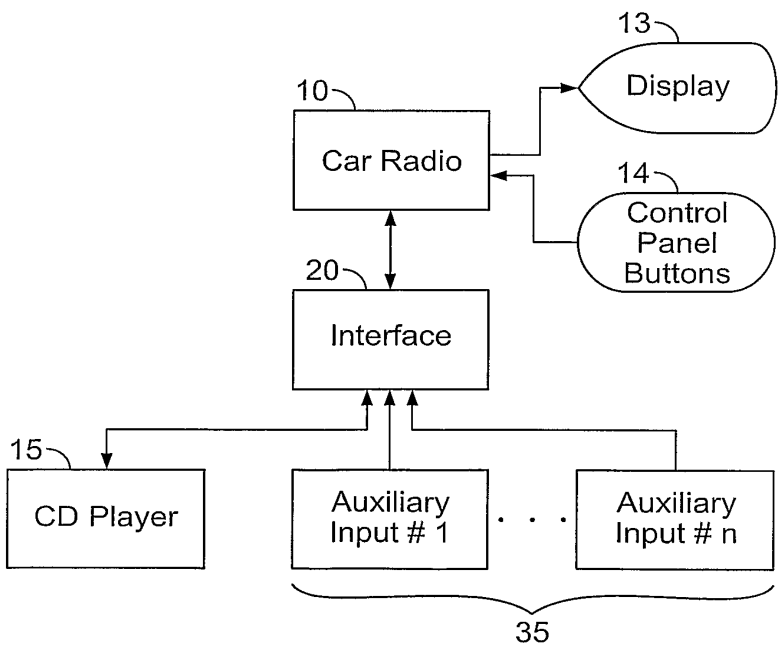

13
Display
10
Car Radio
14
Control Panel Buttons
20
Interface
15
CD Player
Auxiliary Input # 1
Auxiliary Input # n
35

FIG. 2E

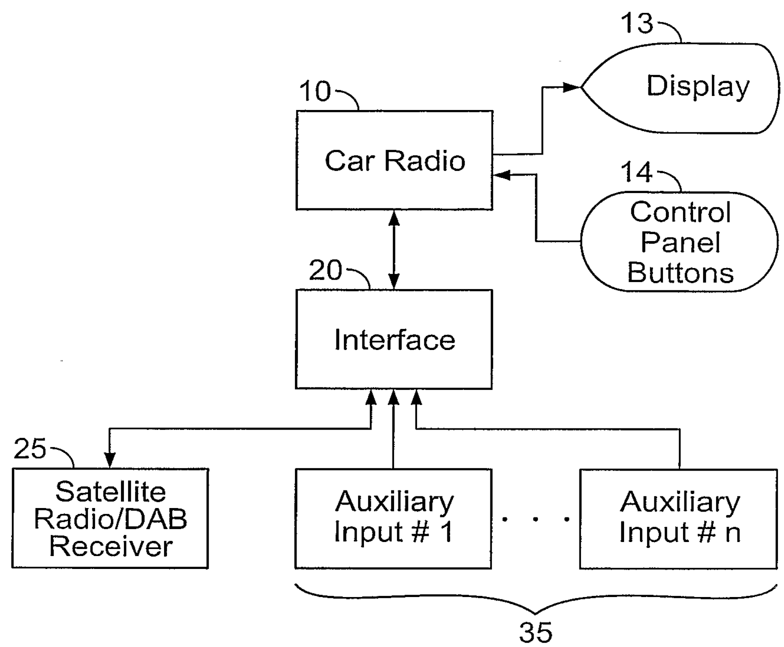

13
Display
10
Car Radio
14
Control
Panel
Buttons
20
Interface
25
Satellite
Radio/DAB
Receiver
Auxiliary
Input # 1
Auxiliary
Input # n
35

FIG. 2F

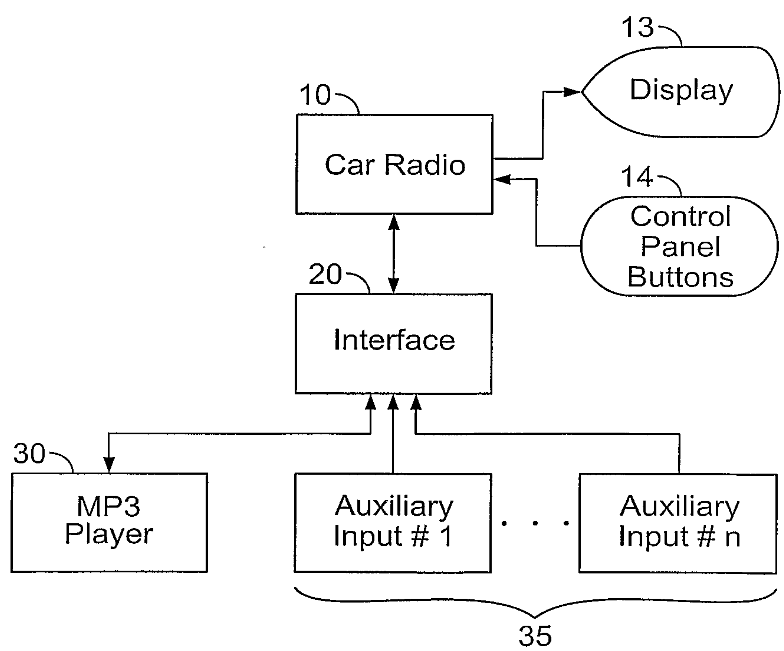

13
Display
10
Car Radio
14
Control
Panel
Buttons
20
Interface
30
MP3
Player
Auxiliary
Input # 1
Auxiliary
Input # n
35

FIG. 2G

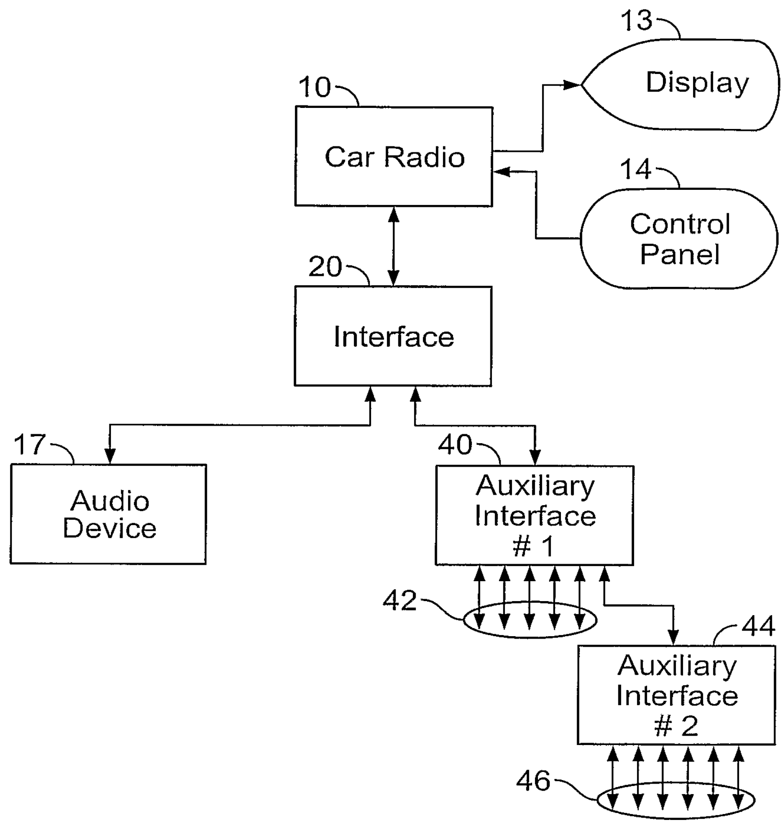

13
Display
10
Car Radio
14
Control Panel
20
Interface
17
Audio Device
40
Auxiliary Interface # 1
42
44
Auxiliary Interface # 2
46

FIG. 2H

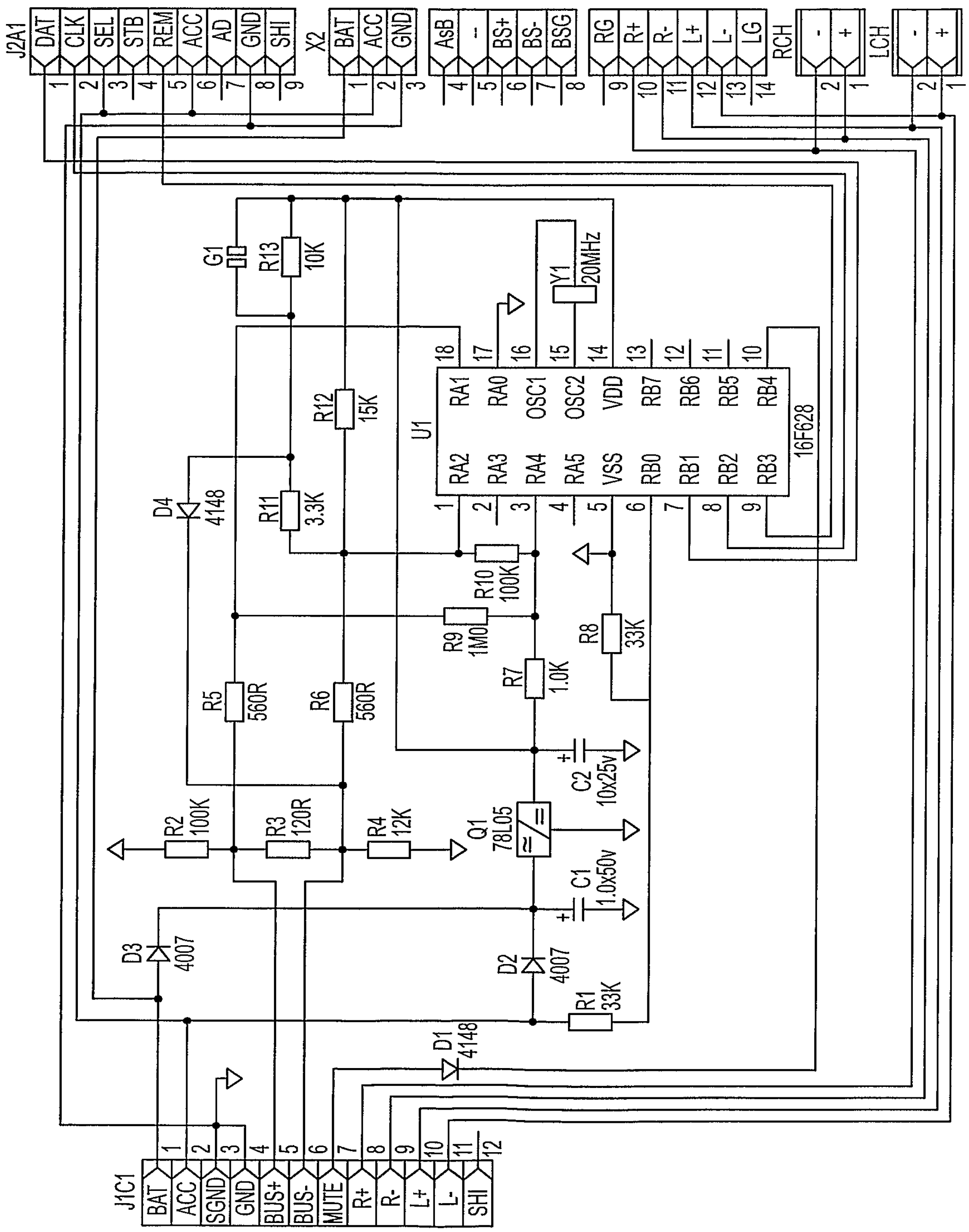

J2A1
DAT
CLK
SEL
STB
REM
ACC
AD
GND
SHI
X2
BAT
ACC
GND
AsB
-
BS+
BS-
BSG
RG
R+
R-
L+
L-
LG
RCH
LCH
G1
R13 10K
Y1 20MHz
U1
16F628
RA1
RA0
OSC1
OSC2
VDD
RB7
RB6
RB5
RB4
RA2
RA3
RA4
RA5
VSS
RB0
RB1
RB2
RB3
R12 15K
R11 3.3K
D4 4148
R10 100K
R9 1M0
R8 33K
R7 1.0K
R5 560R
R6 560R
C2 10x25v
Q1 78L05
R2 100K
R3 120R
R4 12K
C1 1.0x50v
D3 4007
D2 4007
R1 33K
D1 4148
J1C1
BAT
ACC
SGND
GND
BUS+
BUS-
MUTE
R+
R-
L+
L-
SHI

FIG. 3A

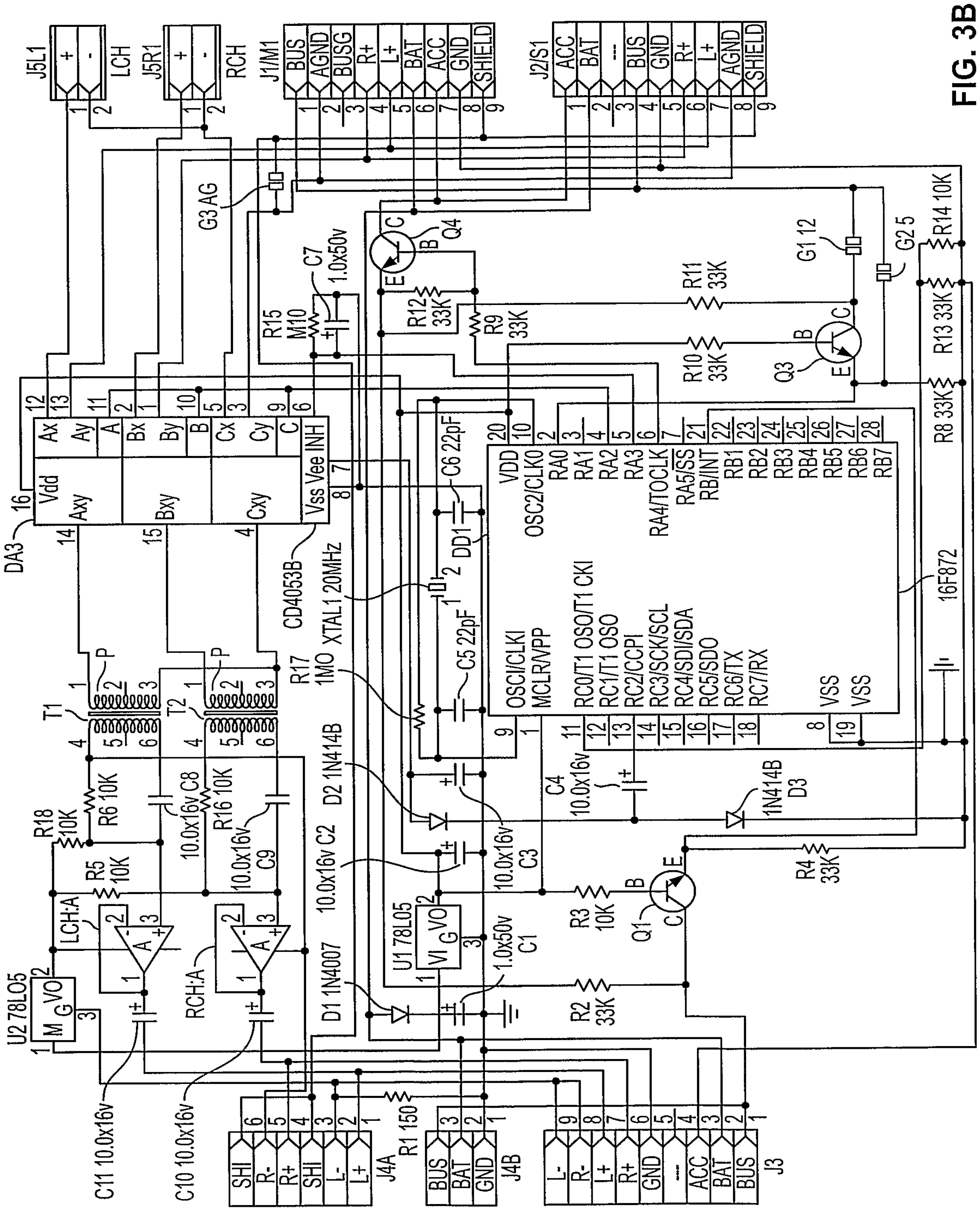

J5L1
LCH
J5R1
RCH
J1/M1
J2/S1
DA3
CD4053B
XTAL1 20MHz
16F872
T1
T2
U1 78L05
U2 78L05
Q1
Q3
Q4
J3
J4A
J4B

FIG. 3B

8/29

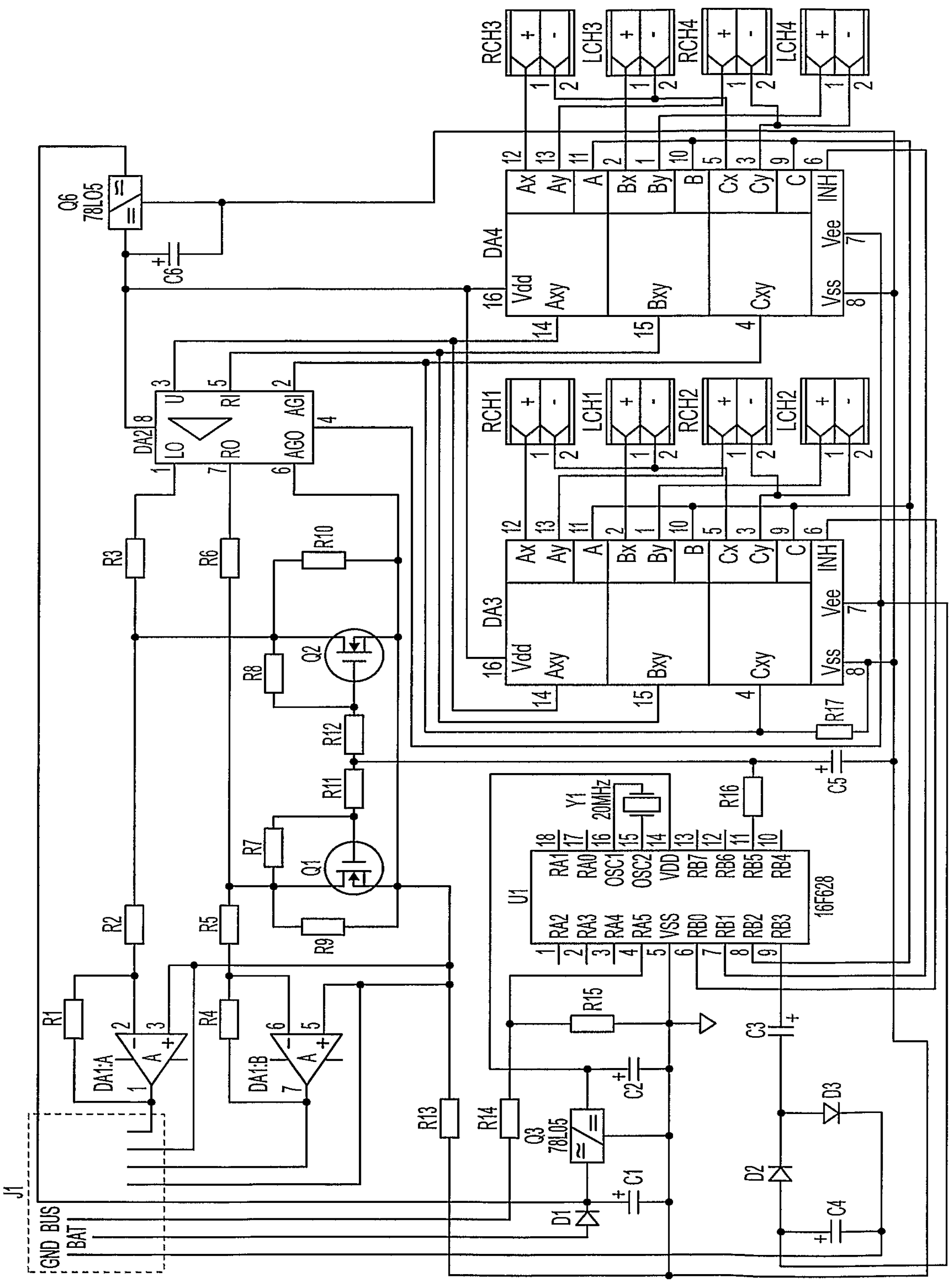

RCH3
LCH3
RCH4
LCH4
RCH1
LCH1
RCH2
LCH2
Q6
78L05
C6
DA4
DA3
DA2
LO
RO
AGO
U
RI
AGI
Ax
Ay
A
Bx
By
B
Cx
Cy
C
INH
Vdd
Axy
Bxy
Cxy
Vee
Vss
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
Q1
Q2
Q3
78L05
C1
C2
C3
C4
C5
D1
D2
D3
Y1
20MHz
U1
16F628
RA0
RA1
RA2
RA3
RA4
RA5
OSC1
OSC2
VDD
VSS
RB0
RB1
RB2
RB3
RB4
RB5
RB6
RB7
DA1:A
DA1:B
J1
GND
BUS
BAT

FIG. 3C

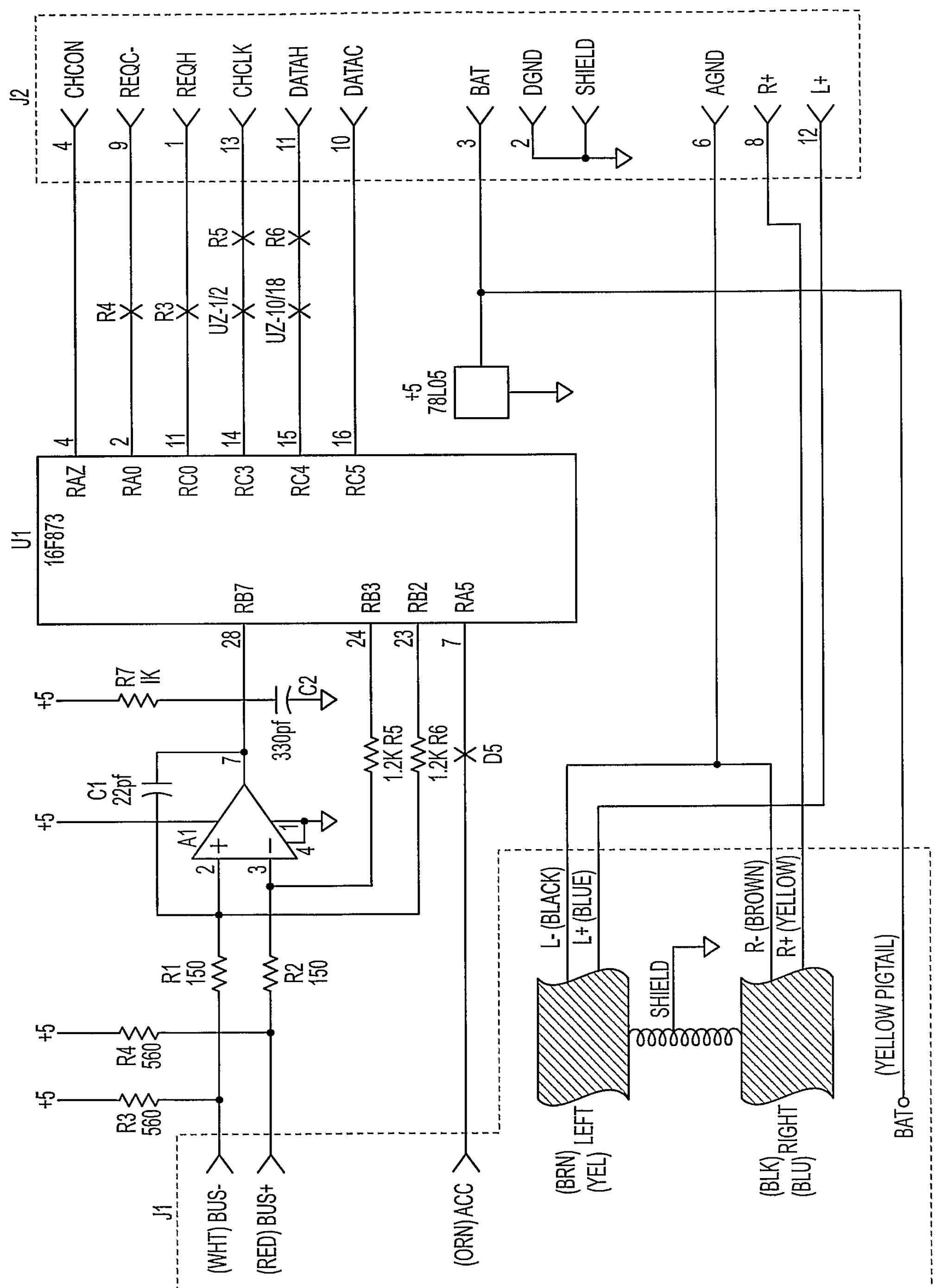

J2
4 CHCON
9 REQC-
1 REQH
13 CHCLK
11 DATAH
10 DATAC
3 BAT
2 DGND
SHIELD
6 AGND
8 R+
12 L+
R4
R3
UZ-1/2
UZ-10/18
R5
R6
+5
78L05
U1
16F873
RAZ
RA0
RC0
RC3
RC4
RC5
RB7
RB3
RB2
RA5
+5
R7
IK
C2
330pf
+5
C1
22pf
A1
1.2K R5
1.2K R6
D5
R1
150
R2
150
+5
R4
560
+5
R3
560
J1
(WHT) BUS-
(RED) BUS+
(ORN) ACC
L- (BLACK)
L+ (BLUE)
R- (BROWN)
R+ (YELLOW)
SHIELD
(BRN)
(YEL)
LEFT
(BLK)
(BLU)
RIGHT
(YELLOW PIGTAIL)
BAT

FIG. 3D

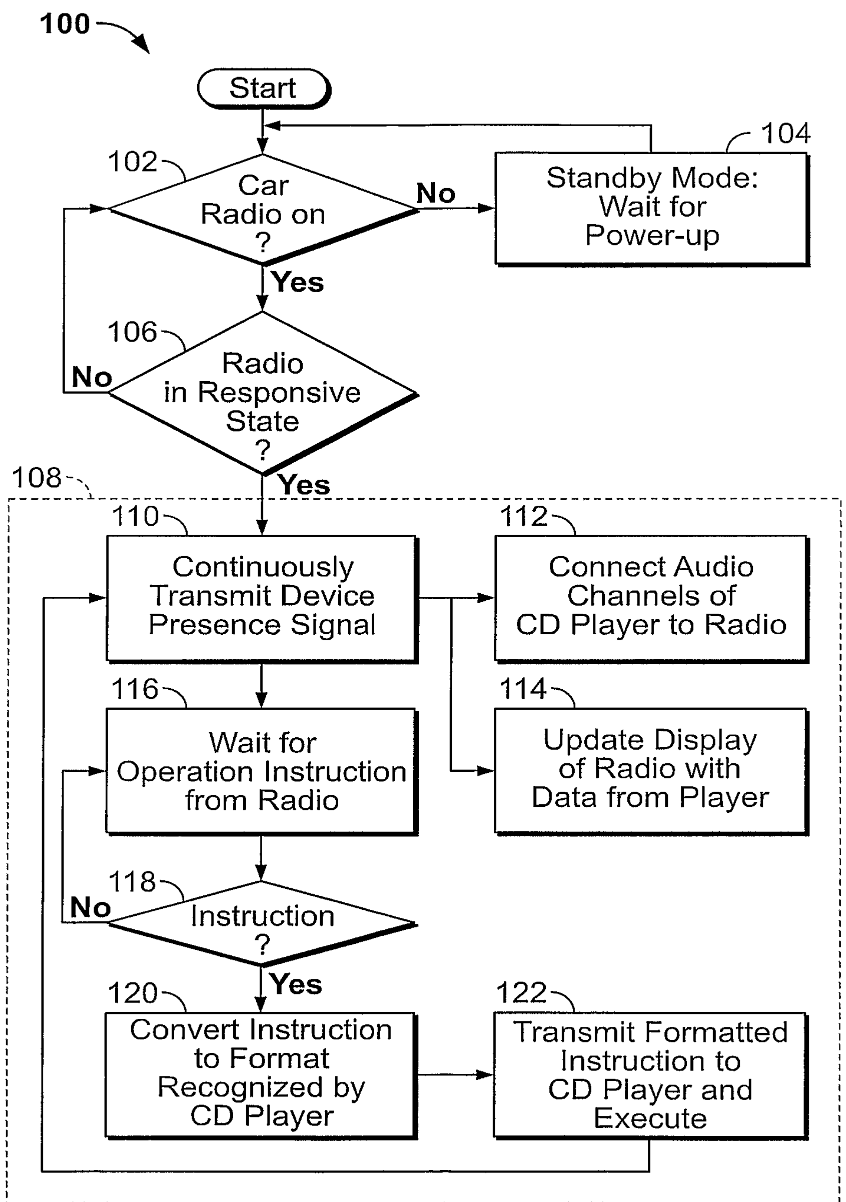

100
Start
102
Car Radio on ?
No
104
Standby Mode: Wait for Power-up
Yes
106
Radio in Responsive State ?
No
Yes
108
110
Continuously Transmit Device Presence Signal
112
Connect Audio Channels of CD Player to Radio
116
Wait for Operation Instruction from Radio
114
Update Display of Radio with Data from Player
118
Instruction ?
No
Yes
120
Convert Instruction to Format Recognized by CD Player
122
Transmit Formatted Instruction to CD Player and Execute

FIG. 4A

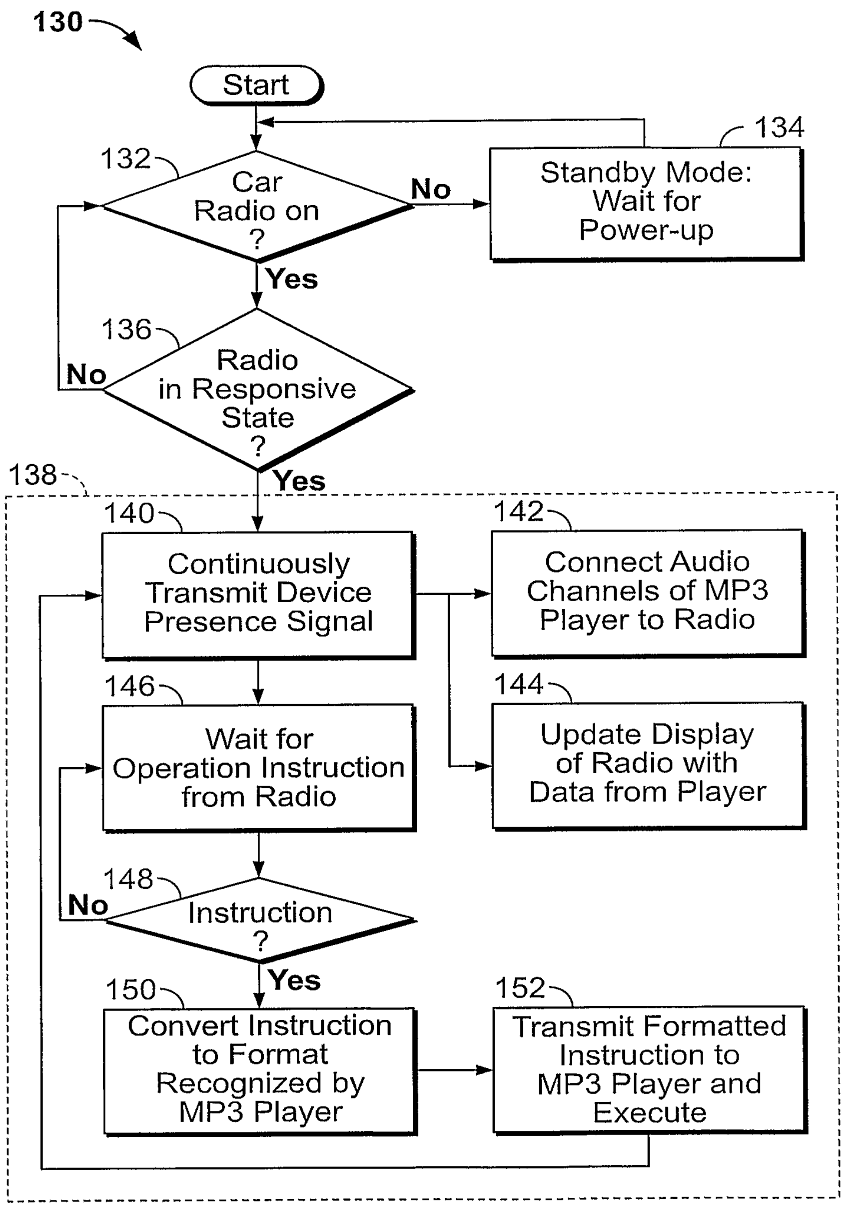
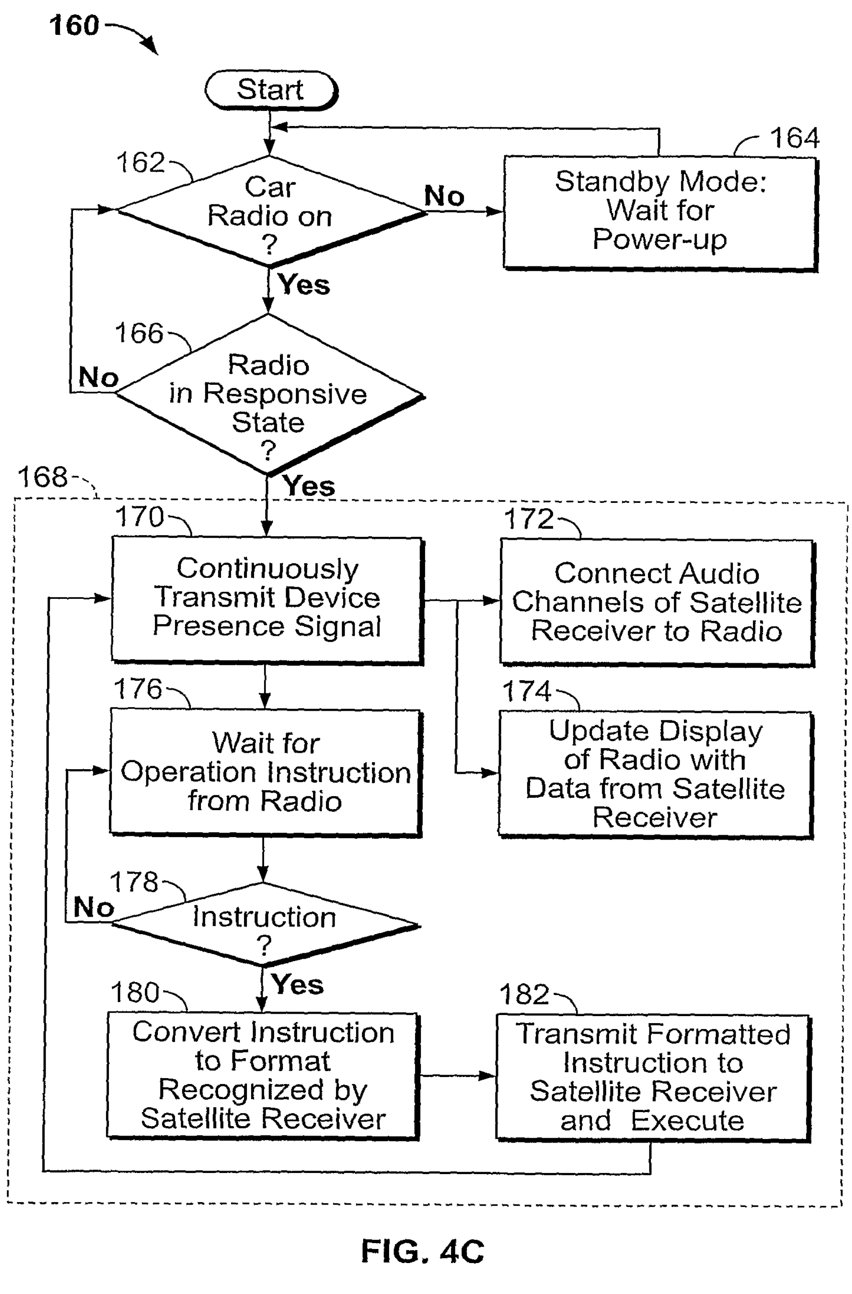
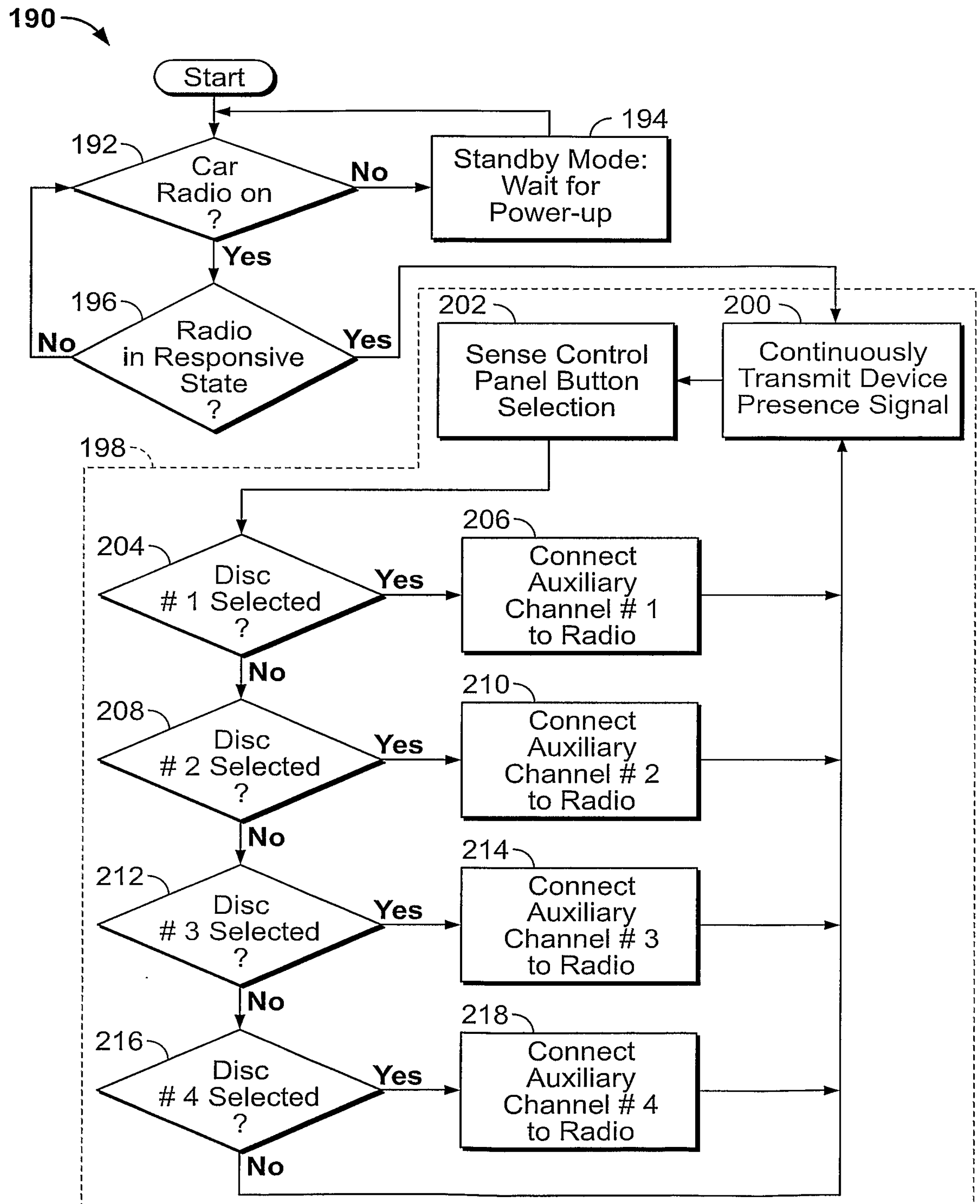

130
Start
132
Car Radio on ?
No
134
Standby Mode: Wait for Power-up
Yes
136
Radio in Responsive State ?
No
Yes
138
140
Continuously Transmit Device Presence Signal
142
Connect Audio Channels of MP3 Player to Radio
146
Wait for Operation Instruction from Radio
144
Update Display of Radio with Data from Player
148
Instruction ?
No
Yes
150
Convert Instruction to Format Recognized by MP3 Player
152
Transmit Formatted Instruction to MP3 Player and Execute

FIG. 4B



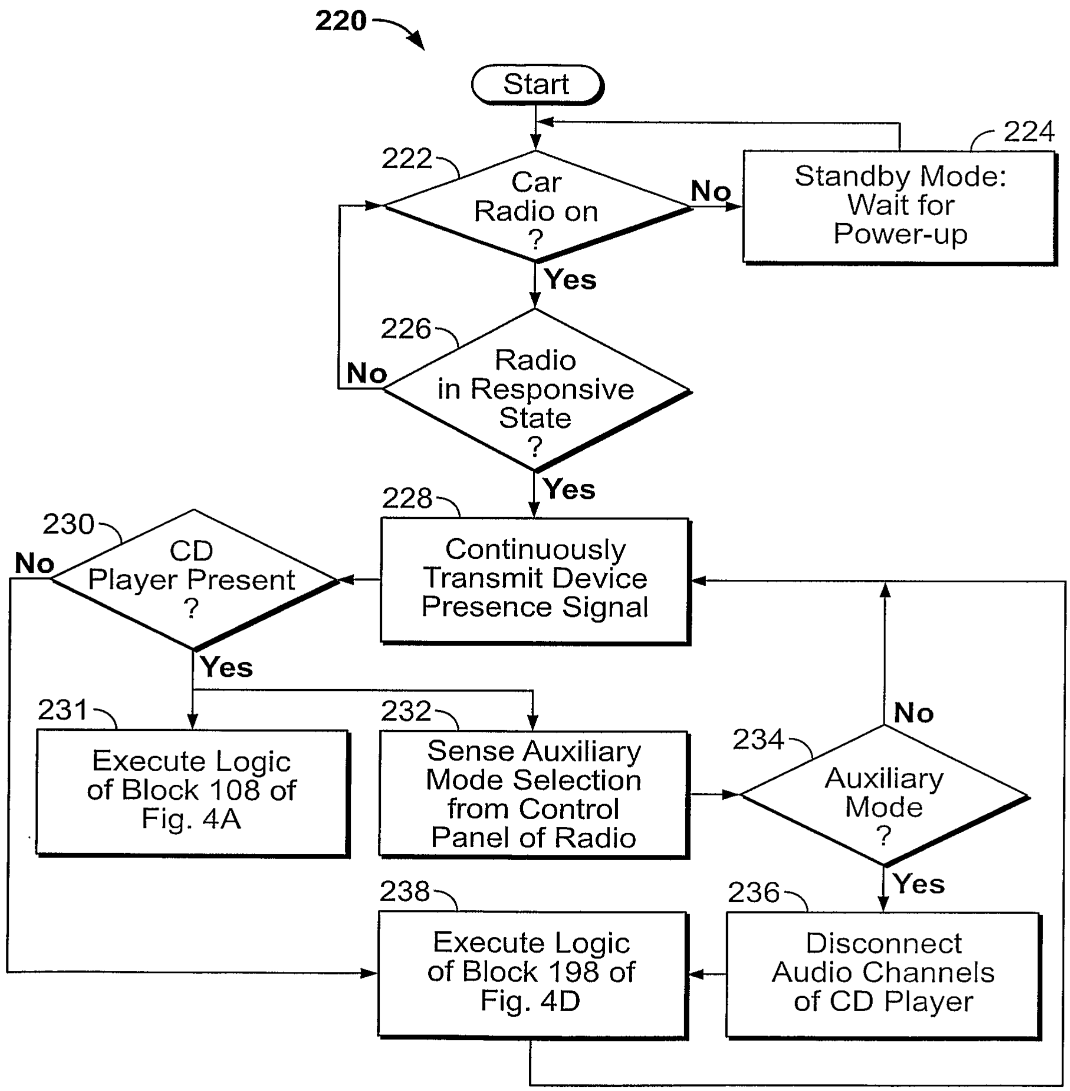
160
Start
162
Car Radio on ?
No
164
Standby Mode: Wait for Power-up
Yes
166
Radio in Responsive State ?
No
Yes
168
170
Continuously Transmit Device Presence Signal
172
Connect Audio Channels of Satellite Receiver to Radio
176
Wait for Operation Instruction from Radio
174
Update Display of Radio with Data from Satellite Receiver
178
No
Instruction ?
Yes
180
Convert Instruction to Format Recognized by Satellite Receiver
182
Transmit Formatted Instruction to Satellite Receiver and Execute

FIG. 4C



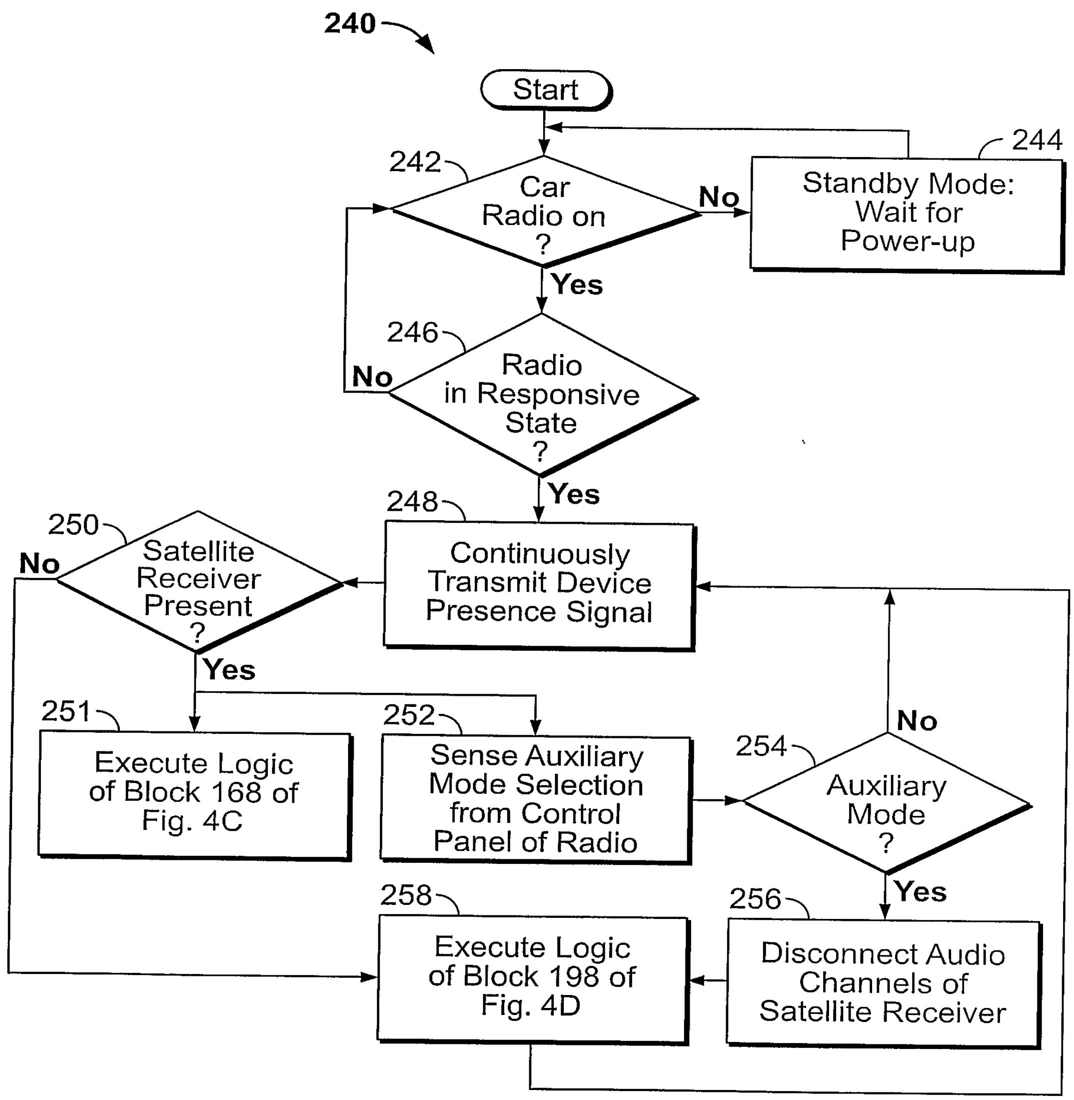
190
Start
192
Car Radio on ?
No
194
Standby Mode: Wait for Power-up
Yes
196
Radio in Responsive State ?
No
Yes
198
202
Sense Control Panel Button Selection
200
Continuously Transmit Device Presence Signal
204
Disc # 1 Selected ?
Yes
206
Connect Auxiliary Channel # 1 to Radio
No
208
Disc # 2 Selected ?
Yes
210
Connect Auxiliary Channel # 2 to Radio
No
212
Disc # 3 Selected ?
Yes
214
Connect Auxiliary Channel # 3 to Radio
No
216
Disc # 4 Selected ?
Yes
218
Connect Auxiliary Channel # 4 to Radio
No

FIG. 4D



220
Start
222
Car Radio on ?
No
224
Standby Mode: Wait for Power-up
Yes
226
Radio in Responsive State ?
No
Yes
228
Continuously Transmit Device Presence Signal
230
CD Player Present ?
No
Yes
231
Execute Logic of Block 108 of Fig. 4A
232
Sense Auxiliary Mode Selection from Control Panel of Radio
234
Auxiliary Mode ?
No
Yes
238
Execute Logic of Block 198 of Fig. 4D
236
Disconnect Audio Channels of CD Player

FIG. 4E



240
Start
242
Car Radio on ?
No
244
Standby Mode: Wait for Power-up
Yes
246
Radio in Responsive State ?
No
Yes
248
Continuously Transmit Device Presence Signal
250
Satellite Receiver Present ?
No
Yes
251
Execute Logic of Block 168 of Fig. 4C
252
Sense Auxiliary Mode Selection from Control Panel of Radio
254
Auxiliary Mode ?
No
Yes
256
Disconnect Audio Channels of Satellite Receiver
258
Execute Logic of Block 198 of Fig. 4D

FIG. 4F

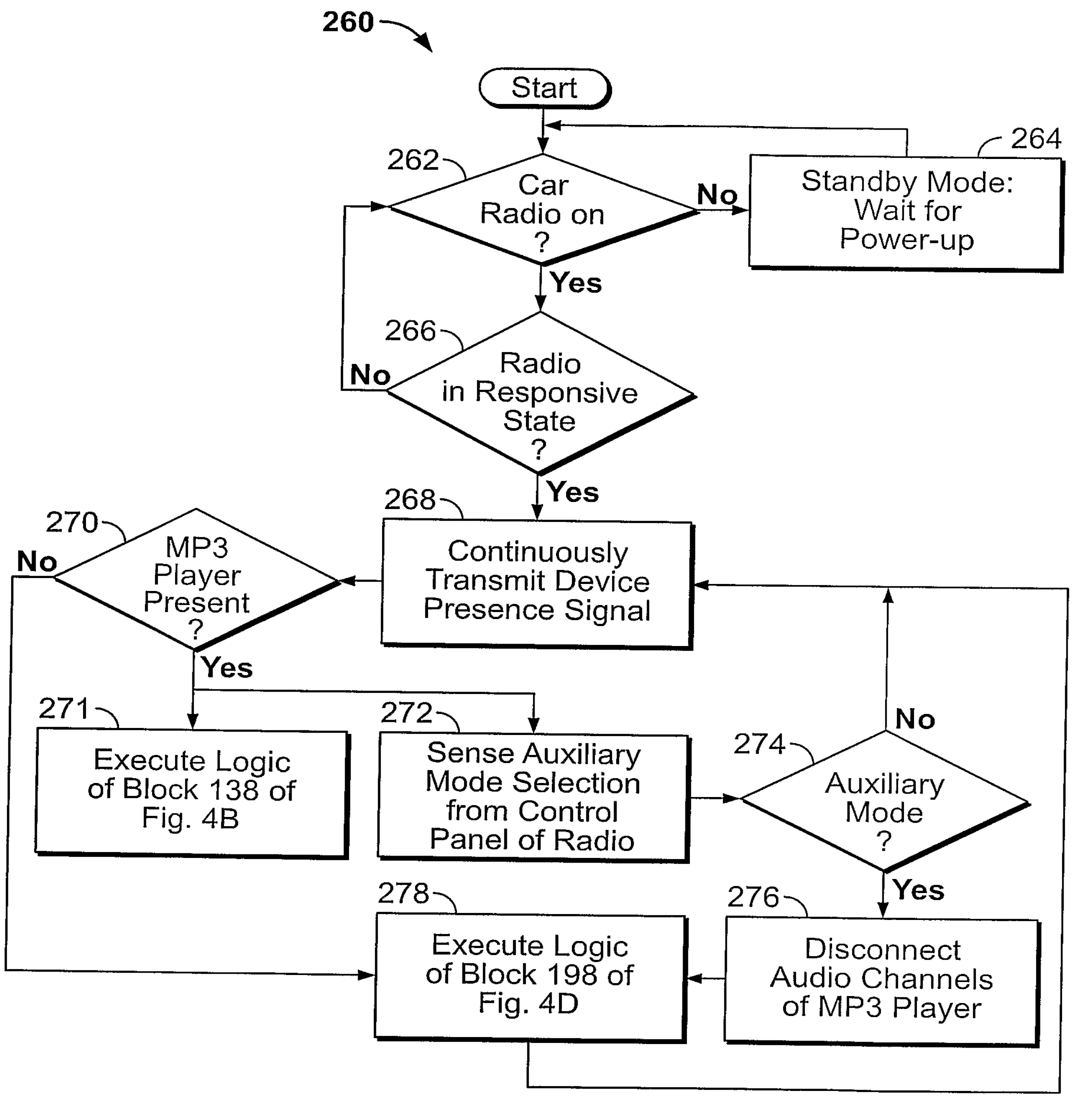

260
Start
262
Car Radio on ?
No
Standby Mode: Wait for Power-up
264
Yes
266
Radio in Responsive State ?
No
Yes
268
Continuously Transmit Device Presence Signal
270
MP3 Player Present ?
No
Yes
271
Execute Logic of Block 138 of Fig. 4B
272
Sense Auxiliary Mode Selection from Control Panel of Radio
274
Auxiliary Mode ?
No
Yes
276
Disconnect Audio Channels of MP3 Player
278
Execute Logic of Block 198 of Fig. 4D

FIG. 4G

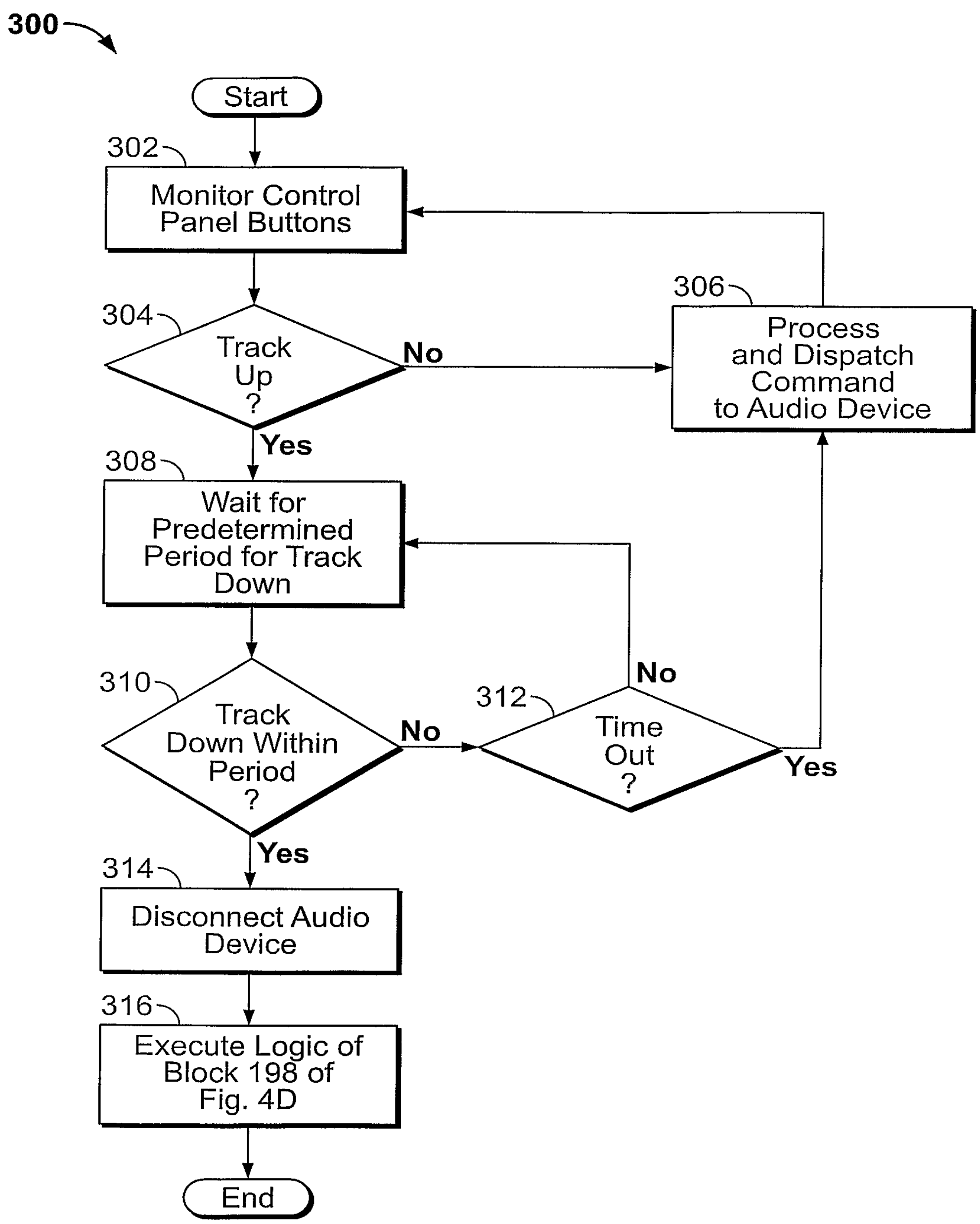

300
Start
302
Monitor Control Panel Buttons
304
Track Up ?
No
306
Process and Dispatch Command to Audio Device
Yes
308
Wait for Predetermined Period for Track Down
310
Track Down Within Period ?
No
312
Time Out ?
No
Yes
Yes
314
Disconnect Audio Device
316
Execute Logic of Block 198 of Fig. 4D
End

FIG. 5

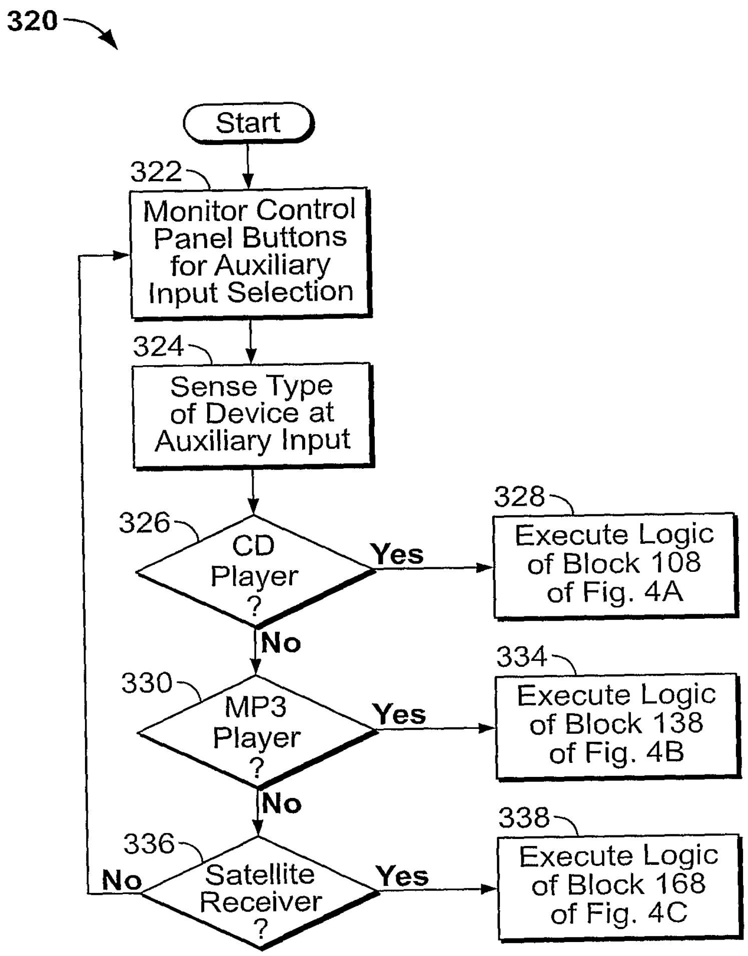

320
Start
322
Monitor Control Panel Buttons for Auxiliary Input Selection
324
Sense Type of Device at Auxiliary Input
326
CD Player ?
Yes
No
328
Execute Logic of Block 108 of Fig. 4A
330
MP3 Player ?
Yes
No
334
Execute Logic of Block 138 of Fig. 4B
336
Satellite Receiver ?
No
Yes
338
Execute Logic of Block 168 of Fig. 4C

FIG. 6

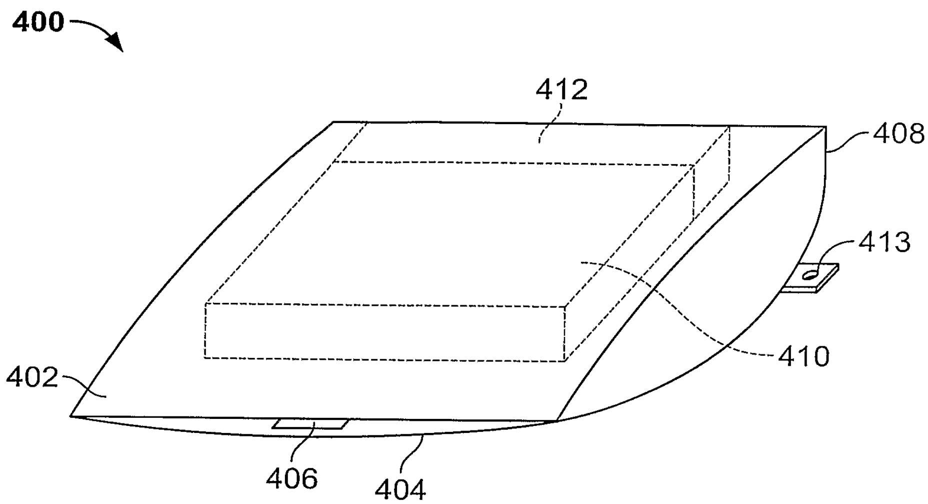


FIG. 7A

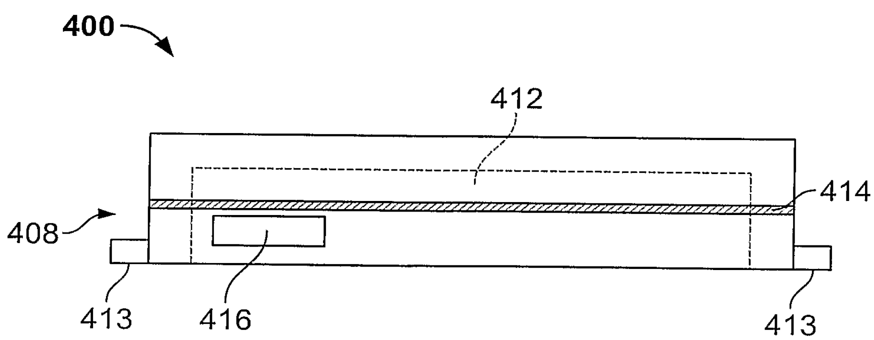


FIG. 7B

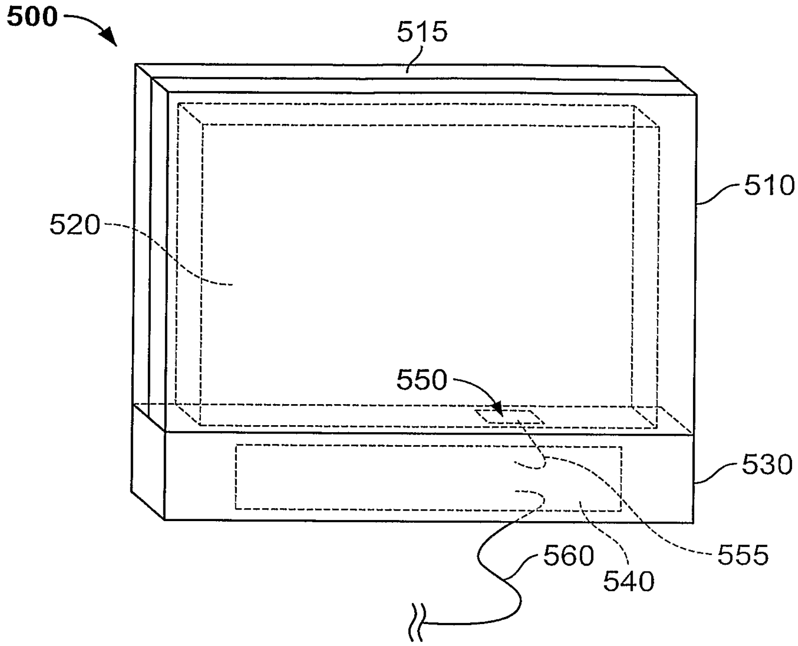


FIG. 8A

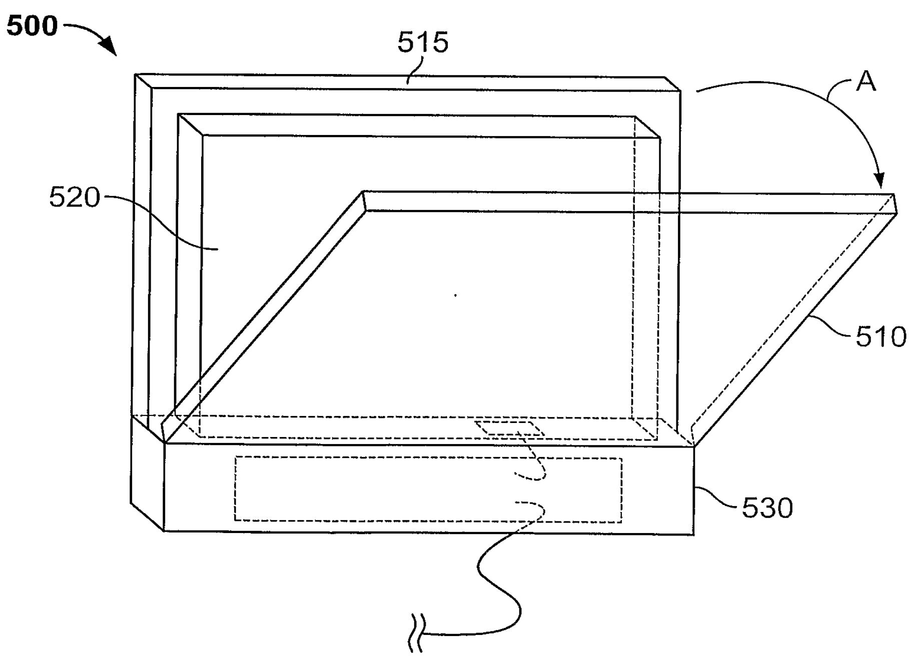


FIG. 8B

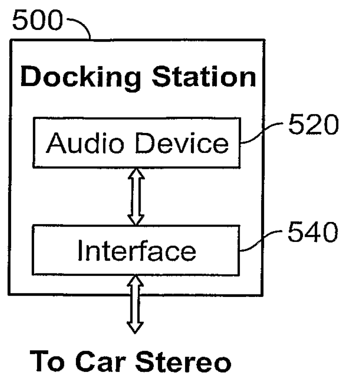

500
Docking Station
Audio Device
520
Interface
540
To Car Stereo

FIG. 9

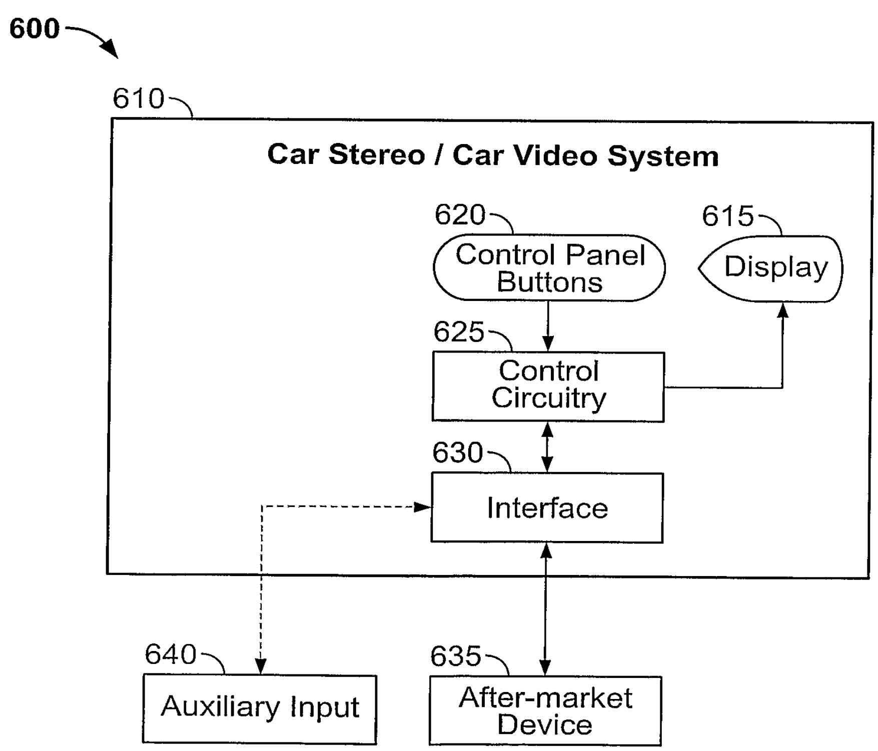

600
610
Car Stereo / Car Video System
620
Control Panel Buttons
615
Display
625
Control Circuitry
630
Interface
640
Auxiliary Input
635
After-market Device

FIG. 10

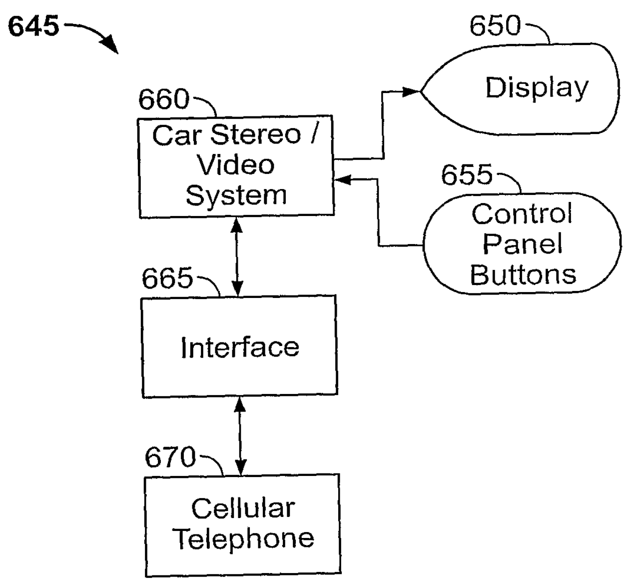

645
650
Display
660
Car Stereo / Video System
655
Control Panel Buttons
665
Interface
670
Cellular Telephone

FIG. 11A

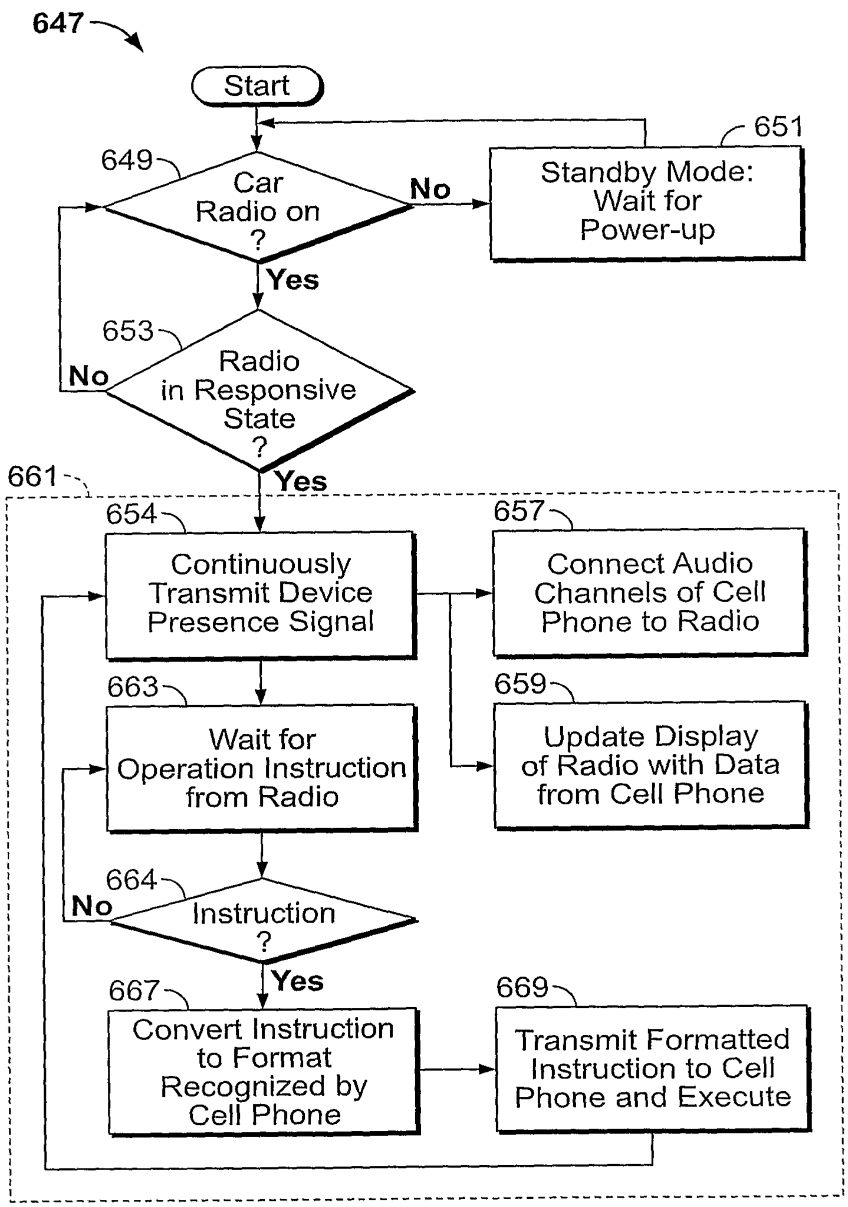

647
Start
649
Car Radio on ?
No
651
Standby Mode: Wait for Power-up
Yes
653
Radio in Responsive State ?
No
661
Yes
654
Continuously Transmit Device Presence Signal
657
Connect Audio Channels of Cell Phone to Radio
663
Wait for Operation Instruction from Radio
659
Update Display of Radio with Data from Cell Phone
664
No
Instruction ?
Yes
667
Convert Instruction to Format Recognized by Cell Phone
669
Transmit Formatted Instruction to Cell Phone and Execute

FIG. 11B

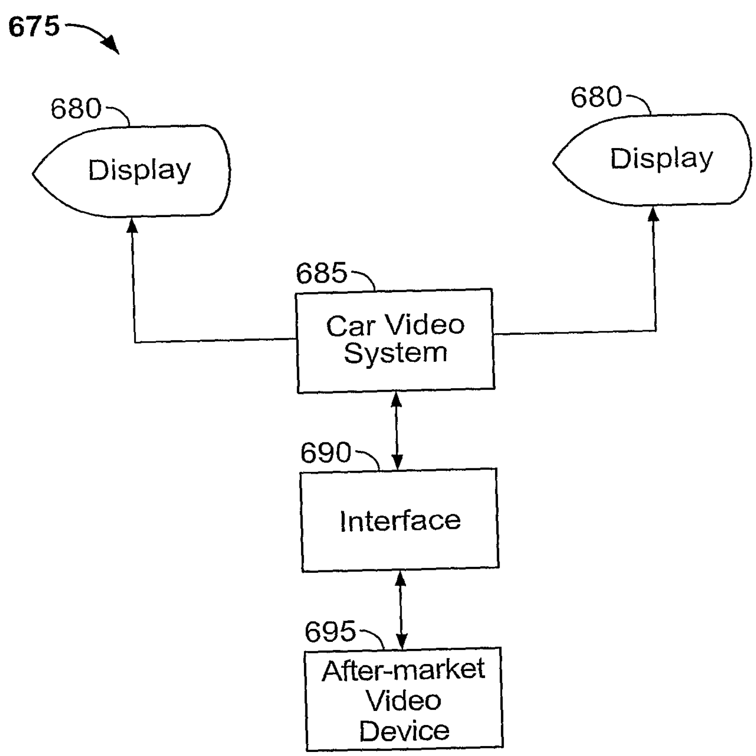
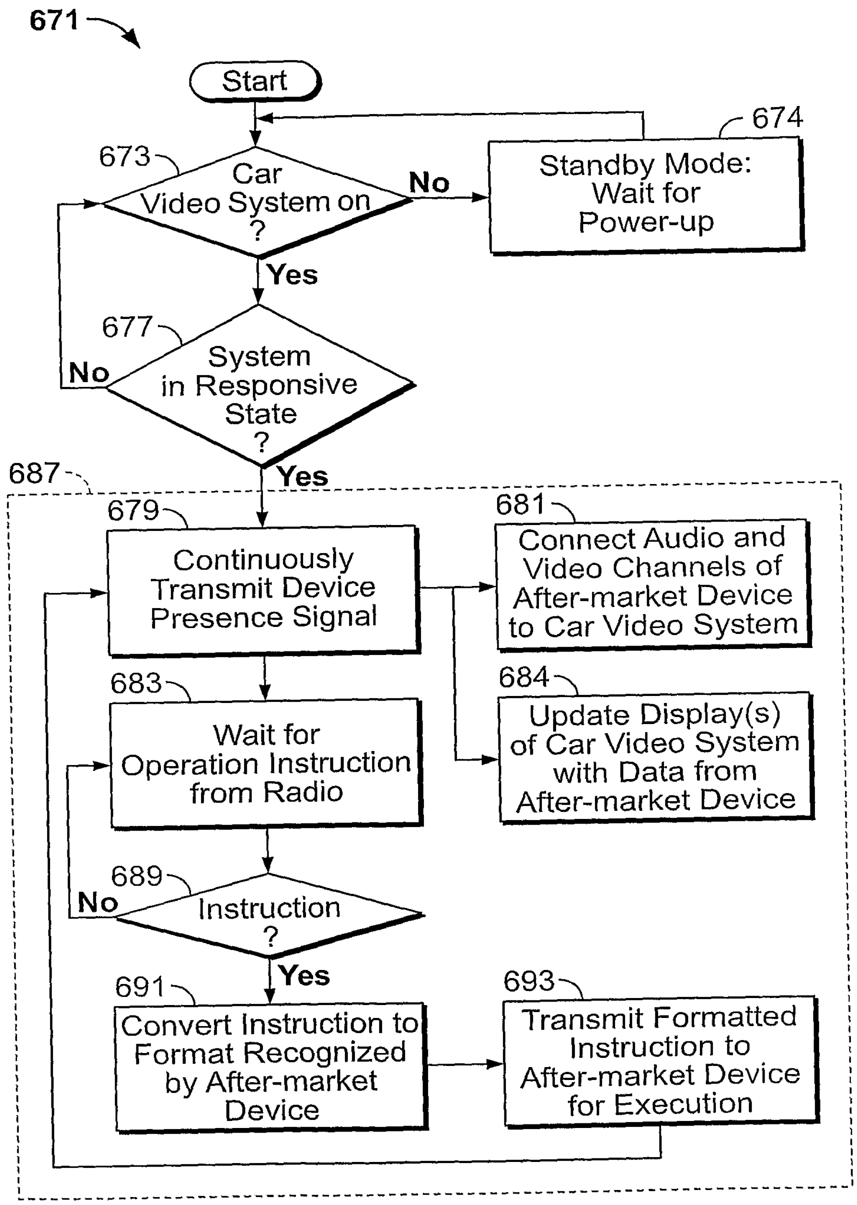

675
680
Display
680
Display
685
Car Video System
690
Interface
695
After-market Video Device

FIG. 12A



671
Start
673
Car Video System on ?
No
674
Standby Mode: Wait for Power-up
Yes
677
System in Responsive State ?
No
Yes
687
679
Continuously Transmit Device Presence Signal
681
Connect Audio and Video Channels of After-market Device to Car Video System
684
Update Display(s) of Car Video System with Data from After-market Device
683
Wait for Operation Instruction from Radio
689
Instruction ?
No
Yes
691
Convert Instruction to Format Recognized by After-market Device
693
Transmit Formatted Instruction to After-market Device for Execution

FIG. 12B

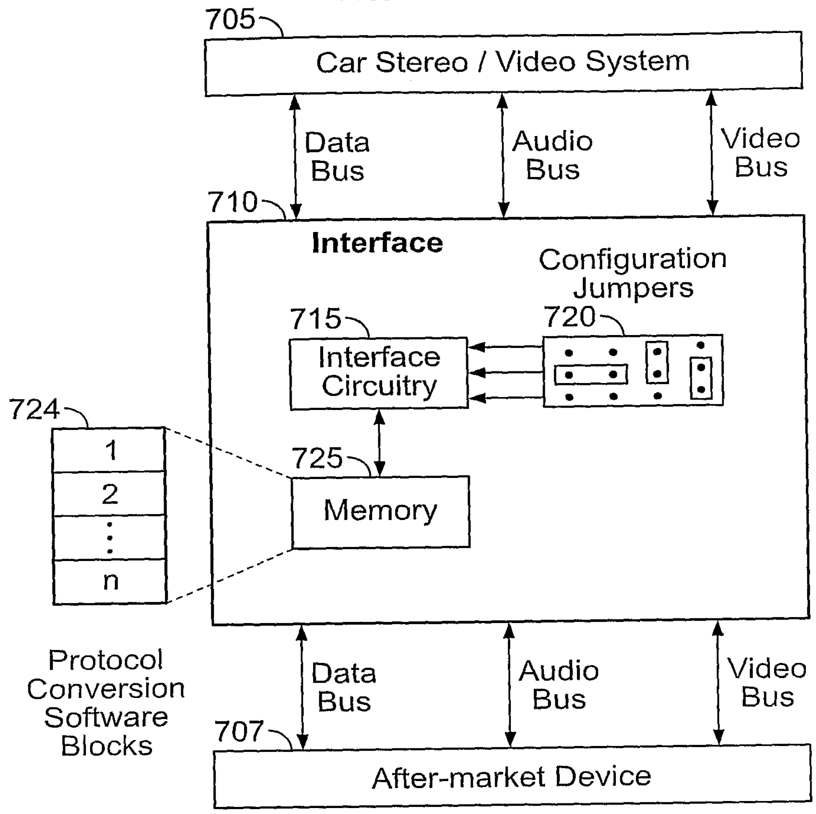


FIG. 13A

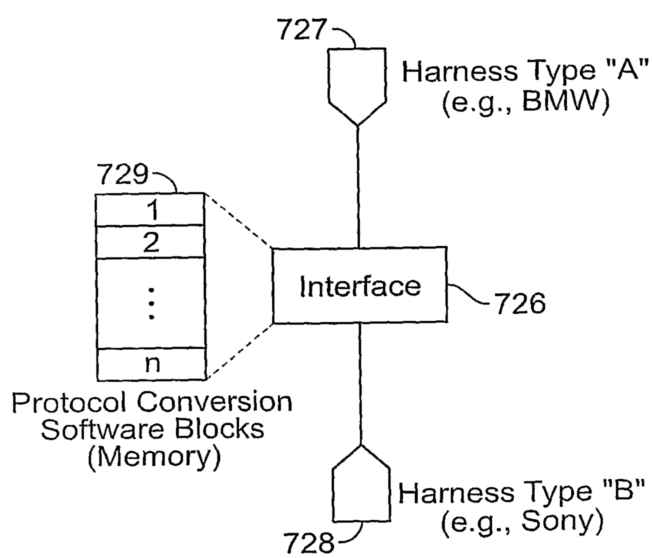


FIG. 13B

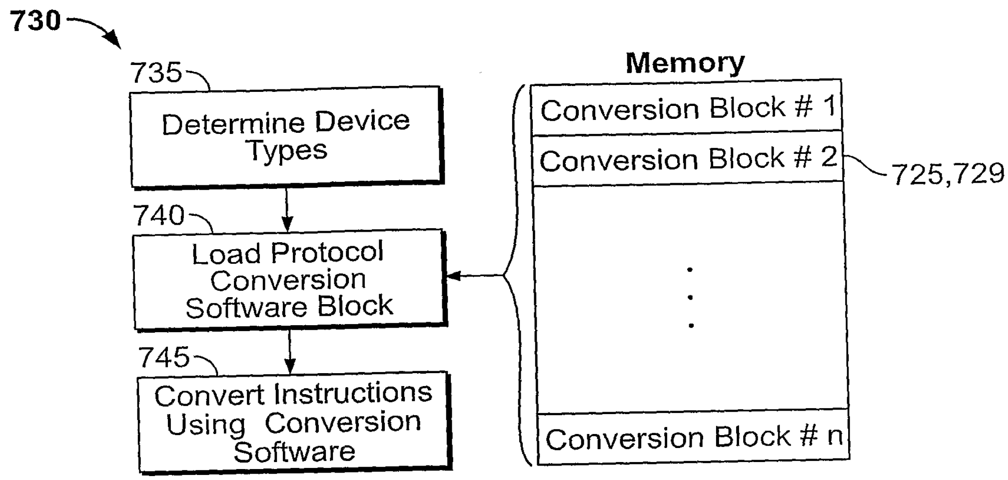

730
735
Determine Device Types
740
Load Protocol Conversion Software Block
745
Convert Instructions Using Conversion Software
Memory
Conversion Block # 1
Conversion Block # 2
Conversion Block # n
725,729

FIG. 14

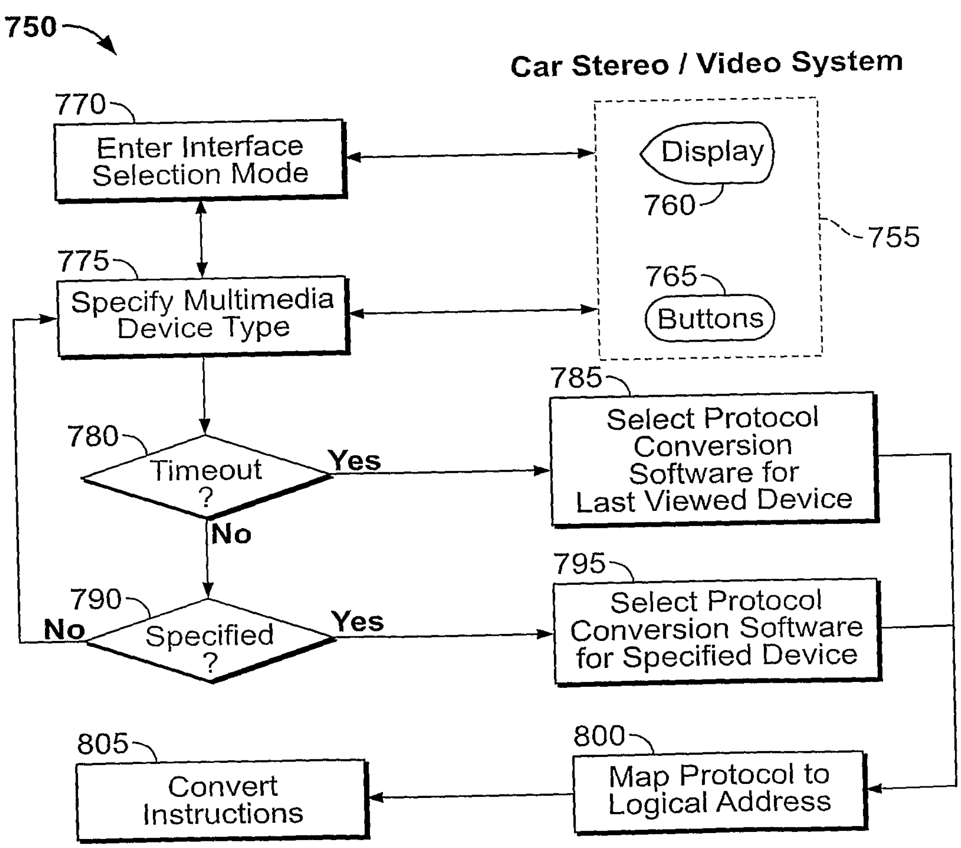
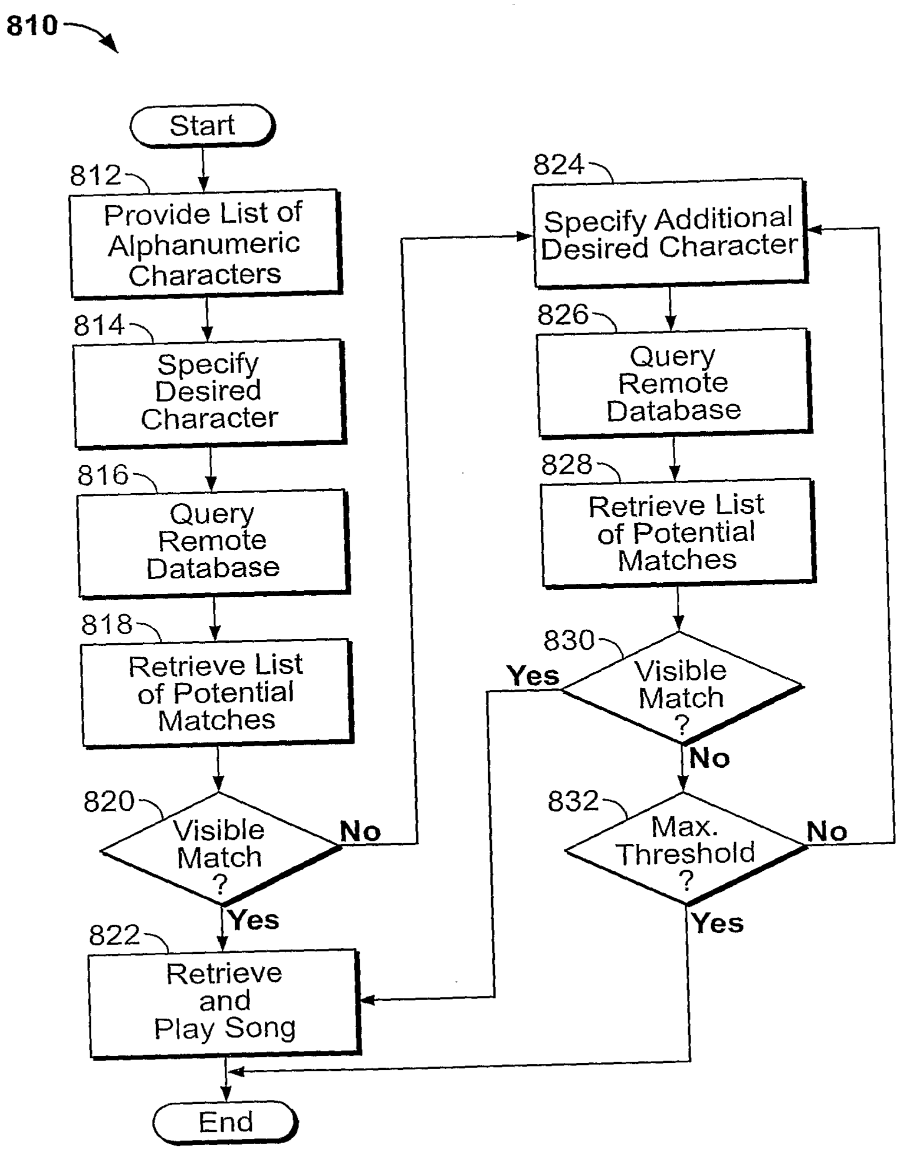

750
Car Stereo / Video System
770
Enter Interface Selection Mode
Display
760
755
775
Specify Multimedia Device Type
765
Buttons
785
Select Protocol Conversion Software for Last Viewed Device
780
Timeout ?
Yes
No
795
Select Protocol Conversion Software for Specified Device
790
No
Specified ?
Yes
805
Convert Instructions
800
Map Protocol to Logical Address

FIG. 15



810
Start
812
Provide List of Alphanumeric Characters
814
Specify Desired Character
816
Query Remote Database
818
Retrieve List of Potential Matches
820
Visible Match ?
No
Yes
822
Retrieve and Play Song
End
824
Specify Additional Desired Character
826
Query Remote Database
828
Retrieve List of Potential Matches
830
Visible Match ?
Yes
No
832
Max. Threshold ?
No
Yes

FIG. 16

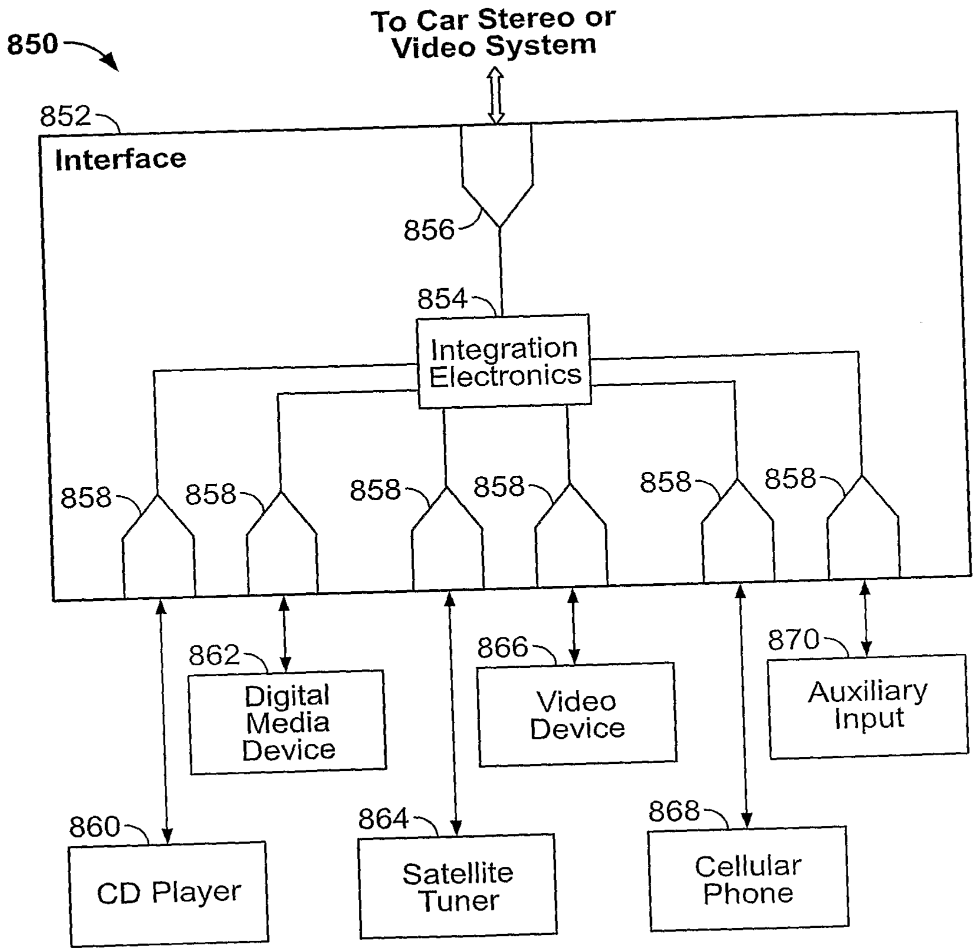

850
To Car Stereo or
Video System
852
Interface
856
854
Integration
Electronics
858
858
858
858
858
858
862
Digital
Media
Device
866
Video
Device
870
Auxiliary
Input
860
CD Player
864
Satellite
Tuner
868
Cellular
Phone

FIG. 17

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(25) Filing Language: English

(26) Publication Language: English

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10/732,909	10 December 2003 (10.12.2003)	US

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(72) Inventor: **MARLOW, Ira**; 6403 Hilltop Court, Fort Lee, NJ 07024 (US).

(74) Agent: **FRISCIA, Michael, R.**; Wolff & Samson, PC, One Boland Drive, West Orange, NJ 07052 (US).

(81) **Designated States** *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) **Designated States** *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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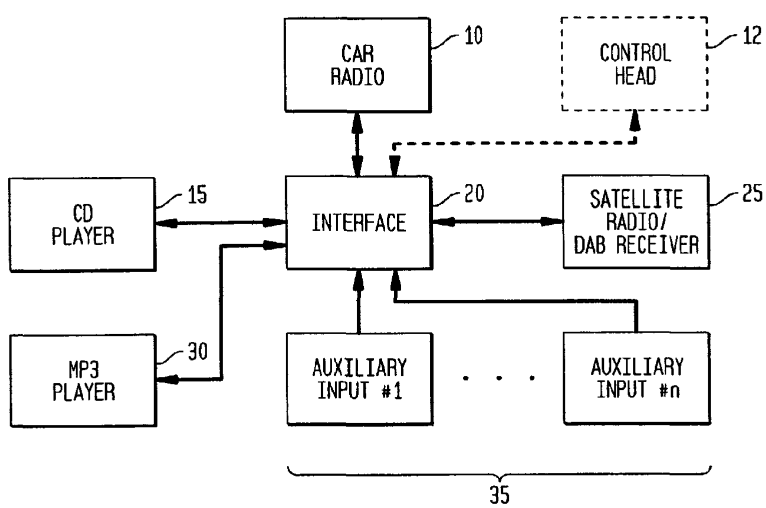
— *with international search report*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

[Continued on next page]

(54) **Title:** AUDIO DEVICE INTEGRATION SYSTEM



(57) **Abstract:** An audio device integration system is provided. One or more after-market audio devices, such as a CD player (15), CD changer, MP3 player (30), satellite receiver (25), DAB receiver (25), or the like, is integrated for use with an existing OEM or after-market car stereo system, wherein control commands can be issued at the car stereo (10) and responsive data from the audio device (15, 25, 30) can be displayed on the stereo. Control commands generated at the car stereo (10) are received, processed, converted into a format recognizable by the audio device (15, 25, 30), and dispatched to the audio device (15, 25, 30) for execution. Information from the audio device (15, 25, 30), including track, disc, song, station, time, and other information, is received, processed, converted into a format recognizable by the car stereo, and dispatched to the car stereo (10) for display thereon.

WO 2004/053722 A1

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

AUDIO DEVICE INTEGRATION SYSTEM

SPECIFICATION

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to an audio device integration system. More specifically, the present invention relates to an audio device integration system for integrating after-market components such as satellite receivers, CD players, CD changers, MP3 players, Digital Audio Broadcast (DAB) receivers, auxiliary audio sources, and the like with factory-installed (OEM) or after-market car stereo systems.

RELATED ART

Automobile audio systems have continued to advance in complexity and the number of options available to automobile purchasers. Early audio systems offered a simple AM and/or FM tuner, and perhaps an analog tape deck for allowing cassettes, 8-tracks, and other types of tapes to be played while driving. Such early systems were closed, in that external devices could not be easily integrated therewith.

With advances in digital technology, CD players have been included with automobile audio systems. Original Equipment Manufacturers (OEMs) often produce car stereos having CD players and/or changers for allowing CDs to be played while driving. However, such systems often include proprietary buses and protocols that do not allow after-market audio systems, such as satellite receivers (e.g., XM satellite tuners), digital audio broadcast (DAB) receivers, MP3 players, CD changers, auxiliary input sources, and the like, to be easily integrated therewith. Thus, automobile purchasers are frequently forced to either entirely replace the OEM audio system, or use same throughout the life of the vehicle or the duration of ownership. Even if the OEM radio is replaced with an after-market radio, the after-market radio also frequently is not operable with an external device.

A particular problem with integrating after-market audio systems with existing car stereos is that signals generated by the car stereo is in a proprietary format, and is not capable of being processed by the after-market system. Additionally, signals generated by the after-market system are also in a proprietary format that is not recognizable by the car stereo. Thus, in order to integrate after-market systems with car stereos, it is necessary to convert signals between such systems.

It known in the art to provide one or more expansion modules for OEM and after-market car stereos for allowing external audio products to be integrated with the car stereo. However, such expansion modules only operate with and allow integration of external audio products manufactured by the same manufacturer as the OEM / after-market car stereo. For example, a satellite receiver manufactured by PIONEER, Inc., cannot be integrated with an OEM car radio manufactured by TOYOTA or an after-market car radio manufactured by CLARION, Inc. Thus, existing expansion modules only serve the limited purpose of integrating equipment by the same manufacturer as the car stereo. Thus, it would be desirable to provide an integration system that allows any audio device of any manufacture to be integrated with any OEM or after-market radio system.

Moreover, it would be desirable to provide an integration system that not only achieves integration of various audio devices that are alien to a given OEM or after-market stereo system, but also allows for information to be exchanged between the after-market device and the car stereo. For example, it would be desirable to provide a system wherein station, track, time, and song information can be retrieved from the after-market device, formatted, and transmitted to the car stereo for display thereby, such as at an LCD panel of the car stereo. Such information could be transmitted and displayed on both hardwired radio systems (*e.g.*, radios installed in dashboards or at other locations within the car), or integrated for display on one or more software or graphically-driven radio systems operable with graphical display panels. Additionally, it would be desirable to provide an audio integration system that allows a user to control more than one device, such as a CD or satellite receiver and one or more auxiliary sources, and to quickly and conveniently switch between same using the existing controls of the car stereo.

Accordingly, the present invention addresses these needs by providing an audio integration system that allows a plurality of audio devices, such as CD players, CD changers, MP3 players, satellite receivers, DAB receivers, auxiliary input sources, or a combination thereof, to be integrated into existing car stereos while allowing information to be displayed on, and control to be provided from, the car stereo.

SUMMARY OF THE INVENTION

The present invention relates to an audio device integration system. One or more after-market audio devices, such as a CD player, CD changer, MP3 player, satellite receiver (e.g., XM tuner), digital audio broadcast (DAB) receiver, or auxiliary input source, can be connected to and operate with an existing stereo system in an automobile, such as an OEM car stereo system or an after-market car stereo system installed in the automobile. The integration system connects to and interacts with the car stereo at any available port of the car stereo, such as a CD input port, a satellite input, or other known type of connector. If the car stereo system is an after-market car stereo system, the present invention generates a signal that is sent to the car stereo to keep same in an operational state and responsive to external data and signals. Commands generated at the control panel are received by the present invention and converted into a format recognizable by the after-market audio device. The formatted commands are executed by the audio device, and audio therefrom is channeled to the car stereo. Information from the audio device is received by the present invention, converted into a format recognizable by the car stereo, and forwarded to the car stereo for display thereby. The formatted information could include information relating to a CD or MP3 track being played, channel, song, and artist information from a satellite receiver or DAB receiver, or video information from one or more external devices connected to the present invention. The information can be presented as one or more menus, textual, or graphical prompts for display on an LCD display of the radio, allowing interaction with the user at the radio. A docking port is provided for allowing portable external audio devices to be connected to the interface of the present invention.

In an embodiment of the present invention, a dual-input device is provided for integrating both an external audio device and an auxiliary input with an OEM or after-market car stereo. The user can select between the external audio device and the auxiliary input using the controls of the car stereo. The invention can automatically detect the type of device connected to the auxiliary input, and integrate same with the car stereo.

In another embodiment of the present invention, an interface is provided for integrating a plurality of auxiliary input sources with an existing car stereo system. A user can select between the auxiliary sources using the control panel of the car stereo. One or more after-market audio devices can be integrated with the auxiliary input sources, and a user can switch between the audio device and the auxiliary input sources using the car stereo. Devices connected to the auxiliary input sources are inter-operable with the car stereo, and are capable of exchanging commands and data via the interface.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other important objects and features of the invention will be apparent from the following Detailed Description of the Invention, taken in connection with the accompanying drawings, in which:

FIG. 1 is a block diagram showing the audio device integration system of the present invention.

FIG. 2a is a block diagram showing an alternate embodiment of the audio device integration system of the present invention, wherein a CD player is integrated with a car radio.

FIG. 2b is a block diagram showing an alternate embodiment of the audio device integration system of the present invention, wherein a MP3 player is integrated with a car radio.

FIG. 2c is a block diagram showing an alternate embodiment of the audio device integration system of the present invention, wherein a satellite or DAB receiver is integrated with a car radio.

FIG. 2d is a block diagram showing an alternate embodiment of the audio device integration system of the present invention, wherein a plurality of auxiliary input sources are integrated with a car radio.

FIG. 2e is a block diagram showing an alternate embodiment of the audio device integration system of the present invention, wherein a CD player and a plurality of auxiliary input sources are integrated with a car radio.

FIG. 2f is a block diagram showing an alternate embodiment of the present invention, wherein a satellite or DAB receiver and a plurality of auxiliary input source are integrated with a car radio.

FIG. 2g is a block diagram showing an alternate embodiment of the present invention, wherein a MP3 player and a plurality of auxiliary input sources are integrated with a car radio.

FIG. 2h is a block diagram showing an alternate embodiment of the present invention, wherein a plurality of auxiliary interfaces and an audio device are integrated with a car stereo.

FIG. 3a is a circuit diagram showing a device according to the present invention for integrating a CD player or an auxiliary input source with a car radio.

FIG. 3b is a circuit diagram showing a device according to the present invention for integrating both a CD player and an auxiliary input source with a car radio, wherein the CD player and the auxiliary input are switchable by a user.

FIG. 3c is a circuit diagram showing a device according to the present invention for integrating a plurality of auxiliary input sources with a car radio.

FIG. 3d is a circuit diagram showing a device according to the present invention for integrating a satellite or DAB receiver with a car radio.

FIG. 4a is a flowchart showing processing logic according to the present invention for integrating a CD player with a car radio.

FIG. 4b is a flowchart showing processing logic according to the present invention for integrating a MP3 player with a car radio.

FIG. 4c is a flowchart showing processing logic according to the present invention for integrating a satellite receiver with a car radio.

FIG. 4d is a flowchart showing processing logic according to the present invention for integrating a plurality of auxiliary input sources with a car radio.

FIG. 4e is a flowchart showing processing logic according to the present invention for integrating a CD player and one or more auxiliary input sources with a car radio.

FIG. 4f is a flowchart showing processing logic according to the present invention for integrating a satellite or DAB receiver and one or more auxiliary input sources with a car radio.

FIG. 4g is a flowchart showing processing logic according to the present invention for integrating a MP3 player and one or more auxiliary input sources with a car stereo.

FIG. 5 is a flowchart showing processing logic according to the present invention for allowing a user to switch between an after-market audio device and one or more auxiliary input sources.

FIG. 6 is a flowchart showing processing logic according to the present invention for determining and handling various device types connected to the auxiliary input ports of the invention.

FIG. 7a is a perspective view of a docking station according to the present invention for retaining an audio device within a car.

FIG. 7b is an end view of the docking station of **FIG. 7a**.

FIGS. 8a-8b are perspective views of another embodiment of the docking station of the present invention, which includes the audio device integration system of the present invention incorporated therewith.

FIG. 9 is a block diagram showing the components of the docking station of **FIGS. 8a-8b**.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to an audio device integration system. One or more after-market audio devices, such as a CD player, CD changer, MP3 player, satellite receiver, digital audio broadcast (DAB) receiver, or the like, can be integrated with an existing car radio, such as an OEM car stereo or an after-market car stereo. Control of the audio device is enabled using the car radio, and information from the audio device, such as channel, artist, track, time, and song information, is retrieved form the audio device, processed, and forwarded to the car radio for display thereon. The information channeled to the car radio can include video from the external device, as well as graphical and menu-based information. A user can review and interact with information via the car stereo. Commands from the car radio are received, processed by the present invention into a format recognizable by the audio device, and transmitted thereto for execution. One or more auxiliary input channels can be integrated by the present invention with the car radio. The user can switch between one or more audio devices and one or more auxiliary input channels using the control panel buttons of the car radio.

As used herein, the term "integration" or "integrated" is intended to mean connecting one or more external devices or inputs to an existing car radio or stereo via an interface, processing and handling signals and audio channels, allowing a user to control the devices via the car stereo, and displaying data from the devices on the radio. Thus, for example, integration of a CD player with a car stereo system allows for the CD player to be remotely controlled via the control panel of the stereo system, and data from the CD player to be sent to the display of the stereo. Of course, control of audio devices can be provided at locations other than the control panel of the radio without departing from the spirit or scope of the present invention. Further, as used herein, the term "inter-operable" is intended to mean allowing the external audio device to receive and process commands that have been formatted by the interface of the present invention, as well as allowing a car stereo to display information that is generated by the external audio device and processed by the present invention. Additionally, by the term "inter-operable," it is meant allowing a device that is alien to the environment of an existing OEM or after-market car stereo to be utilized thereby.

Also, as used herein, the terms "car stereo" and "car radio" are used interchangeably and are intended to include all presently existing car stereos and radios, such as physical devices that are present at any location within a vehicle, in addition to software and/or graphically- or display-driven receivers. An example of such a receiver is a software-driven receiver that operates on a universal LCD panel within a vehicle and is operable by a user via a graphical user interface displayed on the universal LCD panel. Further, any future receiver, whether a hardwired or a software/graphical receiver operable on one or more displays, is considered within the definition of the terms "car stereo" and "car radio," as used herein, and is within the spirit and scope of the present invention.

FIG. 1 is a block diagram showing the audio device integration (or interface) system of the present invention, generally indicated at **20**. A plurality of devices and auxiliary inputs can be connected to the interface **20**, and integrated with an OEM or after-market car radio **10**. A CD player or changer **15** can be integrated with the radio **10** via interface **20**. A satellite radio or DAB receiver **25**, such as an XM radio satellite receiver or DAB receiver known in the art, could be integrated with the radio **10**, via the interface **20**. Further, an MP3 player could also be integrated with the radio **10** via interface **20**. Moreover, a plurality of auxiliary input sources, illustratively indicated as auxiliary input sources **35** (comprising input sources 1 through *n*, *n* being any number), could also be integrated with the car radio **10** via interface **20**. Optionally, a control head **12**, such as that commonly used with after-market CD changers and other similar devices, could be integrated with the car radio **10** via interface **20**, for controlling any of the car radio **10**, CD player/changer **15**, satellite/DAB receiver **25**, MP3 player **30**, and auxiliary input sources **35**. Thus, as can be readily appreciated, the interface **20** of the present invention allows for the integration of a multitude of devices and inputs with an OEM or after-market car radio or stereo.

FIG. 2a is a block diagram of an alternate embodiment of the audio device interface system of the present invention, wherein a CD player/changer **15** is integrated with an OEM or after-market car radio **10**. The CD player **15** is electrically connected with the interface **20**, and exchanges data and audio signals therewith. The interface **20** is electrically connected with the car radio **10**, and exchanges data and audio signals therewith. In a preferred embodiment of the present invention, the car radio **10** includes a display **13** (such as an alphanumeric, electroluminescent display) for displaying information, and a plurality of control panel buttons **14** that normally operate to control the radio **10**. The interface **20** allows the CD player **15** to be controlled by the control buttons **14** of the radio **10**. Further, the interface **20** allows information from the CD player **15**, such as track, disc, time, and song information, to be retrieved therefrom, processed and formatted by the interface **20**, sent to the display **13** of the radio **10**.

Importantly, the interface **20** allows for the remote control of the CD player **15** from the radio **10** (e.g., the CD player **15** could be located in the trunk of a car, while the radio **10** is mounted on the dashboard of the car). Thus, for example, one or more discs stored within the CD player **15** can be remotely selected by a user from the radio **10**, and tracks on one or more of the discs can be selected therefrom. Moreover, standard CD operational commands, such as pause, play, stop, fast forward, rewind, track forward, and track reverse (among other commands) can be remotely entered at the control panel buttons **14** of the radio **10** for remotely controlling the CD player **15**.

FIG. 2b is a block diagram showing an alternate embodiment of the present invention, wherein an MP3 player **30** is integrated with an OEM or after-market car radio **10** via interface **20**. As mentioned earlier, the interface **20** of the present invention allows for a plurality of disparate audio devices to be integrated with an existing car radio for use therewith. Thus, as shown in **FIG. 2b**, remote control of the MP3 player **30** via radio **10** is provided for via interface **20**. The MP3 player **30** is electronically interconnected with the interface **20**, which itself is electrically interconnected with the car radio **10**. The interface **20** allows data and audio signals to be exchanged between the MP3 player **30** and the car radio **10**, and processes and formats signals accordingly so that instructions and data from the radio **10** are processable by the MP3 player **30**, and vice versa. Operational commands, such as track selection, pause, play, stop, fast forward, rewind, and other commands, are entered via the control panel buttons **14** of car radio **10**, processed by the interface **20**, and formatted for execution by the MP3 player **30**. Data from the MP3 player, such as track, time, and song information, is received by the interface **20**, processed thereby, and sent to the radio **10** for display on display **13**. Audio from the MP3 player **30** is selectively forwarded by the interface **20** to the radio **10** for playing.

FIG. 2c is a block diagram showing an alternate embodiment of the present invention, wherein a satellite receiver or DAB receiver **25** is integrated with an OEM or after-market car radio **10** via the interface **20**. Satellite/DAB receiver **25** can be any satellite radio receiver known in the art, such as XM or Sirius, or any DAB receiver known in the art. The satellite/DAB receiver **25** is electrically interconnected with the interface **20**, which itself is electrically interconnected with the car radio **10**. The satellite/DAB receiver **25** is remotely operable by the control panel buttons **14** of the radio **10**. Commands from the radio **10** are received by the interface **20**, processed and formatted thereby, and dispatched to the satellite/DAB receiver **25** for execution thereby. Information from the satellite/DAB receiver **25**, including time, station, and song information, is received by the interface **20**, processed, and transmitted to the radio **10** for display on display **13**. Further, audio from the satellite/DAB receiver **25** is selectively forwarded by the interface **20** for playing by the radio **10**.

FIG. 2d is a block diagram showing an alternate embodiment of the present invention, wherein one or more auxiliary input sources **35** are integrated with an OEM or after-market car radio **10**. The auxiliary inputs **35** can be connected to analog sources, or can be digitally coupled with one or more audio devices, such as after-market CD players, CD changers, MP3 players, satellite receivers, DAB receivers, and the like, and integrated with an existing car stereo. Preferably, four auxiliary input sources are connectable with the interface **20**, but any number of auxiliary input sources could be included. Audio from the auxiliary input sources **35** is selectively forwarded to the radio **10** under command of the user. As will be discussed herein in greater detail, a user can select a desired input source from the auxiliary input sources **35** by depressing one or more of the control panel buttons **14** of the radio **10**. The interface **20** receives the command initiated from the control panel, processes same, and connects the corresponding input source from the auxiliary input sources **35** to allow audio therefrom to be forwarded to the radio **10** for playing. Further, the interface **20** determines the type of audio devices connected to the auxiliary input ports **35**, and integrates same with the car stereo **10**.

As mentioned previously, the present invention allows one or more external audio devices to be integrated with an existing OEM or after-market car stereo, along with one or more auxiliary input sources, and the user can select between these sources using the controls of the car stereo. Such "dual input" capability allows operation with devices connected to either of the inputs of the device, or both. Importantly, the device can operate in "plug and play" mode, wherein any device connected to one of the inputs is automatically detected by the present invention, its device type determined, and the device automatically integrated with an existing OEM or after-market car stereo. Thus, the present invention is not dependent any specific device type to be connected therewith to operate. For example, a user can first purchase a CD changer, plug same into a dual interface, and use same with the car stereo. At a point later in time, the user could purchase an XM tuner, plug same into the device, and the tuner will automatically be detected and integrated with the car stereo, allowing the user to select from and operate both devices from the car stereo. It should be noted that such plug and play capability is not limited to a dual input device, but is provided for in every embodiment of the present invention. The dual-input configuration of the preset invention is illustrated in **FIGS. 2e-2h** and described below.

FIG. 2e is a block diagram showing an alternate embodiment of the present invention, wherein an external CD player/changer **15** and one or more auxiliary input sources **35** are integrated with an OEM or after-market car stereo **10**. Both the CD player **15** and one or more of the auxiliary input sources **35** are electrically interconnected with the interface **20**, which, in turn, is electrically interconnected to the radio **10**. Using the controls **14** of the radio **10**, a user can select between the CD player **15** and one or more of the inputs **35** to selectively channel audio from these sources to the radio. The command to select from one of these sources is received by the interface **20**, processed thereby, and the corresponding source is channeled to the radio **10** by the interface **20**. As will be discussed later in greater detail, the interface **20** contains internal processing logic for selecting between these sources.

FIG. 2f is a block diagram of an alternate embodiment of the present invention, wherein a satellite receiver or DAB receiver and one or more auxiliary input sources are integrated by the interface **20** with an OEM or after-market car radio

10. Similar to the embodiment of the present invention illustrated in **FIG. 2e** and described earlier, the interface **20** allows a user to select between the satellite/DAB receiver **25** and one or more of the auxiliary input sources **35** using the controls **14** of the radio **10**. The interface **20** contains processing logic, described in greater detail below, for allowing switching between the satellite/DAB receiver **25** and one or more of the auxiliary input sources **35**.

FIG. 2g is a block diagram of an alternate embodiment of the present invention, wherein a MP3 player **30** and one or more auxiliary input sources **35** are integrated by the interface **20** with an OEM or after-market car radio **10**. Similar to the embodiments of the present invention illustrated in **FIGS. 2e** and **2f** and described earlier, the interface **20** allows a user to select between the MP3 player **30** and one or more of the auxiliary input sources **35** using the controls **14** of the radio **10**. The interface **20** contains processing logic, as will be discussed later in greater detail, for allowing switching between the MP3 player **30** and one or more of the auxiliary input sources **35**.

FIG. 2h is a block diagram showing an alternate embodiment of the present invention, wherein a plurality of auxiliary interfaces **40** and **44** and an audio device **17** are integrated with an OEM or after-market car stereo **10**. Importantly, the present invention can be expanded to allow a plurality of auxiliary inputs to be connected to the car stereo **10** in a tree-like fashion. Thus, as can be seen in **FIG. 2h**, a first auxiliary interface **40** is connected to the interface **20**, and allows data and audio from the ports **42** to be exchanged with the car radio **10**. Connected to one of the ports **42** is another auxiliary interface **44**, which, in turn, provides a plurality of input ports **46**. Any device connected to any of the ports **42** or **46** can be integrated with the car radio **10**. Further, any device connected to the ports **42** or **46** can be inter-operable with the car radio **10**, allowing commands to be entered from the car radio **10** (*e.g.*, such as via the control panel **14**) for commanding the device, and information from the device to be displayed by the car radio **10**. Conceivably, by configuring the interfaces **40**, **44**, and successive interfaces in a tree configuration, any number of devices can be integrated using the present invention.

The various embodiments of the present invention described above and shown in **FIGS. 1** through **2h** are illustrative in nature and are not intended to limit the spirit or scope of the present invention. Indeed, any conceivable audio device or input source, in any desired combination, can be integrated by the present invention into existing car stereo systems. Further, it is conceivable that not only can data and audio signals be exchanged between the car stereo and any external device, but also video information that can be captured by the present invention, processed thereby, and transmitted to the car stereo for display thereby and interaction with a user thereat.

Various circuit configurations can be employed to carry out the present invention. Examples of such configurations are described below and shown in **FIGS. 3a-3d**.

FIG. 3a is an illustrative circuit diagram according to the present invention for integrating a CD player or an auxiliary input source with an existing car stereo system. A plurality of ports **J1C1, J2A1, X2, RCH,** and **LCH** are provided for allowing connection of the interface system of the present invention between an existing car radio, an after-market CD player or changer, or an auxiliary input source. Each of these ports could be embodied by any suitable electrical connector known in the art. Port **J1C1** connects to the input port of an OEM car radio, such as that manufactured by TOYOTA, Inc. Conceivably, port **J1C1** could be modified to allow connection to the input port of an after-market car radio. Ports **J2A1, X2, RCH,** and **LCH** connect to an after-market CD changer, such as that manufactured by PANASONIC, Inc., or to an auxiliary input source.

Microcontroller **U1** is in electrical communication with each of the ports **J1C1, J2A1,** and **X2,** and provides functionality for integrating the CD player or auxiliary input source connected to the ports **J2A1, X2, RCH,** and **LCH**. For example, microcontroller **U1** receives control commands, such as button or key sequences, initiated by a user at control panel of the car radio and received at the connector **J1C1,** processes and formats same, and dispatches the formatted commands to the CD player or auxiliary input source via connector **J2A1**. Additionally, the microcontroller **U1** receives information provided by the CD player or auxiliary input source via connector **J2A1**, processes and formats same, and transmits the formatted data to the car stereo via connector **J1C1** for display on the display of the car stereo. Audio signals provided at the ports **J2A1, X2, RCH** and **LCH** is selectively channeled to the car radio at port **J1C1** under control of one or more user commands and processing logic, as will be discussed in greater detail, embedded within microcontroller **U1**.

In a preferred embodiment of the present invention, the microcontroller **U1** comprises the 16F628 microcontroller manufactured by MICROCHIP, Inc. The 16F628 chip is a CMOS, flash-based, 8-bit microcontroller having an internal, 4 MHz internal oscillator, 128 bytes of EEPROM data memory, a capture/compare/PWM, a USART, 2 comparators, and a programmable voltage reference. Of course, any suitable microcontroller known in the art can be substituted for microcontroller **U1** without departing from the spirit or scope of the present invention.

A plurality of discrete components, such as resistors **R1** through **R13**, diodes **D1** through **D4**, capacitors **C1** and **C2**, and oscillator **Y1**, among other components, are provided for interfacing the microcontroller **U1** with the hardware connected to the connectors **J1C1, J2A1, X2, RCH**, and **LCH**. These components, as will be readily appreciated to one of ordinary skill in the art, can be arranged as desired to accommodate a variety of microcontrollers, and the numbers and types of discrete components can be varied to accommodate other similar controllers. Thus, the circuit shown in **FIG. 3a** and described herein is illustrative in nature, and modifications thereof are considered to be within the spirit and scope of the present invention.

FIG. 3b is a diagram showing an illustrative circuit configuration according to the present invention, wherein one or more after-market CD changers / players and an auxiliary input source are integrated with an existing car stereo, and wherein the user can select between the CD changer/player and the auxiliary input using the controls of the car stereo. A plurality of connectors are provided, illustratively indicated as ports **J4A**, **J4B**, **J3**, **J5L1**, **J5R1**, **J1**, and **J2**. Ports **J4A, J4B,** and **J3** allow the audio device interface system of the present invention to be connected to one or more existing car stereos, such as an OEM car stereo or an after-market car stereo. Each of these ports could be embodied by any suitable electrical connector known in the art. For example, ports **J4A** and **J4B** can be connected to an OEM car stereo manufactured by BMW, Inc. Port **J3** can be connected to a car stereo manufactured by LANDROVER, Inc. Of course, any number of car stereos, by any manufacturer, could be provided. Ports **J1** and **J2** allow connection to an after-market CD changer or player, such as that manufactured by ALPINE, Inc., and an auxiliary input source.

Optionally, ports **J5L1** and **J5R1** allow integration of a standard analog (line-level) source. Of course, a single standalone CD player or auxiliary input source could be connected to either of ports **J1** or **J2**.

Microcontroller **DD1** is in electrical communication with each of the ports **J4A, J4B, J3, J5L1, J5R1, J1,** and **J2**, and provides functionality for integrating the CD player and auxiliary input source connected to the ports **J1** and **J2** with the car stereo connected to the ports **J4A** and **J4B** or **J3**. For example, microcontroller **DD1** receives control commands, such as button or key sequences, initiated by a user at control panel of the car radio and received at the connectors **J4A** and **J4B** or **J3**, processes and formats same, and dispatches the formatted commands to the CD player and auxiliary input source via connectors **J1** or **J2**. Additionally, the microcontroller **DD1** receives information provided by the CD player and auxiliary input source via connectors **J1** or **J2**, processes and formats same, and transmits the formatted data to the car stereo via connectors **J4A** and **J4B** or **J3** for display on the display of the car stereo. Further, the microcontroller **DD1** controls multiplexer **DA3** to allow selection between the CD player/changer and the auxiliary input. Audio signals provided at the ports **J1, J2, J5L1** and **J5R1** is selectively channeled to the car radio at ports **J4A** and **J4B** or **J3** under control of one or more user commands and processing logic, as will be discussed in greater detail, embedded within microcontroller **DD1**.

In a preferred embodiment of the present invention, the microcontroller **DD1** comprises the 16F872 microcontroller manufactured by MICROCHIP, Inc. The 16F872 chip is a CMOS, flash-based, 8-bit microcontroller having 64 bytes of EEPROM data memory, self-programming capability, an ICD, 5 channels of 10 bit Analog-to-Digital (A/D) converters, 2 timers, capture/compare/PWM functions, a USART, and a synchronous serial port configurable as either a 3-wire serial peripheral interface or a 2-wire inter-integrated circuit bus. Of course, any suitable microcontroller known in the art can be substituted for microcontroller **DD1** without departing from the spirit or scope of the present invention. Additionally, in a preferred embodiment of the present invention, the multiplexer **DA3** comprises the CD4053 triple, two-channel analog multiplexer/demultiplexer manufactured by FAIRCHILD SEMICONDUCTOR, Inc. Any other suitable multiplexer can be substituted for **DA3** without departing from the spirit or scope of the present invention.

A plurality of discrete components, such as resistors **R1** through **R18**, diodes **D1** through **D3**, capacitors **C1-C11,** and **G1-G3**, transistors **Q1-Q3,** transformers **T1** and **T2**, amplifiers **LCH:A** and **LCH:B,** oscillator **XTAL1**, among other components, are provided for interfacing the microcontroller **DD1** and the multiplexer **DA3** with the hardware connected to the connectors **J4A, J4B, J3, J5L1, J5R1, J1,** and **J2**. These components, as will be readily appreciated to one of ordinary skill in the art, can be arranged as desired to accommodate a variety of microcontrollers and multiplexers, and the numbers and types of discrete components can be varied to accommodate other similar controllers and multiplexers. Thus, the circuit shown in **FIG. 3b** and described herein is illustrative in nature, and modifications thereof are considered to be within the spirit and scope of the present invention.

FIG. 3c is a diagram showing an illustrative circuit configuration for integrating a plurality of auxiliary inputs using the controls of the car stereo. A plurality of connectors are provided, illustratively indicated as ports **J1**, **RCH1**, **LCH1**, **RCH2**, **LCH2**, **RCH3**, **LCH3**, **RCH4**, and **LCH4**. Port **J1** allows the audio device integration system of the present invention to be connected to one or more existing car stereos. Each of these ports could be embodied by any suitable electrical connector known in the art. For example, port **J1** could be connected to an OEM car stereo manufactured by HONDA, Inc., or any other manufacturer. Ports **RCH1**, **LCH1**, **RCH2**, **LCH2**, **RCH3**, **LCH3**, **RCH4,** and **LCH4** allow connection with the left and right channels of four auxiliary input sources. Of course, any number of auxiliary input sources and ports/connectors could be provided.

Microcontroller **U1** is in electrical communication with each of the ports **J1**, **RCH1**, **LCH1**, **RCH2**, **LCH2**, **RCH3**, **LCH3**, **RCH4,** and **LCH4**, and provides functionality for integrating one or more auxiliary input sources connected to the ports **RCH1**, **LCH1**, **RCH2**, **LCH2**, **RCH3**, **LCH3**, **RCH4,** and **LCH4** with the car stereo connected to the port **J1**. Further, the microcontroller **U1** controls multiplexers **DA3** and **DA4** to allow selection amongst any of the auxiliary inputs using the controls of the car stereo. Audio signals provided at the ports **RCH1**, **LCH1**, **RCH2**, **LCH2**, **RCH3**, **LCH3**, **RCH4,** and **LCH4** are selectively channeled to the car radio at port **J1** under control of one or more user commands and processing logic, as will be discussed in greater detail, embedded within microcontroller **U1**. In a preferred embodiment of the present invention, the microcontroller **U1** comprises the 16F872 microcontroller discussed earlier. Additionally, in a preferred embodiment of the present invention, the multiplexers **DA3** and **DA4** comprises the CD4053 triple, two-channel analog multiplexer/demultiplexer, discussed earlier. Any other suitable microcontroller and multiplexers can be substituted for **U1, DA3,** and **DA4** without departing from the spirit or scope of the present invention.

A plurality of discrete components, such as resistors **R1** through **R15**, diodes **D1** through **D3**, capacitors **C1-C5,** transistors **Q1-Q2,** amplifiers **DA1:A** and **DA1:B,** and oscillator **Y1**, among other components, are provided for interfacing the microcontroller **U1** and the multiplexers **DA3** and **DA4** with the hardware connected to the ports **J1**, **RCH1**, **LCH1**, **RCH2**, **LCH2**, **RCH3**, **LCH3**, **RCH4**, and **LCH4**. These components, as will be readily appreciated to one of ordinary skill in the art, can be arranged as desired to accommodate a variety of microcontrollers and multiplexers, and the numbers and types of discrete components can be varied to accommodate other similar controllers and multiplexers. Thus, the circuit shown in **FIG. 3c** and described herein is illustrative in nature, and modifications thereof are considered to be within the spirit and scope of the present invention.

FIG. 3d is an illustrative circuit diagram according to the present invention for integrating a satellite receiver with an existing OEM or after-market car stereo system. Ports **J1** and **J2** are provided for allowing connection of the integration system of the present invention between an existing car radio and a satellite receiver. These ports could be embodied by any suitable electrical connector known in the art. Port **J2** connects to the input port of an existing car radio, such as that manufactured by KENWOOD, Inc. Port **1** connects to an after-market satellite receiver, such as that manufactured by PIONEER, Inc.

Microcontroller **U1** is in electrical communication with each of the ports **J1** and **J2**, and provides functionality for integrating the satellite receiver connected to the port **J1** with the car stereo connected to the port **J2**. For example, microcontroller **U1** receives control commands, such as button or key sequences, initiated by a user at control panel of the car radio and received at the connector **J2**, processes and formats same, and dispatches the formatted commands to the satellite receiver via connector **J2**. Additionally, the microcontroller **U1** receives information provided by the satellite receiver via connector **J1**, processes and formats same, and transmits the formatted data to the car stereo via connector **J2** for display on the display of the car stereo. Audio signals provided at the port **J1** is selectively channeled to the car radio at port **J2** under control of one or more user commands and processing logic, as will be discussed in greater detail, embedded within microcontroller **U1**.

In a preferred embodiment of the present invention, the microcontroller **U1** comprises the 16F873 microcontroller manufactured by MICROCHIP, Inc. The 16F873 chip is a CMOS, flash-based, 8-bit microcontroller having 128 bytes of EEPROM data memory, self-programming capability, an ICD, 5 channels of 10 bit Analog-to-Digital (A/D) converters, 2 timers, 2 capture/compare/PWM functions, a synchronous serial port that can be configured as a either a 3-wire serial peripheral interface or a 2-wire inter-integrated circuit bus, and a USART. Of course, any suitable microcontroller known in the art can be substituted for microcontroller **U1** without departing from the spirit or scope of the present invention.

A plurality of discrete components, such as resistors **R1** through **R7**, capacitors **C1** and **C2**, and amplifier **A1**, among other components, are provided for interfacing the microcontroller **U1** with the hardware connected to the connectors **J1** and **J2**. These components, as will be readily appreciated to one of ordinary skill in the art, can be arranged as desired to accommodate a variety of microcontrollers, and the numbers and types of discrete components can be varied to accommodate other similar controllers. Thus, the circuit shown in **FIG. 3d** and described herein is illustrative in nature, and modifications thereof are considered to be within the spirit and scope of the present invention.

FIGS. 4a through **6** are flowcharts showing processing logic according to the present invention. Such logic can be embodied as software and/or instructions stored in a read-only memory circuit (*e.g.*, and EEPROM circuit), or other similar device. In a preferred embodiment of the present invention, the processing logic described herein is stored in one or more microcontrollers, such as the microcontrollers discussed earlier with reference to **FIGS. 3a-3d**. Of course, any other suitable means for storing the processing logic of the present invention can be employed.

FIG. 4a is a flowchart showing processing logic, indicated generally at **100**, for integrating a CD player or changer with an existing OEM or after-market car stereo system. Beginning in step **100**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **104** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **106** is invoked, wherein a second determination is made as to whether the car stereo is in CD player mode. If a negative determination is made, step **106** is re-invoked.

If a positive determination is made in step **106**, a CD handling process, indicated as block **108**, is invoked, allowing the CD player/changer to exchange data and audio signals with any existing car stereo system. Beginning in step **110**, a signal is generated by the present invention indicating that a CD player/changer is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. If the car radio is an OEM car radio, the CD player presence signal need not be generated. Concurrently with step **110**, or within a short period of time before or after the execution of step **110**, steps **112** and **114** are invoked. In step **112**, the audio channels of the CD player/changer are connected (channeled) to the car stereo system, allowing audio from the CD player/changer to be played through the car stereo. In step **114**, data is retrieved by the present invention from the CD player/changer, including track and time information, formatted, and transmitted to the car stereo for display by the car stereo. Thus, information produced by the external CD player/changer can be quickly and conveniently viewed by a driver by merely viewing the display of the car stereo. After steps **110**, **112**, and **114** have been executed, control passes to step **116**.

In steps **116**, the present invention monitors the control panel buttons of the car stereo for CD operational commands. Examples of such commands include track forward, track reverse, play, stop, fast forward, rewind, track program, random track play, and other similar commands. In step **118**, if a command is not detected, step **116** is re-invoked. Otherwise, if a command is received, step **118** invokes step **120**, wherein the received command is converted into a format recognizable by the CD player/changer connected to the present invention. For example, in this step, a command issued from a GM car radio is converted into a format recognizable by a CD player/changer manufactured by ALPINE, Inc. Any conceivable command from any type of car radio can be formatted for use by a CD player/changer of any type or manufacture. Once the command has been formatted, step **122** is invoked, wherein the formatted command is transmitted to the CD player/changer and executed. Step **110** is then re-invoked, so that additional processing can occur.

FIG. 4b is a flowchart showing processing logic, indicated generally at **130**, for integrating an MP3 player with an existing car stereo system. Beginning in step **132**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **134** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **136** is invoked, wherein a second determination is made as to whether the car stereo is in CD player mode. If a negative determination is made, step **136** is re-invoked.

If a positive determination is made in step **136**, an MP3 handling process, indicated as block **138**, is invoked, allowing the MP3 player to exchange data and audio signals with any existing car stereo system. Beginning in step **140**, the CD player presence signal, described earlier, is generated by the present invention and continuously transmitted to the car stereo. If the car radio is an OEM car radio, the CD player presence signal need not be generated. In step **142**, the audio channels of the MP3 player are connected (channeled) to the car stereo system, allowing audio from the MP3 player to be played through the car stereo. In step **144**, data is retrieved by the present invention from the MP3 player, including track, time, title, and song information, formatted, and transmitted to the car stereo for display by the car stereo. Thus, information produced by the MP3 player can be quickly and conveniently viewed by a driver by merely viewing the display of the car stereo. After steps **140**, **142**, and **144** have been executed, control passes to step **146**.

In steps **146**, the present invention monitors the control panel buttons of the car stereo for MP3 operational commands. Examples of such commands include track forward, track reverse, play, stop, fast forward, rewind, track program, random track play, and other similar commands. In step **148**, if a command is not detected, step **146** is re-invoked. Otherwise, if a command is received, step **148** invokes step **150**, wherein the received command is converted into a format recognizable by the MP3 player connected to the present invention. For example, in this step, a command issued from a HONDA car radio is converted into a format recognizable by an MP3 player manufactured by PANASONIC, Inc. Any conceivable command from any type of car radio can be formatted for use by an MP3 player of any type or manufacture. Once the command has been formatted, step **152** is invoked, wherein the formatted command is transmitted to the MP3 player and executed. Step **140** is then re-invoked, so that additional processing can occur.

FIG. 4c is a flowchart showing processing logic, indicated generally at **160**, for integrating a satellite receiver or a DAB receiver with an existing car stereo system. Beginning in step **162**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **164** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **166** is invoked, wherein a second determination is made as to whether the car stereo is in CD player mode. If a negative determination is made, step **166** is re-invoked.

If a positive determination is made in step **166**, a satellite/DAB receiver handling process, indicated as block **168**, is invoked, allowing the satellite/DAB receiver to exchange data and audio signals with any existing car stereo system. Beginning in step **170**, the CD player presence signal, described earlier, is generated by the present invention and continuously transmitted to the car stereo. If the car radio is an OEM car radio, the CD player presence signal need not be generated. In step **172**, the audio channels of the satellite/DAB receiver are connected (channeled) to the car stereo system, allowing audio from the satellite receiver or DAB receiver to be played through the car stereo. In step **174**, data is retrieved by the present invention from the satellite/DAB receiver, including channel number, channel name, artist name, song time, and song title, formatted, and transmitted to the car stereo for display by the car stereo. The information could be presented in one or more menus, or via a graphical interface viewable and manipulable by the user at the car stereo. Thus, information produced by the receiver can be quickly and conveniently viewed by a driver by merely viewing the display of the car stereo. After steps **170**, **172**, and **174** have been executed, control passes to step **176**.

In steps **176**, the present invention monitors the control panel buttons of the car stereo for satellite/DAB receiver operational commands. Examples of such commands include station up, station down, station memory program, and other similar commands. In step **178**, if a command is not detected, step **176** is re-invoked. Otherwise, if a command is received, step **178** invokes step **180**, wherein the received command is converted into a format recognizable by the satellite/DAB receiver connected to the present invention. For example, in this step, a command issued from a FORD car radio is converted into a format recognizable by a satellite receiver manufactured by PIONEER, Inc. Any conceivable command from any type of car radio can be formatted for use by a satellite/DAB receiver of any type or manufacture. Once the command has been formatted, step **182** is invoked, wherein the formatted command is transmitted to the satellite/DAB receiver and executed. Step **170** is then re-invoked, so that additional processing can occur.

FIG. 4d is a flowchart showing processing logic, indicated generally at **190**, for integrating a plurality of auxiliary input sources with a car radio. Beginning in step **192**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **194** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **196** is invoked, wherein a second determination is made as to whether the car stereo is in CD player mode. If a negative determination is made, step **196** is re-invoked.

If a positive determination is made in step **196**, an auxiliary input handling process, indicated as block **198**, is invoked, allowing one or more auxiliary inputs to be connected (channeled) to the car stereo. Further, if a plurality of auxiliary inputs exist, the logic of block **198** allows a user to select a desired input from the plurality of inputs. Beginning in step **200**, the CD player presence signal, described earlier, is generated by the present invention and continuously transmitted to the car stereo. If the car radio is an OEM car radio, the CD player presence signal need not be generated. Then, in step **202**, the control panel buttons of the car stereo are monitored.

In a preferred embodiment of the present invention, each of the one or more auxiliary input sources are selectable by selecting a CD disc number on the control panel of the car radio. Thus, in step **204**, a determination is made as to whether the first disc number has been selected. If a positive determination is made, step **206** is invoked, wherein the first auxiliary input source is connected (channeled) to the car stereo. If a negative determination is made, step **208** is invoked, wherein a second determination is made as to whether the second disc number has been selected. If a positive determination is made, step **210** is invoked, wherein the second auxiliary input source is connected (channeled) to the car stereo. If a negative determination is made, step **212** is invoked, wherein a third determination is made as to whether the third disc number has been selected. If a positive determination is made, step **214** is invoked, wherein the third auxiliary input source is connected (channeled) to the car stereo. If a negative determination is made, step **216** is invoked, wherein a fourth determination is made as to whether the fourth disc number has been selected. If a positive determination is made, step **218** is invoked, wherein the fourth auxiliary input source is connected (channeled) to the car stereo. If a negative determination is made, step **200** is re-invoked, and the process disclosed for block **198** repeated. Further, if any of steps **206**, **210**, **214**, or **218** are executed, then step **200** is re-invoked and block **198** repeated.

The process disclosed in block **198** allows a user to select from one of four auxiliary input sources using the control buttons of the car stereo. Of course, the number of auxiliary input sources connectable with and selectable by the present invention can be expanded to any desired number. Thus, for example, 6 auxiliary input sources could be provided and switched using corresponding selection key(s) or keystroke(s) on the control panel of the radio. Moreover, any desired keystroke, selection sequence, or button(s) on the control panel of the radio, or elsewhere, can be utilized to select from the auxiliary input sources without departing from the spirit or scope of the present invention.

FIG. 4e is a flowchart showing processing logic, indicated generally at **220**, for integrating a CD player and one or more auxiliary input sources with a car radio. Beginning in step **222**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **224** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **226** is invoked, wherein a second determination is made as to whether the car stereo is in CD player mode. If a negative determination is made, step **226** is re-invoked.

If a positive determination is made in step **226**, then step **228** is invoked, wherein the CD player presence signal, described earlier, is generated by the present invention and continuously transmitted to the car stereo. Then, in step **230**, a determination is made as to whether a CD player is present (*i.e.*, whether an external CD player or changer is connected to the audio device integration system of the present invention). If a positive determination is made, steps **231** and **232** are invoked. In step **231**, the logic of block **108** of **FIG. 4a** (the CD handling process), described earlier, is invoked, so that the CD player/changer can be integrated with the car stereo and utilized by a user. In step **232**, a sensing mode is initiated, wherein the present invention monitors for a selection sequence (as will be discussed in greater detail) initiated by the user at the control panel of the car stereo for switching from the external CD player/changer to one or more auxiliary input sources. Step **234** is then invoked, wherein a determination is made as to whether such a sequence has been initiated. If a negative determination is made, step **234** re-invokes step **228**, so that further processing can occur. Otherwise, if a positive determination is made (*i.e.*, the user desires to switch from the external CD player/changer to one of the auxiliary input sources), step **236** is invoked, wherein the audio channels of the CD player/changer are disconnected from the car stereo. Then, step **238** is invoked, wherein the logic of block **198** of **FIG. 4d** (the auxiliary input handling process), discussed earlier, is executed, allowing the user to select from one of the auxiliary input sources. In the event that a negative determination is made in step **230** (no external CD player/changer is connected to the present invention), then step **238** is invoked, and the system goes into auxiliary mode. The user can then select from one or more auxiliary input sources using the controls of the radio.

FIG. 4f is a flowchart showing processing logic, indicated generally at **240**, for integrating a satellite receiver or DAB receiver and one or more auxiliary input sources with a car radio. Beginning in step **242**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **244** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **246** is invoked, wherein a second determination is made as to whether the car stereo is in CD player mode. If a negative determination is made, step **246** is re-invoked.

If a positive determination is made in step **246**, then step **248** is invoked, wherein the CD player presence signal, described earlier, is generated by the present invention and continuously transmitted to the car stereo. Then, in step **250**, a determination is made as to whether a satellite receiver or DAB receiver is present (*i.e.*, whether an external satellite receiver or DAB receiver is connected to the audio device integration system of the present invention). If a positive determination is made, steps **231** and **232** are invoked. In step **251**, the logic of block **168** of **FIG. 4c** (the satellite/DAB receiver handling process), described earlier, is invoked, so that the satellite receiver can be integrated with the car stereo and utilized by a user. In step **252**, a sensing mode is initiated, wherein the present invention monitors for a selection sequence (as will be discussed in greater detail) initiated by the user at the control panel of the car stereo for switching from the external satellite receiver to one or more auxiliary input sources. Step **254** is then invoked, wherein a determination is made as to whether such a sequence has been initiated. If a negative determination is made, step **254** re-invokes step **258**, so that further processing can occur. Otherwise, if a positive determination is made (*i.e.*, the user desires to switch from the external satellite/DAB receiver to one of the auxiliary input sources), step **256** is invoked, wherein the audio channels of the satellite receiver are disconnected from the car stereo. Then, step **258** is invoked, wherein the logic of block **198** of **FIG. 4d** (the auxiliary input handling process), discussed earlier, is executed, allowing the user to select from one of the auxiliary input sources. In the event that a negative determination is made in step **250** (no external satellite/DAB receiver is connected to the present invention), then step **258** is invoked, and the system goes into auxiliary mode. The user can then select from one or more auxiliary input sources using the controls of the radio.

FIG. 4g is a flowchart showing processing logic according to the present invention for integrating an MP3 player and one or more auxiliary input sources with a car stereo. Beginning in step **262**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **264** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **266** is invoked, wherein a second determination is made as to whether the car stereo is in CD player mode. If a negative determination is made, step **266** is re-invoked.

If a positive determination is made in step **266**, then step **268** is invoked, wherein the CD player presence signal, described earlier, is generated by the present invention and continuously transmitted to the car stereo. Then, in step **270**, a determination is made as to whether an MP3 player is present (*i.e.*, whether an external MP3 player is connected to the audio device integration system of the present invention). If a positive determination is made, steps **271** and **272** are invoked. In step **271**, the logic of block **138** of **FIG. 4b** (the MP3 handling process), described earlier, is invoked, so that the CD player/changer can be integrated with the car stereo and utilized by a user. In step **272**, a sensing mode is initiated, wherein the present invention monitors for a selection sequence (as will be discussed in greater detail) initiated by the user at the control panel of the car stereo for switching from the external CD player/changer to one or more auxiliary input sources. Step **274** is then invoked, wherein a determination is made as to whether such a sequence has been initiated. If a negative determination is made, step **274** re-invokes step **278**, so that further processing can occur. Otherwise, if a positive determination is made (*i.e.*, the user desires to switch from the external MP3 player to one of the auxiliary input sources), step **276** is invoked, wherein the audio channels of the MP3 player are disconnected from the car stereo. Then, step **278** is invoked, wherein the logic of block **198** of **FIG. 4d** (the auxiliary input handling process), discussed earlier, is executed, allowing the user to select from one of the auxiliary input sources. In the event that a negative determination is made in step **270** (no external MP3 player is connected to the present invention), then step **278** is invoked, and the system goes into auxiliary mode. The user can then select from one or more auxiliary input sources using the controls of the radio.

As mentioned previously, to enable integration, the present invention contains logic for converting command signals issued from an after-market or OEM car stereo into a format compatible with one or more external audio devices connected to the present invention. Such logic can be applied to convert any car stereo signal for use with any external device. For purposes of illustration, a sample code portion is shown in **Table 1**, below, for converting control signals from a BMW car stereo into a format understandable by a CD changer:

Table 1

```
;       ==============================================
;       Radio requests changer to STOP (exit PLAY mode)
;       Decoding 6805183801004C message
;       ==============================================

Encode_RD_stop_msg:

        movlw 0x68
        xorwf BMW_Recv_buff,W
        skpz
        return

        movlw 0x05
        xorwf BMW_Recv_buff+1,W
        skpz
        return

        movlw 0x18
        xorwf BMW_Recv_buff+2,W
        skpz
        return

        movlw 0x38
        xorwf BMW_Recv_buff+3,W
        skpz
        return

        movlw 0x01
        xorwf BMW_Recv_buff+4,W
        skpz
        return

        tstf  BMW_Recv_buff+5
        skpz
        return

        movlw 0x4C
        xorwf BMW_Recv_buff+6,W
        skpz
        return

        bsf   BMW_Recv_STOP_msg
        return
```

The code portion shown in **Table 1** receives a STOP command issued by a BMW stereo, in a format proprietary to BMW stereos. Preferably, the received command is stored in a first buffer, such as BMW_Recv_buff. The procedure "Encode_RD_stop_msg" repetitively applies an XOR function to the STOP command, resulting in a new command that is in a format compatible with the after-market CD player. The command is then stored in an output buffer for dispatching to the CD player.

Additionally, the present invention contains logic for retrieving information from an after-market audio device, and converting same into a format compatible with the car stereo for display thereby. Such logic can be applied to convert any data from the external device for display on the car stereo. For purposes of illustration, a sample code portion is shown in **Table 2**, below, for converting data from a CD changer into a format understandable by a BMW car stereo:

Table 2

```
;       =========================================
;       Changer replies with STOP confirmation
;       Encoding 180A68390002003F0001027D message
;       =========================================

Load_CD_stop_msg:
        movlw 0x18
        movwf BMW_Send_buff

        movlw 0x0A
        movwf BMW_Send_buff+1

        movlw 0x68
        movwf BMW_Send_buff+2

        movlw 0x39
        movwf BMW_Send_buff+3

        movlw 0x00              ;current status_XX=00, power off
        movwf BMW_Send_buff+4

        movlw 0x02              ;current status_YY=02, power off
        movwf BMW_Send_buff+5

        clrf  BMW_Send_buff+6         ;separate field, always =0

        movfw BMW_MM_stat       ;current   status_MM   ,   magazine
config
        movwf BMW_Send_buff+7

        clrf  BMW_Send_buff+8         ;separate field, always =0

        movfw BMW_DD_stat       ;current status_DD , current disc
        movwf BMW_Send_buff+9

        movfw BMW_TT_stat       ;current   status_TT   ,   current
track
        movwf BMW_Send_buff+10

        xorwf BMW_Send_buff+9,W ;calculate check sum
        xorwf BMW_Send_buff+8,W
        xorwf BMW_Send_buff+7,W
```

```
xorwf BMW_Send_buff+6,W
xorwf BMW_Send_buff+5,W
xorwf BMW_Send_buff+4,W
xorwf BMW_Send_buff+3,W
xorwf BMW_Send_buff+2,W
xorwf BMW_Send_buff+1,W
xorwf BMW_Send_buff,W

movwf BMW_Send_buff+11   ;store check sum
movlw D'12'              ;12 bytes total
movwf BMW_Send_cnt
bsf   BMW_Send_on        ;ready to send
return
```

The code portion shown in **Table 2** receives a STOP confirmation message from the CD player, in a format proprietary to the CD player. Preferably, the received command is stored in a first buffer, such as BMW_Send_buff. The procedure "Load_CD_stop_msg" retrieves status information, magazine information, current disc, and current track information from the CD changer, and constructs a response containing this information. Then, a checksum is calculated and stored in another buffer. The response and checksum are in a format compatible with the BMW stereo, and are ready for dispatching to the car stereo.

While the above code portions are shown using assembler language, it is to be expressly understood that any low or high level language known in the art, such as C or C++, could be utilized without departing from the spirit or scope of the invention. It will be appreciated that various other code portions can be developed for converting signals from any after-market or OEM car stereo for use by an after-market external audio device, and vice versa.

FIG. 5 is a flowchart showing processing logic, indicated generally at **300** for allowing a user to switch between an after-market audio device, and one or more auxiliary input sources. As was discussed earlier, the present invention allows a user to switch from one or more connected audio devices, such as an external CD player/changer, MP3 player, satellite receiver, DAB receiver, or the like, and activate one or more auxiliary input sources. A selection sequence, initiated by the user at the control panel of the car stereo, allows such switching. Beginning in step **302**, the buttons of the control panel are monitored. In step **304**, a determination is made as to whether a "Track Up" button or sequence has been initiated by the user. The "Track Up" button or sequence can for a CD player, MP3 player, or any other device. If a negative determination is made, step **306** is invoked, wherein the sensed button or sequence is processed in accordance with the present invention and dispatched to the external audio device for execution. Then, step **302** is re-invoked, so that additional buttons or sequences can be monitored.

In the event that a positive determination is made in step **304**, step **308** is invoked, wherein the present invention waits for a predetermined period of time while monitoring the control panel buttons for additional buttons or sequences. In a preferred embodiment of the present invention, the predetermined period of time is 750 milliseconds, but of course, other time durations are considered within the spirit and scope of the present invention. In step **310**, a determination is made as to whether the user has initiated a "Track Down" button or sequence at the control panel of the car stereo within the predetermined time period. The track down button or sequence can be for a CD player, MP3 player, or any other device. If a negative determination is made, step **312** is invoked. In step **312**, a determination is made as to whether a timeout has occurred (*e.g.*, whether the predetermined period of time has expired). If a negative determination is made, step **308** is re-invoked. Otherwise, is a positive determination is made, step **312** invokes step **306**, so that any buttons or key sequences initiated by the user that are not a "Track Down" command are processed in accordance with the present invention and dispatched to the audio device for execution.

In the event that a positive determination is made in step **310** (a "Track Down" button or sequence has been initiated within the predetermined time period), then step **314** is invoked. In step **314**, the audio channels of the audio device are disconnected, and then step **316** is invoked. In step **316**, the logic of block **198** of **FIG. 4d** (the auxiliary input handling process), discussed earlier, is invoked, so that the user can select from one of the auxiliary input sources in accordance with the present invention. Thus, at this point in time, the system has switched, under user control, from the audio device to a desired auxiliary input. Although the foregoing description of the process **300** has been described with reference to "Track Up" and "Track Down" buttons or commands initiated by the user, it is to be expressly understood that any desired key sequence, keystroke, button depress, or any other action, can be sensed in accordance with the present invention and utilized for switching modes.

When operating in auxiliary mode, the present invention provides an indication on the display of the car stereo corresponding to such mode. For example, the CD number could be displayed as "1", and the track number displayed as "99," thus indicating to the user that the system is operating in auxiliary mode and that audio and data is being supplied from an auxiliary input source. Of course, any other indication could be generated and displayed on the display of the car stereo, such as a graphical display (*e.g.*, an icon) or textual prompt.

FIG. 6 is a flowchart showing processing logic, indicated generally at **320**, for determining and handling various device types connected to the auxiliary input ports of the invention. The present invention can sense device types connected to the auxiliary input ports, and can integrate same with the car stereo using the procedures discussed earlier. Beginning in step **322**, the control panel buttons of the car stereo are monitored for a button or sequence initiated by the user corresponding to an auxiliary input selection (such as the disc number method discussed earlier with reference to **FIG. 4d**). In response to an auxiliary input selection, step **324** is invoked, wherein the type of device connected to the selected auxiliary input is sensed by the present invention. Then, step **326** is invoked.

In step **326**, a determination is made as to whether the device connected to the auxiliary input is a CD player/changer. If a positive determination is made, step **328** is invoked, wherein the logic of block **108** of **FIG. 4a** (the CD handling process), discussed earlier, is executed, and the CD player is integrated with the car stereo. If a negative determination is made in step **326**, then step **330** is invoked. In step **330**, a determination is made as to whether the device connected to the auxiliary input is an MP3 player. If a positive determination is made, step 334 is invoked, wherein the logic of block **138** if **FIG. 4b** (the MP3 handling process), discussed earlier, is executed, and the MP3 player is integrated with the car stereo. If a negative determination is made in step **330**, then step **336** is invoked. In step **336**, a determination is made as to whether the device connected to the auxiliary input is a satellite receiver or a DAB receiver. If a positive determination is made, step **338** is invoked, wherein the logic of block **168** of **FIG. 4c** (the satellite/DAB receiver handling process), discussed earlier, is executed, and the satellite receiver is integrated with the car stereo. If a negative determination is made in step **336**, step **322** is re-invoked, so that additional auxiliary input selections can be monitored and processed accordingly. Of course, process **320** can be expanded to allow other types of devices connected to the auxiliary inputs of the present invention to be integrated with the car stereo.

The present invention can be expanded for allowing video information generated by an external device to be integrated with the display of an existing OEM or after-market car stereo. In such a mode, the invention accepts RGB input signals from the external device, and converts same to composite signals. The composite signals are then forwarded to the car stereo for display thereby, such as on an LCD panel of the stereo. Further, information from the external device can be formatted and presented to the user in one or more graphical user interfaces or menus capable of being viewed and manipulated on the car stereo.

FIG. 7a is a perspective view of a docking station **400** according to the present invention for retaining an audio device within a car. Importantly, the present invention can be adapted to allow portable audio devices to be integrated with an existing car stereo. The docking station **400** allows such portable devices to be conveniently docked and integrated with the car stereo. The docking station **400** includes a top portion **402** hingedly connected at a rear portion **408** to a bottom portion **404**, preferably in a clam-like configuration. A portable audio device **410**, such as the SKYFI radio distributed by DELPHI, Inc., is physically and electrically connected with the docking portion **412**, and contained within the station **100**. A clasp **406** can be provided for holding the top and bottom portions in a closed position to retain the device **410**. Optionally, a video device could also be docked using the docking station **400**, and tabs **413** can be provided for holding the docking station **400** in place against a portion of a car. Conceivably, the docking station **400** could take any form, such as a sleeve-like device for receiving and retaining a portable audio device and having a docking portion for electrically and mechanically mating with the audio device.

FIG. 7b is an end view showing the rear portion **408** of the docking station **400** of **FIG. 7a**. A hinge **414** connects the top portion and the bottom portions of the docking station **400**. A data port **416** is provided for interfacing with the audio device docked within the station **400**, and is in electrical communication therewith. In a preferred embodiment of the present invention, the data port **416** is an RS-232 serial or

USB data port that allows for the transmission of data with the audio device, and which connects with the audio device integration system of the present invention for integrating the audio device with an OEM or after-market car stereo. Any known bus technology can be utilized to interface with any portable audio or video device contained within the docking station **400**, such as FIREWIRE, D2B, MOST, CAN, USB/USB2, IE Bus, T Bus, I Bus, or any other bus technology known in the art.

FIGS. 8a-8b are perspective views of another embodiment of the docking station of the present invention, indicated generally at **500**, which includes the audio device integration system of the present invention, indicated generally at **540**, incorporated therewith. As shown in **FIG. 8a**, the docking station **500** includes a base portion **530**, a bottom member **515** interconnected with the base portion **530** at an edge thereof, and a top member **510** hingedly interconnected at an edge to the base portion **530**. The top member **510** and the bottom member **515** define a cavity for docking and storing a portable audio device **520**, which could be a portable CD player, MP3 player, satellite (*e.g.*, XM, SIRIUS, or other type) tuner, or any other portable audio device. The docking station **500** would be configured to accommodate a specific device, such as an IPOD from Apple Computer, Inc., or any other portable device.

The audio device integration system **540**, in the form of a circuit board, is housed within the base portion **530** and performs the integration functions discussed herein for integrating the portable audio device **520** with an existing car stereo. The integration system **540** is in communication with the portable audio device **520** via a connector **550**, which is connected to a port on the audio device **520**, and a cable **555** interconnected between the connector **550** and the integration system **540**. The connector **550** could be any suitable connector and can vary according to the device type. For example, a MOLEX, USB, or any other connector could be used, depending on the portable device. The integration system **540** is electrically connected with a car stereo by cable **560**. Alternatively, the integration system could wirelessly communicate with the car stereo. A transmitter could be used at the integration system to communicate with a receiver at the car stereo. Where automobiles include Bluetooth systems, such systems can be used to communicate with the integration system. As can be readily appreciated, the docking station **500** provides a convenient device for docking, storing, and integrating a portable audio device for use with a car stereo. Further, the docking station **500** could be positioned at any desired location within a vehicle, including, but not limited to, the vehicle trunk.

As shown in **FIG. 8b**, the top member **510** can be opened in the general direction indicated by arrow **A** to allow for access to the portable audio device **520**. In this fashion, the device **520** can be quickly accessed for any desired purpose, such as for inserting and removing the device **520** from the docking station **500**, as well as for providing access to the controls of the device **520**.

FIG. 9 is a block diagram showing the components of the docking station of **FIGS. 8a-8b**. The docking station **500** houses both a portable audio device **520** and an audio device integration system (or interface) **540**. The shape and configuration of the docking station **500** can be varied as desired without departing from the spirit or scope of the present invention.

The integration system of the present invention provides for control of a portable audio device, or other device, through the controls of the car stereo system. As such, controls on the steering wheel, where present, may also be used to control the portable audio device or other device.

Having thus described the invention in detail, it is to be understood that the foregoing description is not intended to limit the spirit and scope thereof.

CLAIMS

What is claimed is:

1. An audio device integration system comprising:

a car stereo;

an audio device external to the car stereo;

an interface connected between the car stereo and the audio device for exchanging data and audio signals between the car stereo and the audio device;

means for processing and dispatching commands for controlling the audio device from the car stereo in a format compatible with the audio device; and

means for processing and displaying data from the audio device on a display of the car stereo in a format compatible with the car stereo.

2. The apparatus of claim 1, wherein the car stereo is an OEM car stereo.

3. The apparatus of claim 1, wherein the car stereo is an after-market car stereo.

4. The apparatus of claim 1, wherein the audio device comprises a CD player, CD changer, MP3 player, Digital Audio Broadcast (DAB) receiver, or satellite receiver.

5. The apparatus of claim 1, wherein the interface further comprises a plug-and-play mode for automatically detecting a device type of the audio device and integrating the audio device based upon the device type.

6. The apparatus of claim 1, wherein the interface generates a CD player presence signal for maintaining the car stereo in a state responsive to processed data and audio signals.

7. The apparatus of claim 1, wherein the data comprises track and time information.

8. The apparatus of claim 1, wherein the data comprises song title and artist information.

9. The apparatus of claim 1, wherein the data comprises channel number and channel name information.

10. The apparatus of claim 1, wherein the data comprises video information.

11. The apparatus of claim 1, wherein the data is displayed as a menu on the display of the car stereo.

12. The apparatus of claim 1, wherein the data is displayed in a graphical interface on a graphic panel.

13. The apparatus of claim 1, wherein the commands are input by a user using one or more control buttons or presets on the car stereo.

14. The apparatus of claim 1, further comprising one or more auxiliary input sources connected to the interface.

15. The apparatus of claim 14, wherein audio signals from the one or more auxiliary input sources are selectively channeled to the car stereo by the interface.

16. The apparatus of claim 14, wherein a user can select between the one or more auxiliary input sources by depressing keys on the car stereo.

17. The apparatus of claim 14, wherein a user can select one of the auxiliary input sources by entering a disc number at the car stereo.

18. The apparatus of claim 14, wherein a user can select one of the auxiliary input sources by entering a track number at the car stereo.

19. The apparatus of claim 14, wherein a user can select one of the auxiliary input sources by entering both disc and track numbers at the car stereo.

20. The apparatus of claim 14, wherein a user can select between the audio device and the one or more auxiliary input sources by entering a sequence at the car stereo.

21. The apparatus of claim 20, wherein the sequence comprises a track up selection followed by a track down selection.

22. The apparatus of claim 1, further comprising a second interface connected to the first interface for providing a plurality of auxiliary input sources.

23. The apparatus of claim 22, wherein both the first interface and the second interface are controllable using the car stereo.

24. An audio device integration system comprising:

a car stereo;

a plurality of auxiliary input sources;

an interface connected between the car stereo and the plurality of auxiliary input sources;

means for processing and dispatching commands for controlling an audio device connected to one of the plurality of auxiliary input sources from the car stereo in a format compatible with the audio device;

means for processing and displaying data from the audio device on a display of the car stereo in a format compatible with the car stereo; and means for selecting one of the plurality of auxiliary input sources from the car stereo.

25. The apparatus of claim 24, wherein the means for selecting one of the plurality of auxiliary input sources comprises a disc or track selection entered by a user using control buttons of the car stereo.

26. The apparatus of claim 24, wherein the audio device comprises a CD player, CD changer, MP3 player, satellite receiver, or DAB receiver.

27. The apparatus of claim 24, wherein a device type of the audio device is automatically detected by the interface and the audio device is automatically integrated with the car stereo based upon the device type.

28. The apparatus of claim 24, wherein the interface is switchable into an auxiliary input mode by issuing a control sequence at the car stereo.

29. The apparatus of claim 28, wherein the control sequence comprises a track up command followed by a track down command.

30. A method for integrating a device with a car stereo comprising:

connecting an interface to the car stereo and the device to the interface;

receiving control commands from the car stereo at the interface;

processing the control commands into a format compatible with the device and dispatching processed control commands to the device;

receiving data and audio from the device at the interface;

processing the data into a second format compatible with the car stereo and dispatching the audio and processed data to the car stereo; and

displaying the processed data on the car stereo and playing the audio through the car stereo.

31. The method of claim 30, wherein the step of receiving data from the device comprises retrieving CD track and time information from the device.

32. The method of claim 30, wherein the step of receiving data from the device comprises retrieving MP3 song, title, track, and time information from the device.

33. The method of claim 30, wherein the step of receiving data from the device comprises retrieving channel number, channel name, artist, and song information from the device.

34. The method of claim 30, wherein the step of receiving data from the device comprises retrieving video information from the device.

35. The method of claim 30, wherein the step of displaying the processed data comprises displaying the data in an LCD panel.

36. The method of claim 30, wherein the step of displaying the processed data comprises displaying the data in a graphical user interface at the car stereo.

37. The method of claim 30, wherein the step of displaying processed data comprises displaying video at the car stereo.

38. The method of claim 30, wherein the step of connecting the audio device to the interface comprises connecting a CD player, CD changer, MP3 player, satellite receiver, or DAB receiver to the interface.

39. The method of claim 30, further comprising connecting an auxiliary input source to the interface.

40. The method of claim 39, further comprising receiving a selection command from the car stereo and channeling data and audio from the auxiliary input source to the interface in response to the selection command.

41. The method of claim 40, further comprising processing the data from the auxiliary input source for display on the car stereo.

42. An apparatus for docking a portable device for integration with a car stereo comprising:

a top member interconnected with a bottom member and defining a storage area for storing the portable device;

a docking portion within the storage area for electrically communicating and physically mating with the portable device; and

a data port disposed on the top member or the bottom member and in electrical communication with the docking portion, the data port connectable with a device for integrating the portable device with the car stereo.

43. The apparatus of claim 42, further comprising a hinge for connecting the top member and bottom member at an edge thereof.

44. The apparatus of claim 42, wherein the data port comprises an RS-232 or USB port.

45. The apparatus of claim 42, wherein the top portion and the bottom portion define a sleeve for holding the portable audio device.

46. The apparatus of claim 42, further comprising a clasp for retaining the top and bottom members in a closed position.

47. A method of integrating an after-market device with an OEM or after-market car stereo comprising:

connecting the after-market device to an interface;

connecting the interface to a car stereo;

determining whether the car stereo is an OEM car stereo or an after-market car stereo;

if the car stereo is an after-market car stereo, generating and transmitting a presence signal to the car stereo to maintain the car stereo in an operational state responsive to external signals; and

selectively channeling data and audio signals from the after-market device to the car stereo using the interface.

48. The method of claim 47, further comprising receiving control commands from the car stereo at the interface.

49. The method of claim 48, further comprising converting the control commands into a format recognizable by the after-market audio device.

50. The method of claim 49, further comprising dispatching formatted commands to the after-market audio device for execution thereby.

51. The method of claim 47, further comprising converting data received at the interface from the after-market audio device into a format compatible with the car stereo.

52. The method of claim 51, further comprising displaying formatted data on the car stereo.

53. The method of claim 52, wherein the step of displaying formatted data comprises displaying channel numbers, channel names, titles, tracks, song names, or artist names on the car stereo.

54. The method of claim 52, wherein the step of displaying formatted data comprises displaying video on the car stereo.

55. A docking station for docking and integrating a portable audio device for use with a car stereo, comprising:

a base portion;

a bottom member connected to the base portion;

a top member connected to the base portion, the base portion, bottom member, and top member defining a cavity for receiving a portable device; and

an integration device positioned within the base portion for integrating the portable device with a car stereo.

56. The apparatus of claim 55, wherein the top member is hingedly connected at an edge to the base portion.

57. The apparatus of claim 55, wherein the base portion comprises a connector for connecting the integration device with the portable device.

58. The apparatus of claim 55, further comprising a cable interconnected at one end to the integration device and at an opposite end to the car stereo.

59. The apparatus of claim 55, wherein the integration device is wirelessly connected to the car stereo.

60. The apparatus of claim 59, wherein the integration device is connected to the car stereo by a Bluetooth wireless connection.

61. The apparatus of claim 55, wherein the portable device comprises a CD player, CD changer, MP3 player, Digital Audio Broadcast (DAB) receiver, or satellite receiver.

62. The apparatus of claim 61, wherein the satellite tuner comprises an XM or SIRIUS satellite tuner.

63. The apparatus of claim 55, wherein the integration device comprises a circuit board housed in the base portion.

64. The apparatus of claim 55, wherein the apparatus is mountable in a vehicle trunk.

65. The apparatus of claim 55, wherein the top member is pivotable away from the bottom member to allow access to the portable device.

66. The apparatus of claim 55, wherein the integration device is connected to the car stereo using a Firewire, D2B, MOST, CAN, USB, USB2, IE Bus, T Bus, I Bus, or serial connection.

67. The apparatus of claim 55, wherein the car stereo is an OEM or after-market car stereo.

68. The apparatus of claim 55, further comprising one or more auxiliary input ports connected to the integration device for integrating additional portable devices external to the docking station.

69. A method for docking and integrating a portable audio device for use with a car stereo, comprising:

providing a docking station having a base portion, a bottom member connected to the base portion, a top member connected to the base portion, and an integration device housed within the base portion;

inserting a portable device into the docking station and connecting the portable device to a connector on the base portion; and

integrating the portable device with the integration device for use with a car stereo.

70. The method of claim 69, further comprising opening the top member away from the bottom member prior to inserting the portable device into the docking station.

71. The method of claim 69, further comprising closing the top member to retain the portable device in the docking station.

72. The method of claim 69, further comprising interconnecting the integration device with the car stereo with a cable.

73. The method of claim 69, further comprising establishing a wireless connection between the integration device and the car stereo.

74. The method of claim 73 further comprising establishing a Bluetooth wireless connection between the integration device and the car stereo.

75. The method of claim 69, further comprising integrating a CD player, CD changer, MP3 player, Digital Audio Broadcast (DAB) receiver, or satellite receiver with the car stereo.

76. The method of claim 69, further comprising integrating an XM or SIRIUS satellite tuner with the car stereo.

77. The method of claim 69, further comprising mounting the docking station in a vehicle trunk.

78. The method of claim 69, further comprising connecting the integration device to the car stereo using a Firewire, D2B, MOST, CAN, USB, USB2, IE Bus, T Bus, I Bus, or serial connection.

79. The method of claim 69, further comprising integrating the portable device with an after-market or OEM car stereo.

80. The method of claim 69, further comprising connecting an external portable device to an auxiliary input port on the docking station and integrating the external portable device with the car stereo.

FIG. 1

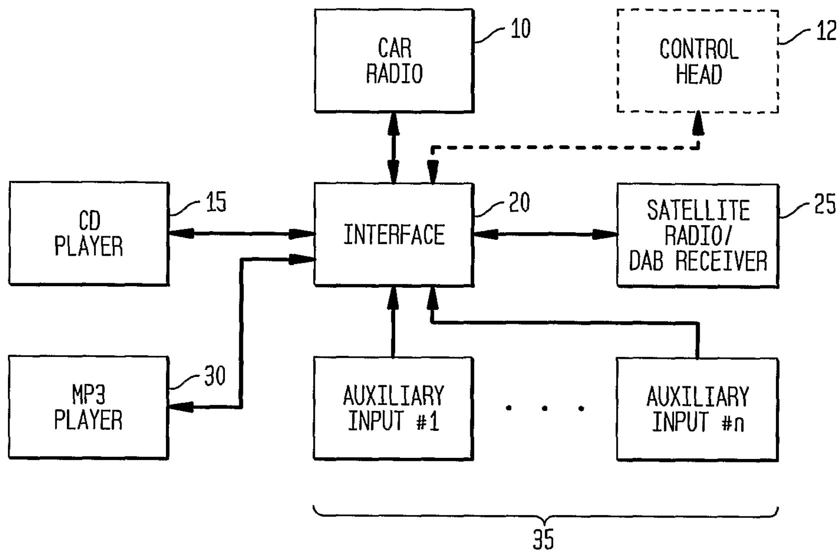

CAR
RADIO
10
CONTROL
HEAD
12
CD
PLAYER
15
INTERFACE
20
SATELLITE
RADIO/
DAB RECEIVER
25
MP3
PLAYER
30
AUXILIARY
INPUT #1
AUXILIARY
INPUT #n
35

FIG. 2A

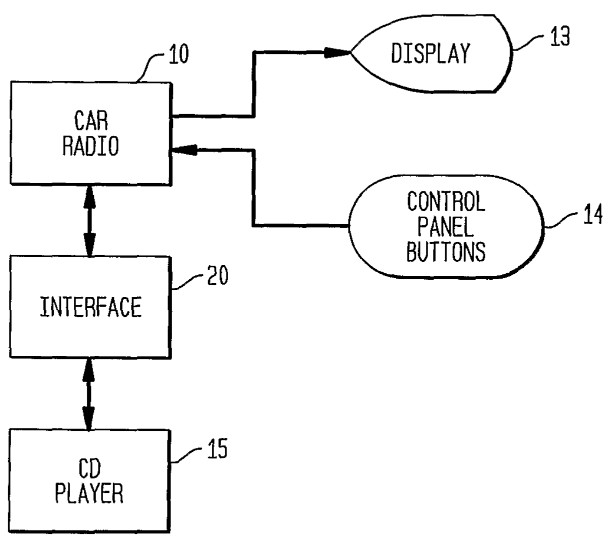

10
CAR
RADIO
DISPLAY
13
CONTROL
PANEL
BUTTONS
14
INTERFACE
20
CD
PLAYER
15

FIG. 2B

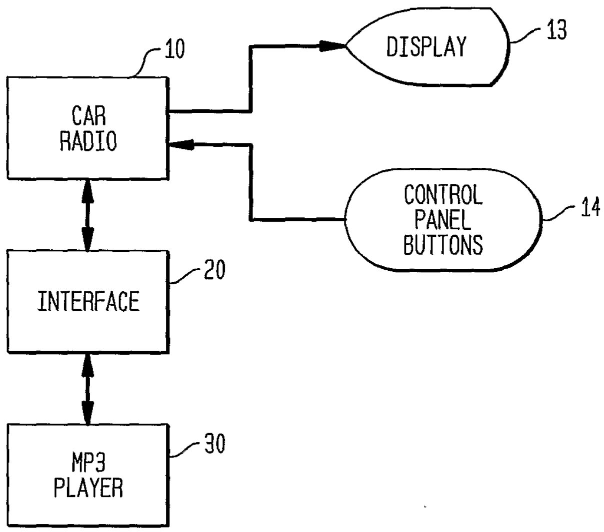


FIG. 2C

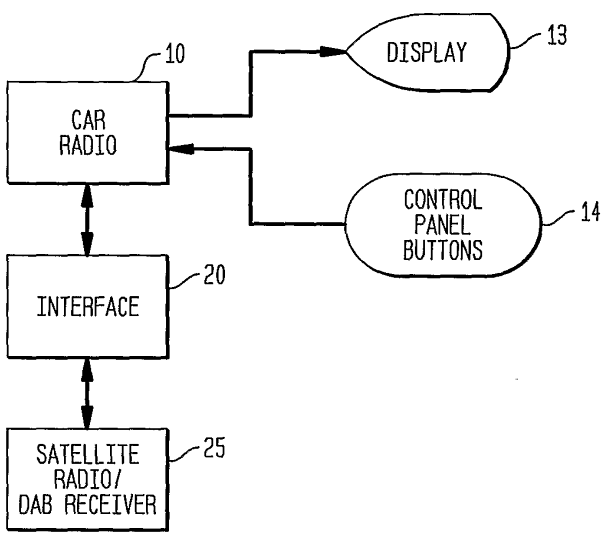


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FIG. 2D

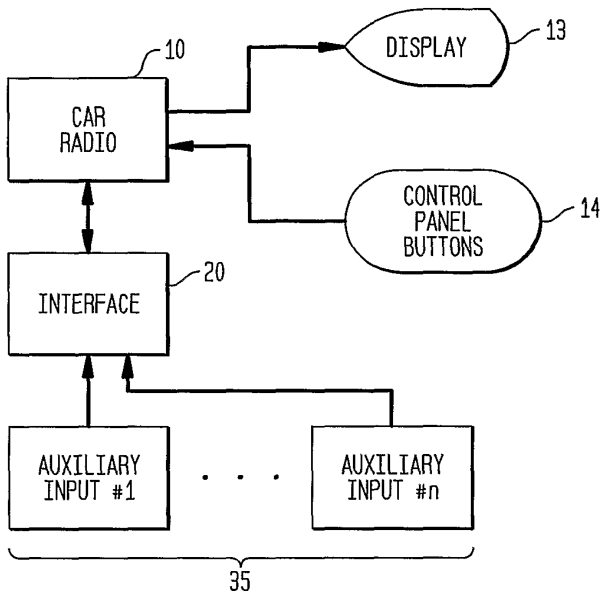

FIG. 2E

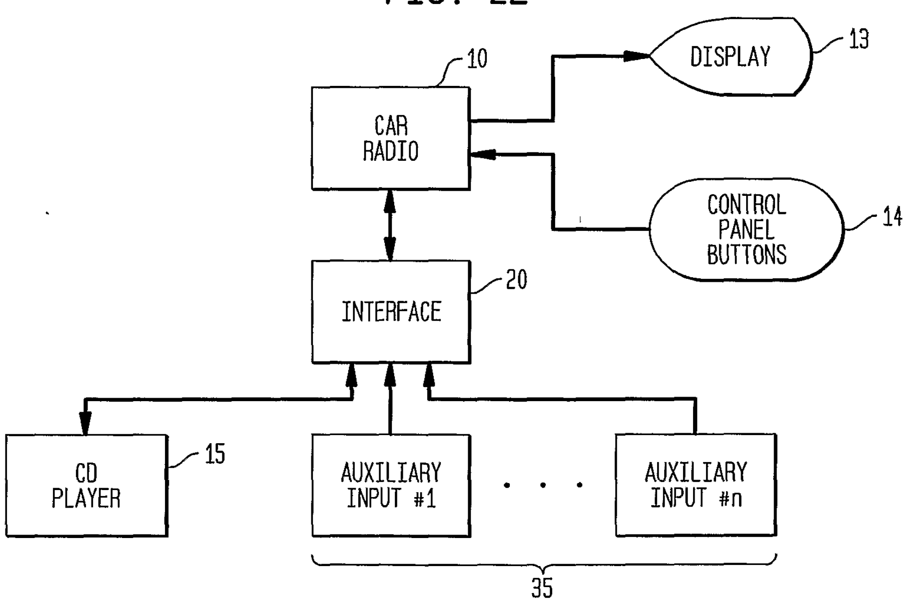

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FIG. 2F

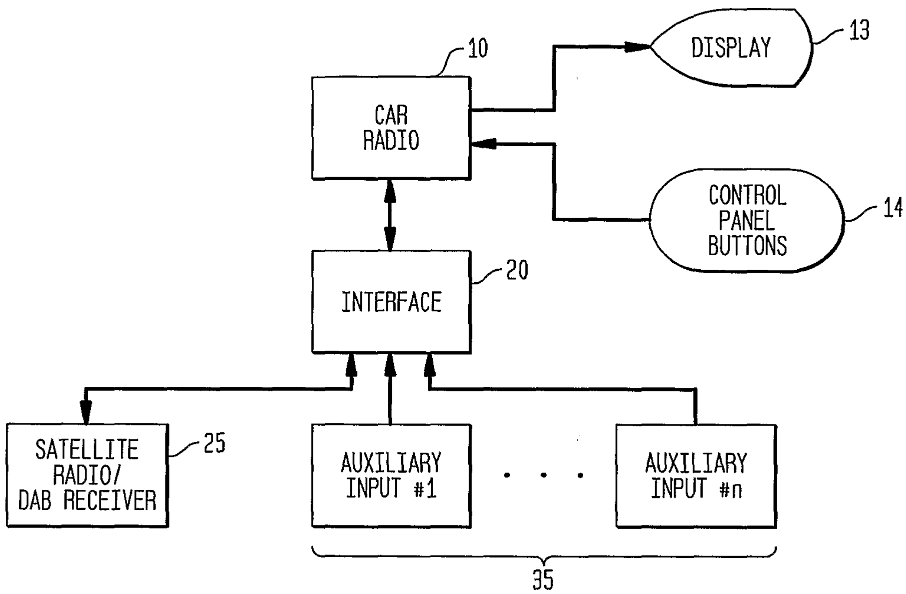

FIG. 2G

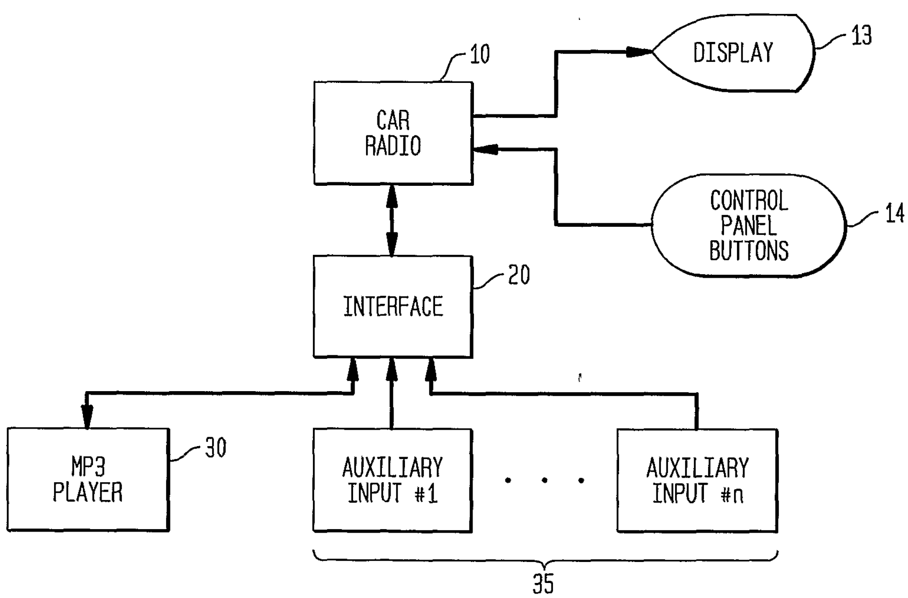

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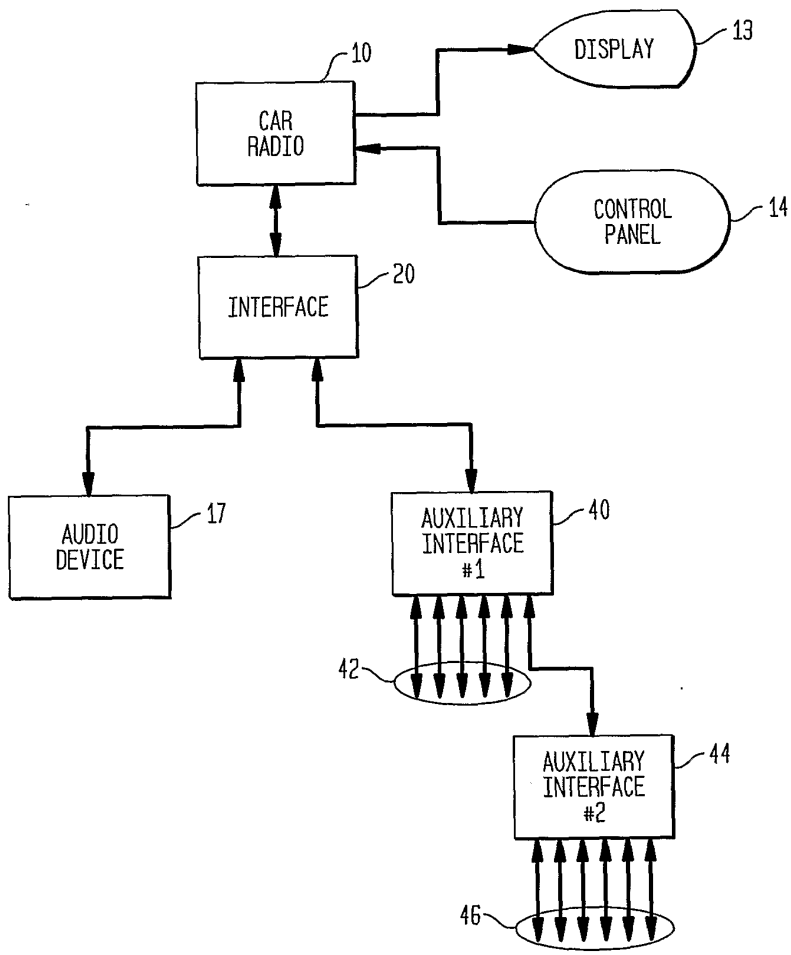
FIG. 2H



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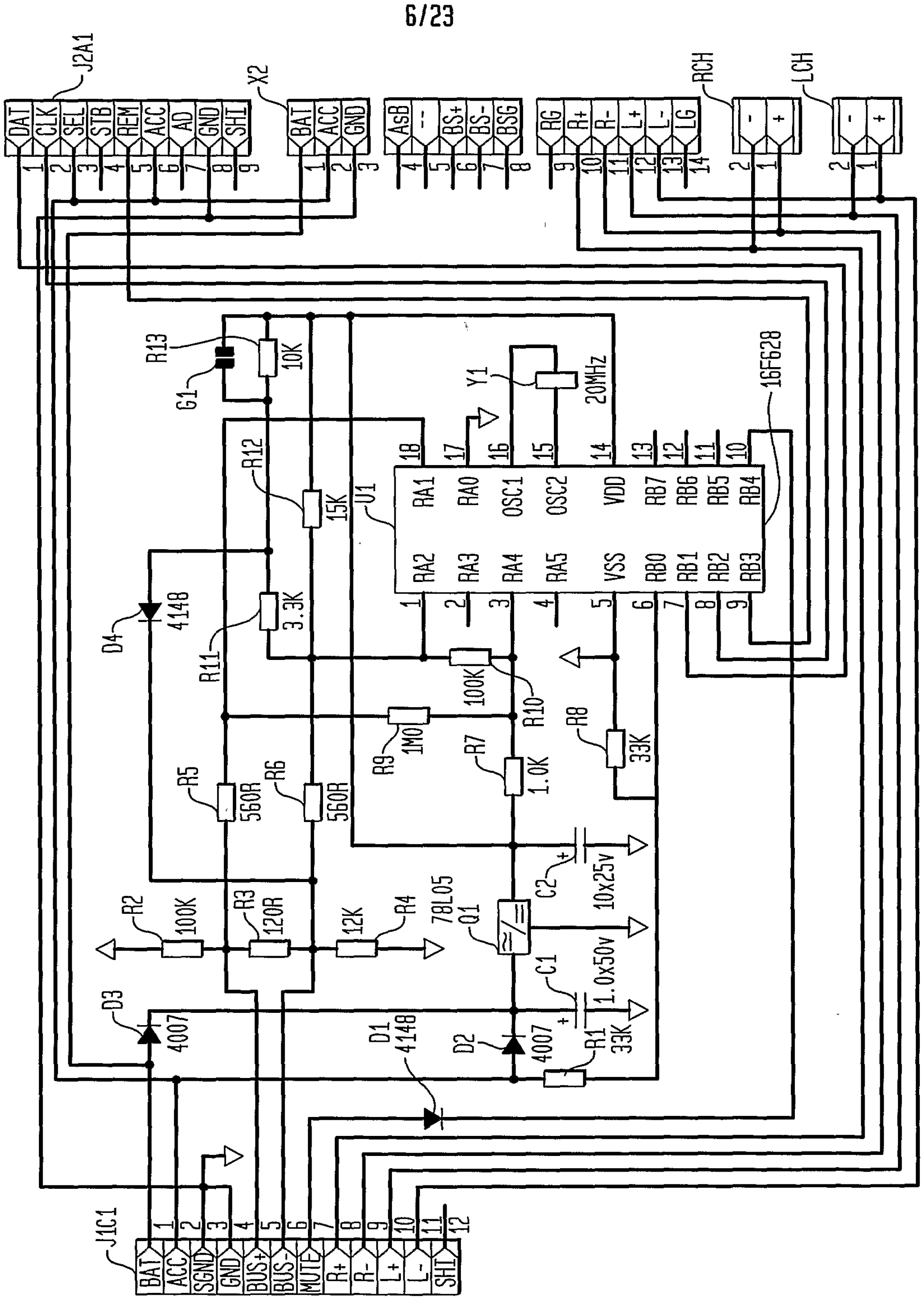

FIG. 3A

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FIG. 3B1

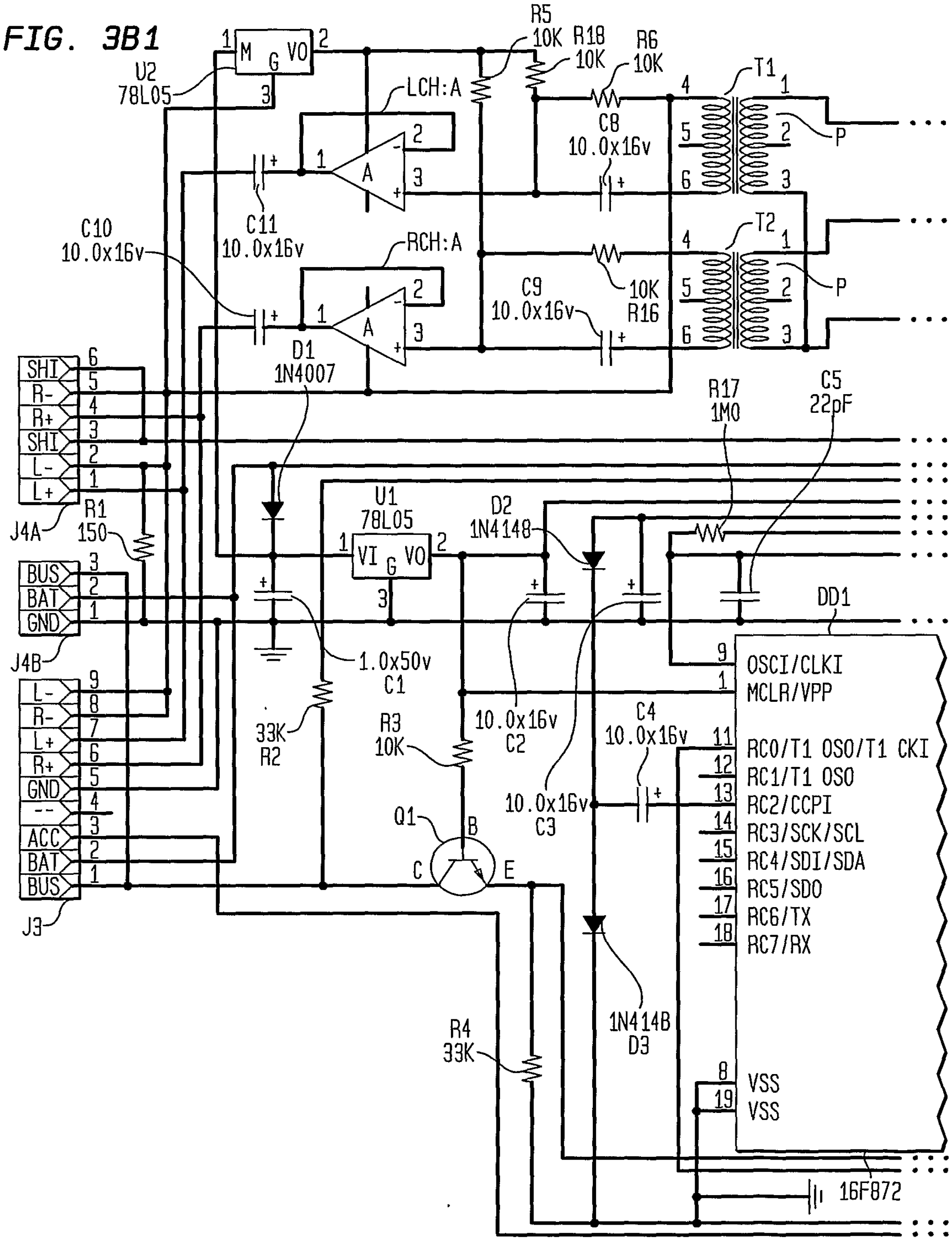
U2
78L05
M G VO
LCH:A
RCH:A
R5
10K
R18
10K
R6
10K
T1
T2
P
C8
10.0x16v
C9
10.0x16v
10K
R16
C10
10.0x16v
C11
10.0x16v
D1
1N4007
SHI
R-
R+
L-
L+
J4A
R1
150
BUS
BAT
GND
J4B
U1
78L05
VI G VO
D2
1N4148
R17
1M0
C5
22pF
DD1
1.0x50v
C1
33K
R2
10.0x16v
C2
R3
10K
C4
10.0x16v
10.0x16v
C3
Q1
B
C
E
ACC
J3
OSCI/CLKI
MCLR/VPP
RC0/T1 OSO/T1 CKI
RC1/T1 OSO
RC2/CCPI
RC3/SCK/SCL
RC4/SDI/SDA
RC5/SDO
RC6/TX
RC7/RX
VSS
VSS
1N414B
D3
R4
33K
16F872

FIG. 3B2

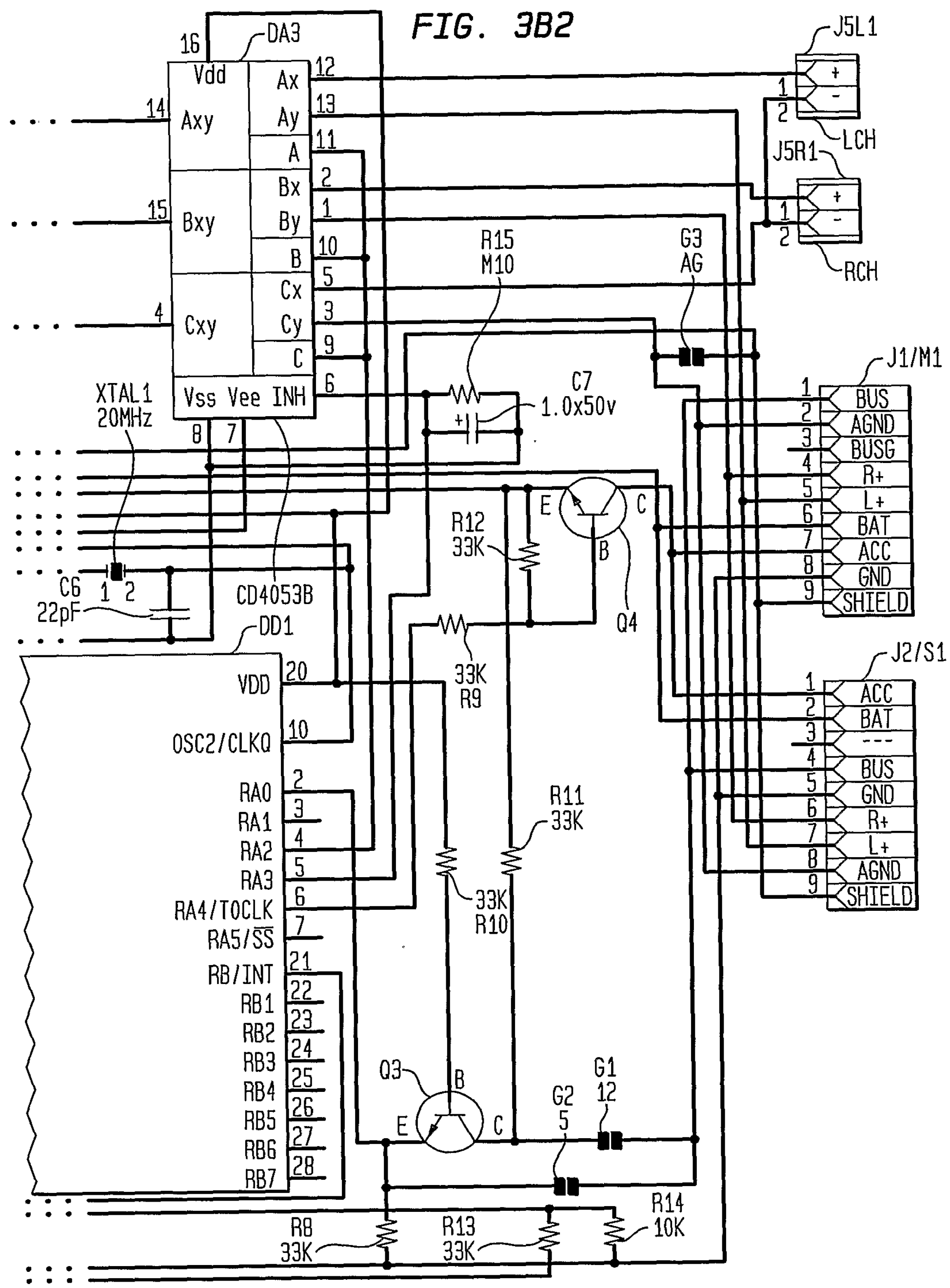

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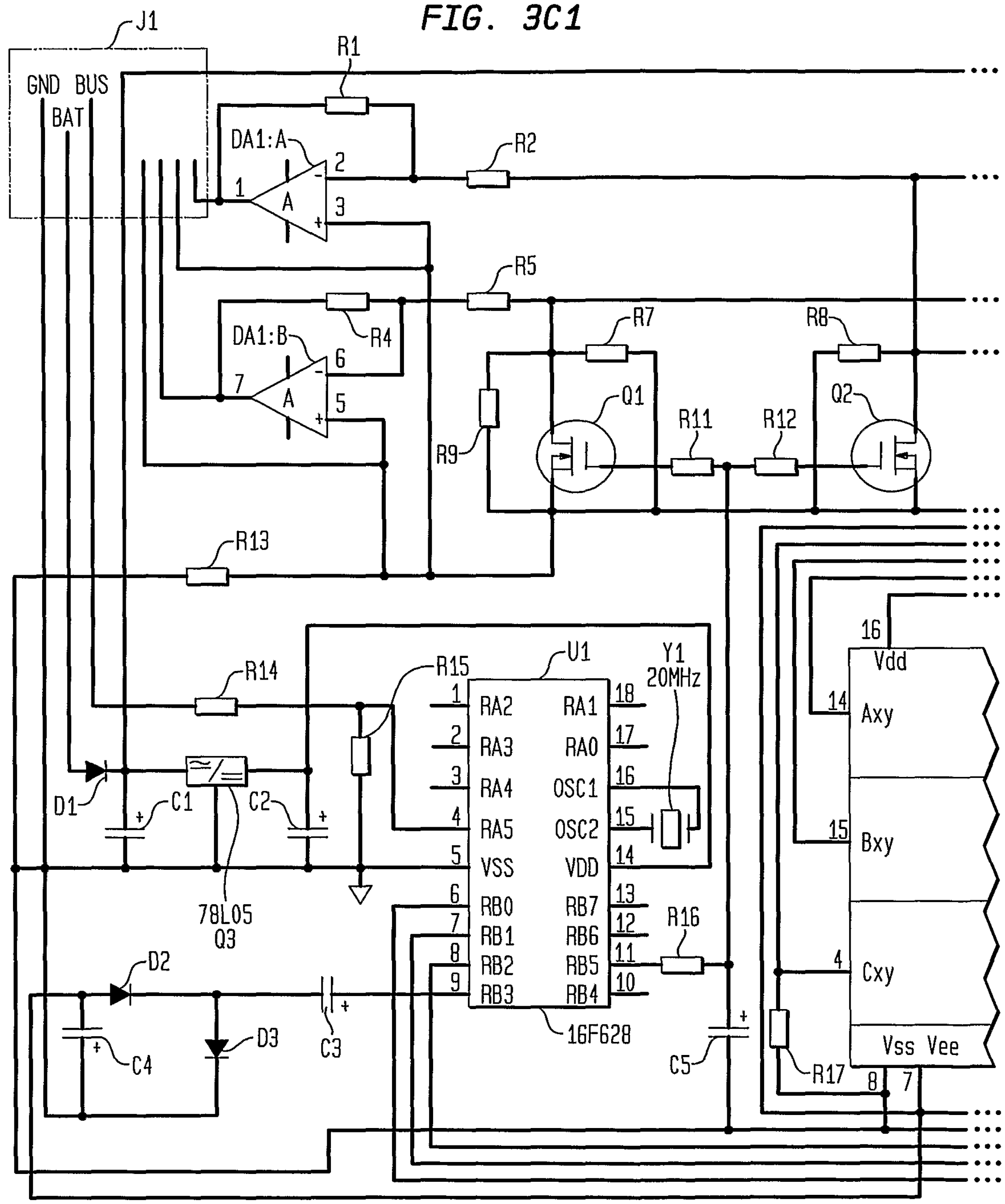
FIG. 3C1



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10/23

FIG. 3C2

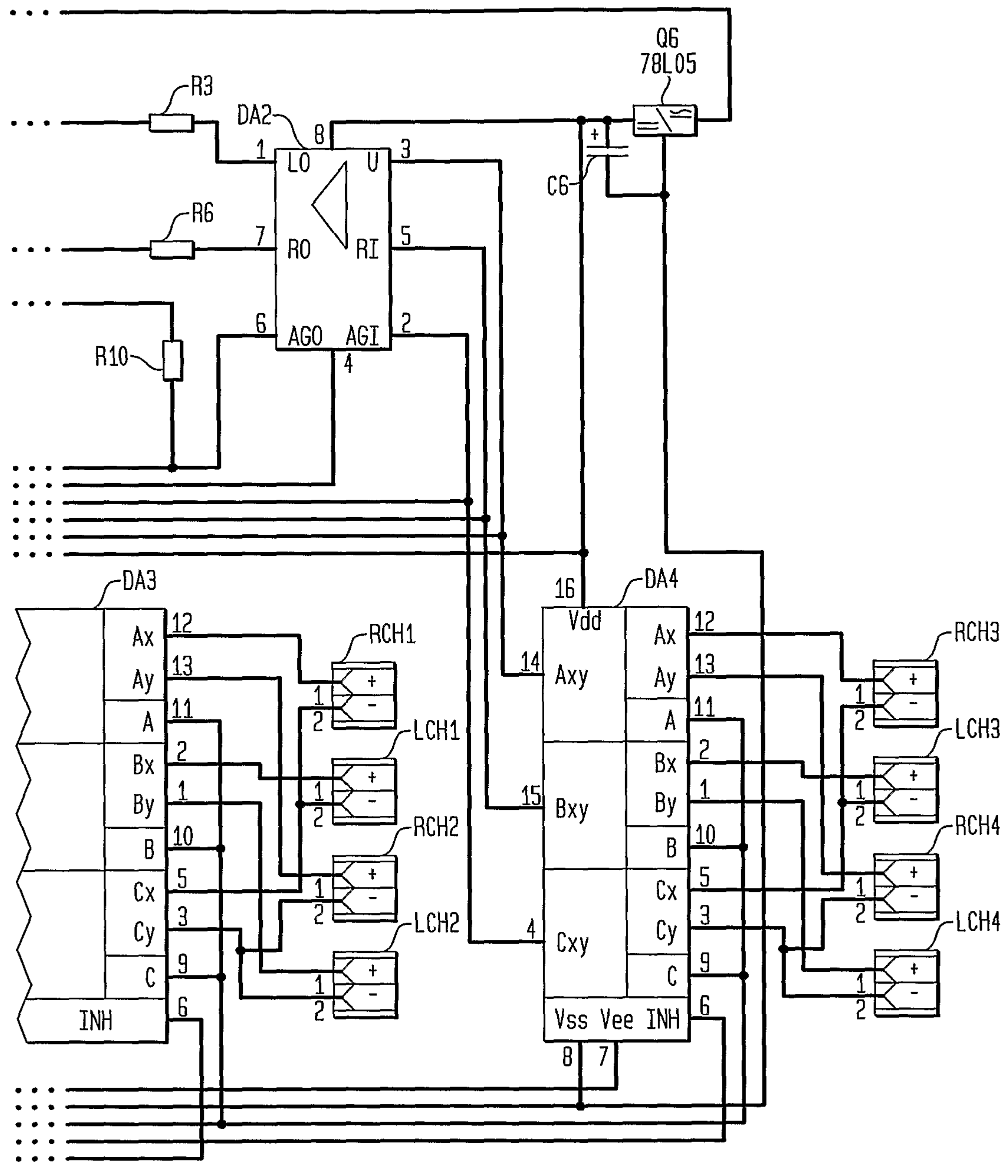

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FIG. 3D

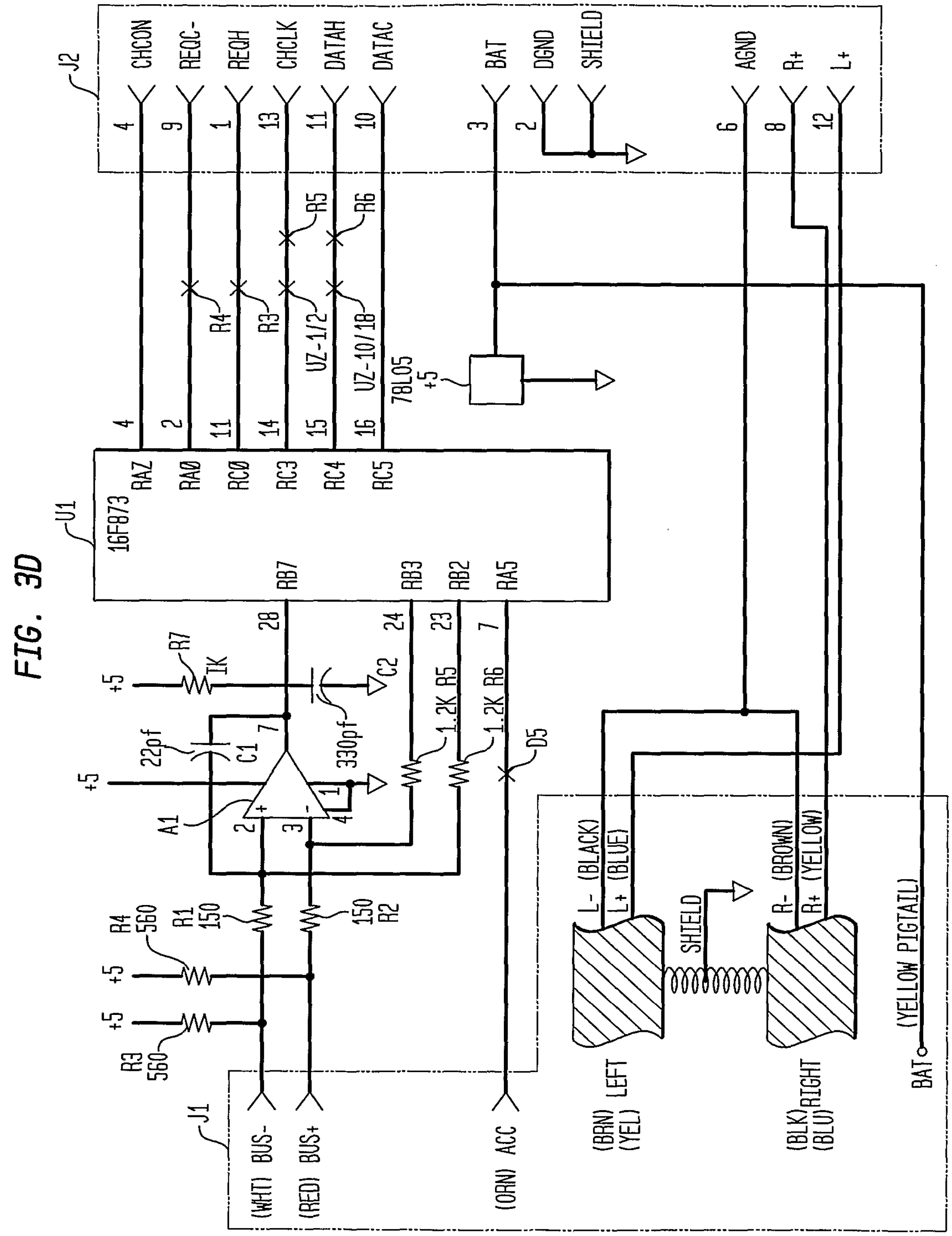

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FIG. 4A

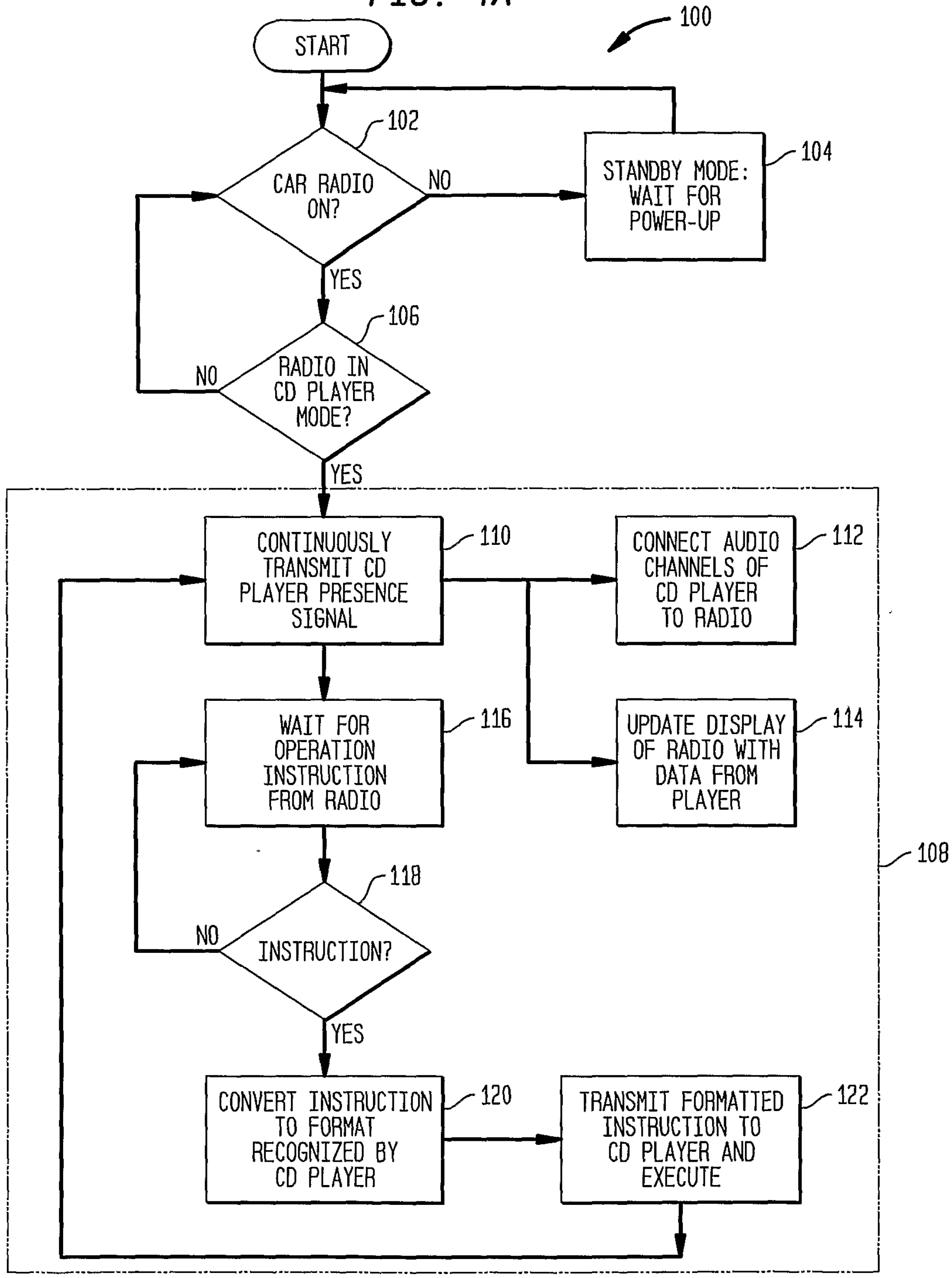

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FIG. 4B

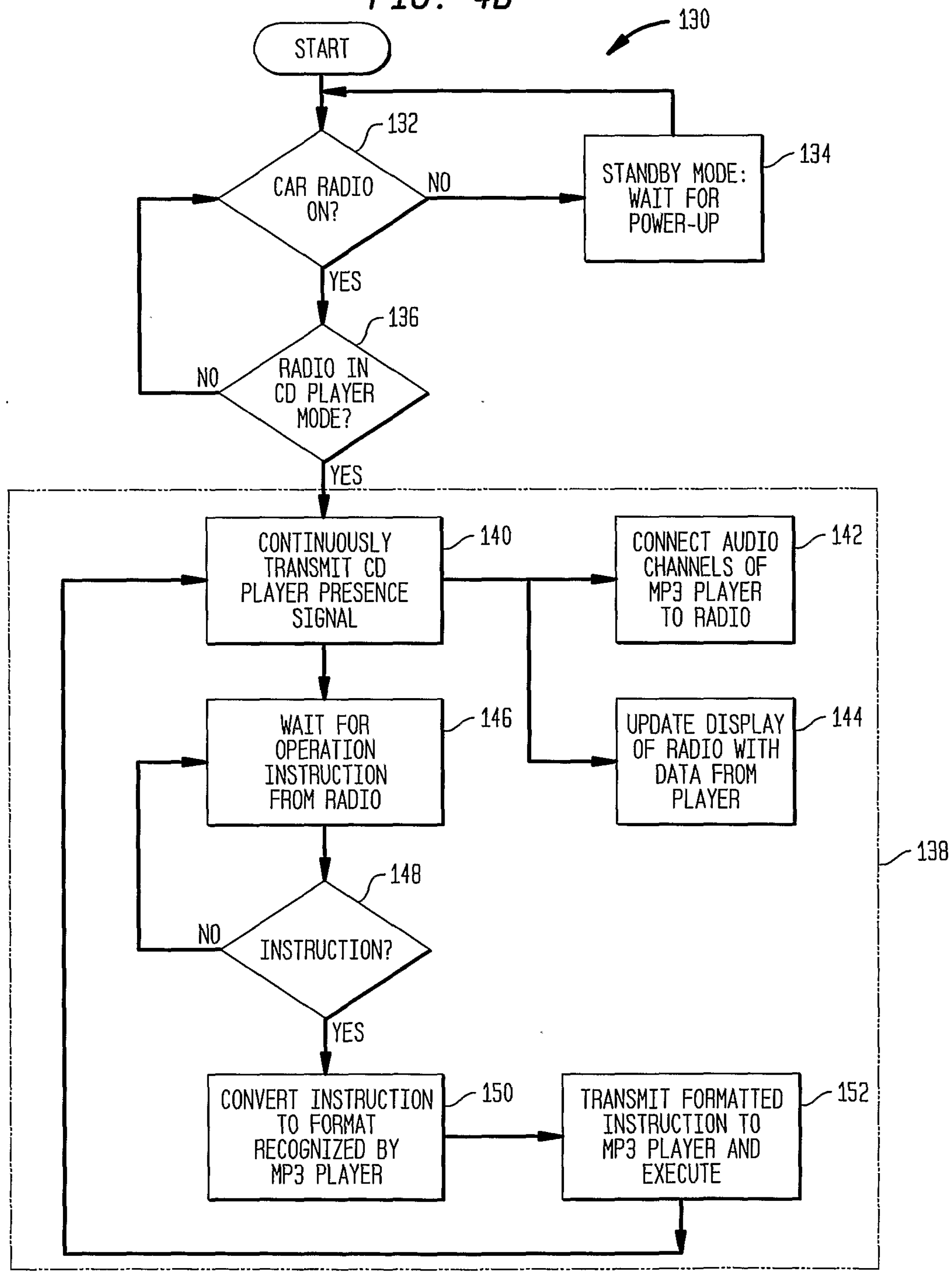

130
START
132
CAR RADIO ON?
NO
STANDBY MODE: WAIT FOR POWER-UP
134
YES
136
NO
RADIO IN CD PLAYER MODE?
YES
CONTINUOUSLY TRANSMIT CD PLAYER PRESENCE SIGNAL
140
CONNECT AUDIO CHANNELS OF MP3 PLAYER TO RADIO
142
WAIT FOR OPERATION INSTRUCTION FROM RADIO
146
UPDATE DISPLAY OF RADIO WITH DATA FROM PLAYER
144
138
148
NO
INSTRUCTION?
YES
CONVERT INSTRUCTION TO FORMAT RECOGNIZED BY MP3 PLAYER
150
TRANSMIT FORMATTED INSTRUCTION TO MP3 PLAYER AND EXECUTE
152

FIG. 4C

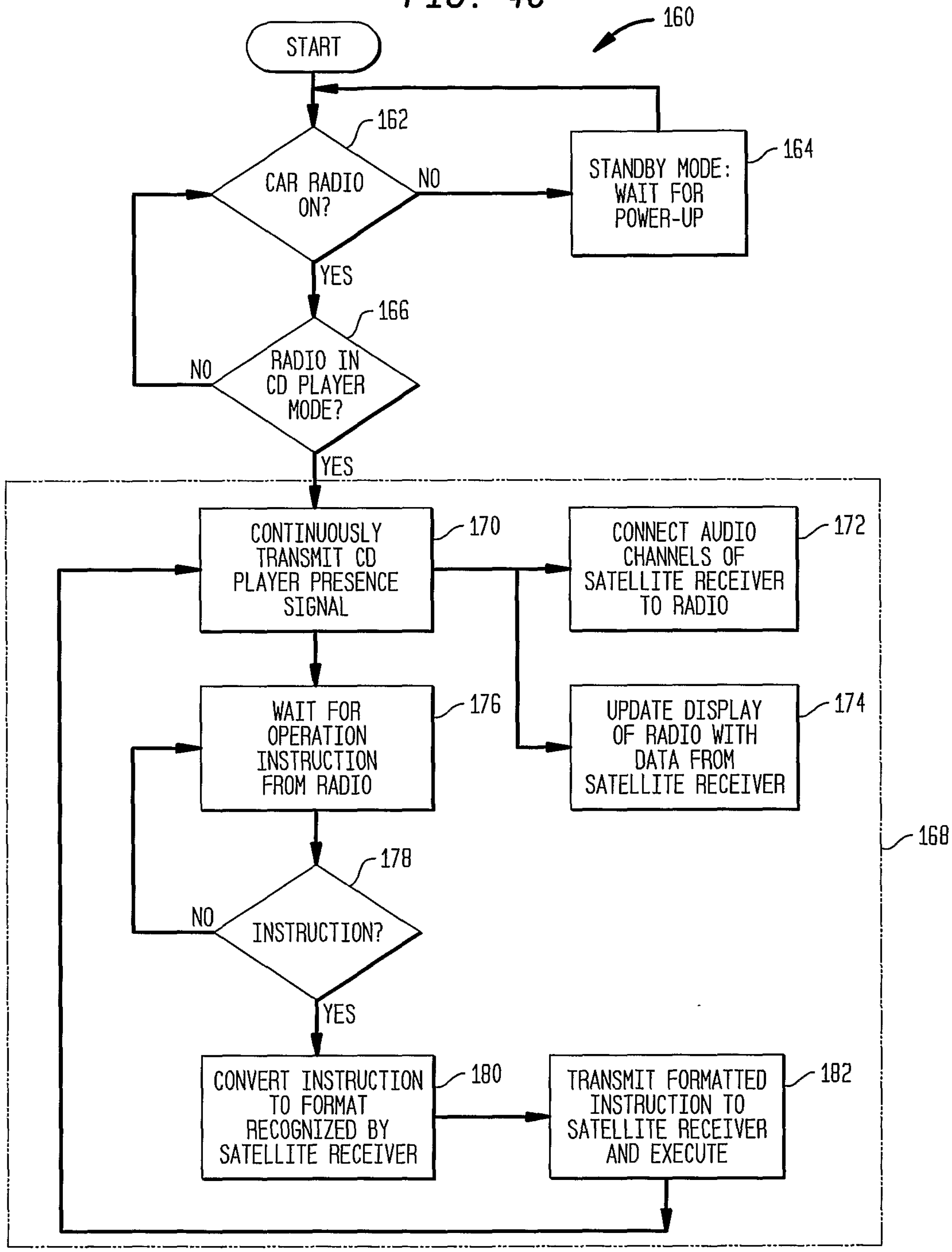
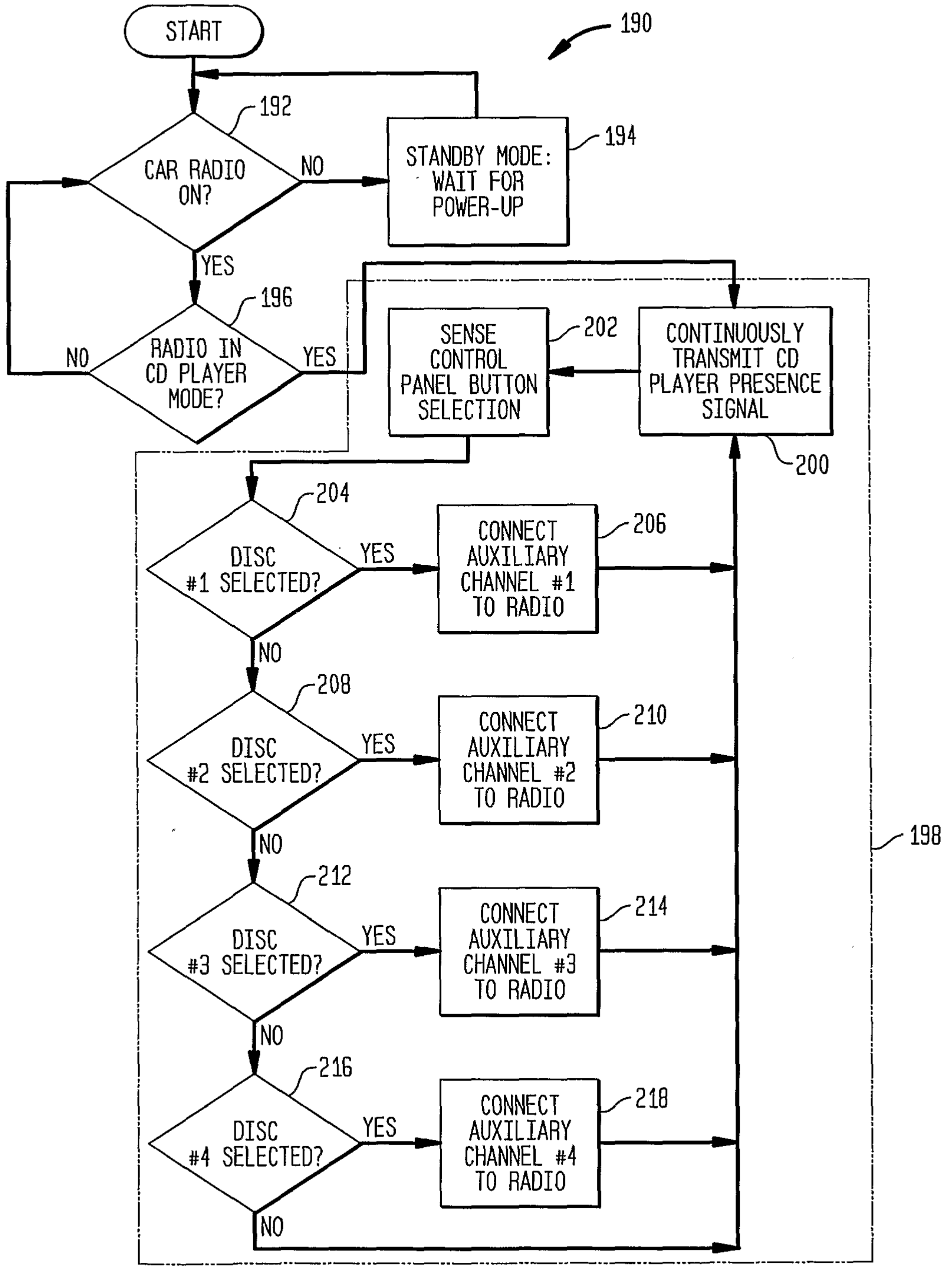

160
START
162
CAR RADIO ON?
NO
STANDBY MODE: WAIT FOR POWER-UP
164
YES
166
RADIO IN CD PLAYER MODE?
NO
YES
CONTINUOUSLY TRANSMIT CD PLAYER PRESENCE SIGNAL
170
CONNECT AUDIO CHANNELS OF SATELLITE RECEIVER TO RADIO
172
WAIT FOR OPERATION INSTRUCTION FROM RADIO
176
UPDATE DISPLAY OF RADIO WITH DATA FROM SATELLITE RECEIVER
174
168
178
INSTRUCTION?
NO
YES
CONVERT INSTRUCTION TO FORMAT RECOGNIZED BY SATELLITE RECEIVER
180
TRANSMIT FORMATTED INSTRUCTION TO SATELLITE RECEIVER AND EXECUTE
182

FIG. 4D



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16/23

FIG. 4E

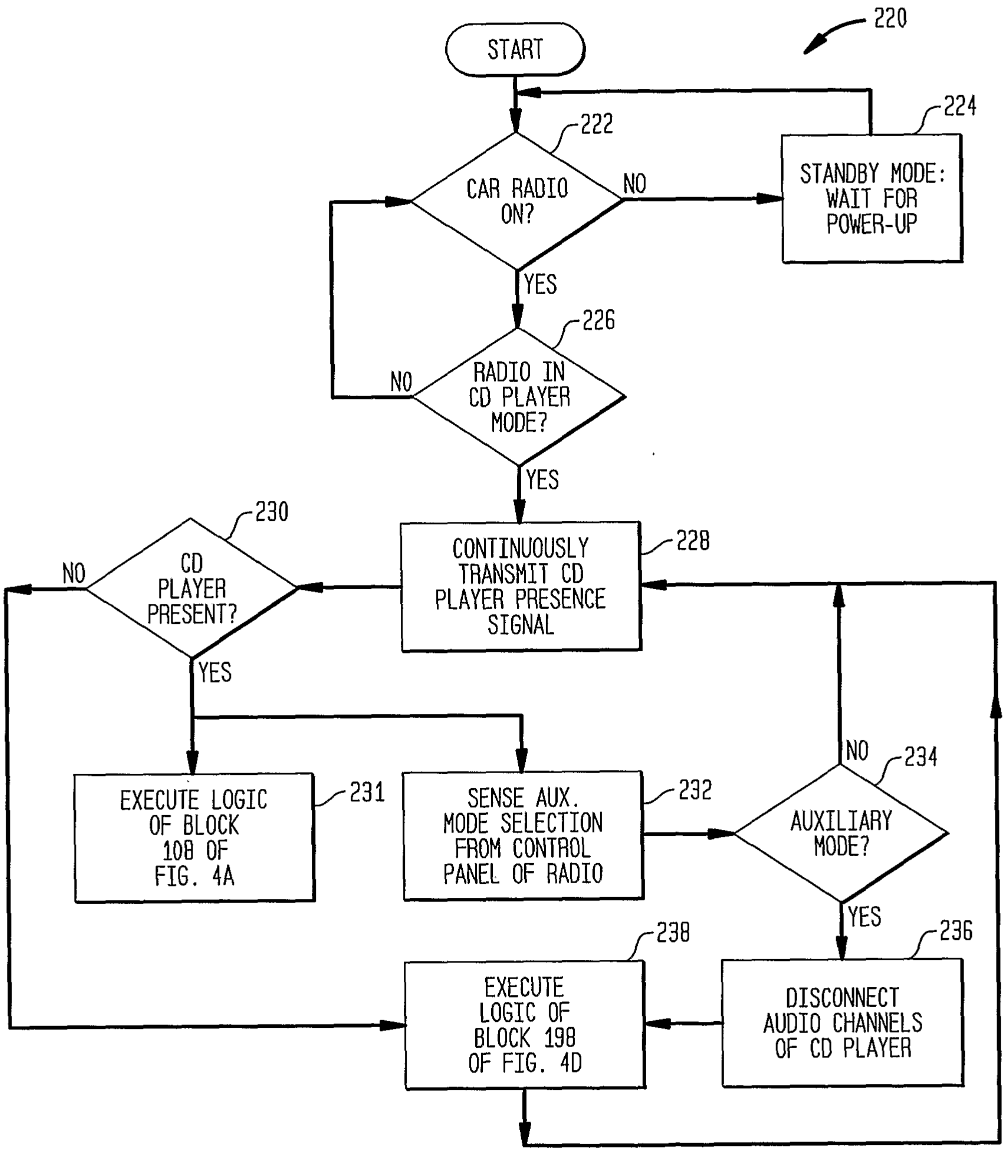

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FIG. 4F

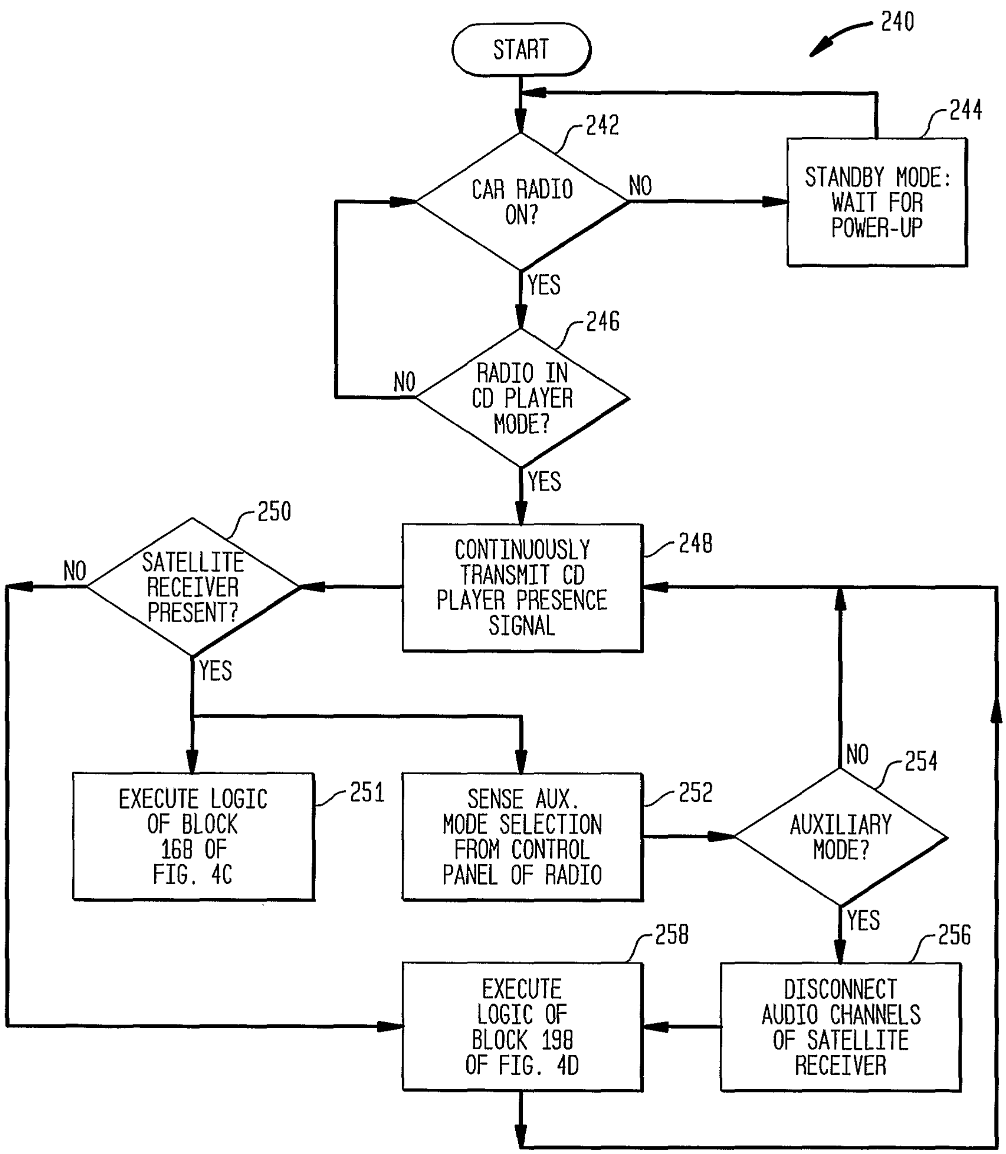

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FIG. 4G

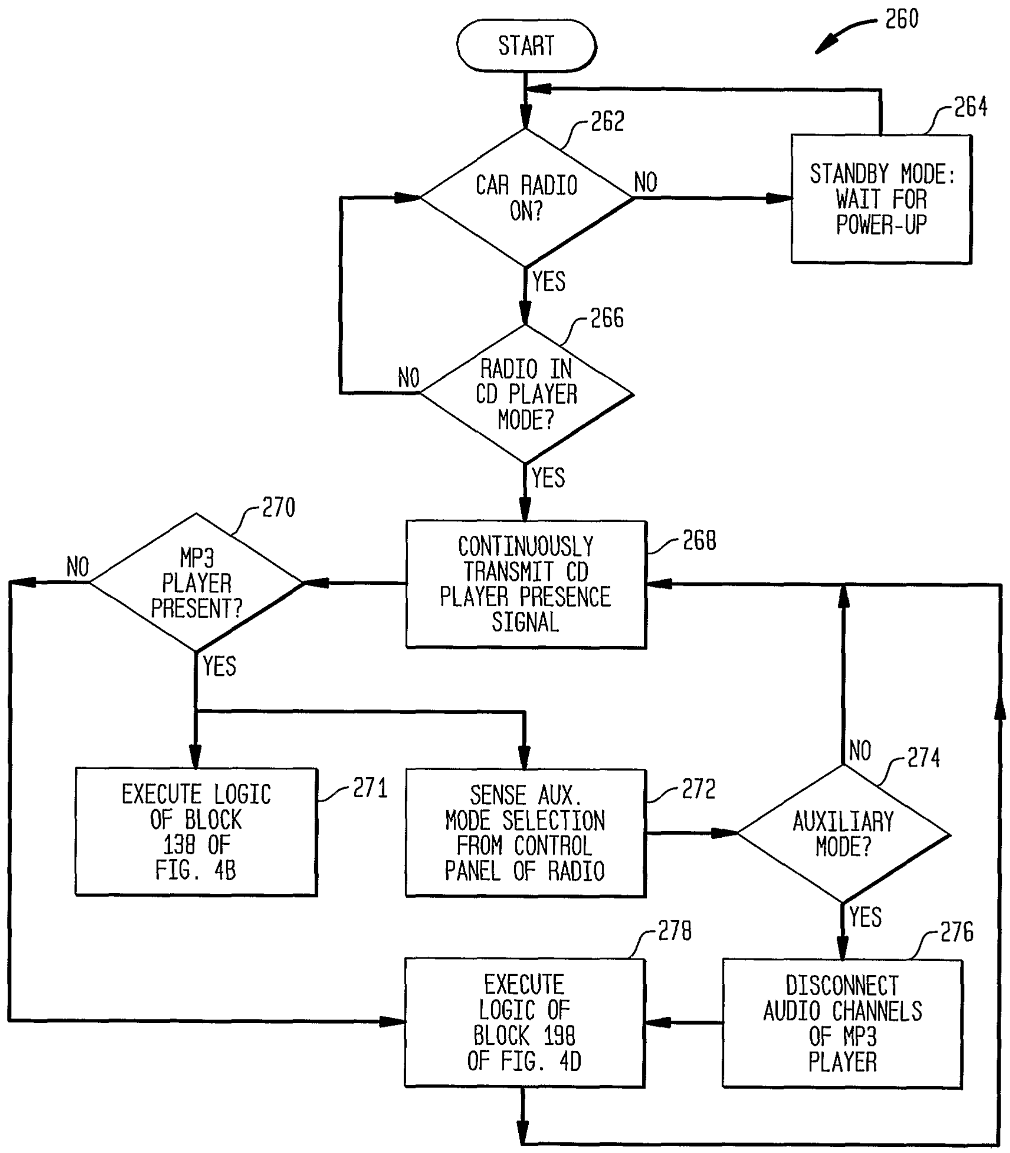

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FIG. 5

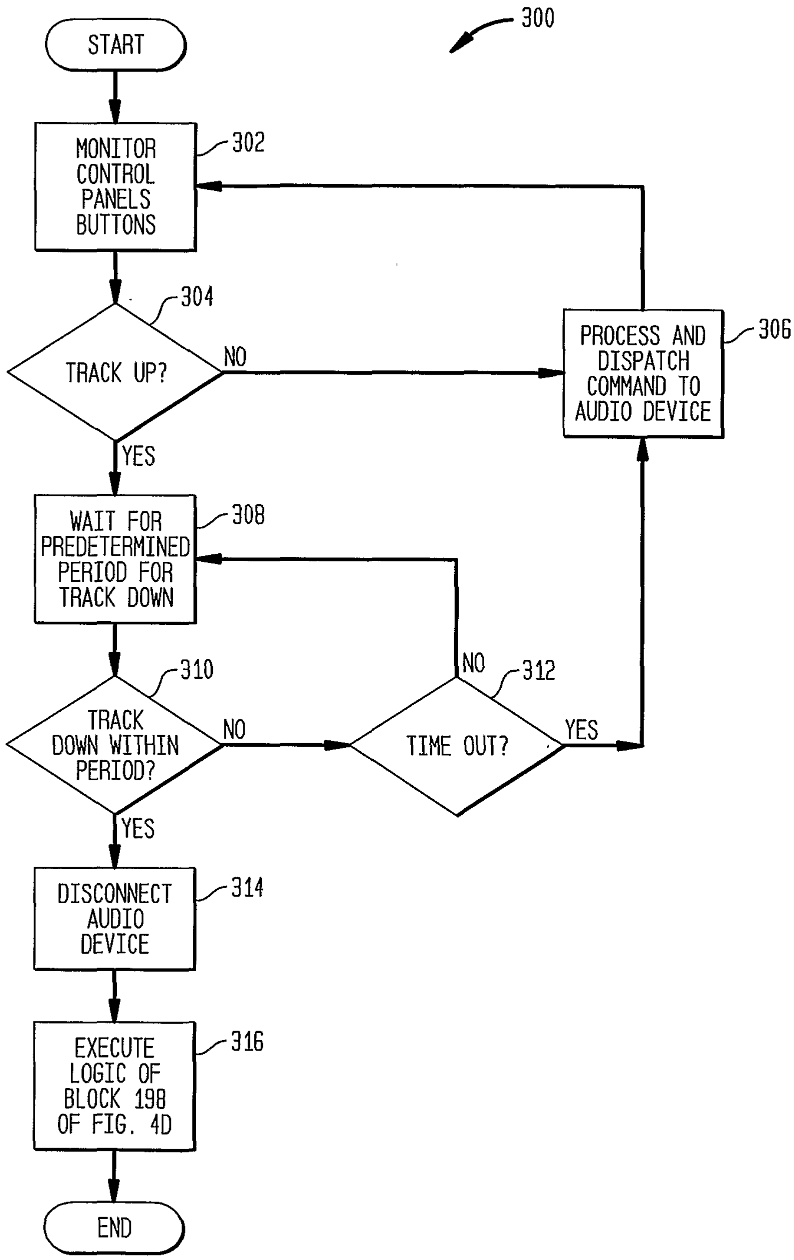
300
START
MONITOR CONTROL PANELS BUTTONS
302
304
TRACK UP?
NO
YES
PROCESS AND DISPATCH COMMAND TO AUDIO DEVICE
306
WAIT FOR PREDETERMINED PERIOD FOR TRACK DOWN
308
310
TRACK DOWN WITHIN PERIOD?
NO
TIME OUT?
NO
312
YES
YES
DISCONNECT AUDIO DEVICE
314
EXECUTE LOGIC OF BLOCK 198 OF FIG. 4D
316
END

FIG. 6

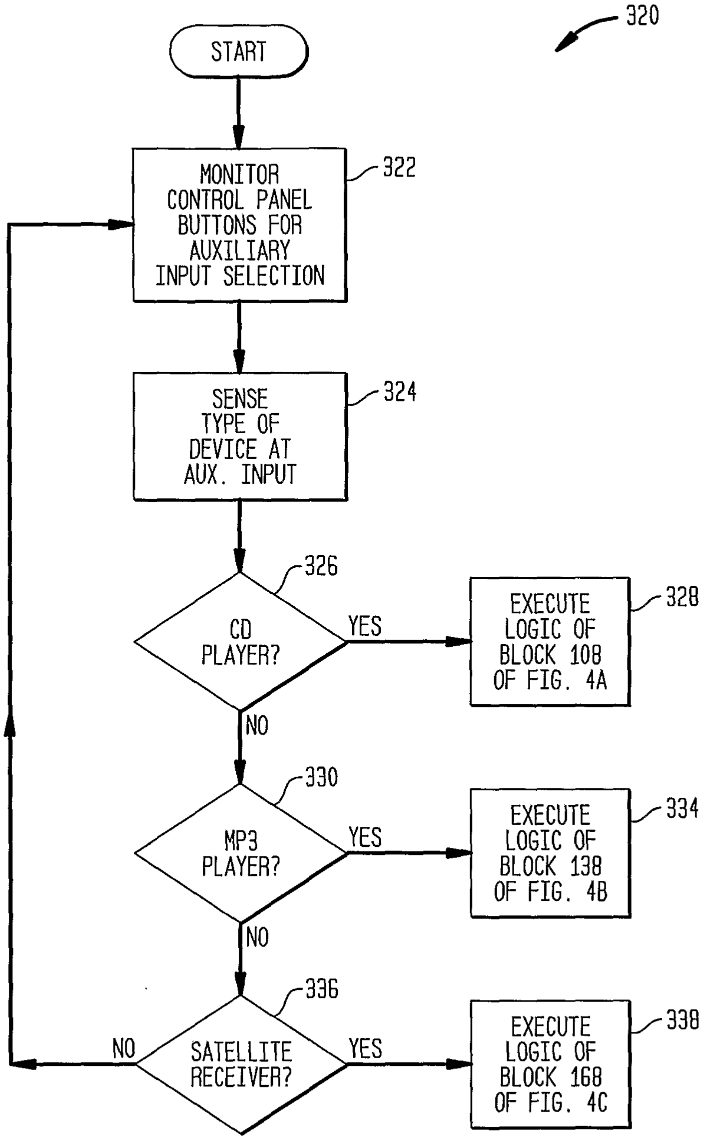

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FIG. 7A

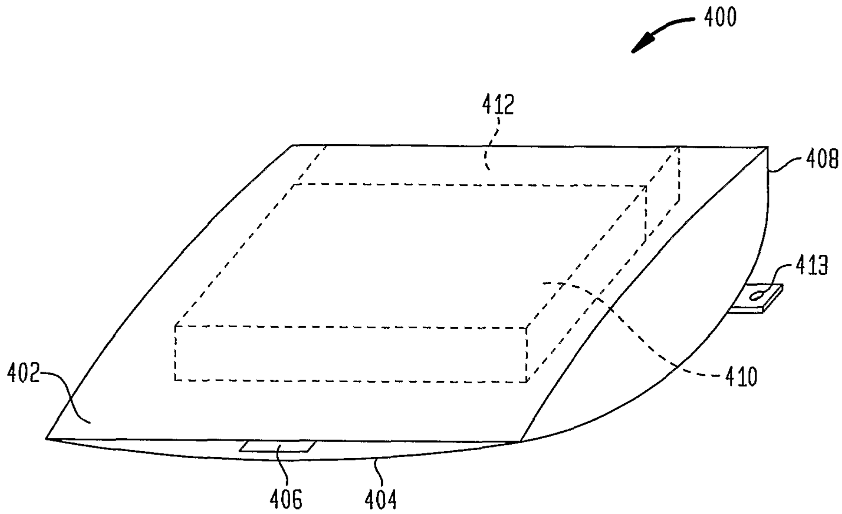

FIG. 7B

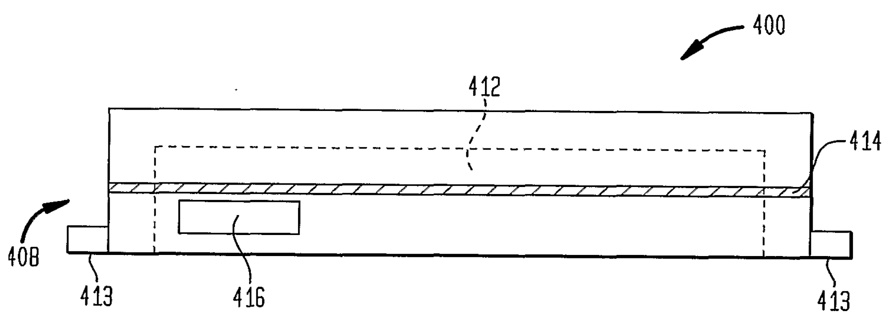

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FIG. 8A

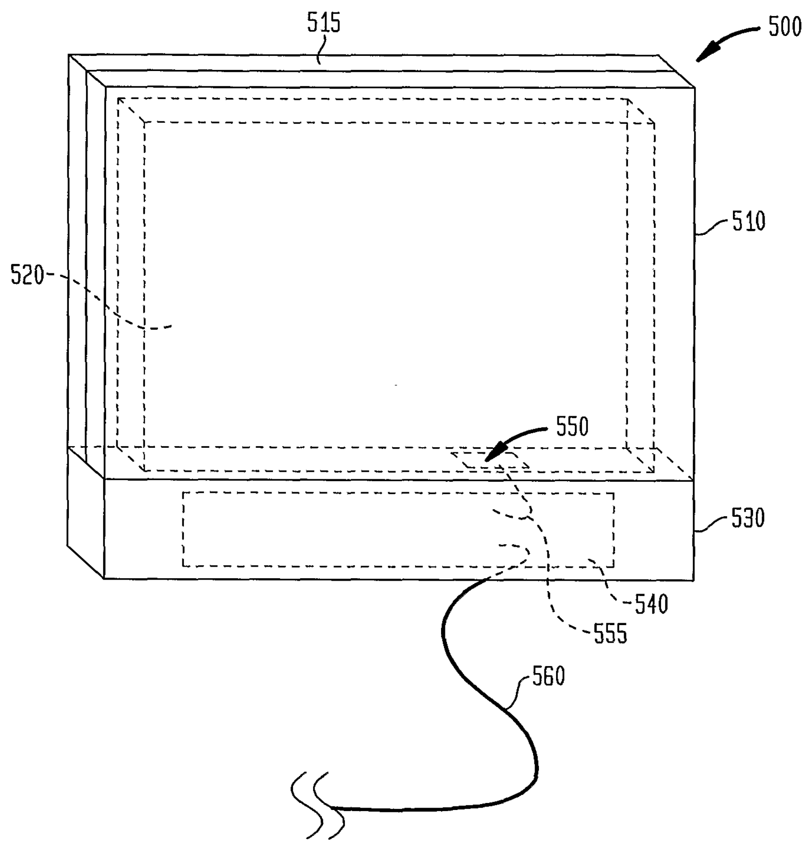

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FIG. 8B

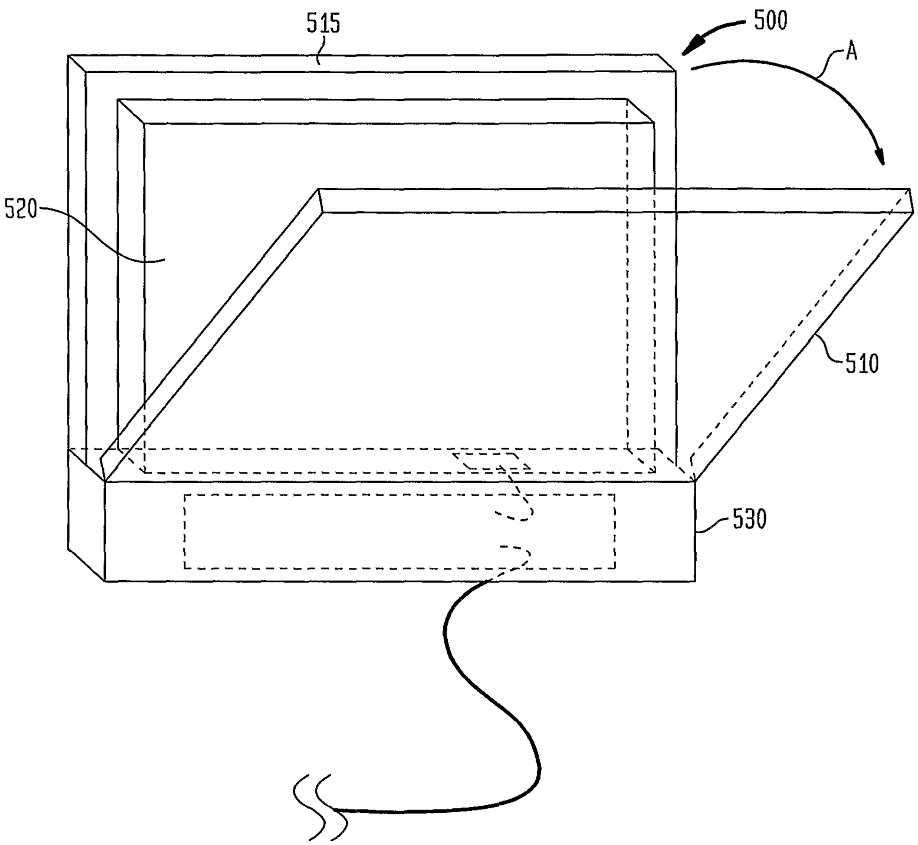
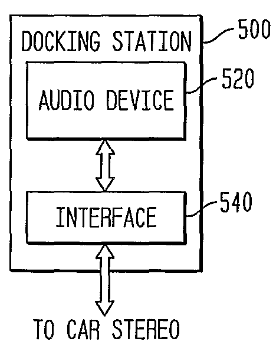

515
500
A
520
510
530

FIG. 9


DOCKING STATION
500
AUDIO DEVICE
520
INTERFACE
540
TO CAR STEREO

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US03/39493

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G06F 17/00; H04B 1/00, 3/00;
US CL : 700/94; 381/86, 77

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)
U.S. : 700/94; 381/86, 77; 455/346,347; D14/434

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 practicable, search terms used)
Databases available through EAST (USPAT, US-PGPUB, EPO, JPO, DERWENT)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 6,396,164 B1 (BARNEA ET AL) 28 May 2002 (28.05.2002), see entire document.	1,2,5,11-21,24-25,27-30,35-36,39-41 ----------- 3,4,6-10,22-23,26,31-34,37-38,42-80
Y, P	US 2003/0007649 A1 (RIGGS) 09 January 2003 (09.01.2003), paragraphs 0037-0040 and 0092-0099.	4,26,38,48-50,57,64,67,73-76, 79
Y	US 6,157,725 A (BECKER) 05 December 2000 (05.12.2000), col. 4, lines 41-58; col. 6, lines 6-46; col 8, line 20-col. 10, line 58.	3,4,6,9-10,26,34-38,44,47-54,61-62,64,66-67,72,75-79
Y	US 5,339,362 A (HARRIS) 16 August 1994 (16.08.1994), col. 3, line 25-col. 4, line 61 and Figures 2,3.	42-46,55-80
Y	US 2001/0044664 A1 (MUELLER et al) 22 November 2001 (22.11.2001), paragraphs 0020-0028,0034-0035.	4,7-12,26,31-38,51-54,61-67,75-76
Y	US 6,330,337 B1 (NICHOLSON) 11 December 2001 (11.12.2001), Figure 2 and col. 3, line 32-col. 4,1 line 28.	22-23,68,80

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"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 07 April 2004 (07.04.2004)	Date of mailing of the international search report 12 MAY 2004
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230	Authorized officer Bill Isen *Eugenio Logan* Telephone No. 703-305-3900

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

PCT/US03/39493

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,772,079 A (DOUGLAS et al) 20 September 1988 (20.09.1988), col. 3, lines 25-64.	42-46,55-80

Form PCT/ISA/210 (second sheet) (July 1998)

(19) KOREAN INTELLECTUAL PROPERTY OFFICE

KOREAN PATENT ABSTRACTS

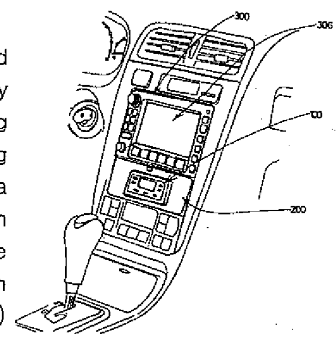
(11)Publication number: 1020010035788 A
(43)Date of publication of application: 07.05.2001

(21)Application number: 1019990042524
(22)Date of filing: 02.10.1999
(30)Priority: ..
(51)Int. Cl G11B 20/10

(71)Applicant: PARK, GYU JIN
(72)Inventor: PARK, GYU JIN

(54) CAR DIGITAL COMBINATION SYSTEM

(57) Abstract:



PURPOSE: A car digital combination system is provided to enhance performance of a car A/V system by permitting a digital data each genre, such as a learning data, a car repair guide, a data for so called singing room realization, and so on which are processed in a caption player by organically coupling a digital caption player to a car A/V system, to be displayed on a large size screen for a car A/V system or a car navigation system. CONSTITUTION: A digital caption player(100) downloads various digital data including a caption synchronized with a digital audio, reproduce the digital data, and digital-records a voice inputted from the outside. A docking station(200) accommodates the digital caption player(100) to fix it on a front face panel of a car and connects a digital caption character output signal and an audio output signal and a control signal for function selection/control from the digital caption layer(100) to a car A/V system(300). The car A/V system(300) receives digital data of the digital caption player (100) inputted through the docking station(200) and outputs the audio and caption data to display devices for a speaker and a monitor, respectively. The digital caption player(100) and the car A/V system(300) having a display device(306) of a large size screen are arranged in the vicinity of centerpesia of the car. The digital caption player(100) is organically coupled to the car A/V system(300) through the docking station(200) for holding the digital caption player(100). The car A/V system(300) may include a car navigation.

Legal Status
Date of request for an examination (19991002)
Notification date of refusal decision (00000000)

Final disposal of an application (rejection)
Date of final disposal of an application (20020621)
Patent registration number ( )
Date of registration (00000000)
Number of opposition against the grant of a patent ( )
Date of opposition against the grant of a patent (00000000)
Number of trial against decision to refuse ( )
Date of requesting trial against decision to refuse ( )

KOREAN PATENT ABSTRACTS XML 2(1-2)

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Korean FullDoc. English Fulltext

(19) KOREAN INTELLECTUAL PROPERTY OFFICE

KOREAN PATENT ABSTRACTS

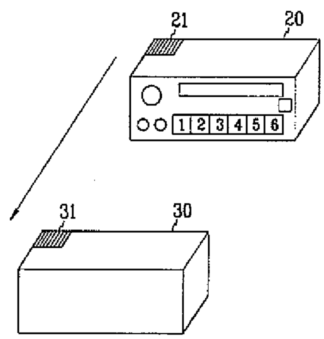
(11)Publication number: 1020010059192 A
(43)Date of publication of application: 06.07.2001

(21)Application number: 1019990066582
(22)Date of filing: 30.12.1999
(30)Priority: ..
(51)Int. Cl G11B 17/02

(71)Applicant: HYUNDAI MOTOR COMPANY
(72)Inventor: LEE, JAE GWANG

(54) COMPACT DISK CHANGER OPERATING SYSTEM

(57) Abstract:



PURPOSE: A compact disk changer operating system is provided to reduce inconvenience caused by installing a cable and a cost by deleting DIN cable. CONSTITUTION: An audio head unit(20) is installed in a vehicle and has a wireless transmitting apparatus to be able to transmit by a wireless. A CD changer(30) has a wireless receiving apparatus receives a signal from the wireless transmitting apparatus and is made an operating control by the audio head unit(20). The wireless transmitting apparatus of the audio head unit(20) is composed of an infrared emitting diode(21). The wireless receiving apparatus of the CD changer(30) is composed of a photo diode(31). The infrared emitting diode(21) and the photo diode(31) are just only one example of practice and is not restricted by practice example if only transmission and reception can be possible by the wireless. In the same manner installation position of the infrared emitting diode(21) and the photo diode(31) also are not limited to a special position.

(19)日本国特許庁（ＪＰ）　(12)**公開特許公報**(Ａ)　(11)特許出願公開番号

特開2000－286874
(P2000－286874A)

(43)公開日　平成12年10月13日(2000.10.13)

(51)Int.Cl.^{7}	識別記号	ＦＩ		テーマコード*(参考)
Ｈ０４Ｌ　12/40		Ｈ０４Ｌ　11/00	３２０	３Ｄ０２０
Ｂ６０Ｒ　11/02		Ｂ６０Ｒ　11/02	Ｂ	５Ｋ０３２
Ｈ０４Ｌ　12/28		Ｈ０４Ｌ　11/00	３１０Ｚ	５Ｋ０３３

審査請求　未請求　請求項の数５　ＯＬ　（全　６　頁）

(21)出願番号　特願平11－90570

(22)出願日　平成11年３月31日(1999.3.31)

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(74)代理人　100079164
弁理士　高橋　勇

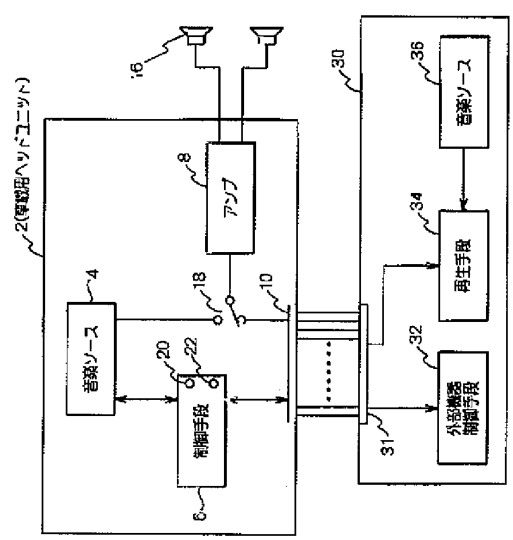
Ｆターム(参考)　3D020 BA02 BA05 BA09 BA10 BA13 BB01 BC03 BE03
5K032 BA06 BA08 DB03 DB04
5K033 BA06 BA08 DB03 DB04

(54)【発明の名称】　車載用ヘッドユニット及び車載用外部機器

(57)【要約】

【課題】　車載用オーディオの外部機器を低コストでかつ利用しやすいものとすること。

【解決手段】　内部音楽ソース４からの音声信号を増幅するアンプ８と、外部機器を接続する外部機器コネクタ１０と、この外部機器コネクタ１０にケーブルを介して接続される外部機器から入力される音声信号と前記内部音楽ソースから入力される音声信号とを切替える切替スイッチ１８と、前記内部音楽ソース４と前記外部機器３０との切替えを制御する制御手段６とを備えている。しかも、外部機器コネクタ３１が、バス接続用の複数のバス用ピン１２を接続するバス用ピン接続端子と、このバス用ピンに併設されコントロール信号を送受する２つのコントロール用ピン接続端子と、前記外部機器と接続される前記バス用ピンおよび前記コントロールピンとを有する１本のケーブルを係合するコネクタ本体１１とを備えた。



【特許請求の範囲】

【請求項１】　内部音楽ソースからの音声信号を増幅するアンプと、外部機器を接続する外部機器コネクタと、この外部機器コネクタにケーブルを介して接続される外部機器から入力される音声信号と前記内部音楽ソースから入力される音声信号とを切替える切替スイッチと、前記内部音楽ソースと前記外部機器との切替えを制御する制御手段とを備えた車載用ヘッドユニットにおいて、

前記外部機器コネクタが、バス接続用の複数のバス用ピン接続端子と、このバス用ピンに併設されコントロール信号を送受する２つのコントロール用ピン接続端子と、前記外部機器と接続される前記バス用ピンおよび前記コントロールピンとを有する１本のケーブルを係合するコネクタ本体とを備えたことを特徴とする車載用ヘッドユニット。

【請求項２】　前記制御手段が、前記始動時に前記バス用ピンと前記コントロールピンとに接続チェック信号をそれぞれ送信すると共に当該接続チェック信号に応答があった側のピン接続端子を有効と設定する第１の接続開始制御部を備えたことを特徴とする請求項１記載の車載用ヘッドユニット。

【請求項３】　前記制御手段が、前記始動時に前記２つのコントロール用ピン接続端子のうち一方を予め定められた一定期間中ハイにすると共に当該一定期間経過後は当該２つのコントロール用ピン接続端子への出力を前記始動時前の状態に戻す第２の接続開始制御部を備えたことを特徴とする請求項１記載の車載用ヘッドユニット。

【請求項４】　ヘッドユニットに対して外部機器となるＴＶ，ＣＤ又はＭＤ等の外部音楽ソースを再生する再生手段と、この再生手段によって再生される音声信号を前記ヘッドユニットへケーブルを介して伝達するためのヘッドユニット用コネクタと、このヘッドユニット用コネクタから入力される制御信号に応じて前記再生手段を制御する外部機器制御手段とを備えた車載用外部機器において、

前記ヘッドユニット用コネクタが、バス接続用の複数のバス用ピン接続端子と、このバス用ピンに併設されコントロール信号を送受する２つのコントロール用ピン接続端子と、前記外部機器と接続される前記バス用ピンおよび前記コントロールピンとを有する１本のケーブルを係合するコネクタ本体とを備えると共に、

前記再生手段に、前記ヘッドユニット用コネクタから入力される接続チェック信号に応じて前記コントロール用ピン接続端子又は前記バス用ピン接続端子の一方を選択する接続切替手段を備えたことを特徴とする車載用外部機器。

【請求項５】　ヘッドユニットに対して外部機器となるＴＶ，ＣＤ又はＭＤ等の外部音楽ソースを再生する再生手段と、前記ヘッドユニットから入力される制御信号に応じて前記再生手段を制御する外部機器制御手段とを備えた車載用外部機器において、

前記外部機器制御手段に、前記ヘッドユニット又は他の外部機器と接続する２以上の拡張コネクタを併設し、

前記拡張コネクタが、バス接続用の複数のバス用ピン接続端子と、このバス用ピンに併設されコントロール信号を送受する２つのコントロール用ピン接続端子と、前記外部機器と接続される前記バス用ピンおよび前記コントロールピンとを有する１本のケーブルを係合するコネクタ本体とを備え、

前記外部機器制御手段が、前記ヘッドユニットが接続されたコネクタに対して前記コントロール用ピン接続端子を有効と設定すると共に前記他の外部機器が接続されたコネクタに対して前記バス用ピン接続端子を有効に設定する複数接続制御部を備えたことを特徴とする車載用外部機器。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、車載用ヘッドユニット及び車載用外部機器に係り、特に、車載用ヘッドユニットに車載用外部機器を増設する際の接続方式に特徴のある車載用ヘッドユニット及び車載用外部機器に関する。

【０００２】

【従来の技術】従来、車載用オーディオのヘッドユニットと外部機器の接続方式は、デッキ接続とバス接続の２通がある。一般的には、ヘッドユニットは例えばＦＭ／ＡＭラジオ付きカセットであり、一方、外部機器はＣＤプレーヤ、ＭＤプレーヤまたはＴＶ等である。

【０００３】

【発明が解決しようとする課題】しかしながら、上記従来例では、デッキ接続とバス接続の接続方式は互換性がないため、ＣＤプレーヤはデッキ接続用とバス接続用の二種類を用意しなければならない、という不都合があった。このため、ユーザは、外部機器を選定する時に、自分のヘッドユニットがデッキ接続用であるのか、それともバス接続用であるのかを確認しなければならなかった。

【０００４】

【発明の目的】本発明は、係る従来例の有する不都合を改善し、特に、車載用オーディオの外部機器を低コストでかつ利用しやすいものとすることのできる車載用ヘッドユニット及び車載用外部機器を提供することを、その目的とする。

【０００５】

【課題を解決するための手段】そこで、本発明による車載用ヘッドユニットでは、内部音楽ソースからの音声信号を増幅するアンプと、外部機器を接続する外部機器コネクタと、この外部機器コネクタにケーブルを介して接続される外部機器から入力される音声信号と前記内部音楽ソースから入力される音声信号とを切替える切替スイ

ッチと、前記内部音楽ソースと前記外部機器との切替えを制御する制御手段とを備えている。そして、外部機器コネクタが、バス接続用の複数のバス用ピン接続端子と、このバス用ピンに併設されコントロール信号を送受する2つのコントロール用ピン接続端子と、前記外部機器と接続される前記バス用ピンおよび前記コントロールピンとを有する1本のケーブルを係合するコネクタ本体とを備えた、という構成を採っている。これにより前述した目的を達成しようとするものである。

【0006】ここでは、外部機器コネクタが、バス接続用のバス用ピン接続端子と、デッキ接続用のコントロール用ピン接続端子とを備えたため、いずれの接続形式の外部機器であっても、同一のケーブルで接続される。このため、外部機器の購入に際して、ヘッドユニットのコネクタ形状に応じて外部機器を選択する必要がない。

【0007】

【発明の実施の形態】以下、本発明の実施の形態を図面を参照して説明する。図1は本発明による車載用ヘッドユニットと当該車載用ヘッドユニットに接続した車載用外部機器との構成を示すブロック図である。図1に示すように、車載用ヘッドユニット2は、内部音楽ソース4からの音声信号を増幅するアンプ8と、外部機器を接続する外部機器コネクタ10と、この外部機器コネクタ10にケーブルを介して接続される外部機器から入力される音声信号と前記内部音楽ソースから入力される音声信号とを切替える切替スイッチ18と、前記内部音楽ソース4と前記外部機器30との切替えを制御する制御手段6とを備えている。

【0008】しかも、図2に示すように、外部機器コネクタ31が、バス接続用の複数のバス用ピン12を接続するバス用ピン接続端子(図2のピン番号1, 2のBUS+と-)と、このバス用ピンに併設されコントロール信号を送受する2つのコントロール用ピン接続端子(図2のピン番号5, 13のCONT1及び2)と、前記外部機器と接続される前記バス用ピンおよび前記コントロールピンとを有する1本のケーブルを係合するコネクタ本体11とを備えている。

【0009】図2に示すように、本実施形態ではヘッドユニット2と外部機器30とを接続するコネクタ及び信号ラインをデッキ接続用とバス接続用の両方を含む形態としている。デッキ接続Dは、図3(A)に示すように、外部機器を1台のみ接続する方式である。その長所は低コストで製造できる点にあり、対処は、1台のみの接続であることと、CDチェンジャーなどをヘッドユニットの操作により制御することができない点にある。デッキ接続では、例えば、ヘッドユニットの内部音楽ソース(ラジオ、テープ)が動作中はCONT1を"Hi"とし、外部機器が動作中は、CONT2を"Hi"とする。外部機器が動作中にヘッドユニットが動作すると、CONT1を"Hi"とする。これに応じて外部機器は再生を停止し、CONT2を"Lo"とする。

【0010】一方、バス接続は複数台の外部機器の接続が可能であり、また、CDチェンジャーなどの制御をヘッドユニットで行うことができる。バス接続では、各機器にアドレスを割り当ててバスにより接続し、動作、停止等の要求をやりとりすることで連携する。バス接続では、通信用ICが必要となり、マイコン処理が増えるため、コストが高くなってしまう。一般的に、デッキ接続は廉価品に、バス接続は高級品に使用されている。

【0011】本実施形態では、図1に示すように、図2に示した方式の13ピンを用いることで、ヘッドユニットがバス接続であるのかまたはデッキ接続であるのかに関わらず、同一の外部機器を接続することができる。図1に示す例では、外部機器は、ヘッドユニットに対して外部機器となるTV, CD又はMD等の外部音楽ソースを再生する再生手段34と、この再生手段34によって再生される音声信号を前記ヘッドユニットへケーブルを介して伝達するためのヘッドユニット用コネクタ31と、このヘッドユニット用コネクタ31から入力される制御信号に応じて前記再生手段34を制御する外部機器制御手段32とを備えている。そして、ヘッドユニット用コネクタ31は、上述した外部機器コネクタと同一の形状、構造を採っている。そして、ヘッドユニット用コネクタから入力される接続チェック信号に応じて再生手段を前記コントロール用ピン接続端子又は前記バス用ピン接続端子の一方を選択する接続方式切替手段を備えている。この接続方式切替手段が、ヘッドユニットの採用する接続方式に応じて、バス接続またはデッキ接続を選択するため、ユーザがヘッドユニットの接続方式を確認する必要がなくなる。これは、ヘッドユニット側がデッキ接続またはバス接続のみに対応している場合に好適である。

【0012】また、ヘッドユニット側が両方の接続方式に対応していて、外部機器が一方の接続方式にのみ対応している場合には、図1に示したヘッドユニット2の制御手段6が、始動時(ACC ON時)にバス用ピンと前記コントロールピンとに接続チェック信号それぞれ送信すると共に当該接続チェック信号に応答があった側のピン接続端子を有効と設定する第1の接続開始制御部20を備えるとよい。

【0013】さらに、ヘッドユニットがデッキ接続のみに対応している場合には、第1の接続開始制御部20に代えて、始動時に前記2つのコントロール用ピン接続端子のうち一方を予め定められた一定期間中ハイにすると共に当該一定期間経過後は当該2つのコントロール用ピン接続端子への出力を前記始動時前の状態に戻す第2の接続開始制御部を備えるとよい。この場合、デッキ接続にのみ対応した外部機器や、または両方の接続方式に対応した外部機器との間でデッキ接続を確立する。

【0014】図4は本実施形態による13ピンの接続方

式を使用して複数台の外部機器を接続した例を示すブロック図である。図4に示す例では、ヘッドユニットを低コストとするためにデッキ接続専用としつつ、図2に示すコネクタを採用する。そして、外部機器として操作パネルを有するTVを設け、このTVから2台の他の外部機器をバス接続する。そして、TVの操作パネルを操作することで、デッキ接続を介してヘッドユニットに送信する音楽ソースを選択する。図4に示す他の外部機器30，38は、図2に示すコネクタを有しつつ、さらにデッキ接続とバス接続の両方に対応したものとすると、当該他の外部機器を直接ヘッドユニット2に接続することもでき、接続の形態に応じて外部機器の接続方式及びコネクタを選択する必要がなくなる。

【0015】図4に示す外部機器40は、ヘッドユニット又は他の外部機器と接続する2以上の拡張コネクタ41を備えている。そして、当該拡張コネクタは、図1に示す外部機器コネクタと同様の形式、構造を採っている。そして、この外部機器40のコントローラとなる外部機器制御手段は、ヘッドユニット2が接続されたコネクタ41に対して前記コントロール用ピン接続端子を有効と設定することでデッキ接続を行い、さらに、他の外部機器が接続されたコネクタ41に対して前記バス用ピン接続端子を有効に設定することでバス接続する複数接続制御部を備えている。これにより、ヘッドユニット2を低コストとしつつ、複数台の外部機器を接続でき、そして、すべて同一のケーブルを利用して接続できるため、接続及び機器の選定が容易となる。

【0016】図5は本発明による車載用ヘッドユニットの実施例の構成を示すブロック図である。図5に示す車載用ヘッドユニットは、FM／AMラジオ付カセットである。図5に示すように、FM／AMラジオ付カセット（ヘッドユニット）は、車両アンテナで受信する電波に同調するチューナー回路52と、カセットテープを再生するテープヘッド54からの再生信号を増幅するテープイコライザアンプ53と、外部機器30から入力される音声信号を増幅するグランドアイソレーションアンプ55と、これらの音楽ソースからの音声信号を切替信号に応じて切り替える音声信号切替スイッチ18とを備えている。

【0017】FM／AMラジオ付カセット2はさらに、切替スイッチから入力される音声信号の増幅を調整するボリウム回路7と、このボリウム回路の出力を増幅するパワーアンプ8とを備えている。また、このパワーアンプ8は、スピーカー16に接続されている。そして、外部機器30とデッキ接続される制御手段としての制御用マイコン6を備えている。

【0018】図6に示すように、FM／AMラジオ付カセット2と外部機器との接続の確立は、AccON時の接続チェック信号の送受信により行う。図6（A）はデッキ接続を確立するための接続チェック信号の一例を示す波形図であり、FM／AMラジオ付カセット2は、AccON時に500〔ms〕CONT1を”Hi”とする。これにより、FM／AMラジオ付カセット2がデッキ接続を要求していることを外部機器に伝達する。また、FM／AMラジオ付カセット2がバス接続を外部機器に要求するには、図6（B）に示すように、AccON時直後に接続チェック信号となるパルス信号を各機器に送信し、返事を待つ。外部機器から当該接続チェック信号に応じた信号が入力されると、当該外部機器とバス接続を確立する。

【0019】図7に示すように、外部機器30は、AccON時に、バス信号とCONT1信号とをチェックして現在接続されているヘッドユニットがどちらの方式かを判断する。すなわち、AccONとなると、バス接続用の接続チェック信号が入力されたか否かを確認し（ステップS1）、図6（B）に示す信号が入力された場合にはバス接続を確立する（ステップS2）。一方、バス接続用の接続チェック信号が入力されない場合には、図6（A）に示すCONT1が”Hi”であるか否かを判定する（ステップS3）。そして、CONT1が”Hi”であれば、デッキ接続を確立する（ステップS4）。

【0020】また、AccONから2秒間バス信号、CONT1も入力されないときには、外部機器はヘッドユニットに対して接続要求のバス信号を送信する。

【0021】上述したように本実施形態によると、1つの接続コネクタの中にデッキ接続とバス接続の2つの方式の配線を入れ、そして、外部機器は、接続されたヘッドユニットがどちらの方式のものであるかを識別するため、外部機器は1機種で対応できるため、品種を少なくすることができ、そして、ユーザが外部機器を選定するときに自分のヘッドユニットがどちらの接続方式であるかを考慮する必要がなくなる。

【0022】

【発明の効果】本発明は以上のように構成され機能するので、これによると、外部機器コネクタが、バス接続用のバス用ピン接続端子と、デッキ接続用のコントロール用ピン接続端子とを備えたため、いずれの接続形式の外部機器であっても、同一のケーブルで接続することができ、従って、同一の機能の外部機器についてコネクタ形状別に外部機器の製造を行う必要がなく、また、ユーザは、外部機器の購入に際して、ヘッドユニットのコネクタ形状に応じて外部機器を選択する必要がなく、このため、外部機器の増設作業を簡単に行うことができる、という従来にない優れた車載用ヘッドユニット及び車載用外部機器を提供することができる。

【図面の簡単な説明】

【図1】本発明の一実施形態の構成を示すブロック図である。

【図2】図1に示した外部機器コネクタ等の形式及び構

造の一例を示す説明図である。

【図3】ヘッドユニットと外部機器の接続の例を示すブロック図であり、図3（A）はデッキ接続の一例を示し、図3（B）はバス接続の一例を示す図である。

【図4】デッキ接続形式のヘッドユニットに複数の外部機器を接続する例を示すブロック図である。

【図5】本発明の一実施例の構成を示すブロック図である。

【図6】接続チェック信号の一例を示す波形図であり、図6（A）はデッキ接続での接続チェック信号の一例を示す図で、図6（B）はバス接続での接続チェック信号の一例を示す図である。

【図7】図6に示す接続チェック信号を用いた外部機器側の接続確立処理の一例を示すフローチャートである。

【符号の説明】

2　ヘッドユニット（例えば、FM／AMラジオ付カセット）

4　ヘッドユニットの音楽ソース（例えば、カセット）

6　制御手段（制御用マイコン）

8　アンプ

10　外部機器用コネクタ

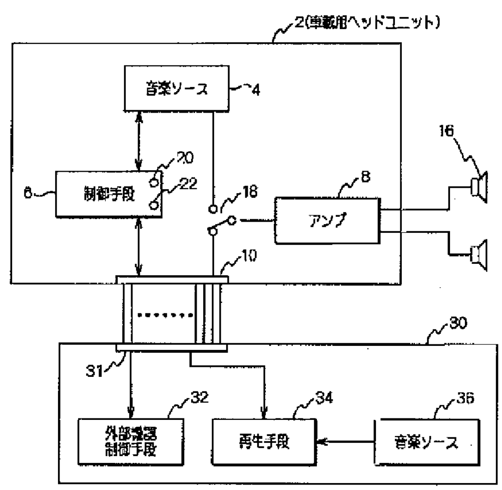
16　スピーカ

30　外部機器（例えば、CDプレーヤ）

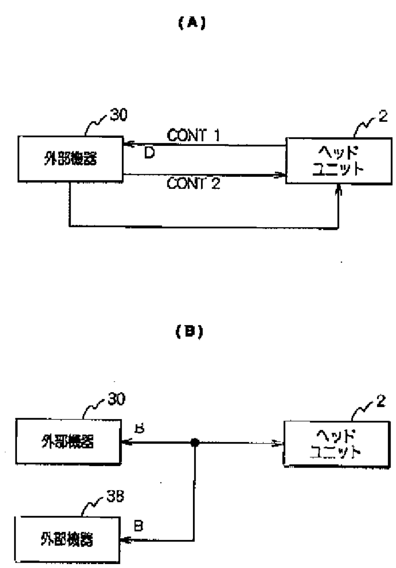
31　ヘッドユニット用コネクタ

32　外部機器接続制御手段（制御用マイコン及び通信用IC）

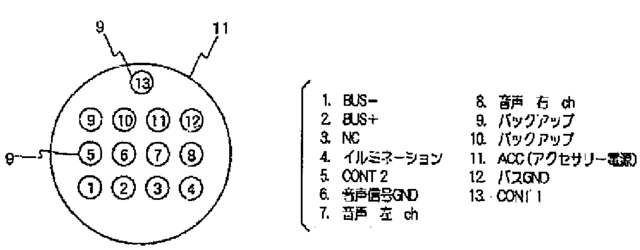
【図1】



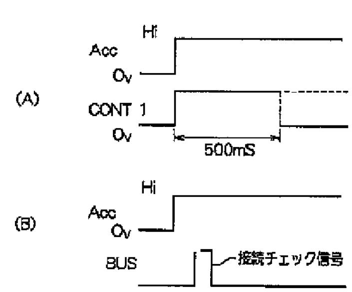
【図3】



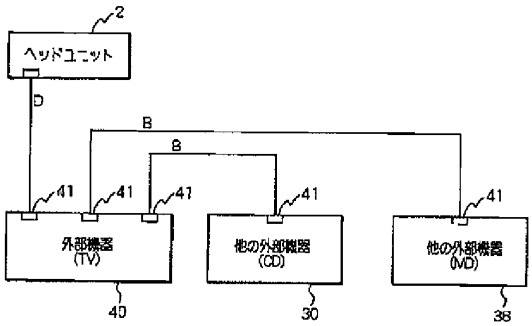
【図2】



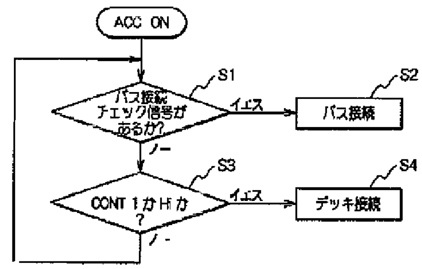
【図6】



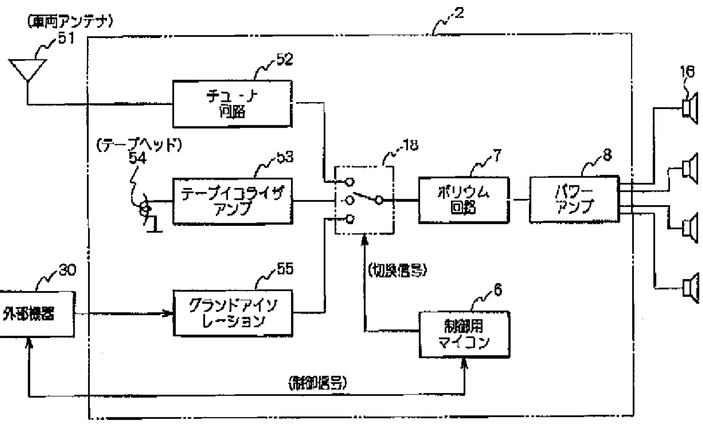
【図4】


ヘッドユニット
外部機器
(TV)
他の外部機器
(CD)
他の外部機器
(MD)

【図7】


ACC ON
バス接続
チェック信号が
あるか?
イエス
バス接続
ノー
CONT 1 が H か
?
イエス
デッキ接続
ノー

【図5】


(車両アンテナ)
チューナ
回路
(テープヘッド)
テープイコライザ
アンプ
ボリウム
回路
パワー
アンプ
(切換信号)
外部機器
グランドアイソ
レーション
制御用
マイコン
(制御信号)

PATENT ABSTRACTS OF JAPAN

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H04L 12/28

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(22)Date of filing : 31.03.1999

(71)Applicant : SUZUKI MOTOR CORP

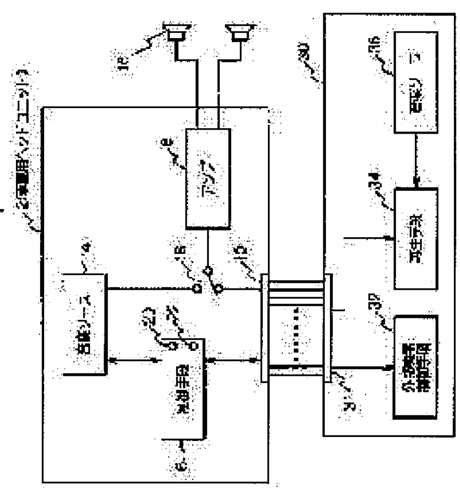
(72)Inventor : UEMURA HIROSHI

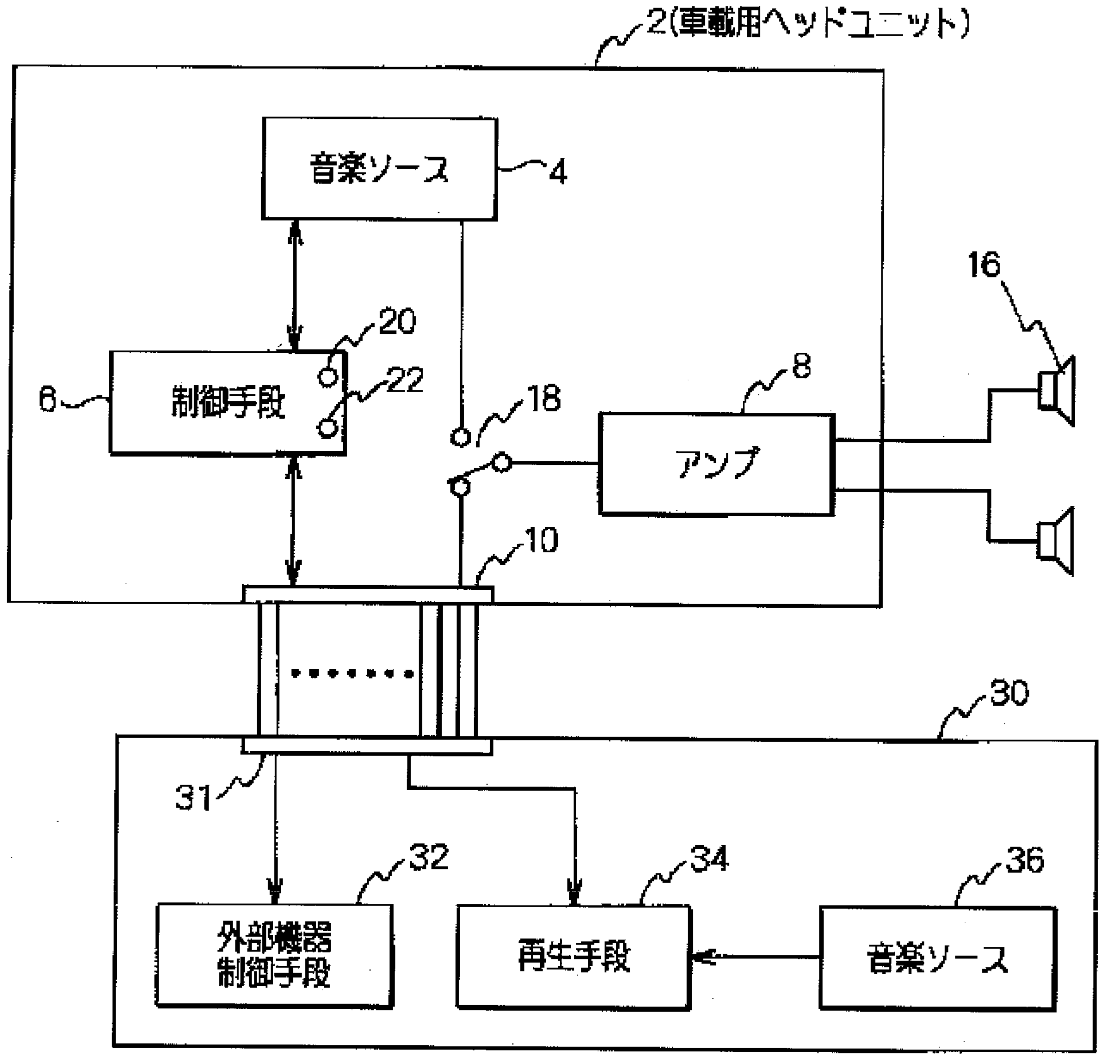
(54) ON-VEHICLE HEAD UNIT AND ON-VEHICLE EXTERNAL DEVICE

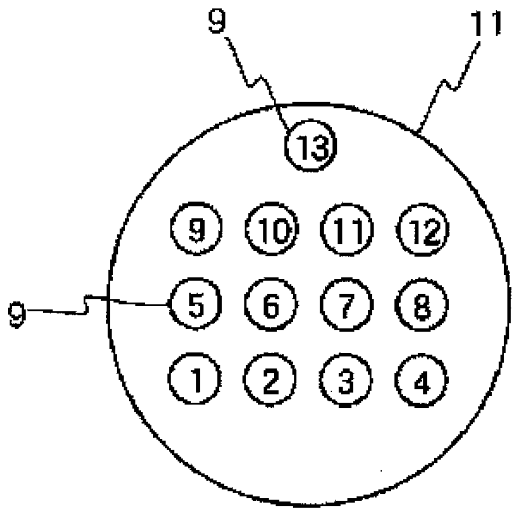
(57)Abstract:

PROBLEM TO BE SOLVED: To provide an external device for an on-vehicle audio unit which device is inexpensive and easily used.

SOLUTION: An on-vehicle head unit 2 is provided with an amplifier 8 that amplifies an audio signal from an internal music source 4, an external unit connector 10 for connecting the head unit 2 to an external device, a changeover switch 18 that selects an audio signal received from the external device connected to the external unit connector 10 via a cable or the audio signal received from the internal music source, and a control means 6 that controls switching between the internal music source 4 and the external device 30. Furthermore, an external device connector 31 is provided with bus use pin connection terminals connected to a plurality of bus pins for bus connection, two control pin connection terminals provided along the bus pins to send/receive a control signal, and a connector main body engaging one cable connected to the external device and having the bus pins and the control pins.

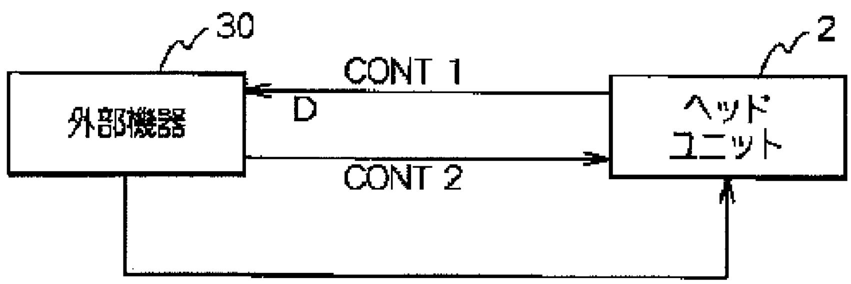



2(車載用ヘッドユニット)
音楽ソース
4
16
20
22
6
制御手段
18
8
アンプ
10
30
31
32
34
36
外部機器
制御手段
再生手段
音楽ソース

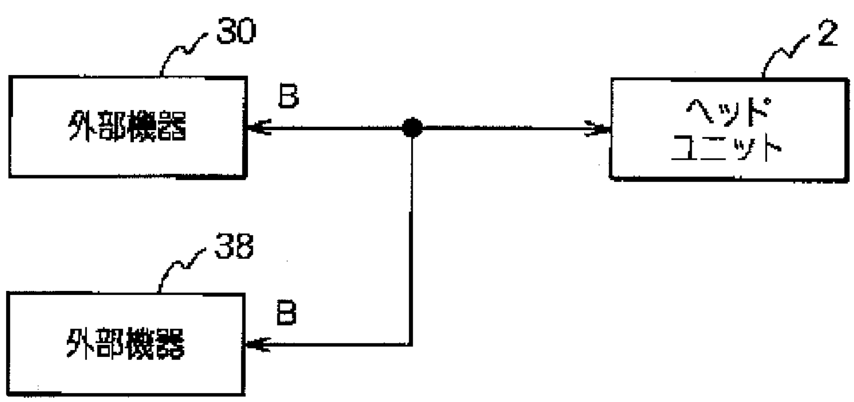


1. BUS−
2. BUS+
3. NC
4. イルミネーション
5. CONT 2
6. 音声信号GND
7. 音声　左　ch
8. 音声　右
9. バックア
10. バックア
11. ACC (ア
12. バスGN
13. CONT 1

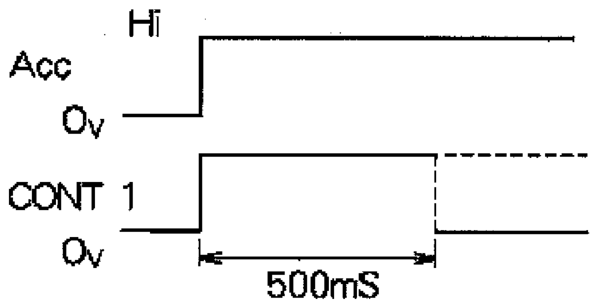
(A)



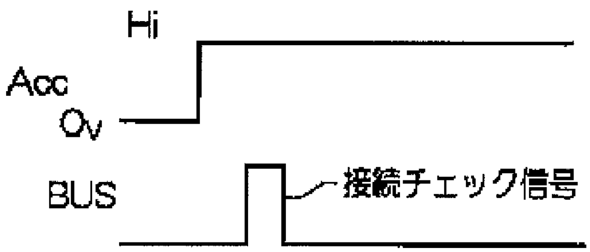
(B)

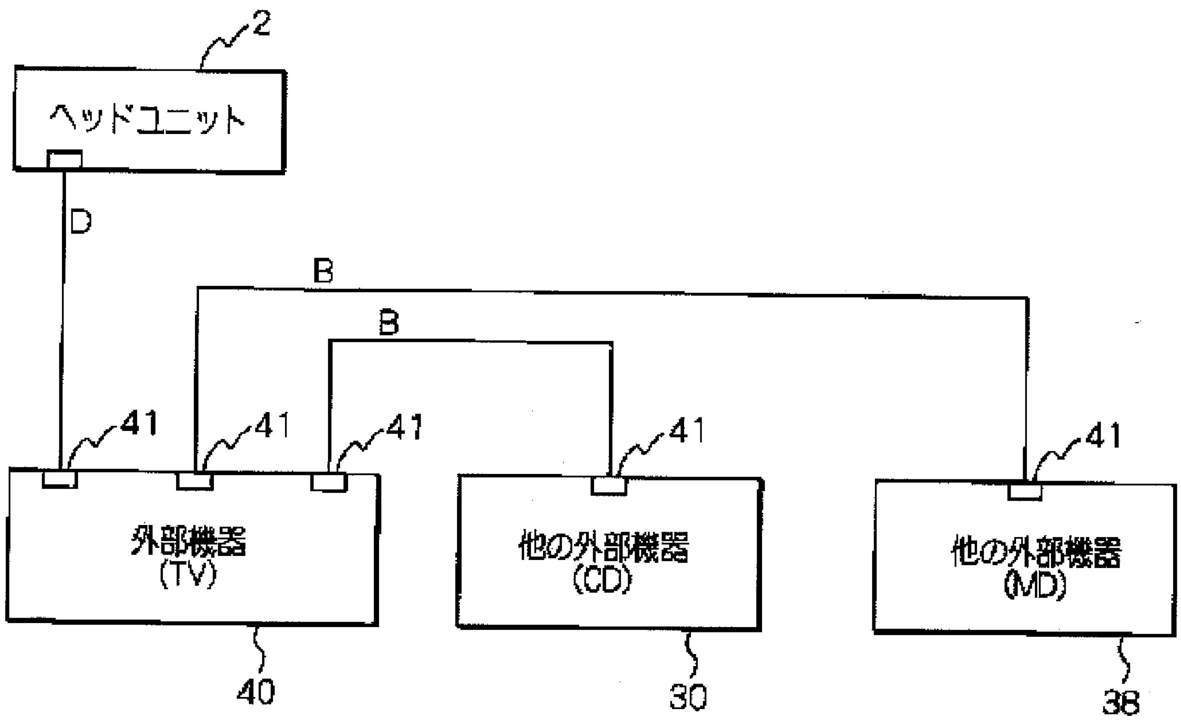


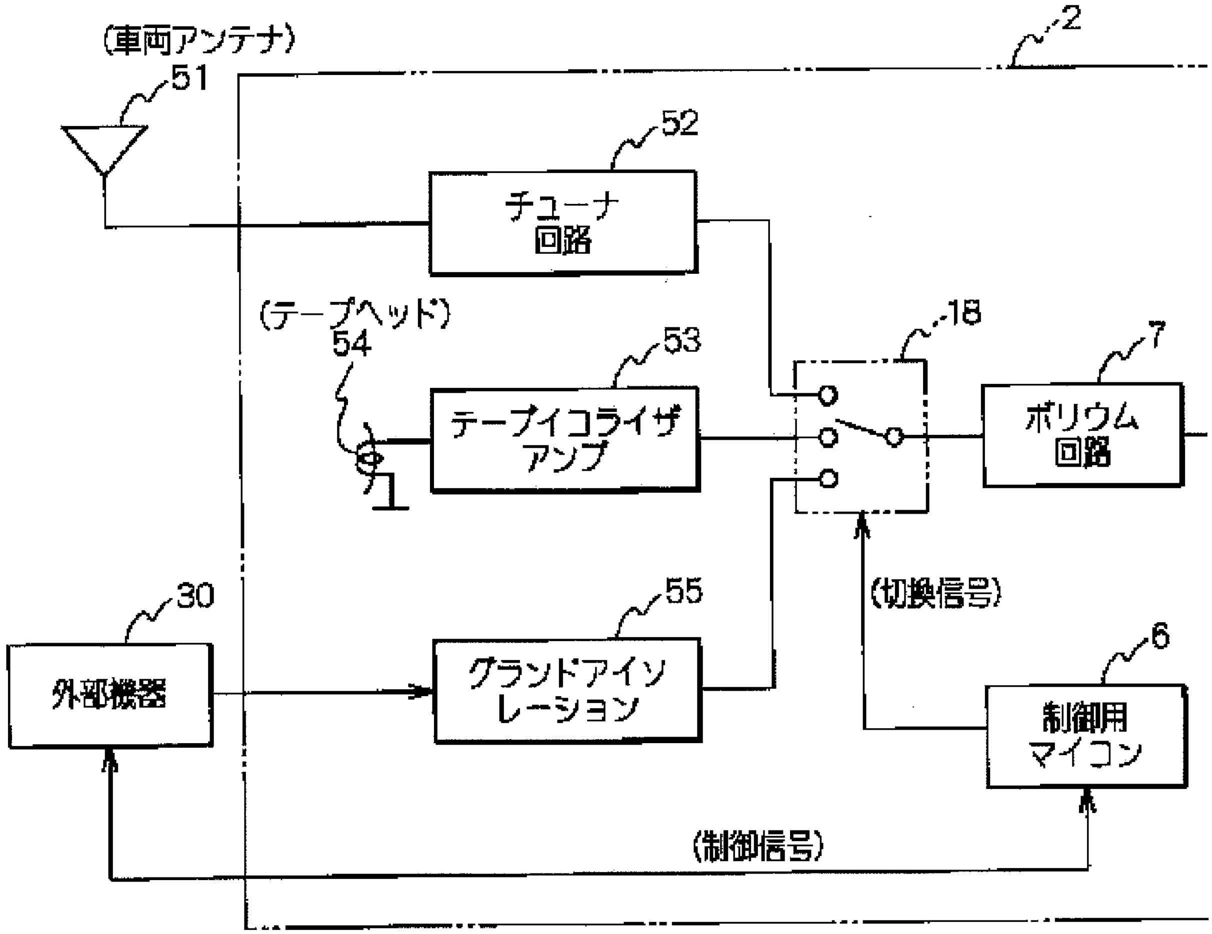
(A)



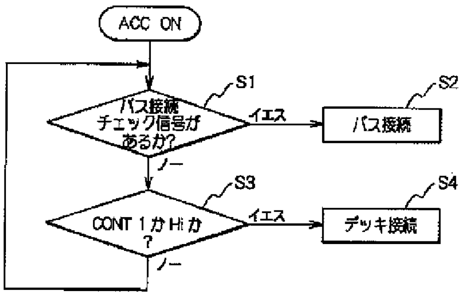
(B)




2
ヘッドユニット
D
B
B
41
41
41
41
41
外部機器
(TV)
他の外部機器
(CD)
他の外部機器
(MD)
40
30
38


(車両アンテナ)
51
2
52
チューナ
回路
(テープヘッド)
54
53
テープイコライザ
アンプ
18
7
ボリウム
回路
30
外部機器
55
グランドアイソ
レーション
(切換信号)
6
制御用
マイコン
(制御信号)

Drawing selection Drawing 7



[Translation done.]

* NOTICES *

CLAIMS

[Claim(s)]

[Claim 1]Amplifier which amplifies an audio signal characterized by comprising the following from an internal music source, A changeover switch which changes an external device connector which connects an external instrument, and an audio signal inputted from an external instrument connected to this external device connector via a cable and an audio signal inputted from said internal music source, A head unit for mount provided with a control means which controls a change to said internal music source and said external instrument.
A pin connection terminal for buses of plurality [external device connector / said] for bus connections.
Two pin connection terminals for control which are put side by side at this pin for buses, and send and receive a control signal.
Said pin for buses connected with said external instrument, and said control pin.

[Claim 2]Said control means, the time of said start up -- said pin for buses, and said control pin -- a connection check signal -- the head unit for mount according to claim 1 provided with the 1st starting connection control section that sets up a pin connection terminal of a side which it each transmitted and had a response in the connection check signal concerned as it is effective.

[Claim 3]Said control means, Make one side into a high in fixed time which was able to be defined beforehand between said two pin connection terminals for control at the time of said start up, and. The head unit for mount according to claim 1, wherein after the fixed time progress concerned is provided with the 2nd starting connection control section that returns an output to the two pin connection terminals for control concerned to a front state at the time of said start up.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the head unit for mount, and the external instrument for mount, and relates to the head unit for mount and the external instrument for mount which have the feature in the connection type at the time of extending the external instrument for mount to the head unit for mount especially.
[0002]
[Description of the Prior Art]Conventionally, the head unit of the audio for mount and the connection type of an external instrument have two copies, deck connection and a bus connection. Generally, a head unit is for example, a cassette with FM/AM radio, and, on the other hand, an external instrument is a CD player, an MD player, or TV.
[0003]
[Problem(s) to be Solved by the Invention]However, in the above-mentioned conventional example, since the connection type of deck connection and a bus connection was incompatible, there was inconvenience that the CD player had to prepare two kinds, the object for deck connection and the object for bus connections. for this reason, when a user selects an external instrument, its head unit is an object for deck connection -- or it had to be checked whether it was an object for bus connections.
[0004]
[Objects of the Invention]This invention improves the inconvenience which the starting conventional example has, and sets it as the purpose to provide the head unit for mount which shall be low cost and shall be especially easy to use the external instrument of the audio for mount, and the external instrument for mount.
[0005]
[Means for Solving the Problem]So, in a head unit for mount by this invention. Amplifier which

amplifies an audio signal from an internal music source, and an external device connector which connects an external instrument, It has a changeover switch which changes an audio signal inputted from an external instrument connected to this external device connector via a cable, and an audio signal inputted from said internal music source, and a control means which controls a change to said internal music source and said external instrument. And a pin connection terminal for buses of plurality [external device connector] for bus connections, Composition of having had a connector body engaged in one cable which has two pin connection terminals for control which are put side by side at this pin for buses, and send and receive a control signal, and said pins for buses connected with said external instrument and said control pins is taken. It is going to attain the purpose which this mentioned above.
[0006]Here, since an external device connector was provided with a pin connection terminal for buses for bus connections, and a pin connection terminal for control for deck connection, even if it is an external instrument of which connection form, it is connected by the same cable. For this reason, it is not necessary when purchasing an external instrument to choose an external instrument according to connector shape of a head unit.
[0007]
[Embodiment of the Invention]Hereafter, an embodiment of the invention is described with reference to drawings. Drawing 1 is a block diagram showing composition with the external instrument for mount linked to the head unit for mount by this invention, and the head unit for mount concerned. As shown in drawing 1, the head unit 2 for mount is provided with the following.
Amplifier 8 which amplifies the audio signal from the internal music source 4.
The external device connector 10 which connects an external instrument.
The changeover switch 18 which changes the audio signal inputted from the external instrument connected to this external device connector 10 via a cable, and the audio signal inputted from said internal music source.
The control means 6 which controls the change to said internal music source 4 and said external instrument 30.

[0008]And the pin connection terminal for buses (BUS+ and - of the pin numbers 1 and 2 of drawing 2) to which the external device connector 31 connects two or more pins 12 for buses for bus connections as shown in drawing 2, Two pin connection terminals for control (CONT1 of the pin numbers 5 and 13 of drawing 2, and 2) which are put side by side at this pin for buses, and send and receive a control signal, It has the connector body 11 engaged in one cable which has said pin for buses connected with said external instrument, and said control pin.
[0009]As shown in drawing 2, in this embodiment, the connector and signal line which connect

the head unit 2 and the external instrument 30 are made into the gestalt containing both the object for deck connection, and for bus connections. The deck connection D is a method which accepts one external instrument and connects, as shown in drawing 3 (A). The strong point is in the point which can be manufactured by low cost, and it being only one set of connection and the point which cannot control a CD changer etc. by operation of a head unit have management. In deck connection, while the internal music source (radio, tape) of a head unit operates, CONT1 is made into "Hi", and while the external instrument operates, CONT2 is made into "Hi", for example. An external instrument will make CONT1 "Hi", if the head unit operates working. According to this, an external instrument suspends reproduction and makes CONT2 "Lo".

[0010]On the other hand, connection of two or more sets of external instruments is possible for a bus connection, and it can control CD changer y- etc. by a head unit. At a bus connection, an address is assigned to each apparatus, and it connects by bus, and cooperates by exchanging the demand of operation, a stop, etc. In a bus connection, since IC for communication is needed and microcomputer processing increases, cost will become high. Generally, deck connection is used for low-priced goods, and the bus connection is used for quality articles.

[0011]a head unit is a bus connection in using 13 pins of the method shown in drawing 2 in this embodiment, as shown in drawing 1 -- or although it is deck connection, it cannot be concerned, but the same external instrument can be connected. The reproduction means 34 which plays the alien-frequencies easy sauce in which an external instrument turns into an external instrument to a head unit, such as TV, CD, or MD, in the example shown in drawing 1, The connector 31 for head units for transmitting the audio signal reproduced by this reproduction means 34 to said head unit via a cable, It has the external instrument control means 32 which controls said reproduction means 34 according to the control signal inputted from this connector 31 for head units. And the connector 31 for head units has taken the same shape as the external device connector mentioned above, and structure. And it has the connection type switching means which chooses either said pin connection terminal for control, or said pin connection terminal for buses for a reproduction means according to the connection check signal inputted from the connector for head units. In order that this connection type switching means may choose a bus connection or deck connection according to the connection type which a head unit adopts, it becomes unnecessary for a user to check the connection type of a head unit. This is preferred when the head unit side supports only deck connection or a bus connection.

[0012]When the head unit side supports both connection types and the external instrument supports only one connection type, The control means 6 of the head unit 2 shown in drawing 1, the time of start up (at the time of ACC ON) -- the pin for buses, and said control pin -- a connection check signal -- it each transmits and it is good to have the 1st starting connection control section 20 that sets up the pin connection terminal of the side which had a response in the connection check signal concerned as it is effective.

[0013]When the head unit supports only deck connection, It replaces with the 1st starting connection control section 20, One side is made into the high in fixed time which was able to be defined beforehand between said two pin connection terminals for control at the time of start up, and after the fixed time progress concerned is good to have the 2nd starting connection control section that returns the output to the two pin connection terminals for control concerned to a front state at the time of said start up. In this case, deck connection is established between the external instrument only corresponding to deck connection, or the external instrument corresponding to both connection types.

[0014]Drawing 4 is a block diagram showing the example which connected two or more sets of external instruments using the connection type of 13 pins by this embodiment. The connector shown in drawing 2 is adopted in the example shown in drawing 4, being only for deck connection, in order to make a head unit into low cost. And TV which has a navigational panel as an external instrument is formed, and the bus connection of two sets of other external instruments is carried out from this TV. And the music source which transmits to a head unit via deck connection by operating the navigational panel of TV is chosen. If other external instruments 30 and 38 shown in drawing 4 should correspond to both deck connection and a bus connection further, having a connector shown in drawing 2, being concerned -- others -- it becomes unnecessary to be also able to connect an external instrument to the head unit 2 directly, and to choose the connection type and connector of an external instrument according to the gestalt of connection

[0015]The external instrument 40 shown in drawing 4 is provided with the two or more expansion connectors 41 linked to a head unit or other external instruments. And the expansion connector concerned has taken the same form as the external device connector shown in drawing 1, and structure. And the external instrument control means used as the controller of this external instrument 40, Deck connection is made by setting up said pin connection terminal for control to the connector 41 to which the head unit 2 was connected, as it is effective, It has two or more connect control part which carries out a bus connection by setting up said pin connection terminal for buses effectively to the connector 41 to which other external instruments were connected. Thereby, making the head unit 2 into low cost, two or more sets of external instruments are connectable, and since it is altogether connectable using the same cable, connection and selection of apparatus become easy.

[0016]Drawing 5 is a block diagram showing the composition of the example of the head unit for mount by this invention. The head unit for mount shown in drawing 5 is a cassette with FM/AM radio. As shown in drawing 5, the cassette with FM/AM radio (head unit) is provided with the following.

The tuner circuit 52 which sides with the electric wave received with a vehicular antenna.
Tape equalizer amplifier 53 which amplifies the regenerative signal from the tape head 54 which plays a cassette tape.
Grand isolation amplifier 55 which amplifies the audio signal inputted from the external instrument 30.
The audio signal changeover switch 18 which changes the audio signal from these music sources according to a switching signal.

[0017]The cassette 2 with FM/AM radio is provided with the BORIUMU circuit 7 which adjusts further amplification of the audio signal inputted from a changeover switch, and the power amplification 8 which amplifies the output of this BORIUMU circuit. This power amplification 8 is connected to the speaker 16. And it has the control oriented microcomputer 6 as a control means by which deck connection is made with the external instrument 30.

[0018]As shown in drawing 6, transmission and reception of the connection check signal at the time of AccON perform establishment of connection between the cassette 2 with FM/AM radio, and an external instrument. Drawing 6 (A) is a wave form chart showing an example of the connection check signal for establishing deck connection, and the cassette 2 with FM/AM radio is 500 at the time of AccON. [ms] CONT1 is made into "Hi". This transmits to an external instrument that the cassette 2 with FM/AM radio is demanding deck connection. In order for the cassette 2 with FM/AM radio to require a bus connection of an external instrument, as shown in drawing 6 (B), he transmits the pulse signal which turns into a connection check signal immediately after at the time of AccON to each apparatus, and waits for the reply. If the signal according to the connection check signal concerned is inputted from an external instrument, the external instrument concerned and bus connection will be established.

[0019]As shown in drawing 7, the head unit which the external instrument 30 checks a bus signal and CONT1 signal at the time of AccON, and is connected now judges which method it is. That is, when it comes to AccON, it checks whether the connection check signal for bus connections has been inputted (Step S1), and a bus connection is established when the signal shown in drawing 6 (B) is inputted (Step S2). On the other hand, when the connection check signal for bus connections is not inputted, it is judged whether CONT1 shown in drawing 6 (A) is "Hi" (Step S3). And deck connection will be established if CONT1 is "Hi" (step S4).

[0020]When a bus signal and CONT1 are not inputted for 2 seconds from AccON, an external instrument transmits the bus signal of a connection request to a head unit.

[0021]According to this embodiment, as mentioned above, put wiring of two methods, deck connection and a bus connection, in one connection connector, and and an external instrument, Variety can be lessened, and when a user selects an external instrument, it becomes unnecessary for its head unit to take into consideration which connection type it is, since the external instrument can respond by 1 model in order to identify of which method the connected head unit is a thing.

[0022]

[Effect of the Invention]Since this invention was constituted as mentioned above, and functioned and the external device connector was provided with the pin connection terminal for buses for bus connections, and the pin connection terminal for control for deck connection according to this, Even if it is an external instrument of which connection form, can connect by the same cable, therefore it is not necessary to manufacture an external instrument according to connector shape about the external instrument of the same function and, and a user faces the purchase of an external instrument, It is not necessary to choose an external instrument according to the connector shape of a head unit, and, for this reason, the outstanding head unit for mount and the external instrument for mount which are not in the former that the extension work of an external instrument can be done easily can be provided.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention]This invention relates to the head unit for mount, and the external instrument for mount, and relates to the head unit for mount and the external instrument for mount which have the feature in the connection type at the time of extending the external instrument for mount to the head unit for mount especially.

[Translation done.]

* NOTICES *

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art]Conventionally, the head unit of the audio for mount and the connection type of an external instrument have two copies, deck connection and a bus connection. Generally, a head unit is for example, a cassette with FM/AM radio, and, on the other hand, an external instrument is a CD player, an MD player, or TV.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention]Since this invention was constituted as mentioned above, and functioned and the external device connector was provided with the pin connection terminal for buses for bus connections, and the pin connection terminal for control for deck connection according to this, Even if it is an external instrument of which connection form, can connect by the same cable, therefore it is not necessary to manufacture an external instrument according to connector shape about the external instrument of the same function and, and a user faces the purchase of an external instrument, It is not necessary to choose an external instrument according to the connector shape of a head unit, and, for this reason, the outstanding head unit for mount and the external instrument for mount which are not in the former that the extension work of an external instrument can be done easily can be provided.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, in the above-mentioned conventional example, since the connection type of deck connection and a bus connection was incompatible, there was inconvenience that the CD player had to prepare two kinds, the object for deck connection and the object for bus connections. for this reason, when a user selects an external instrument, its head unit is an object for deck connection -- or it had to be checked whether it was an object for bus connections.
[0004]
[Objects of the Invention]This invention improves the inconvenience which the starting conventional example has, and sets it as the purpose to provide the head unit for mount which shall be low cost and shall be especially easy to use the external instrument of the audio for mount, and the external instrument for mount.

[Translation done.]

MEANS

[Means for Solving the Problem]So, in a head unit for mount by this invention. Amplifier which amplifies an audio signal from an internal music source, and an external device connector which connects an external instrument, It has a changeover switch which changes an audio signal inputted from an external instrument connected to this external device connector via a cable, and an audio signal inputted from said internal music source, and a control means which controls a change to said internal music source and said external instrument. And a pin connection terminal for buses of plurality [external device connector] for bus connections, Composition of having had a connector body engaged in one cable which has two pin connection terminals for control which are put side by side at this pin for buses, and send and receive a control signal, and said pins for buses connected with said external instrument and said control pins is taken. It is going to attain the purpose which this mentioned above.
[0006]Here, since an external device connector was provided with a pin connection terminal for buses for bus connections, and a pin connection terminal for control for deck connection, even if it is an external instrument of which connection form, it is connected by the same cable. For this reason, it is not necessary when purchasing an external instrument to choose an external instrument according to connector shape of a head unit.
[0007]
[Embodiment of the Invention]Hereafter, an embodiment of the invention is described with reference to drawings. Drawing 1 is a block diagram showing composition with the external instrument for mount linked to the head unit for mount by this invention, and the head unit for mount concerned. As shown in drawing 1, the head unit 2 for mount is provided with the following.
Amplifier 8 which amplifies the audio signal from the internal music source 4.
The external device connector 10 which connects an external instrument.
The changeover switch 18 which changes the audio signal inputted from the external

instrument connected to this external device connector 10 via a cable, and the audio signal inputted from said internal music source.
The control means 6 which controls the change to said internal music source 4 and said external instrument 30.

[0008]And the pin connection terminal for buses (BUS+ and - of the pin numbers 1 and 2 of drawing 2) to which the external device connector 31 connects two or more pins 12 for buses for bus connections as shown in drawing 2, Two pin connection terminals for control (CONT1 of the pin numbers 5 and 13 of drawing 2, and 2) which are put side by side at this pin for buses, and send and receive a control signal, It has the connector body 11 engaged in one cable which has said pin for buses connected with said external instrument, and said control pin.

[0009]As shown in drawing 2, in this embodiment, the connector and signal line which connect the head unit 2 and the external instrument 30 are made into the gestalt containing both the object for deck connection, and for bus connections. The deck connection D is a method which accepts one external instrument and connects, as shown in drawing 3 (A). The strong point is in the point which can be manufactured by low cost, and it being only one set of connection and the point which cannot control a CD changer etc. by operation of a head unit have management. In deck connection, while the internal music source (radio, tape) of a head unit operates, CONT1 is made into "Hi", and while the external instrument operates, CONT2 is made into "Hi", for example. An external instrument will make CONT1 "Hi", if the head unit operates working. According to this, an external instrument suspends reproduction and makes CONT2 "Lo".

[0010]On the other hand, connection of two or more sets of external instruments is possible for a bus connection, and it can control CD changer y- etc. by a head unit. At a bus connection, an address is assigned to each apparatus, and it connects by bus, and cooperates by exchanging the demand of operation, a stop, etc. In a bus connection, since IC for communication is needed and microcomputer processing increases, cost will become high. Generally, deck connection is used for low-priced goods, and the bus connection is used for quality articles.

[0011]a head unit is a bus connection in using 13 pins of the method shown in drawing 2 in this embodiment, as shown in drawing 1 -- or although it is deck connection, it cannot be concerned, but the same external instrument can be connected. The reproduction means 34 which plays the alien-frequencies easy sauce in which an external instrument turns into an external instrument to a head unit, such as TV, CD, or MD, in the example shown in drawing 1, The connector 31 for head units for transmitting the audio signal reproduced by this reproduction means 34 to said head unit via a cable, It has the external instrument control means 32 which controls said reproduction means 34 according to the control signal inputted from this connector 31 for head units. And the connector 31 for head units has taken the same shape as the external device connector mentioned above, and structure. And it has the connection type switching means which chooses either said pin connection terminal for control, or said pin connection terminal for buses for a reproduction means according to the connection check signal inputted from the connector for head units. In order that this connection type switching means may choose a bus connection or deck connection according to the connection type which a head unit adopts, it becomes unnecessary for a user to check the connection type of a head unit. This is preferred when the head unit side supports only deck connection or a bus connection.

[0012]When the head unit side supports both connection types and the external instrument supports only one connection type, The control means 6 of the head unit 2 shown in drawing 1, the time of start up (at the time of ACC ON) -- the pin for buses, and said control pin -- a connection check signal -- it each transmits and it is good to have the 1st starting connection control section 20 that sets up the pin connection terminal of the side which had a response in the connection check signal concerned as it is effective.

[0013]When the head unit supports only deck connection, It replaces with the 1st starting connection control section 20, One side is made into the high in fixed time which was able to be defined beforehand between said two pin connection terminals for control at the time of start up, and after the fixed time progress concerned is good to have the 2nd starting connection control section that returns the output to the two pin connection terminals for control concerned to a front state at the time of said start up. In this case, deck connection is established between the external instrument only corresponding to deck connection, or the external instrument corresponding to both connection types.

[0014]Drawing 4 is a block diagram showing the example which connected two or more sets of external instruments using the connection type of 13 pins by this embodiment. The connector shown in drawing 2 is adopted in the example shown in drawing 4, being only for deck connection, in order to make a head unit into low cost. And TV which has a navigational panel as an external instrument is formed, and the bus connection of two sets of other external instruments is carried out from this TV. And the music source which transmits to a head unit via deck connection by operating the navigational panel of TV is chosen. If other external instruments 30 and 38 shown in drawing 4 should correspond to both deck connection and a bus connection further, having a connector shown in drawing 2, being concerned -- others -- it becomes unnecessary to be also able to connect an external instrument to the head unit 2 directly, and to choose the connection type and connector of an external instrument according to the gestalt of connection

[0015]The external instrument 40 shown in drawing 4 is provided with the two or more expansion connectors 41 linked to a head unit or other external instruments. And the expansion connector concerned has taken the same form as the external device connector shown in drawing 1, and structure. And the external instrument control means used as the controller of this external instrument 40, Deck connection is made by setting up said pin connection terminal for control to the connector 41 to which the head unit 2 was connected, as it is effective, It has two or more connect control part which carries out a bus connection by setting up said pin connection terminal for buses effectively to the connector 41 to which other external instruments were connected. Thereby, making the head unit 2 into low cost, two or more sets of external instruments are connectable, and since it is altogether connectable using the same cable, connection and selection of apparatus become easy.

[0016]Drawing 5 is a block diagram showing the composition of the example of the head unit for mount by this invention. The head unit for mount shown in drawing 5 is a cassette with FM/AM radio. As shown in drawing 5, the cassette with FM/AM radio (head unit) is provided with the following.

The tuner circuit 52 which sides with the electric wave received with a vehicular antenna.

Tape equalizer amplifier 53 which amplifies the regenerative signal from the tape head 54 which plays a cassette tape.

Grand isolation amplifier 55 which amplifies the audio signal inputted from the external instrument 30.

The audio signal changeover switch 18 which changes the audio signal from these music sources according to a switching signal.

[0017]The cassette 2 with FM/AM radio is provided with the BORIUMU circuit 7 which adjusts further amplification of the audio signal inputted from a changeover switch, and the power amplification 8 which amplifies the output of this BORIUMU circuit. This power amplification 8 is connected to the speaker 16. And it has the control oriented microcomputer 6 as a control means by which deck connection is made with the external instrument 30.

[0018]As shown in drawing 6, transmission and reception of the connection check signal at the time of AccON perform establishment of connection between the cassette 2 with FM/AM radio, and an external instrument. Drawing 6 (A) is a wave form chart showing an example of the connection check signal for establishing deck connection, and the cassette 2 with FM/AM radio is 500 at the time of AccON. [ms] CONT1 is made into "Hi". This transmits to an external instrument that the cassette 2 with FM/AM radio is demanding deck connection. In order for the cassette 2 with FM/AM radio to require a bus connection of an external instrument, as shown in drawing 6 (B), he transmits the pulse signal which turns into a connection check signal immediately after at the time of AccON to each apparatus, and waits for the reply. If the signal according to the connection check signal concerned is inputted from an external instrument, the external instrument concerned and bus connection will be established.

[0019]As shown in drawing 7, the head unit which the external instrument 30 checks a bus signal and CONT1 signal at the time of AccON, and is connected now judges which method it is. That is, when it comes to AccON, it checks whether the connection check signal for bus connections has been inputted (Step S1), and a bus connection is established when the signal shown in drawing 6 (B) is inputted (Step S2). On the other hand, when the connection check signal for bus connections is not inputted, it is judged whether CONT1 shown in drawing 6 (A) is "Hi" (Step S3). And deck connection will be established if CONT1 is "Hi" (step S4).
[0020]When a bus signal and CONT1 are not inputted for 2 seconds from AccON, an external instrument transmits the bus signal of a connection request to a head unit.
[0021]According to this embodiment, as mentioned above, put wiring of two methods, deck connection and a bus connection, in one connection connector, and and an external instrument, Variety can be lessened, and when a user selects an external instrument, it becomes unnecessary for its head unit to take into consideration which connection type it is, since the external instrument can respond by 1 model in order to identify of which method the connected head unit is a thing.

[Translation done.]

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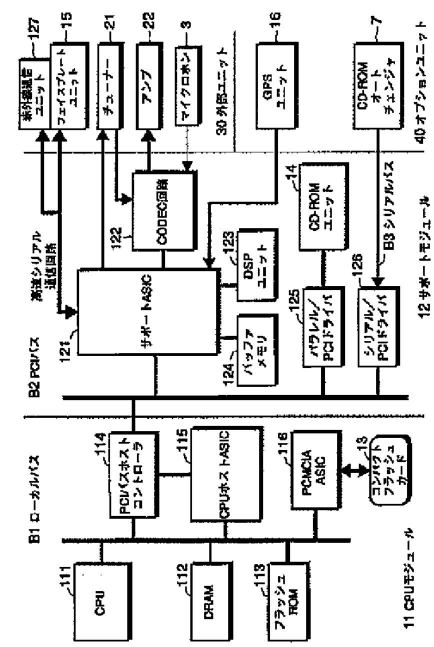
(54)【発明の名称】　カーオーディオシステム、車載用コンピュータ及びカーオーディオシステムの制御方法

(57)【要約】

【課題】　汎用的なＯＳを持つ小形コンピュータとカーオーディオシステムとを組み合わせることで、互いの利点を活かす。

【解決手段】　コンピュータに含まれるＣＰＵ１１１の形式に対応したローカルバスＢ１と、カーオーディオシステムに含まれる機器１５，２１，２２，３，１６，７を接続するためのＰＣＩバスＢ２と、それぞれのバスＢ１，Ｂ２の間でデータの形式を変換するＰＣＩバスホストコントローラ１１４と、を備える。フラッシュＲＯＭ１１３にはＣＰＵ１１１のためのＯＳを格納する。ＣＰＵはメモリ１１２などを効率よくアクセスすることで複雑な処理を高速に行う。コンピュータとカーオーディオシステムの両方の動作をスムースに行う。音の信号を再生しながら別のバスで別の処理を行うといったマルチタスクが容易になる。ＣＰＵの形式を変える場合もＣＰＵの形式に対応したバスだけを変えればよい。



【特許請求の範囲】
【請求項１】 制御用のコンピュータを備えたカーオーディオシステムにおいて、
前記コンピュータはオペレーティングシステムを備え、
このオペレーティングシステムは、
コンピュータ上の資源を管理する手段と、
ユーザインタフェースを含む入出力を制御する手段と、
予め決められた形式のプログラムを実行する手段と、
を備えたことを特徴とするカーオーディオシステム。
【請求項２】 制御用のコンピュータを備えたカーオーディオシステムにおいて、
前記コンピュータに含まれるＣＰＵの形式に対応した第１のバスと、
前記カーオーディオシステムに含まれる機器を接続するための第２のバスと、
を備えたことを特徴とするカーオーディオシステム。
【請求項３】 制御用のコンピュータを備えたカーオーディオシステムにおいて、
前記コンピュータに含まれるＣＰＵの形式に対応したローカルバスと、
前記カーオーディオシステムに含まれる機器を接続するためのＰＣＩバスと、
を備えたことを特徴とするカーオーディオシステム。
【請求項４】 それぞれの前記バスの間でデータの形式を変換する手段を備えたことを特徴とする請求項２又は３記載のカーオーディオシステム。
【請求項５】 前記カーオーディオシステムに含まれる複数の機器をデイジーチェイン形式で接続するための第３のバスを備えたことを特徴とする請求項１から４のいずれか１つに記載のカーオーディオシステム。
【請求項６】 予め決められた形式のプログラムを実行するために必要な環境を実現するオペレーティングシステムと、
カーオーディオシステムと、
前記カーオーディオシステムを制御する手段と、
を備えたことを特徴とする車載用コンピュータ。
【請求項７】 カーオーディオシステムを備えた車載用コンピュータにおいて、
前記コンピュータに含まれるＣＰＵの形式に対応した第１のバスと、
前記カーオーディオシステムに含まれる機器を接続するための第２のバスと、
を備えたことを特徴とする車載用コンピュータ。
【請求項８】 カーオーディオシステムを備えた車載用コンピュータにおいて、
前記コンピュータに含まれるＣＰＵの形式に対応したローカルバスと、
前記カーオーディオシステムに含まれる機器を接続するためのＰＣＩバスと、
を備えたことを特徴とする車載用コンピュータ。
【請求項９】 それぞれの前記バスの間でデータの形式を変換する手段を備えたことを特徴とする請求項７又は８記載の車載用コンピュータ。
【請求項１０】 前記カーオーディオシステムに含まれる複数の機器をデイジーチェイン形式で接続するための第３のバスを備えたことを特徴とする請求項６から９のいずれか１つに記載の車載用コンピュータ。
【請求項１１】 オペレーティングシステムを備えたコンピュータを使ってカーオーディオシステムを制御するカーオーディオシステムの制御方法において、
前記オペレーティングシステムが、予め決められた形式のプログラムを実行するために必要な環境を実現するステップと、
前記プログラムが前記カーオーディオシステムを制御するステップと、
を含むことを特徴とするカーオーディオシステムの制御方法。
【請求項１２】 コンピュータを使ってカーオーディオシステムを制御するカーオーディオシステムの制御方法において、
前記コンピュータに含まれるＣＰＵが、このＣＰＵの形式に対応した第１のバスを通してデータをやり取りするステップと、
前記カーオーディオシステムに含まれる機器が、機器を接続するための第２のバスを通してデータをやり取りするステップと、
を含むことを特徴とするカーオーディオシステムの制御方法。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、汎用的なＯＳを持つ小形コンピュータとカーオーディオシステムとを組み合わせることで、互いの利点を活かす技術に関するものである。
【０００２】
【従来の技術】近年、半導体の技術がめざましい進歩をとげており、いろいろな分野の電子機器が、半導体を使うことによって小型化・高性能化している。このように半導体を使うことで小型化・高性能化している電子機器の１つに、パーソナルコンピュータ（以下「パソコン」という）がある。
【０００３】特に最近では、ハンドヘルド（持ち運び型）やパームトップなどと呼ばれる小型のパソコン（以下「ハンドヘルドパソコン」と総称する）も増えている。このようなハンドヘルドパソコンに適した基本ソフトウェア、すなわちオペレーティングシステム（Operating System：以下「ＯＳ」という）として、例えばＷｉｎｄｏｗｓ（マイクロソフト株式会社の登録商標）ＣＥなどが知られている。
【０００４】このような汎用的なＯＳは、コンピュータ

の持っているＣＰＵの処理能力やメモリなどをきめ細かく管理することで高度な処理能力を実現したり、プログラムに依存しない統一的で使いやすいユーザインタフェースを提供したり、予め決められた形式のプログラムであれば、自由に追加変更することでコンピュータの機能を追加変更できるといった利点を持っている。

【０００５】同じように、半導体を使うことで小型化・高性能化している別の電子機器としては、自動車に搭載するカーオーディオシステムやカーナビゲーションシステムが挙げられる。このうちカーオーディオシステムは、俗にカーステレオなどと呼ばれ、ＣＤプレーヤやＡＭやＦＭのチューナーなどを、アンプやスピーカなどと組み合わせたものである。また、カーナビゲーションシステムは、方位磁石、走行距離計、ＧＰＳなどを使って車の現在位置を特定しながら、指定された目的地まで、地図を画面表示したり道案内をするシステムである。

【０００６】なお、最近では、カーオーディオシステムに、カーナビゲーションシステム、ハンズフリーの携帯電話、盗難防止用の警報システムなどを組み合わせることも多いので、以下、これら車載用の電子機器を「カーオーディオシステム」と総称する。

【０００７】

【発明が解決しようとする課題】上に述べたような、ＯＳを備えたハンドヘルドパソコンと、カーオーディオシステムとは、従来では互いに全く別々のものであった。つまり、広い意味でのコンピュータを、制御用に備えたカーオーディオシステムは存在したが、この場合のコンピュータは特定の目的だけのために働く組み込みシステムと呼ばれるものである。

【０００８】この組み込みシステムは、必要最小限の能力を持ったＣＰＵを使い、スイッチ操作を受け付けたりディスク再生機構を作動させる、といったハードウェアに対する必要最小限の処理を、アセンブラなどを使った小さなプログラムで実現したものである。このため、パソコンのようにデータの加工や保存をしたり、プログラムを変更追加することで機能を変更追加するといった使い方はできない。

【０００９】一方、ハンドヘルドパソコンは、自ら音楽を鳴らしたり、カーオーディオシステムを制御する機能は持っていなかった。このため、ユーザは、ハンドヘルドパソコンを事実上車内に持ち込むことはあったが、カーオーディオシステムと関係付けて使うことはなかった。

【００１０】ところで、最近のカーオーディオシステムは、ラジオのチューナー、カセットテープデッキやＣＤプレーヤといった従来の機器だけでなく、ＭＤプレーヤ、ＣＤやＭＤのオートチェンジャ、カーナビゲーションシステム、ユーザの命令を認識する音声認識装置、ハンズフリーの携帯電話、盗難防止用の警報システムという具合に、ますます多くの機器が組み込まれるようになってきている。そして、このように複雑になってゆくカーオーディオシステムを、個々の装置に設けられたスイッチだけで使いこなすことは非常に難しい。

【００１１】つまり、このようにカーオーディオシステムが複雑になると、操作キーやダイヤルといった多くのスイッチが車内のいろいろな場所にあることになる。このため、どれが何の操作キーなのかを覚えるのが大変である。

【００１２】すなわち、複雑になってゆくカーオーディオシステムを使いこなすためには、複雑なシステムを制御する高度な処理能力、使いやすいユーザインタフェース、制御に関する機能を追加変更できるような柔軟性を持った小形コンピュータ、とりわけ汎用的なＯＳを備えたハンドヘルドパソコンと同等の情報処理装置を制御に使うことが望まれる。

【００１３】また、ハンドヘルドパソコンの側から考えても、現代のように自動車を使うことが多く、渋滞も多い社会では、車内でも活用の幅を広げることが望まれる。特に、カーオーディオシステムと組み合わせることで、操作キーやメモリを兼用したり、ユーザが車内で知りたい情報をコンピュータを使った合成音声で読み上げさせ、その声をカーオーディオシステムのスピーカから聞いたり、カーオーディオシステムに組み込まれた携帯電話の回線で外部のコンピュータネットワークにアクセスしたり、といった使い方ができれば、今までよりも活用の幅を広げることができる。

【００１４】なお、汎用的なＯＳを使うような高速なＣＰＵと、カーオーディオシステムに含まれるような機器を組み合わせるときは、両者の動作速度の違いなどから、それぞれに合った別々のバスを備えることが望まれる。さらに、いくつもの機器を組み合わせたカーオーディオシステムでは、複数の機器を、単純なすっきりした配線で容易に接続できることが望まれる。

【００１５】本発明は、上に述べたような従来技術の問題点を解決するために提案されたもので、その目的は、汎用的なＯＳを持つ小形コンピュータとカーオーディオシステムとを組み合わせることで、互いの利点を活かすことである。また、本発明の別の目的は、複数のバスを使うことで、高速なＣＰＵとその他の機器の両方を、無駄なくスムースに働かせることである。また、本発明の別の目的は、いろいろな機器をデイジーチェイン方式で芋づる式につなげるようにすることである。

【００１６】

【課題を解決するための手段】上に述べた目的を達成するため、請求項１の発明は、制御用のコンピュータを備えたカーオーディオシステムにおいて、前記コンピュータはオペレーティングシステムを備え、このオペレーティングシステムは、コンピュータ上の資源を管理する手段と、ユーザインタフェースを含む入出力を制御する手段と、予め決められた形式のプログラムを実行する手段

と、を備えたことを特徴とする。請求項6の車載用コンピュータは、予め決められた形式のプログラムを実行するために必要な環境を実現するオペレーティングシステムと、カーオーディオシステムと、前記カーオーディオシステムを制御する手段と、を備えたことを特徴とする。請求項11の発明は、請求項1の発明を方法という見方からとらえたもので、オペレーティングシステムを備えたコンピュータを使ってカーオーディオシステムを制御するカーオーディオシステムの制御方法において、前記オペレーティングシステムが、予め決められた形式のプログラムを実行するために必要な環境を実現するステップと、前記プログラムが前記カーオーディオシステムを制御するステップと、を含むことを特徴とする。請求項1，6，11の発明では、カーオーディオシステムを制御するコンピュータが汎用的なOSを備えていて、この汎用的なOSは、CPUやメモリといった資源を管理することでコンピュータの能力を最大限発揮させ、また、プログラムに依存しない統一的で使いやすいユーザインタフェースを提供し、さらに、予め決められた形式のプログラムを追加したり変更することで機能の追加や変更を容易にする。このため、複雑なカーオーディオシステムの制御が容易になる。また、車内でもいろいろなプログラムを使ったり、カーオーディオシステムの機器を利用して情報処理をすることが可能になる。

【0017】請求項2の発明は、制御用のコンピュータを備えたカーオーディオシステムにおいて、前記コンピュータに含まれるCPUの形式に対応した第1のバスと、前記カーオーディオシステムに含まれる機器を接続するための第2のバスと、を備えたことを特徴とする。請求項7の発明は、カーオーディオシステムを備えた車載用コンピュータにおいて、前記コンピュータに含まれるCPUの形式に対応した第1のバスと、前記カーオーディオシステムに含まれる機器を接続するための第2のバスと、を備えたことを特徴とする。請求項12の発明は、請求項2の発明を方法という見方からとらえたもので、コンピュータを使ってカーオーディオシステムを制御するカーオーディオシステムの制御方法において、前記コンピュータに含まれるCPUが、このCPUの形式に対応した第1のバスを通してデータをやり取りするステップと、前記カーオーディオシステムに含まれる機器が、機器を接続するための第2のバスを通してデータをやり取りするステップと、を含むことを特徴とする。請求項3の発明は、制御用のコンピュータを備えたカーオーディオシステムにおいて、前記コンピュータに含まれるCPUの形式に対応したローカルバスと、前記カーオーディオシステムに含まれる機器を接続するためのPCIバスと、を備えたことを特徴とする。請求項8の発明は、カーオーディオシステムを備えた車載用コンピュータにおいて、前記コンピュータに含まれるCPUの形式に対応したローカルバスと、前記カーオーディオシステムに含まれる機器を接続するためのPCIバスと、を備えたことを特徴とする。請求項4の発明は、請求項2又は3記載のカーオーディオシステムにおいて、それぞれの前記バスの間でデータの形式を変換する手段を備えたことを特徴とする。請求項9の発明は、請求項7又は8記載の車載用コンピュータにおいて、それぞれの前記バスの間でデータの形式を変換する手段を備えたことを特徴とする。請求項2，3，7，8，12の発明では、コンピュータのCPUと、カーオーディオシステムの機器とが、互いの形式に対応した違ったバスを使ってデータをやり取りし、データは、2つのバスの間では必要に応じて形式を変換して受け渡される（請求項4，9）。このため、各機器の動作よりCPUの動作が速くても、CPUは各機器の動作サイクルに合わせる必要がなく、メモリなどを効率よくアクセスすることで複雑な処理を高速に行うことができる。また、CPUがやり取りするデータと、機器がやり取りするデータとが、同じバスの伝達能力を奪い合うことがないので、コンピュータとカーオーディオシステムの両方の動作をスムースに行うことができる。また、機器を接続するためのバスを使って音の信号を再生しながら、同時に、CPUの形式に対応したバスを使って別の処理を行うといったマルチタスクが容易になる。また、CPUを別の形式のものに変える場合も、各機器と、それら機器を接続するためのバスはそのままで、CPUの形式に対応したバスだけを新しいCPUの形式に合わせて変えればよいので、CPUの変更にも容易に対応することができる。

【0018】請求項5の発明は、請求項1から4のいずれか1つに記載のカーオーディオシステムにおいて、前記カーオーディオシステムに含まれる複数の機器をデイジーチェイン形式で接続するための第3のバスを備えたことを特徴とする。請求項10の発明は、請求項6から9のいずれか1つに記載の車載用コンピュータにおいて、前記カーオーディオシステムに含まれる複数の機器をデイジーチェイン形式で接続するための第3のバスを備えたことを特徴とする。請求項5，10の発明では、複数の機器を芋づる式に次々と、デイジーチェイン形式でつないでゆくことができる。このため、機器の数が増えたり車内のあちこちに機器を分散設置するときも、スター方式のように長い配線が1箇所に集中することがなく、設置が容易になる。また、配線がすっきりわかりやすくなるので、構成を変えたり保守や修理をすることも容易になる。

【0019】

【発明の実施の形態】次に、本発明の実施の形態（以下「実施形態」という）について、図面を参照して具体的に説明する。この実施形態は、CDプレーヤなどのいろいろな機器を備えたカーオーディオシステムであるが、ハンドヘルドパソコンで使うような汎用的なOSを備えたコンピュータを備えていて、カーオーディオシステム

の制御もこのコンピュータで行うものである。なお、以下の説明で使うそれぞれの図について、それより前で説明した図と同じ部材や同じ種類の部材については同じ符号をつけ、説明は省略する。

【0020】〔1．構成〕

〔1－1．全体の構成〕まず、図1は、この実施形態の全体構成を示すブロック図である。この実施形態は、この図に示すように、メインユニット1の他に、カーオーディオシステムを構成する各機器として、チューナーアンプユニット2と、マイクロホン3と、GPSアンテナ4と、セキュリティコントロールユニット5と、電話ユニット6と、CD－ROMオートチェンジャ7と、電源バックアップ用の補助バッテリ9と、を備えている。

【0021】このうちメインユニット1は、制御用のコンピュータを内蔵していて、このコンピュータによってシステム全体を制御する部分である。また、チューナーアンプユニット2は、AMとFMのアンテナ2aの他に、図示はしないが、ラジオチューナーと、スピーカを鳴らすためのアンプを備えた部分である。また、マイクロホン3は、音声認識による操作ができるように、ユーザの声を入力するためのものである。この音声認識の機能は、上に述べたコンピュータのプログラムによって実現される。

【0022】〔1－1－1．メインユニット〕また、メインユニット1は、コンパクトフラッシュカード13を差し込むためのソケット13Sと、付け外しできるフェイスプレートユニット15と、を備えている（図1）。コンパクトフラッシュカード13は、フラッシュメモリを使った記憶媒体で、メインユニット1に設けられたソケット13Sに差し込むことで、メインユニット1からデータを読み書きすることができる。このコンパクトフラッシュカード13は、データやプログラムなどを他のコンピュータとやり取りしたり、このカーオーディオシステムでのいろいろな設定データをバックアップしておくために使う。

【0023】また、付け外しできるフェイスプレートユニット15は、ユーザにいろいろな情報を表示する表示部と、ユーザがいろいろな操作をするための操作キーなどを設けた操作部と、を備えていて、DCP(Detachable Control Panel)とも呼ばれるものである。このフェイスプレートユニット15の表示部は、例えば横256ドット縦64ドットといった大型のカラーLCD（液晶表示装置）などである。

【0024】このフェイスプレートユニット15は、車を降りるときに取り外して持ち出せば、盗人がカーオーディオシステムを物色しても、肝心の表示部も操作部のないのを見て利用も転売もできないことをさとり、盗むことをあきらめるという盗難防止効果がある。取り外したフェイスプレートユニット15は、ケース15aに入れて持ち歩けば、それ自体や周りのものなどを傷つけることがない。

【0025】また、このフェイスプレートユニット15は、図1には示さないが、ハンドヘルドパソコン8とIrDAなどの形式でデータをやり取りするための赤外線通信ユニットを備えている。

【0026】〔1－1－2．他の機器〕また、GPSアンテナ4は、GPS衛星から電波を受け取るためのアンテナである。このGPSアンテナ4からの信号は、GPS受信機4aを経てメインユニット1内のGPSユニットに送られる。このGPSユニットは、図1には示さないが、受信機のある地球上の位置を電波から計算するものである。また、上に述べたコンピュータ上では、プログラムによってカーナビゲーションシステムの機能が実現され、計算結果はこのカーナビゲーションシステムの機能に渡される。

【0027】また、セキュリティコントロールユニット5は、振動や衝撃を検出するセンサ5aで、盗難やいたずらなどを検出すると、サイレン5bを鳴らすといった対応をする部分である。また、電話ユニット6は、自動車電話の機能を制御するユニットであり、電話アンテナ6aやハンドセット6bを使った通話を実現する部分である。また、CD－ROMオートチェンジャ7は、予めセットされた何枚かのCDを自動的に掛け替えることで、ユーザの選んだディスクや曲を再生するユニットである。

【0028】〔1－1－3．デイジーチェイン接続〕ここで、これらセキュリティコントロールユニット5、電話ユニット6及びCD－ROMオートチェンジャ7は、USB(Universal Serial Bus)によってメインユニット1に接続されている。このUSBは、複数の機器をデイジーチェイン形式で接続するためのシリアルバス（第3のバス）である。

【0029】この実施形態では、このようにUSBによって接続される機器は、外部とのデータのやり取りを、このUSBの形式で行うように構成されている。例えば、CD－ROMオートチェンジャ7は、アップストリーム用とダウンストリーム用のハブ（HUB）を備え、このCD－ROMオートチェンジャ7の内部では、音楽CDやCD－ROMからデジタルデータが一旦ATAPI形式（パラレル形式）で読み出されるが、読み出されたデータは、内蔵されているデータコンバータによって、シリアル形式であるUSB(Universal Serial Bus)形式に変換されたうえでUSBに送り出される。

【0030】この様な構成により、ユニット5，6、CD－ROMオートチェンジャ7の結線がシリアル結線となるので、それらユニット5，6，7をメインユニット1から離れた場所に設置する場合、その設置が容易となる。なお、図1ではユニット5、ユニット6、オートチェンジャ7の順で接続されているが、接続順は任意であり、また、必要なもののみの接続としても良い。

【0031】〔1－2．メインユニットの内部構成〕次に、図2は、上に述べた各部分のうち主なものを示したブロック図であり、特に、メインユニット1内部の具体的な構成を中心に説明するものである。この図の全体は、破線で4つに区切ってあり、左寄りがCPUモジュール11、中央がサポートモジュール12、右上が外部ユニット30、右下がオプションユニット40になっている。このうち、CPUモジュール11とサポートモジュール12は、メインユニット1の内部に設けられている。

【0032】また、外部ユニット30とオプションユニット40は、メインユニット1に接続されているいくつかずつの機器をまとめて指しているものである。なお、図2では、説明の都合で、コンパクトフラッシュカード13はCPUモジュール11の下の方に、フェイスプレートユニット15は、外部ユニット30の上の方に示している。

【0033】このうちCPUモジュール11とサポートモジュール12は、カーオーディオシステム全体を制御する制御用コンピュータを構成している。このうちCPUモジュール11は、CPU111を中心とした論理的な演算処理をする部分であり、サポートモジュール12は、カーオーディオシステムに含まれる他の機器との入出力を行う部分である。

【0034】CPUモジュール11でデータの主な通り道になっているのは、CPU111を中心として形成されたローカルバスB1（第1のバス）である。一方、サポートモジュール12でデータの主な通り道になっているのは、各機器を接続するためのPCI（Peripheral Component Interconnect）バスB2（第2のバス）である。

【0035】〔1－2－1．CPUモジュールの構成〕CPUモジュール11のローカルバスB1は、CPU111の形式に合わせたもので、このローカルバスB1には、DRAM112と、フラッシュROM113と、PCIバスホストコントローラ114と、CPUホストASIC115と、PCMCIA・ASIC116が接続されている。このうちDRAM112は、CPU111がカーオーディオシステムの制御などの情報処理を行うときに、変数領域などのワークエリアを提供する部分である。

【0036】また、フラッシュROM113は、書き換え可能なROMで、ここでは、OS、BIOS、アプリケーションプログラムといった広い意味でのソフトウェアを格納している部分である。ここに格納されているOSの機能は、コンピュータ上の資源を管理すること、ユーザインタフェースを含む入出力を制御すること、予め決められた形式のプログラムを実行することなどであり、例えば、従来技術のところで述べたWindows CEをベースにしたものなどが考えられる。

【0037】また、PCIバスホストコントローラ114は、ローカルバスB1とPCIバスB2とを接続し、これら2つのバスの間でやり取りするデータの形式を変換する手段である。

【0038】また、CPUホストASIC115などの「ASIC」は、Application Specific Integrated Circuit の略で、ROMやRAM、CPUといった汎用的な集積回路に対して、特定の用途向けに作られたICやLSIを指す。具体的には、このCPUホストASIC115は、ローカルバスB1とPCIバスホストコントローラ114とのインタフェース用のASICである。つまり、このCPUホストASIC115は、PCIバスB2とCPUモジュール11との間でやり取りされるデータの窓口になる部分であり、具体的には、CPUモジュール11と外部との入出力をCPU111に代わって行うほか、PCIバスB2から送られてきたデータについて、CPU111に渡す種類のものかどうかを見分ける。

【0039】そして、CPUホストASIC115は、CPU111に渡すべきものはローカルバスB1を通じてCPU111に送るが、それ以外のもの、例えば送られてきたデータに対してCPU111が演算をするまでもなく、予め決められた反応を機械的に返せば足りるものについては、そのような反応を返す。

【0040】また、PCMCIA・ASIC116は、コンパクトフラッシュカード13が、いわゆるPCカードとしてPCMCIA(Personal Computer Memory Card International Association)の規格に基づいているのに対応したインタフェース用の部分であり、コンパクトフラッシュカード13に対するデータの読み書きを制御する部分である。

【0041】〔1－2－2．サポートモジュールにかかわる構成〕次に、サポートモジュール12のPCIバスB2は、カーオーディオシステムを構成するいろいろな機器との間でデータをやり取りするためのバスである。ここで、このPCIバスB2に接続される機器としては、外部ユニット30とオプションユニット40があり、これらはそれぞれ、いくつかの機器をまとめて指しているものである。

【0042】つまり、外部ユニット30は、図1に示したメインユニット1とは別のユニットになっているもので、この例では具体的には、メインユニット1から付け外しできるフェイスプレートユニット15、チューナーアンプユニット2内に設けられたチューナー21とアンプ22、マイクロホン3である。このうちフェイスプレートユニット15は、赤外線通信ユニット127を備えている。

【0043】また、オプションユニット40は、このカーオーディオシステムに組み込むかどうかをオプションとして選べるユニットであり、この例では具体的には、

ＧＰＳユニット１６とＣＤ－ＲＯＭオートチェンジャ７である。さらに、メインユニット１の内部にはＣＤ－ＲＯＭユニット１４があり、このＣＤ－ＲＯＭユニット１４もＰＣＩバスＢ２に接続されている。このＣＤ－ＲＯＭユニット１４は、１枚のＣＤやＣＤ－ＲＯＭからデジタルデータを読み出すためのプレーヤである。これらＣＤ－ＲＯＭオートチェンジャ７とＣＤ－ＲＯＭユニット１４はどちらも、いわゆる音楽ＣＤからデータを読み出す事もできるし、ＣＤ－ＲＯＭからデータを読み出す事もできるという互換性のある（コンパチブルな）ものである。

【００４４】サポートモジュール１２において、ＰＣＩバスＢ２がこれらの機器との間でデータをやり取りするためには、サポートＡＳＩＣ１２１、ＣＯＤＥＣ回路１２２、ＤＳＰユニット１２３、バッファメモリ１２４、パラレル／ＰＣＩドライバ１２５、シリアル／ＰＣＩドライバ１２６が使われる。

【００４５】このうちサポートＡＳＩＣ１２１は、サポートモジュール１２と各機器との間で、どこから来たデータをどこへ送るかというデータの交通整理をする部分である。また、ＣＯＤＥＣ回路１２２の「ＣＯＤＥＣ」とは"Coder/Decoder" つまりデータの符号化復号化技術の略語であり、このＣＯＤＥＣ回路１２２は、例えば、与えられたデジタルデータをアナログ信号に変換するＤ／Ａ変換をしたり、逆に、アナログ信号をデジタルデータに変換するＡ／Ｄ変換などを行う部分である。

【００４６】また、ＤＳＰユニット１２３の「ＤＳＰ」はデジタルサウンドプロセッサ、つまりデジタル形式の音の信号を専門に処理する回路を意味する略語で、このＤＳＰユニット１２３は、音楽などを表わすデジタルデータを与えられると、システムに設定されている左右のバランス、ボリューム、フェイダー、サラウンド、イコライザといった項目が音の内容に反映されるように、デジタルデータを処理する部分である。

【００４７】また、バッファメモリ１２４は、ＣＤ－ＲＯＭユニットなどの音響機器とＰＣＩバスＢ２とではデータを読み書きするサイクルが違うことから、データを蓄えて少しずつ取り出すことでこの違いを埋めるためのバッファであり、ＳＲＡＭなどで構成されている。

【００４８】また、パラレル／ＰＣＩドライバ１２５は、ＣＤ－ＲＯＭユニット１４から送られてくるパラレル形式のデジタルデータを、ＰＣＩバスＢ２のデータ形式に変換する部分である。また、シリアル／ＰＣＩドライバ１２６は、ＣＤ－ＲＯＭオートチェンジャ７から送られてくるシリアル形式のデジタルデータを、ＰＣＩバスＢ２のデータ形式に変換する部分である。

【００４９】なお、赤外線通信ユニット１２７を含むフェイスプレートユニット１５は、サポートＡＳＩＣ１２１に高速シリアル通信回路で接続され、ＧＰＳユニット１６はサポートＡＳＩＣ１２１に、ＵＡＲＴ(Universal Asynchronous Receiver-Transitter)などの調歩同期シリアル通信回路で接続されている。また、ＣＤ－ＲＯＭユニット１４はパラレル／ＰＣＩドライバ１２５に、ＡＴＡＰＩ(AT Attachment Packet Interface)などのパラレル通信回路で接続されている。また、図示はしないが、赤外線通信ユニット１２７には、赤外線によるデータのやり取りを司るＡＳＩＣが設けられている。

【００５０】〔２．作用〕上に述べたように構成されたこの実施形態は次のように働く。

〔２－１．全体的な作用〕

〔２－１－１．データの入力〕この実施形態では、各機器から入力されてくるデータのうち、デジタルデータは、サポートモジュール１２のサポートＡＳＩＣ１２１に直接入力される。例えば、フェイスプレートユニット１５からは、どのキーが押されたかというデータが送られてくる。また、ＧＰＳユニット１６からは、ＧＰＳ衛星からの電波を使って計算した緯度、経度といったデジタルデータが送られてくる。また、フェイスプレートユニット１５に設けられた赤外線通信ユニット１２７からは、ハンドヘルドパソコン８から赤外線で転送されたデジタルデータが送られてくる。

【００５１】また、ＣＤ－ＲＯＭユニット１４及びＣＤ－ＲＯＭオートチェンジャ７からは、音楽ＣＤから読み出した音のデータ、すなわちオーディオデータや、ＣＤ－ＲＯＭから読み出したデジタルデータ、すなわちＣＤ－ＲＯＭデータが、パラレル／ＰＣＩドライバ１２５やシリアル／ＰＣＩドライバ１２６によってＰＣＩバスＢ２のデータ形式に変換されたうえで、ＰＣＩバスＢ２経由でサポートＡＳＩＣ１２１に送られてくる。

【００５２】さらに、図２には示さないが、図１に示したセキュリティコントロールユニット５からは異常の発生を知らせるデジタルデータが送られてくる。同様に、図１に示した電話ユニット６からは、通話の着信や発信元の電話番号などを知らせるデジタルデータ、すなわち文字データが送られてくるし、通話中には、相手の話し声を伝えるデジタルデータ、すなわち音声データがサポートＡＳＩＣ１２１に送られてくる。

【００５３】なお、これらセキュリティコントロールユニット５や電話ユニット６は、シリアルバスＢ３にデイジーチェイン接続されているので、セキュリティコントロールユニット５や電話ユニット６から送られてくる情報は、ＣＤ－ＲＯＭオートチェンジャ７からのデジタルデータと同じように、シリアル／ＰＣＩドライバ１２６によってＰＣＩバスＢ２のデータ形式に変換されたうえで、ＰＣＩバスＢ２経由で送られてくる。

【００５４】一方、各機器から入力されてくるデータのうち、アナログ信号は、一旦ＣＯＤＥＣ回路１２２に入力され、このＣＯＤＥＣ回路１２２によってデジタルデータに変換（Ａ／Ｄ変換）されたうえで、サポートＡＳＩＣ１２１に渡される。例えば、マイクロホン３からは

ユーザの声がアナログ信号で入力され、チューナー21からは、チューニングの結果受信されたラジオの放送内容がアナログ信号で入力されてくる。

【0055】〔2－1－2．入力されたデータの行き先〕このように集まってくる情報に対して、サポートASIC121はどの情報をどこに送るかという交通整理の役割を果たす。すなわち、サポートASIC121は、大まかには、音のデータはDSPユニット123で処理したうえCODEC回路122を通してアンプ22に送り、音以外のデータはCPUモジュール11に送る。但し、音のデータのなかでもマイクロホン3から入力されたデータは音声認識のためにCPUモジュール11に送る。

【0056】アンプ22に送られる音のデータとしては、例えば、チューナー21でチューニングされたラジオ放送の内容、CD－ROMユニット14やCD－ROMオートチェンジャ7で音楽CDから読み出された録音内容、電話ユニット6から送られてきた通話相手の話し声などが考えられる。

【0057】また、音以外のデータとしては、例えば、フェイスプレートユニット15でどの操作キーが押されたかのデータ、赤外線通信ユニット127から送られてきたファイルなどのデータ、GPSユニット16から送られてきた緯度、経度といったデジタルデータ、CD－ROMユニット14やCD－ROMオートチェンジャ7で、CD－ROMから読み出されたカーナビゲーションシステム用の地図の内容や地域ごとの情報の内容、セキュリティコントロールユニット5から送られてくる異常発生を知らせるデータ、電話ユニット6から送られてくる通話着信や発信元の電話番号などを知らせるデータなどが考えられる。

【0058】〔2－1－3．CPUモジュールでの情報処理〕CPUモジュール11では、サポートASIC121からデジタルデータが送られてくると、PCIバスホストコントローラ114が、送られてきたデータをローカルバスB1のデータ形式に変換したうえでCPUホストASIC115に渡す。このCPUホストASIC115は、CPU111に代わって入出力を司り、データを渡されると、そのデータがCPU111に渡すべきものかそうでないかを、データの形式などから判断する。

【0059】つまり、CPUホストASIC115は、機械的に一定の反応を返せば足りるデータに対しては、予め決められた反応を、PCIバスホストコントローラ114を通してサポートモジュール12に返すが、それ以外のデータはCPU111に渡す。

【0060】CPU111は、フラッシュROM113に記録されているOSやプログラムのコードにしたがって、渡されたデータを処理し、この処理の際に必要なワークエリアなどの記憶領域としてはDRAM112を利用する。例えば、マイクロホン3から入力されたユーザの声が送られてくると、CPU111は、予め用意している命令語の特徴を表わすパラメータや波形などと、受け取ったユーザの声とを比較し、一番似ている命令語をユーザが言ったものと推定し、その命令語にしたがって動作を行う。

【0061】また、コンパクトフラッシュカード13の読み書きは、CPUモジュール11において、CPU111からの依頼にしたがって、CPUホストASIC115がPCMCIA・ASIC116を制御することによって行われる。

【0062】そして、CPU111による情報処理の結果は、PCIバスホストコントローラ114によってPCIバスB2のデータ形式に変換されたうえで、サポートモジュール12に送られる。情報処理の結果としてサポートモジュール12に送られるデータとしては、サポートモジュール12の各部分や各機器に対する動作の指令などであり、サポートモジュール12では、このように送られてきたデータにしたがって入出力などの処理が行われる。

【0063】〔2－1－4．サポートモジュールでの入出力などの処理〕例えば、CDからのデータ読み出しやラジオのチューニングをさせる指令がCPUモジュール11から届くと、CD－ROMユニット14、CD－ROMオートチェンジャ7やチューナー21がそれにしたがった動作を行う。また、スピーカから出ている音の音源を現在とは別の機器に切り替える指令がCPUモジュール11から届くと、サポートASIC121はCODEC回路122に送り出すデジタルデータを、それまでの機器のものから、新しく指定された機器によるものに切り替える。

【0064】なお、デジタルデータをアンプ22に出力する場合、アンプ22はアナログ信号しか受け付けないので、CODEC回路122は、デジタルデータをアナログ信号に変換（D／A変換）したうえでアンプ22に出力する。

【0065】また、例えばユーザに対する表示データが、CPUモジュール11やその他の機器からサポートASIC121に送られてくると、サポートASIC121は、この表示データを高速シリアル通信回路を通してフェイスプレートユニット15に転送する。この場合、フェイスプレートユニット15では、転送されてきた表示データにしたがって、ユーザに対する情報が表示部に表示される。

【0066】続いて、上に述べたような各部分の働きによって、ユーザがこの実施形態のカーオーディオシステムをどのように使うことができるのかを具体的に説明する。

【0067】〔2－2．操作と情報の表示〕この実施形態のカーオーディオシステムを操作するときは、ユーザ

は、フェイスプレートユニット１５に設けられている操作キーを押してもよいし、操作の内用ごとに予め決められている語句を発話してもよい。例えば、ユーザがＣＤやＦＭチューナーを利用したいときは、ＣＤに切り替える操作キーを押してもよいし、予め決められた語句として例えば「しーでぃー」や「えふえむ」などとマイクロホン３に向かって発話すればよい。

【００６８】ユーザが操作キーを押したときは、そのデータがサポートＡＳＩＣ１２１からＣＰＵモジュール１１に転送され、ＣＰＵ１１１が新たな表示データをサポートＡＳＩＣ１２１に送り、フェイスプレートユニット１５の表示部は、この表示データを使って、ラジオを操作するための画面表示やＣＤを操作するための画面表示などに切り替わる。

【００６９】また、例えば、ユーザが「しーでぃー」といった語句を発話すると、マイクロホン３からアナログ信号がＣＯＤＥＣ回路１２２によってデジタルデータに変換され、このデジタルデータが、サポートＡＳＩＣ１２１からＰＣＩバスホストコントローラとＣＰＵホストＡＳＩＣ１１５を経てＣＰＵ１１１に送られ、ＣＰＵ１１１は、このデジタルデータに基づいて、ユーザがどの言葉を言ったのかを認識し、認識結果に応じて、操作キーが押されたときと同じような対応をする。

【００７０】なお、例えば、フェイスプレートユニット１５の表示部をタッチパネルにしておき、コンピュータのグラフィカルユーザインタフェースとして、例えばその時点で使える機能をアイコンで表示部に表示し、ユーザが使いたい機能のアイコンを指で触るとその機能が働くようにすることもできる。さらに、例えば、そのようなアイコンによる表示と音声認識を合わせて使えば、一度にいくつかのアイコンが表示され、ユーザが「つぎ」と発話すれば画面が切り替わって次のいくつかのアイコンが表示され、ユーザが「もどる」と発話すれば画面が１つ前の状態に戻る、といった使い方も可能である。

【００７１】〔２－３．ラジオを聞く場合〕上に述べたような操作で、例えばユーザが「えふえむ」と発話してラジオのＦＭ放送を選び、ＣＰＵ１１１がそれを認識すると、サポートＡＳＩＣ１２１はＣＰＵ１１１からの命令にしたがってチューナー２１をＦＭの受信状態に切り替え、また、アンプ２２に送り出すデータのソースをチューナー２１からの音声のデータに切り替える。この場合、チューナー２１は、前回選局した周波数を受信してもよいし、また、例えば、ユーザが「シークアップ」といった語句を発話することで、周波数を少しずつ変えながら受信状態のよい次の周波数を自動的に探す（自動掃引）ようにしてもよい。

【００７２】このようにラジオを聞く場合は、チューナー２１から送られてくる受信内容はアナログ信号なので、このアナログ信号はＣＯＤＥＣ回路１２２に入力され、デジタルデータに変換されたうえでサポートＡＳＩＣ１２１に送られる。サポートＡＳＩＣ１２１は、ＣＯＤＥＣ回路１２２から受け取ったデジタルデータをＤＳＰユニット１２３に渡し、ＤＳＰユニット１２３は、予めシステムの上で設定されているバランスやボリュームといった設定項目にしたがってこのデジタルデータを処理し、サポートＡＳＩＣ１２１に送り返す。

【００７３】そして、サポートＡＳＩＣ１２１は、このように返ってきたデジタルデータをＣＯＤＥＣ回路１２２に再び送り返し、ＣＯＤＥＣ回路１２２はこのデジタルデータを再びアナログ信号に変換して戻したうえで、今度はアンプ２２に送ってスピーカから流れるようにする。

【００７４】〔２－４．ＣＤの再生〕また、ユーザは、音楽ＣＤを聞きたいときは、ＣＤ－ＲＯＭユニット１４やＣＤ－ＲＯＭオートチェンジャ７に聞きたい音楽ＣＤをセットし、「すたーと」となどと音声などで再生を指示したり、次の曲へ飛ぶといった指示をすればよい。例えば、ＣＤ－ＲＯＭユニット１４内の音楽ＣＤを再生するときは、サポートＡＳＩＣ１２１からの指令によってＣＤ－ＲＯＭユニット１４が作動し、ＣＤ－ＲＯＭユニット１４からはデジタルデータであるオーディオデータが送られてくる。

【００７５】そして、パラレル／ＰＣＩドライバ１２５は、このオーディオデータをＰＣＩバスＢ２のデータ形式に変換してサポートＡＳＩＣ１２１に送り、サポートＡＳＩＣ１２１は、ＰＣＩバスＢ２からオーディオデータを受け取ると、このオーディオデータを一旦ＤＳＰユニット１２３に渡して処理させ、処理されたオーディオデータを再びＤＳＰユニット１２３から受け取ると、処理されたオーディオデータをデジタル入出力ポートからＣＯＤＥＣ回路１２２に渡し、アナログ信号の形でアンプ２２に出力させる。

【００７６】音楽ＣＤを再生するのがＣＤ－ＲＯＭオートチェンジャ７のときは、シリアルバスＢ３から送られてくるシリアル形式のオーディオデータを、シリアル／ＰＣＩドライバ１２６がＰＣＩバスＢ２のデータ形式に変換するが、それ以降の処理はＣＤ－ＲＯＭユニット１４の場合と同じように行われる。

【００７７】なお、ＣＤ－ＲＯＭユニット１４やＣＤ－ＲＯＭオートチェンジャ７と、ＣＯＤＥＣ回路１２２やＤＳＰユニット１２３とを相対的に比べると、前者は長い時間のサイクルでまとまった量のデータを送ってくるのに対して、後者は短い時間のサイクルでデータを少しずつ処理するため、両者の間にサイクルにずれがある。このため、サポートＡＳＩＣ１２１は、ＣＤ－ＲＯＭユニット１４又はＣＤ－ＲＯＭオートチェンジャ７がまとめて送ってきたデジタルデータをバッファメモリ１２４に格納し、一番古い部分から次々と取り出してはＤＳＰユニット１２３に渡して処理させることで、上に述べたようなずれを埋めて再生が滑らかに行われるようにす

る。

【0078】〔2－5．CD－ROMとカーナビゲーションの利用〕また、ユーザが例えばカーナビゲーションシステムの機能を使いたいときは、例えばCD－ROMユニット14に、カーナビゲーションシステム用のデータ（アプリケーションソフト、地図等）が記録されたCD－ROMをセットしたうえで、カーナビゲーションシステムの機能を起動する。このようなカーナビゲーションシステムの機能は、例えばコンピュータのプログラムとしてCPUモジュール11のフラッシュROM113に記録しておき、CPU111にこのようなプログラムを実行させることによって実現することができる。

【0079】このようなカーナビゲーションシステムが、CD－ROMに記録された地図のデータや地域ごとのいろいろな情報などを読み出そうとするときは、例えばCD－ROMユニット14から読み出されたデジタルデータがパラレル／PCIドライバ125、PCIバスホストコントローラ114、CPUホストASIC115を経てCPU111に渡される。CPU111は、このように受け取った地図などのデータに基づいてフェイスプレートユニット15の表示部に表示するためのビットマップイメージをDRAM112上に作成したうえ、サポートモジュール12に送り出す。

【0080】また、このようにカーナビゲーションシステムを使うときは、図1に示したGPSアンテナ4でGPS衛星からの電波を受信し、図2のGPSユニット16がこの電波から緯度や経度などを計算し、このデータがCPU111に送られてくる。すると、CPU111は、これらの緯度や経度などのデータから、このカーオーディオシステムを積んだ車が現在どこを走っているのかを地図上で特定する事ができる。この結果、ユーザが入力しなくても出発地点として現在地を設定したり、現在の地点が中心となるような大まかな地図を表示したり、次の右折や左折を指示する図形を表示したりすることができる。

【0081】なお、ナビゲーション用のデータは、コンパクトフラッシュカード13（又はDRAM112）、又はフラッシュROM113に記憶しておいても良い。

【0082】また、すでに説明したような音声認識による操作の仕方は、このようにカーナビゲーションシステムの機能を使うときにも利用することができ、例えば、曲がり角ごとに右折や左折といった指示を出すカーナビゲーションシステムを使う場合、1つ前の指示や1つ先の指示をユーザが見たいときは、「つぎ」とか「もどる」といった語句を発話することで次々と表示を切り替えることもできる。

【0083】さらに、このような道案内はアンプ22を通して合成音声を出力することでユーザに知らせることもでき、このようにすれば、次にどこを曲がるか知るために表示部に視線を移す必要がなくなる。

【0084】〔2－6．電話の利用〕また、ユーザは、電話ユニット6を使って通話するとき、次のようにコンピュータの利点とカーオーディオシステムの利点を活かすことができる。例えば、ユーザは、コンピュータのプログラムを使って、自分の知っている人の電話番号と名前をシステムの、例えばDRAM112、コンパクトフラッシュカード13に予め登録しておく。

【0085】電話が着信すると、図2には図示しないが、電話ユニット6からシリアルバスB3とシリアル／PCIドライバ126を通じて、電話が着信したことを知らせるデジタルデータと、発信元の電話番号を表わすデジタルデータがサポートASIC121に送られる。これらのデータはさらに、CPUモジュール11のCPU111に送られ、CPU111は、予め登録された電話番号の中に、今かかってきている発信元の電話番号が登録されているかどうか検索する。

【0086】予め登録された電話番号の中に、今かかってきている発信元の電話番号があったときは、CPU11はその電話番号に対応する名前をサポートモジュール12に送り返すことで、フェイスプレートユニット15に電話をかけてきている人の名前を表示させたり、合成音声による「○○さんからです」といった案内を車載スピーカから流すことで、誰が電話をかけてきているのかをユーザに知らせることができる。

【0087】このような表示や案内、また呼び出し音などで電話がかかってきていることを知ったユーザが、予め決められた語句を発話して電話をつなぐように指示すると、相手の声がスピーカから流れると同時に、マイクロホン3から入力されるユーザの声がCODEC回路122によってデジタルデータに変換され、サポートASIC121、シリアル／PCIドライバ126、シリアルバスB3を経て電話ユニット6に送られ、ユーザは手を使わずにいわゆるハンズフリーの状態で通話を行うことができる。

【0088】なお、呼び出し音が一定の回数だけ鳴ったところで、例えば電話ユニット6やCPUモジュール11に用意された留守番電話機能などが電話に応答する。

【0089】また、ユーザの側から発信しようとするときも、例えば、予め登録してある電話番号と名前を表示画面の上でつぎつぎに表示させ、電話を掛けたい相手が表示されたところで発信のアイコンなどを指でタッチすると、その電話番号がCPUモジュール11からデジタルデータとして電話ユニット6に転送されて自動的に電話がかかり、相手が出ればそのまま話すことができる。

【0090】また、ユーザが登録した名前を発話し、CPUモジュール11がこれを認識することでその名前に対応する電話番号に自動的に発信したり、掛けたい電話番号を1桁ずつ発話して認識させたり、ユーザが「りだいやる」と発話したことを認識して電話を掛ける先を決めるようにすることもできる。

【0091】〔2－7．セキュリティコントロールユニットの利用〕また、セキュリティコントロールユニット5は、単独で使うこともできるし、上に述べた電話ユニット6と連動させて使うこともできる。例えば（図1）、ユーザは車を離れるときに、セキュリティコントロールユニット5を作動させ、送信機5ｃを持って降りる。車両のユーザと何ら関係のない第三者がドアノブに触れたり、鍵穴をいじったり、ドアやトランクをこじ開けようとしたり、車を無断で移動させようとすると、それによる衝撃や振動をセンサ5ａが感じ取り、センサ5ａからの信号を受けたセキュリティコントロールユニット5は、例えばサイレン5ｂを大音量で鳴らす。これにより車外の環境に対し警報の効果がもたらされる。

【0092】ユーザ自身は、車に戻ってきたとき、持っている送信機5ｃを操作すれば、予め決められた暗号がセキュリティコントロールユニット5に送られ、セキュリティコントロールユニット5の機能は解除されるので、鍵を使ったり車を動かしてもサイレンが鳴ったりすることはない。

【0093】このようなセキュリティコントロールユニット5は、電話ユニット6と連動させて使えばさらに効果がある。つまり、センサ5ａが異常を感知したとき、セキュリティコントロールユニット5は、サイレンを鳴らすだけでなく、割り込み信号を送ってＣＰＵモジュール11及びサポートモジュール12を含むカーオーディオシステムを起動させる。このような起動を可能にするためには、カーオーディオシステムの電源と起動スイッチに接続した電子回路を用意し、割り込み信号が来ていないかをこの電子回路に常に監視させておき、割り込み信号が来るとただちに電源と起動スイッチをオンにしてカーオーディオシステムを起動させればよい。

【0094】このように起動されたＣＰＵ111は、セキュリティコントロールユニット5から異常発生を知らせるデータを受け取ると、電話ユニット6に指令を送ることで電話を掛けさせる。このときに電話を掛ける先は、異常時の通報先として予め設定しておけばよく、例えば、警察、ユーザの持っている携帯電話、警備会社などとすればよい。そして、掛けた先に電話がつながると、合成音声や予め録音したアナウンスを相手に聞かせることで異常を知らせる。このようにすれば、知らせを受けた者が現場に急行できる。

【0095】〔2－8．ユーティリティプログラムの利用〕また、通常のハンドヘルドパソコンと同じように、ＯＳやアプリケーションプログラムの機能として、アドレス帳、カレンダー、スケジュール管理、音声録音、時計、電卓、ゲームといった機能を利用すれば、車の中でもいろいろな情報処理を行うことが可能となる。さらに、これらの機能を実現するアプリケーションプログラムを削除したり、新しいものに入れ替えたり、追加することで、個々のユーザが自分にあった情報処理の環境を整えることができる。

【0096】〔2－9．コンパクトフラッシュカードの利用〕また、この実施形態のカーオーディオシステムでは、コンパクトフラッシュカード13を使うことで、他のハンドヘルドパソコンや他のカーオーディオシステムなどとの間で情報をやり取りすることができる。

【0097】例えば、コンパクトフラッシュカード13から新しいアプリケーションプログラムやＯＳをフラッシュＲＯＭ113に読み込ませることで、新しい機能を追加するしたりＯＳを更新することが容易になる。特に、汎用のＯＳを使うことによって、一般のソフトウェアメーカーがアプリケーションプログラムやＯＳの機能モジュールなどを作りやすくなるので、それを記録したコンパクトフラッシュカード13も出回って手に入れやすくなり、ユーザはこのカーオーディオシステムを、コンピュータとしても、より便利に使えるようになる。

【0098】また、他のパソコンやハンドヘルドパソコンで作ったアドレス帳のような個人的なデータを、コンパクトフラッシュカード13でこのカーオーディオシステムに持ち込めば、それまでの作業をこのカーオーディオシステム上で続けることができる。さらに、これとは逆に、このカーオーディオシステムで作ったデータをコンパクトフラッシュカード13で他のパソコンやハンドヘルドパソコンに移して作業を続けることもできる。

【0099】また、上に述べたようなユーティリティプログラムを使って自分が作ったデータを、コンパクトフラッシュカード13にバックアップコピーしておけば、カーオーディオシステムの不調や他人が使ったためにデータが消えたような場合でも、コンパクトフラッシュカード13からデータを再びメインユニット1に読み込ませて情報処理を続けることができる。

【0100】また、自分に合ったカーオーディオシステムのいろいろな設定をコンパクトフラッシュカード13にバックアップコピーしておけば、たとえ家族の他の誰かが設定を変えても、自分が車を使うときは自分の持っていたコンパクトフラッシュカード13をメインユニット1に差し込んで内容を読み込ませることで、自分にとって使い勝手のよい元通りの設定でカーオーディオシステムを使うことができる。

【0101】〔2－10．ハンドヘルドパソコンとの通信〕さらに、この実施形態では、赤外線通信ユニット127を使うことで、ハンドヘルドパソコン8との間で、コンパクトフラッシュカード13を抜き差ししたりケーブルなどで接続するといった手間をかけずに、容易にデータをやり取りすることができる。このため、ハンドヘルドパソコン8内に記録しておいたファイルなどを使ってＯＳやアプリケーションプログラムを更新したり、カーオーディオシステム上で作った個人的なデータをハンドヘルドパソコン8に直接移し替えたり、そのような個人的なデータのバックアップを、ハンドヘルドパソコン

8の持っている比較的大きな記憶領域に保存しておいたり、カーオーディオシステムの設定などをハンドヘルドパソコン8を通して他の車のカーオーディオシステムに移し替えたり、といったいろいろな使い方も可能になる。

【0102】〔3．効果〕以上のように、この実施形態では、カーオーディオシステムを制御するコンピュータが汎用的なOSを備えていて、この汎用的なOSは、CPUやメモリといった資源を管理することでコンピュータの能力を最大限発揮させ、また、プログラムに依存しない統一的で使いやすいユーザインタフェースを提供し、さらに、予め決められた形式のプログラムを追加したり変更することで機能の追加や変更も容易にする。このため、複雑なカーオーディオシステムの制御が容易になる。

【0103】また、OSの規格にあったプログラムであれば、車内でもいろいろなプログラムを使うことが可能になり、カーオーディオシステムの表示部や操作キー、スピーカといった機器を利用して情報処理をすることも可能になる。もちろん、この場合でも、ハンドヘルドパソコン並の大きなメモリを使ってユーザが自分の個人的な情報を保存したり、パソコンのように情報を編集することができる。

【0104】また、この実施形態では、コンピュータのCPUと、カーオーディオシステムの機器とが、互いの形式に対応した違ったバスを使ってデータをやり取りし、データは、2つのバスの間では必要に応じて形式を変換して受け渡される。このため、各機器の動作よりCPUの動作が速くても、CPUは各機器の動作サイクルに合わせる必要がなく、メモリなどを効率よくアクセスすることで複雑な処理を高速に行うことができる。また、CPUがやり取りするデータと、機器がやり取りするデータとが、同じバスの伝達能力を奪い合うことがないので、コンピュータとカーオーディオシステムの両方がそれぞれの動作をスムースに行うことができる。

【0105】また、機器を接続するためのバスを使って音の信号を再生しながら、同時に、CPUの形式に対応したバスを使って別の処理を行うといったマルチタスクが容易になる。また、CPUを別の形式のものに変える場合も、各機器と、それら機器を接続するためのバスはそのままで、CPUの形式に対応したバスだけを新しいCPUの形式に合わせて変えればよいので、CPUの変更にも容易に対応することができる。

【0106】特に、この実施形態では、複数の機器を芋づる式に次々と、デイジーチェイン形式でつないでゆくことができる。このため、機器の数が増えたり車内のあちこちに機器を分散設置するときも、スター方式のように長い配線が1箇所に集中することがなく設置が容易になる。また、配線がすっきりわかりやすくなるので、カーオーディオシステムの構成を変えたり保守や修理をすることも容易になる。

【0107】加えて、この実施形態では、オーディオデータであるか文字データであるかといったデータの種類とは関係なく、どのようなデータもUSBなどを通してデジタルデータとしてやり取りされ、処理されるので、環境変化やノイズの影響を受けにくく、オーディオ特性も安定する。

【0108】〔4．他の実施の形態〕なお、本発明は上に述べた実施形態に限定されるものではなく、次に例示するような他の実施の形態も含むものである。例えば、上に述べた実施形態では、コンピュータのOSの具体例としてWindows　CEを挙げたが、これは単なる例示に過ぎないので、他の種類の既にあるOSを使ったり、今後新しく登場するOSを使うことも本発明の範囲に含まれる。

【0109】また、上に述べた実施形態では車載用のカーオーディオシステムを制御する例を示したが、本発明は、家庭内で据え置き型ステレオなどの電気製品を制御するのに使うことも可能で、この場合も、新しいアプリケーションソフトウェアを使ったり、全体が小型で済むといった本発明の利点を活かすことができる。

【0110】また、上に述べた実施形態では、いろいろなバスや通信回路について具体的な規格を挙げたが、そのような規格は例示に過ぎず、同じような使い方ができるほかの規格に置き換えることもできる。また、例えば、第1のバスや第2のバスは、CPUモジュールとサポートモジュールをワンチップ化することで内部バスにすることもできる。

【0111】

【発明の効果】以上のように、本発明によれば、汎用的なOSを持つコンピュータとカーオーディオシステムを組み合わせることで互いの利点を活かし、複雑なカーオーディオシステムも容易に制御し、コンピュータの使い方も広げることができる。

【図面の簡単な説明】

【図1】この発明の実施形態の全体構成を示すブロック図。

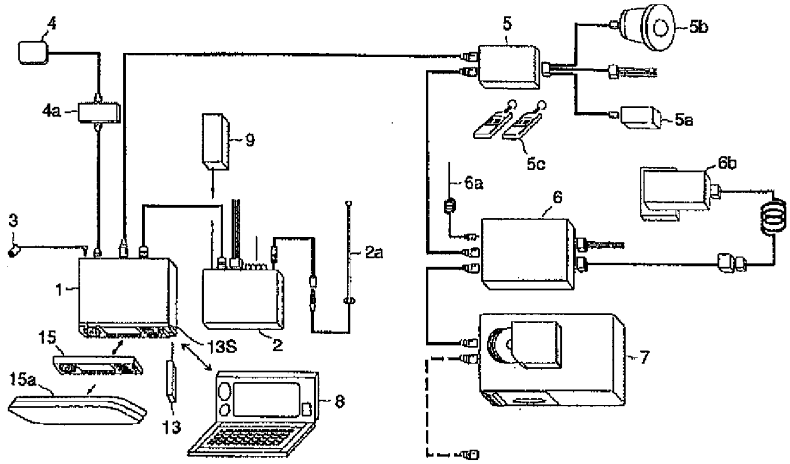
【図2】この発明の実施形態について、メインユニットの内部構成を中心に示したブロック図。

【符号の説明】

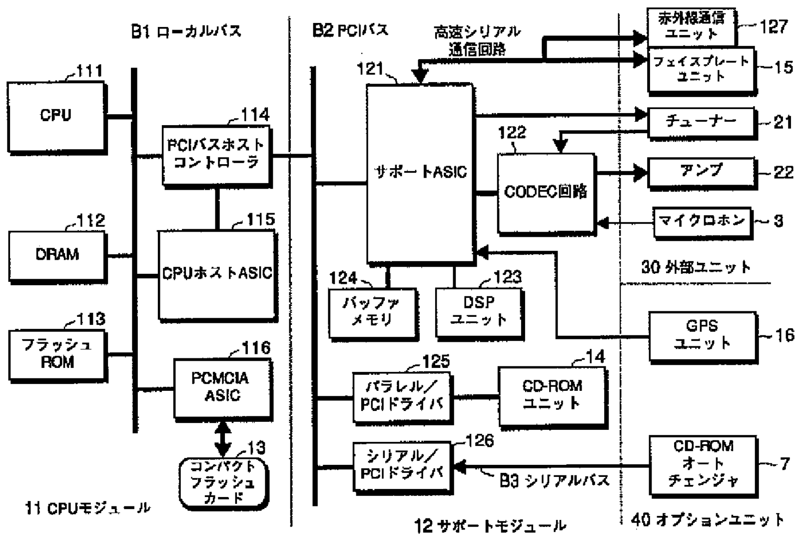
1…メインユニット1
11…CPUモジュール
111…CPU
112…DRAM
113…フラッシュROM
114…PCIバスホストコントローラ
115…CPUホストASIC
116…PCMCIA・ASIC
12…サポートモジュール
121…サポートASIC

１２２…ＣＯＤＥＣ回路
１２３…ＤＳＰユニット
１２４…バッファメモリ
１２５…パラレル／ＰＣＩドライバ
１２６…シリアル／ＰＣＩドライバ
１２７…赤外線通信ユニット
１３…コンパクトフラッシュカード
１３Ｓ…ソケット
１４…ＣＤ－ＲＯＭユニット
１５…フェイスプレートユニット
１５ａ…ケース
１６…ＧＰＳユニット
2…チューナーアンプユニット
２ａ…アンテナ
２１…チューナー
２２…アンプ
3…マイクロホン
4…ＧＰＳアンテナ
４ａ…受信機
5…セキュリティコントロールユニット
５ａ…センサ
５ｂ…サイレン
５ｃ…送信機
6…電話ユニット
６ａ…アンテナ
６ｂ…ハンドセット
7…ＣＤ－ＲＯＭオートチェンジャ
8…ハンドヘルドパソコン
9…補助バッテリ
３０…外部ユニット
４０…オプションユニット

【図１】



【図2】



フロントページの続き

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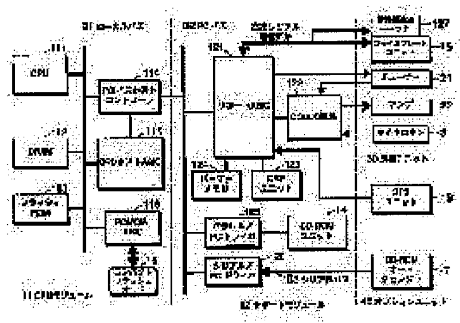
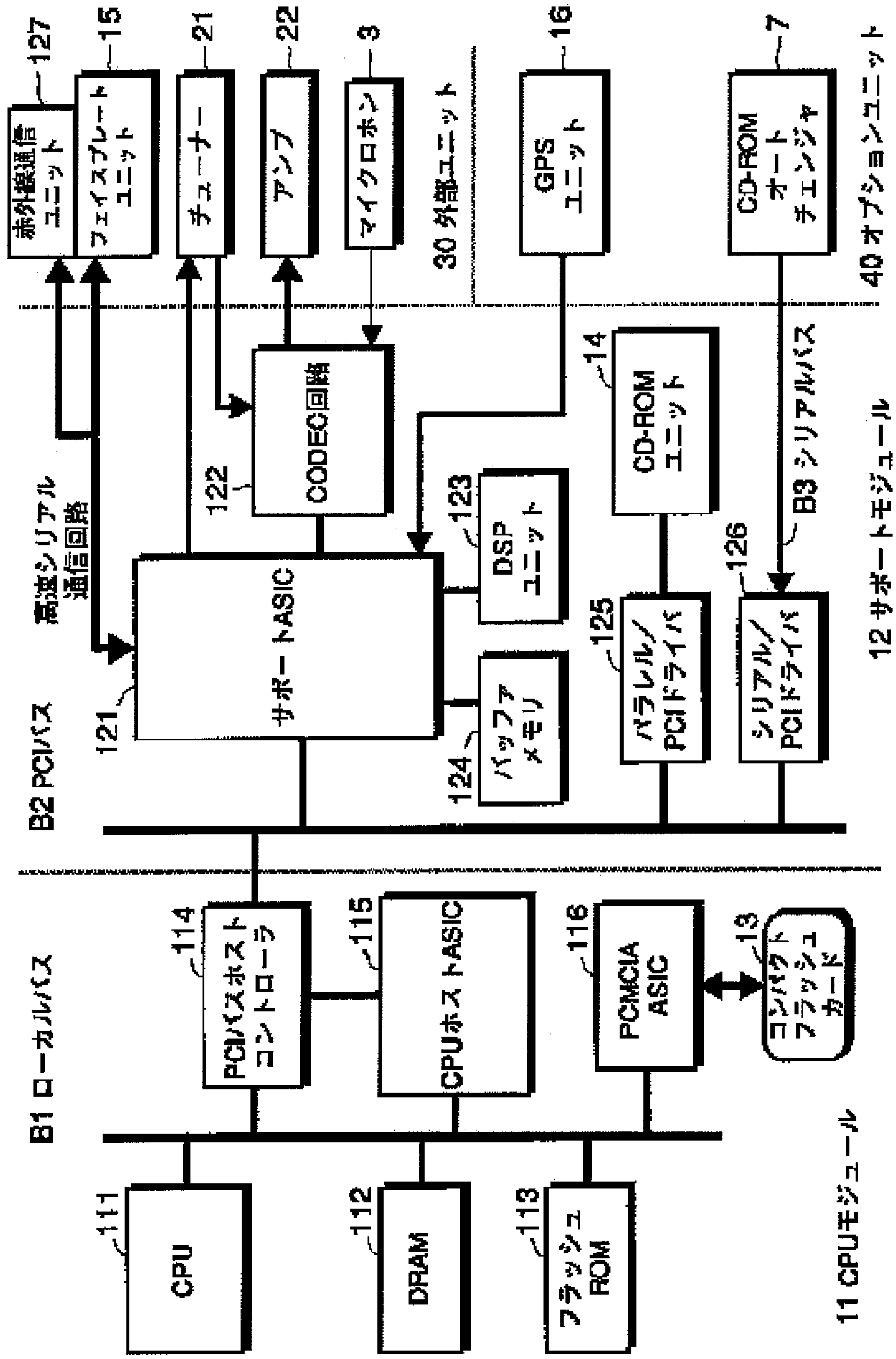
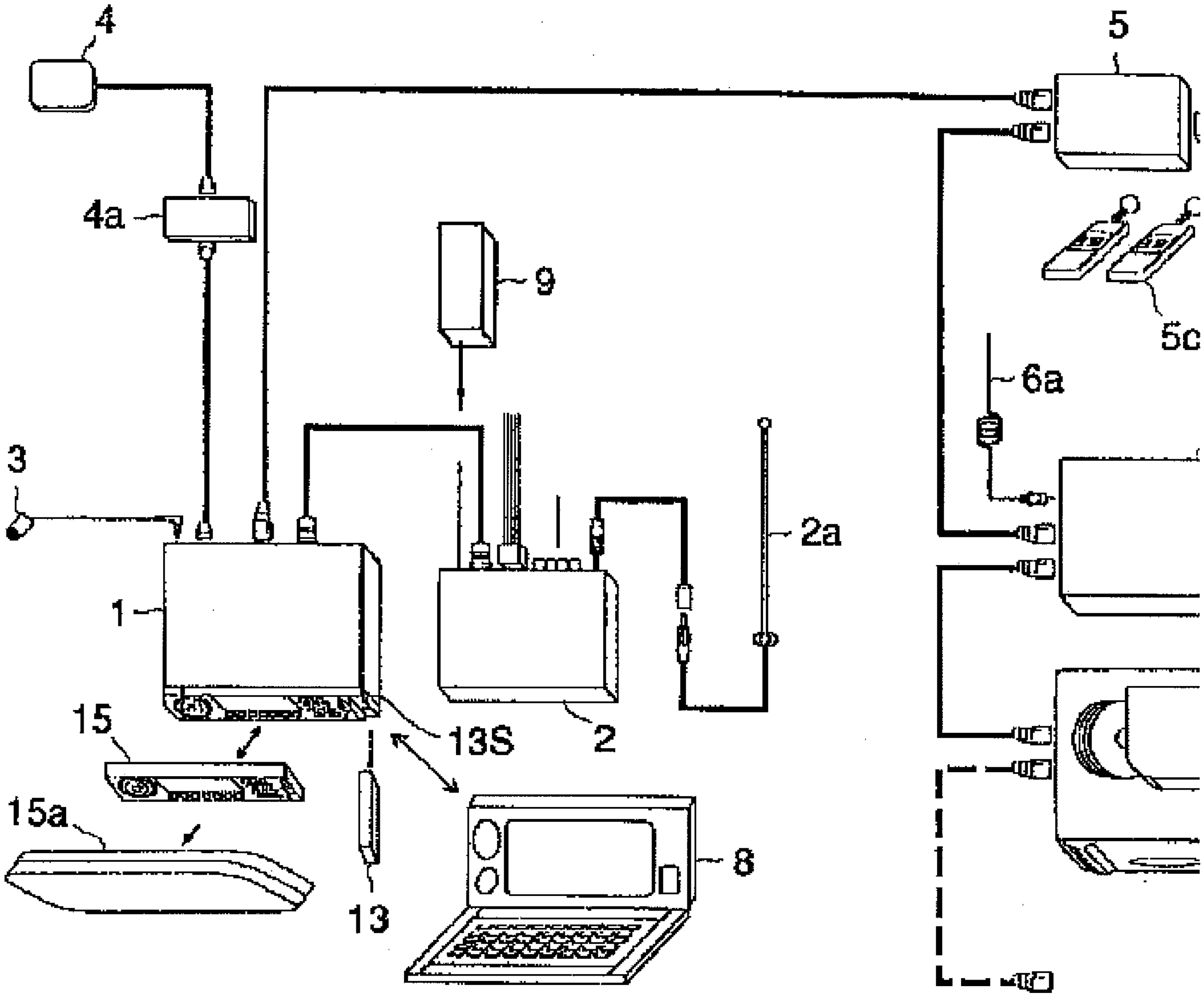
(54) CAR AUDIO SYSTEM, VEHICLE-MOUNTED COMPUTER, AND METHOD FOR CONTROLLING CAR AUDIO SYSTEM

(57)Abstract:
PROBLEM TO BE SOLVED: To utilize both advantages by combining a compact computer with a universal OS and a car audio system.
SOLUTION: A local bus B1 corresponding to the form of a CPU 11 included in a computer, a PCI bus B2 for connecting equipment 15, 21, 22, 3, 16, and 7 included in a car audio system, and a PCI bus host controller 114 for converting data form between the buses B1 and B2 are provided. An OS for the CPU 111 is stored in a flash ROM 113. The CPU 111 can speedily perform complex processing by efficiently accessing a memory 112 or the like. The computer and the car audio system can be operated smoothly. A multi-task can be facilitated, where another processing can be made with another path while an audio signal is being reproduced. Only the path corresponding to the form of the CPU 111 may be changed when the form of the CPU 111 is to be changed.




127 赤外線通信ユニット
15 フェイスプレートユニット
21 チューナー
22 アンプ
3 マイクロホン
30 外部ユニット
16 GPSユニット
7 CD-ROMオートチェンジャ
40 オプションユニット
高速シリアル通信回路
122 CODEC回路
123 DSPユニット
14 CD-ROMユニット
B3 シリアルバス
126
121 サポートASIC
124 バッファメモリ
125 パラレル/PCIドライバ
シリアル/PCIドライバ
12 サポートモジュール
B2 PCIバス
B1 ローカルバス
114 PCIバスホストコントローラ
115 CPUホストASIC
116 PCMCIA ASIC
13 コンパクトフラッシュカード
111 CPU
112 DRAM
113 フラッシュROM
11 CPUモジュール


4
5
4a
9
5c
6a
3
2a
1
15
13S
2
15a
8
13

CLAIMS

[Claim(s)]
[Claim 1]A car audio system comprising provided with a computer for control:
A means by which said computer is provided with an operating system and this operating system manages resources on a computer.
A means to execute a program of form beforehand decided to be a means to control input and output containing a user interface.

[Claim 2]A car audio system comprising provided with a computer for control:
The 1st bus corresponding to form of CPU contained in said computer.
The 2nd bus for connecting apparatus contained in said car audio system.

[Claim 3]A car audio system comprising provided with a computer for control:
A local bus corresponding to form of CPU contained in said computer.
A PCI bus for connecting apparatus contained in said car audio system.

[Claim 4]The car audio system according to claim 2 or 3 provided with a means to change form of data between said each bus.
[Claim 5]A car audio system of any one statement of four from claim 1 provided with the 3rd bus for connecting two or more apparatus contained in said car audio system in daisy chain form.
[Claim 6]A computer for mount characterized by comprising the following.
An operating system which realizes environment required in order to execute a program of form decided beforehand.
A means to control a car audio system and said car audio system.

[Claim 7]A computer for mount provided with a car audio system characterized by comprising the following.
The 1st bus corresponding to form of CPU contained in said computer.
The 2nd bus for connecting apparatus contained in said car audio system.

[Claim 8]A computer for mount provided with a car audio system characterized by comprising the following.
A local bus corresponding to form of CPU contained in said computer.
A PCI bus for connecting apparatus contained in said car audio system.

[Claim 9]The computer for mount according to claim 7 or 8 provided with a means to change form of data between said each bus.
[Claim 10]A computer for mount of any one statement of nine from claim 6 provided with the 3rd bus for connecting two or more apparatus contained in said car audio system in daisy chain form.
[Claim 11]A control method of a car audio system which controls a car audio system using a computer provided with an operating system characterized by comprising the following.
A step which realizes environment which needs said operating system in order to execute a program of form decided beforehand.
A step by which said program controls said car audio system.

[Claim 12]A control method of a car audio system which controls a car audio system using a computer characterized by comprising the following.
A step with which CPU contained in said computer exchanges data through the 1st bus corresponding to form of this CPU.
A step which exchanges data through the 2nd bus for apparatus contained in said car audio system to connect apparatus.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention is combining a small computer with general-purpose OS, and a car audio system, and relates to the art of harnessing a mutual advantage.
[0002]
[Description of the Prior Art]In recent years, progress with remarkable art of a semiconductor is accomplished and the electronic equipment of various fields has become a miniaturization and highly efficient by using a semiconductor. Thus, one of the electronic equipment made a miniaturization and highly efficient by using a semiconductor has a personal computer (henceforth a "personal computer").
[0003]The small personal computers (it names generically the following "hand-held PC") called [especially] a handheld computer (carried type), a palm top, etc. these days are also increasing in number. Windows(registered trademark of Microsoft Corp.) CE etc. are known, for example as base software (it is called below Operating System: "OS") suitable for such a hand-held PC, i.e., an operating system.
[0004]Such a general-purpose OS realizes advanced throughput by managing finely throughput, a memory, etc. of CPU which the computer has, or, If it is a program of the form which provided the user interface independent of a program which it is unific and is easy to use, or was decided beforehand, it has the advantage that the current update of the function of a computer can be carried out by carrying out a current update freely.
[0005]As another electronic equipment which similarly has been made a miniaturization and highly efficient by using a semiconductor, the car audio system and car-navigation system which are carried in a car are mentioned. Among these, a car audio system is commonly called a car stereo etc., and combines the tuner of a CD player, AM, or FM, etc. with amplifier, a loudspeaker, etc. A car-navigation system is a shown system to which a screen display of the

map is carried out to the specified destination, pinpointing the current position of a car using an azimuth magnet, an odometer, GPS, etc.

[0006]These days, since a car-navigation system, a handsfree cellular phone, an anti-theft alarm system, etc. are combined with a car audio system in many cases, the electronic equipment for these mount is hereafter named a "car audio system" generically.

[0007]

[Problem(s) to be Solved by the Invention]The hand-held PC provided with OS which was described above, and the car audio system were mutual completely separate in the former. That is, although the car audio system which prepared the computer in the large meaning for control existed, the computer in this case is called the embedded system which works only for the specific purpose.

[0008]CPU with necessary minimum capability is used for this embedded system, and it realizes necessary minimum processing to the hardware of receiving an operation switch or operating a disk reproduction mechanism, by the small program using an assembler etc. For this reason, usage of carrying out the change addition of the function by carrying out processing and preservation of data like a personal computer, or carrying out the change addition of the program cannot be done.

[0009]On the other hand, it did not have a function which a hand-held PC sounds music itself, or controls a car audio system. For this reason, although the user might carry the hand-held PC into in the car as a matter of fact, he did not use, having connected with the car audio system.

[0010]By the way, the latest car audio system, Not only in conventional apparatus called the tuner, cassette tape deck, and CD player of radio, Many apparatus is increasingly built into the condition of an MD player, CD, the autochanger of MD, a car-navigation system, the voice recognition equipment that recognizes a user's command, a handsfree cellular phone, and an anti-theft alarm system. And it is dramatically difficult to master the car audio system which becomes complicated in this way only with the switch in which it was provided by each device.

[0011]That is, when a car audio system becomes complicated in this way, many switches, such as an operation key and a dial, will be in various places in the car. For this reason, it is serious to memorize which is what operation key.

[0012]Namely, in order to master the car audio system which becomes complicated. To use for control an information processor equivalent to the hand-held PC provided with the small computer with the pliability which can carry out the current update of the function about the advanced throughput which controls a complicated system, the user interface, and control which are easy to use, and especially general-purpose OS is desired.

[0013]Even if it thinks from the hand-held PC side, a car is used like the present age in many cases, and in the car is wanted to expand the width of practical use in society also with much traffic congestion. By combining with a car audio system especially, make an operation key and a memory serve a double purpose, or, The information which a user wants to know in the car is made to be read out by the synthesized speech using a computer, If usage of hearing the voice from the loudspeaker of a car audio system, or accessing an external computer network by the circuit of the cellular phone built into the car audio system can be done, the width of practical use can be expanded rather than former.

[0014]When combining high-speed CPU which uses general-purpose OS, and apparatus which is contained in a car audio system, to have a separate bus suitable for each from the difference in both working speed, etc. is desired. In the car audio system which combined a lot of apparatus, two or more apparatus is wanted to be easily connectable with simple refreshed wiring.

[0015]Proposed in order that this invention might solve the problem of conventional technology which was described above, it is combining a small computer with general-purpose OS, and a car audio system, and the purpose is to harness a mutual advantage. Another purpose of this invention is to use two or more buses, and is using both high-speed apparatus of CPU and others smoothly without futility. Another purpose of this invention is to connect various apparatus one after another with a daisy chain mode.

[0016]

[Means for Solving the Problem]In order to attain the purpose described above, an invention of claim 1 equips a car audio system provided with a computer for control with the following.

A means by which said computer is provided with an operating system and this operating system manages resources on a computer.

A means to control input and output containing a user interface.

A means to execute a program of form decided beforehand.

A computer for mount of claim 6 is provided with the following.

An operating system which realizes environment required in order to execute a program of form decided beforehand.

Car audio system.

A means to control said car audio system.

An invention of claim 11 is what caught an invention of claim 1 from a view of a method, In a control method of a car audio system which controls a car audio system using a computer provided with an operating system, A step which realizes environment which needs said operating system in order to execute a program of form decided beforehand, and a step by which said program controls said car audio system are included. A computer which controls a car audio system by invention of claims 1, 6, and 11 is provided with general-purpose OS, and it this general-purpose OS, A user interface which carries out the maximum exertion of the capability of a computer by managing resources, such as CPU and a memory, and is not dependent on a program and which it is unific and is easy to use is provided, and an addition and change of a function are made easy by adding a program of form decided further beforehand, or changing. For this reason, control of a complicated car audio system becomes easy. It becomes possible for in the car to use various programs, or to process information using apparatus of a car audio system.

[0017]An invention of claim 2 was provided with the 1st bus corresponding to form of CPU contained in said computer, and the 2nd bus for connecting apparatus contained in said car audio system in a car audio system provided with a computer for control. An invention of claim 7 was provided with the 1st bus corresponding to form of CPU contained in said computer, and the 2nd bus for connecting apparatus contained in said car audio system in a computer for mount provided with a car audio system. An invention of claim 12 is what caught an invention of claim 2 from a view of a method, In a control method of a car audio system which controls a car audio system using a computer, A step with which CPU contained in said computer exchanges data through the 1st bus corresponding to form of this CPU, Apparatus contained in said car audio system contains a step which exchanges data through the 2nd bus for connecting apparatus. An invention of claim 3 was provided with a PCI bus for connecting apparatus contained in said car audio system with a local bus corresponding to form of CPU contained in said computer in a car audio system provided with a computer for control. An invention of claim 8 was provided with a PCI bus for connecting apparatus contained in said car audio system with a local bus corresponding to form of CPU contained in said computer in a computer for mount provided with a car audio system. An invention of claim 4 was provided with a means to change form of data between said each bus, in the car audio system according to claim 2 or 3. An invention of claim 9 was provided with a means to change form of data between said each bus, in the computer for mount according to claim 7 or 8. In an invention of claims 2, 3, 7, 8, and 12, data is exchanged using a bus CPU of a computer and apparatus of a car audio system made the mistake in corresponding to a mutual form, and between two buses, if needed, data changes form, wins popularity and is passed (claims 4 and 9). For this reason, even if operation of CPU is quicker than operation of each apparatus, it is not necessary to double CPU with a motion cycle of each apparatus, and complicated processing can be performed at high speed by accessing a memory etc. efficiently. Since data which CPU exchanges, and data which apparatus exchanges do not scramble for communicative competence of the same bus, it can operate smoothly in both a computer and a car audio system. Multitasking of performing another processing using a bus corresponding to form of CPU becomes easy simultaneously, reproducing a signal of a sound using a bus for connecting apparatus. Also when changing CPU into a thing of another form, a bus for connecting these apparatus with each apparatus remains as it is, and since what is necessary is to change only a bus corresponding to form of CPU according to form of new CPU, it can respond also to change of CPU easily.

[0018]An invention of claim 5 was provided with the 3rd bus for connecting two or more apparatus contained in said car audio system in a car audio system of any one statement of four from claim 1 in daisy chain form. An invention of claim 10 was provided with the 3rd bus for connecting two or more apparatus contained in said car audio system in a computer for mount of any one statement of nine from claim 6 in daisy chain form. In an invention of claims 5 and 10, two or more apparatus can be connected in daisy chain form one after another, and it can die. For this reason, also when the number of apparatus increases or distributed installation of the apparatus is carried out here and there [in the car], long wiring is not concentrated in one place like a star method, and installation becomes easy. Since wiring becomes intelligible shapely, it also becomes easy to change composition or to carry out maintenance and repair.

[0019]

[Embodiment of the Invention]Next, an embodiment of the invention (henceforth a "embodiment") is concretely described with reference to drawings. Although this embodiment is the car audio system provided with various apparatus, such as a CD player, it is provided with the computer provided with general-purpose OS which is used for a hand-held PC, and also performs control of a car audio system by this computer. The same numerals are attached about the member same about each figure used by the following explanation as the figure explained before it, or the same kind of member, and explanation is omitted.

[0020][1. composition]

[Composition of whole 1-1.] First, drawing 1 is a block diagram showing the entire configuration of this embodiment. As shown in this figure, this embodiment as each apparatus which constitutes a car audio system other than the main unit 1, It has the tuner amplifier unit 2, the microphone 3, the GPS antenna 4, the security control unit 5, the telephone unit 6, the CD-ROM autochanger 7, and the auxiliary battery 9 for power supply backup.

[0021]Among these, the main unit 1 is a portion which builds in the computer for control and controls the whole system by this computer. Although the tuner amplifier unit 2 does not carry out the graphic display other than the antenna 2a of AM and FM, it is the portion provided with a radio tuner and the amplifier for sounding a loudspeaker. The microphone 3 is for inputting a user's voice so that operation by speech recognition can be performed. The function of this speech recognition is realized by the program of the computer described above.

[0022][1-1-1. main unit] The main unit 1 is provided with the socket 13S for inserting CompactFlash card 13, and the face plate unit 15 removed [attach and] and made (drawing 1). CompactFlash card 13 is a storage using a flash memory, and data can be written from the main unit 1 by inserting in the socket 13S formed in the main unit 1. This CompactFlash card 13 is used in order to exchange data, a program, etc. with other computers or to back up

various information sets in this car audio system.
[0023]The face plate unit 15 attached, removed and made, It has the indicator which displays various information on a user, and the final controlling element which provided the operation key for a user to do various operations etc., and is referred to also as DCP (Detachable Control Panel). The indicator of this face plate unit 15 is large-sized color LCD (liquid crystal display) of 64 dots by 256 dots, etc., for example.
[0024]if it removes and carries out when getting off a car, even if a thief looks for a car audio system, neither use nor resale can do this face plate unit 15, also seeing an important indicator not have a final controlling element -- there are ** and a theft preventive effect of giving up stealing. If the removed face plate unit 15 is put into the case 15a and it carries around, it will damage neither itself nor a surrounding thing.
[0025]Although this face plate unit 15 is not shown in drawing 1, it is provided with the infrared-ray-communication unit for exchanging data in the form of the hand-held PC 8, IrDA, etc.
[0026][Apparatus] besides 1-1-2. The GPS antenna 4 is an antenna for receiving an electric wave from a GPS Satellite. The signal from this GPS antenna 4 is sent to the GPS unit in the main unit 1 through GPS receiver 4a. Although this GPS unit is not shown in drawing 1, it calculates the position on the earth with a receiver from an electric wave. On the computer described above, by a program, the function of a car-navigation system is realized and a calculation result is passed to the function of this car-navigation system.
[0027]The security control unit 5 is the sensor 5a which detects vibration and a shock, and when a theft, a mischief, etc. are detected, it is a portion which carries out correspondence of sounding the siren 5b. The telephone unit 6 is a unit which controls the function of a car telephone, and is a portion which realizes the telephone call using the telephone antenna 6a or the hand set 6b. The CD-ROM autochanger 7 is hanging automatically some CDs set beforehand again, and is a unit which plays the disk which the user chose, and music.
[0028][1-1-3. daisy chain connection] Here, these security control unit 5, the telephone unit 6, and the CD-ROM autochanger 7 are connected to the main unit 1 by USB (Universal Serial Bus). This USB is a serial bus (the 3rd bus) for connecting two or more apparatus in daisy chain form.
[0029]The apparatus connected by USB in this way comprises this embodiment so that data with the exterior may be exchanged in the form of this USB. For example, the CD-ROM autochanger 7, Although it has the hub (HUB) the object for upstreams, and for downstreams and digital data is once read from an audio CD or CD-ROM according to ATAPI form (parallel form) inside this CD-ROM autochanger 7, After the read data is changed into the USB (Universal Serial Bus) form which is serial form by the data converter built in, it is sent out to USB.
[0030]The installation becomes easy when installing these units 5, 6, and 7 in the place distant

from the main unit 1, since connection of the units 5 and 6 and the CD-ROM autochanger 7 turns into serial connection with such composition. Although connected in order of the unit 5, the unit 6, and the autochanger 7 in drawing 1, connection order is good also as connection of only arbitrary and required things.

[0031][The internal configuration of a 1-2. main unit] Next, drawing 2 is a block diagram showing the main things among each portion described above, and is especially explained focusing on the concrete composition of main unit 1 inside. This whole figure is divided into four with the dashed line, in the left, CPU module 11 and a center become the support module 12, the upper right becomes the external unit 30, and the lower right has become the option unit 40. Among these, CPU module 11 and the support module 12 are formed in the inside of the main unit 1.

[0032]The external unit 30 and the option unit 40 have pointed out collectively the apparatus of every some connected to the main unit 1. On account of explanation, CompactFlash card 13 is shown in the direction under CPU module 11, and drawing 2 shows the face plate unit 15 to the direction on the external unit 30.

[0033]Among these, CPU module 11 and the support module 12 constitute the computer for control which controls the whole car audio system. Among these, CPU module 11 is a portion which carries out logical data processing centering on CPU111, and the support module 12 is a portion which performs input and output with other apparatus contained in a car audio system.

[0034]The local bus B1 (the 1st bus) formed considering CPU111 as a center is a way with CPU module 11 as [main] data. PCI (Peripheral Component Interconnect) for that it is a way by the support module 12 as [main] data to connect each apparatus on the other hand It is bus B-2 (the 2nd bus).

[0035][Composition of a 1-2-1. CPU module] The local bus B1 of CPU module 11, It is what was doubled with the form of CPU111, and DRAM112, the flash ROM 113, the PCI bus host controller 114, CPU host ASIC115, and PCMCIA-ASIC116 are connected to this local bus B1. Among these, DRAM112 is a portion which provides work areas, such as a variable area, when CPU111 processes information in control of a car audio system, etc.

[0036]The flash ROM 113 is rewritable ROM and is a portion which stores the software in large meanings, such as OS, BIOS, and an application program, here. The function of OS stored here manages the resources on a computer, It is controlling the input and output containing a user interface, executing the program of the form decided beforehand, etc., for example, what used as the base Windows CE which conventional technology described by the way can be considered.

[0037]The PCI bus host controller 114 is a means to change the form of the data which connects the local bus B1 and PCI bus B-2, and is exchanged between these two buses.

[0038]"ASIC", such as CPU host ASIC115, is the abbreviation for Application Specific Integrated Circuit, and points out IC and LSI which were made for specific uses to general-purpose integrated circuits, such as ROM, RAM, and CPU. Specifically, this CPU host ASIC115 is ASIC for the interface of the local bus B1 and the PCI bus host controller 114. This CPU host ASIC115 [that is,], Between PCI bus B-2 and CPU module 11, are a portion which becomes a window of the data exchanged and specifically, Input and output with CPU module 11 and the exterior are performed instead of CPU111, and also it is recognized whether it is a thing of the kind passed to CPU111 about the data sent from PCI bus B-2.
[0039]And although what should pass CPU host ASIC115 to CPU111 is sent to CPU111 through the local bus B1, CPU111 does not need to calculate to the other thing, for example, the sent data, and such a reaction is returned about that for which it is sufficient if the reaction for which it opted beforehand is returned mechanically.
[0040]PCMCIA-ASIC116 CompactFlash card 13, It is a portion for an interface corresponding to being based on the standard of PCMCIA (Personal Computer Memory Card International Association) as what is called a PC card, It is a portion which controls the reading and writing of data to CompactFlash card 13.
[0041][Composition in connection with a 1-2-2. support module] Next, PCI bus B-2 of the support module 12 is a bus for exchanging data among various apparatus which constitutes a car audio system. Here, as apparatus connected to this PCI bus B-2, there are the external unit 30 and the option unit 40, and these have pointed out some apparatus collectively, respectively.
[0042]That is, the external unit 30 is unit with the another main unit 1 shown in drawing 1, and in this example specifically, It is the tuner 21, the amplifier 22, and the microphone 3 which were formed in the face plate unit 15 attached, removed and made from the main unit 1, and the tuner amplifier unit 2. Among these, the face plate unit 15 is provided with the infrared-ray-communication unit 127.
[0043]The option unit 40 is a unit from which it can choose whether to include in this car audio system as an option, and, specifically, are GPS unit 16 and the CD-ROM autochanger 7 in this example. There is the CD-ROM unit 14 in the inside of the main unit 1, and this CD-ROM unit 14 is also connected to PCI bus B-2. This CD-ROM unit 14 is a player for reading digital data from one CD or CD-ROM. These CD-ROM autochanger 7 and the CD-ROM unit 14 have the compatibility that data can also be read from what is called an audio CD, and both can also read data from CD-ROM (it is compatible).
[0044]In the support module 12, in order for PCI bus B-2 to exchange data among these apparatus, Support ASIC121, CODEC circuit 122, DSP unit 123, the buffer memory 124, the parallel / PCI driver 125, and the serial / PCI driver 126 are used.
[0045]Among these, support ASIC121 is a portion which controls traffic in the data where to

send the data which came from where between the support module 12 and each apparatus. "CODEC" of CODEC circuit 122 is an abbreviation of "Coder/Decoder", i.e., the coding decryption art of data, and this CODEC circuit 122, For example, it is a portion which performs the A/D conversion etc. which carry out D/A conversion which changes the given digital data into an analog signal, or change an analog signal into digital data conversely.

[0046]"DSP" of DSP unit 123 is an abbreviation to mean a digital sound processor, i.e., the circuit which processes the signal of the sound of digital format specially, and this DSP unit 123, When the digital data showing music etc. can be given, as items, such as balance of the right and left set as the system, volume, Feder, surround, and an equalizer, are reflected in the contents of the sound, it is a portion which processes digital data.

[0047]By audio equipment and PCI bus B-2s, such as a CD-ROM unit, since the buffer memory 124 differs in the cycle which write data, it is a buffer for this difference to be filled up with storing data and taking it out little by little, and comprises SRAM etc.

[0048]Parallel / PCI driver 125 is portions which change into the data format of PCI bus B-2 the digital data of parallel form sent from the CD-ROM unit 14. A serial / PCI driver 126 is portions which change into the data format of PCI bus B-2 the digital data of serial form sent from the CD-ROM autochanger 7.

[0049]The face plate unit 15 containing the infrared-ray-communication unit 127, It is connected to support ASIC121 in a high-speed serial communication circuit, and GPS unit 16 is connected to support ASIC121 in start-stop serial communication circuits, such as UART (UniversalAsynchronous Receiver-Transitter). The CD-ROM unit 14 is connected to parallel / PCI driver 125 by parallel communication circuits, such as ATAPI (AT Attachment Packet Interface). Although a graphic display is not carried out, ASIC which manages an exchange of the data based on infrared rays is provided in the infrared-ray-communication unit 127.

[0050][2. operation] This embodiment constituted as stated above works as follows.

[2-1. -- overall operation]

[2-1-1. entry of data] According to this embodiment, the direct entry of the digital data is carried out to support ASIC121 of the support module 12 among the data inputted from each apparatus. For example, the data which key was pressed is sent from the face plate unit 15. From GPS unit 16, digital data called the latitude and longitude which were calculated using the electric wave from a GPS Satellite is sent. From the infrared-ray-communication unit 127 provided in the face plate unit 15, the digital data transmitted with infrared rays from the hand-held PC 8 is sent.

[0051]From the CD-ROM unit 14 and the CD-ROM autochanger 7. The data of the sound read from the audio CD, i.e., audio information, After the digital data read from CD-ROM, i.e., CD-ROM data, is changed into the data format of PCI bus B-2 by parallel / PCI driver 125, and the serial / PCI driver 126, it is sent to support ASIC121 via PCI bus B-2.

[0052]Although not shown in drawing 2, the digital data which tells generating of abnormalities is sent from the security control unit 5 shown in drawing 1. Similarly, from the telephone unit 6 shown in drawing 1, the digital data which tells the telephone number of the mail arrival and dispatch origin of a telephone call, etc., i.e., alphabetic data, is sent, and the digital data which tells a partner's voice, i.e., voice data, is sent during a telephone call support ASIC121.
[0053]These security control unit 5 and the telephone unit 6, Since daisy chain connection is carried out to the serial bus B3, the information sent from the security control unit 5 or the telephone unit 6, Like the digital data from the CD-ROM autochanger 7, after being changed into the data format of PCI bus B-2 by a serial / PCI driver 126, it is sent via PCI bus B-2.
[0054]On the other hand, among the data inputted from each apparatus, after the analog signal was once inputted into CODEC circuit 122 and is changed into digital data by this CODEC circuit 122 (A/D conversion), it is passed to support ASIC121. For example, from the microphone 3, a user's voice is inputted with an analog signal, and the contents of broadcast of the radio received as a result of tuning are inputted with an analog signal from the tuner 21.
[0055]Destination [of the data of which the [2-1-2. input was done]] The role of traffic control which information support ASIC121 sends where is played to the information for which it gathers in this way. That is, roughly, support ASIC121 was processed with DSP unit 123, and also it sends the data of a sound to the amplifier 22 through CODEC circuit 122, and data other than a sound is sent to CPU module 11. However, the data inputted from the microphone 3 also in the data of a sound is sent to CPU module 11 for speech recognition.
[0056]The contents of the radio broadcast tuned up by the tuner 21 as data of a sound sent to the amplifier 22, for example, The voice etc. of the contents of sound recording read from the audio CD with the CD-ROM unit 14 or the CD-ROM autochanger 7 and the call partner seen off from the telephone unit 6 can be considered.
[0057]The data of which operation key was pressed by the face plate unit 15 as data other than a sound, for example, With the digital data, the CD-ROM unit 14, and the CD-ROM autochanger 7 which are called the latitude and longitude which have been sent from the data of the file etc. which have been sent from the infrared-ray-communication unit 127, and GPS unit 16. The contents of the map for car-navigation systems and the contents of the information for every area which were read from CD-ROM, The data which tells the abnormal occurrence led from the security control unit 5, the data which tells the telephone number etc. of telephone call arrival [which is sent from the telephone unit 6] and dispatch origin, etc. can be considered.
[0058][Information processing with a 2-1-3. CPU module] In CPU module 11, if digital data is sent from support ASIC121, after the PCI bus host controller 114 changes the sent data into the data format of the local bus B1, CPU host ASIC115 will be passed. If this CPU host ASIC115 manages input and output instead of CPU111 and is passed data, it will judge [what

that data should pass to CPU111, or] from the form of data, etc. whether that is right.
[0059]That is, the other data is passed to CPU111 although the reaction for which it opted beforehand to the data for which it is sufficient if CPU host ASIC115 returns a fixed reaction mechanically is returned to the support module 12 through the PCI bus host controller 114.
[0060]CPU111 processes the passed data according to the code of OS and the program which are recorded on the flash ROM 113, and uses DRAM112 as storage areas, such as a work area required in the case of this processing. For example, when a user's voice inputted from the microphone 3 is sent, CPU111, The parameter showing the feature of the instruction word currently prepared beforehand, a waveform, etc. are compared with the voice of the user who received, a most alike instruction word is presumed to be what the user said, and it operates according to the instruction word.
[0061]In CPU module 11, according to the request from CPU111, reading and writing of CompactFlash card 13 are performed, when CPU host ASIC115 controls PCMCIA-ASIC116.
[0062]And the result of information processing by CPU111 is sent to the support module 12, after being changed into the data format of PCI bus B-2 by the PCI bus host controller 114. As data sent to the support module 12 as a result of information processing, it is instructions of the operation to each portion and each apparatus of the support module 12, etc., and processing of input and output etc. is performed in the support module 12 according to the data sent in this way.
[0063][Processing of input and output with a 2-1-4. support module etc.] For example, if the instructions which tuning of the data read from CD or radio is made arrive from CPU module 11, the CD-ROM unit 14, the CD-ROM autochanger 7, and the tuner 21 will perform operation according to it. If the instructions which change the sound source of the sound which has come out of the loudspeaker to apparatus different from the present arrive from CPU module 11, support ASIC121 will change the digital data sent out to CODEC circuit 122 from the thing of the apparatus till then to what is depended on the apparatus specified newly.
[0064]When outputting digital data to the amplifier 22, since the amplifier 22 receives only an analog signal, after CODEC circuit 122 changes digital data into an analog signal (D/A conversion), it outputs it to the amplifier 22.
[0065]If the indicative data to a user is sent to support ASIC121 from CPU module 11 or other apparatus, for example, support ASIC121 will transmit this indicative data to the face plate unit 15 through a high-speed serial communication circuit. In this case, in the face plate unit 15, the information to a user is displayed on an indicator according to the transmitted indicative data.
[0066]Then, work of each portion which was described above explains concretely how a user can use the car audio system of this embodiment.
[0067][Presenting of 2-2. operation and information] When operating the car audio system of this embodiment, a user may press the operation key provided in the face plate unit 15, and

may utter the words and phrases beforehand decided for every internal use of operation. as the words and phrases which may press the operation key changed to CD when a user wants to use CD and an FM tuner and which carried out and were decided beforehand -- for example, -- "-- carrying out - ****-" -- "-- what is necessary is to obtain, to increase and just to speak toward **" etc. and the microphone 3

[0068]When a user presses the operation key, the data is transmitted to CPU module 11 from support ASIC121, CPU111 sends a new indicative data to support ASIC121, and the indicator of the face plate unit 15 changes to a screen display for operating a screen display and CD for operating radio using this indicative data, etc.

[0069]a user -- ", if it carries out and the words and phrases - ****-" are uttered, An analog signal is changed into digital data from the microphone 3 by CODEC circuit 122, From support ASIC121, through PCI bus host controller and CPU host ASIC115, it is sent to CPU111 by this digital data and CPU111, Based on this digital data, it recognizes which language the user said, and the same correspondence as the time of the operation key being pressed is carried out according to a recognition result.

[0070]For example, use the indicator of the face plate unit 15 as the touch panel, and as a graphical user interface of a computer, For example, the function which can be used at the time is displayed on an indicator by an icon, and if the icon of the function which a user wants to use is touched with a finger, the function can work. If they use, for example, a display and speech recognition in one voice by such an icon, The usage that a screen will return to the state in front of one if a screen will change, some following icons will be displayed if some icons are displayed at once and a user speaks with the "next", and a user speaks, saying "It returns" is also possible.

[0071][When 2-3. radio is listened to] it is the operation which was described above -- a user -- ", if obtain, and increase, it speaks with **", FM broadcasting of radio is chosen and CPU111 recognizes it, Support ASIC121 changes the sauce of the data which changes the tuner 21 to the receive state of FM according to the command from CPU111, and is sent out to the amplifier 22 to the data of the sound from the tuner 21. in this case, the good next frequency of a receive state is looked for automatically, the tuner 21 being that carry out and a user utters the words and phrases "a seeking rise" which may receive the frequency tuned in last time, for example, and changing frequency little by little (automatic scanning) -- it may be made like.

[0072]Thus, since the receiving contents sent from the tuner 21 are analog signals when listening to radio, this analog signal is inputted into CODEC circuit 122, and after being changed into digital data, it is sent to support ASIC121. Support ASIC121 passes the digital data received from CODEC circuit 122 to DSP unit 123, and DSP unit 123, This digital data is processed according to the setting-out item of the balance and volume which are beforehand set up on the system, and it returns to support ASIC121.

[0073]And support ASIC121 returns again the digital data which has returned in this way to CODEC circuit 122, and after it changed this digital data into the analog signal again and CODEC circuit 122 returns it, it is sent to the amplifier 22 and it is made to flow through it from a loudspeaker shortly.
[0074][Playback of 2-4.CD] A user sets an audio CD to ask the CD-ROM unit 14 and the CD-ROM autochanger 7 and should just do directions of pointing to playback with "**** -", etc. a sound, etc., or flying to the following music to hear an audio CD. For example, when playing the audio CD in the CD-ROM unit 14, the CD-ROM unit 14 operates by the instructions from support ASIC121, and the audio information which is digital data is sent from the CD-ROM unit 14.
[0075]And parallel / PCI driver 125, Change this audio information into the data format of PCI bus B-2, send to support ASIC121 and support ASIC121, If the audio information which once passes this audio information to DSP unit 123, made process it, and was processed when audio information was received from PCI bus B-2 is again received from DSP unit 123, The processed audio information is passed to CODEC circuit 122 from a digital-input/output port, and it is made to output to the amplifier 22 in the form of an analog signal.
[0076]When the CD-ROM autochanger 7 reproduces an audio CD, a serial / PCI driver 126 changes into the data format of PCI bus B-2 the audio information of the serial form sent from the serial bus B3, but. Processing after it is performed like the case of the CD-ROM unit 14.
[0077]The CD-ROM unit 14 and the CD-ROM autochanger 7, If CODEC circuit 122 and DSP unit 123 are compared relatively, in order that the latter may process data little by little in the cycle of short time to the former sending the data of the quantity collected in the cycle of long time, a cycle has a gap among both. For this reason, support ASIC121 stores in the buffer memory 124 the digital data which the CD-ROM unit 14 or the CD-ROM autochanger 7 has sent collectively, A gap which was described above is filled up with passing DSP unit 123 and making it process, if it takes out from the oldest portion one after another, and reproduction is made to be performed smoothly.
[0078][Use of 2-5.CD-ROM and car navigation] A user for example, to use the function of a car-navigation system. For example, after setting to the CD-ROM unit 14 CD-ROM on which the data for car-navigation systems (application software, a map, etc.) was recorded, the function of a car-navigation system is started. The function of such a car-navigation system is realizable by recording on the flash ROM 113 of CPU module 11, for example as a program of a computer, and making CPU111 execute such a program.
[0079]When such a car-navigation system tries to read the data of the map recorded on CD-ROM, various information for every area, etc., For example, the digital data read from the CD-ROM unit 14 is passed to CPU111 through parallel / PCI driver 125, PCI bus host controller 114, and CPU host ASIC115. CPU111 created on DRAM112 the bitmapped image for

displaying on the indicator of the face plate unit 15 based on the data of the map etc. which were received in this way, and also it is sent out to the support module 12.
[0080]When using a car-navigation system in this way, the GPS antenna 4 shown in drawing 1 receives the electric wave from a GPS Satellite, GPS unit 16 of drawing 2 calculates latitude, longitude, etc. from this electric wave, and this data is sent to CPU111. Then, CPU111 can specify on a map where the car loading with this car audio system is running from the data of such latitude, longitude, etc. now. As a result, even if a user does not input, a its present location can be set up as a departure point, or the rough map that the present point takes the lead can be displayed, or the figure which directs next right-turn and left turn can be displayed.
[0081]The data for navigation may be memorized to CompactFlash card 13 (or DRAM112) or the flash ROM 113.
[0082]The method of operation by speech recognition which was already explained, Thus, also when using the function of a car-navigation system, it can use, For example, when using the car-navigation system which issues directions, such as right-turn and left turn, for every corner of a street and a user wants to see the directions before one, and directions of one beyond, one display after another can also be changed by uttering the "next" and the words and phrases of "returning."
[0083]In order to know where it will next turn, it becomes unnecessary to turn a look to an indicator, if a user can also be told about such guidance and it does in this way with outputting synthesized speech through the amplifier 22.
[0084][Use of a 2-6. telephone] The user can harness the advantage of a computer, and the advantage of a car audio system as follows, when talking over the telephone using the telephone unit 6. For example, the user registers into DRAM112 and CompactFlash card 13 of the system beforehand people's telephone number and name which he knows using the program of a computer.
[0085]If a telephone receives a message, it will not illustrate to drawing 2, but the digital data which tells that the telephone received a message from the telephone unit 6 through the serial bus B3, and the serial / PCI driver 126, and the digital data showing the telephone number of a sending agency are sent to support ASIC121. These data is further sent to CPU111 of CPU module 11, and CPU111 searches whether the telephone number of the dispatch origin which is hanging now into the telephone number registered beforehand is registered.
[0086]When there is a telephone number of the dispatch origin which is hanging now into the telephone number registered beforehand, CPU111 is returning the name corresponding to the telephone number to the support module 12, A user can be told about who is telephoning by displaying the name of those who are telephoning the face plate unit 15, or pouring the guidance by synthesized speech "it is from Mr. OO" from a mounted loudspeaker.
[0087]If the user who knew geting a telephone call in such a display, guidance, a calling

sound, etc. directs to utter the words and phrases decided beforehand and to connect a telephone, A user's voice inputted from the microphone 3 is changed into digital data by CODEC circuit 122 at the same time a partner's voice flows from a loudspeaker, It is sent to the telephone unit 6 through support ASIC121, the serial / PCI driver 126, and the serial bus B3, and the user can talk over the telephone in what is called the handsfree state, without using a hand.

[0088]The answering machine function etc. which were prepared for the telephone unit 6 or CPU module 11, for example answer a telephone in the place where only the number of times with a constant calling sound sounded.

[0089]If the icon of dispatch, etc. are touched with a finger in the place which displayed the telephone number and name which have been registered beforehand one after another on the display screen, for example and where the partner who wants to telephone was displayed also when it is going to send from the user side, The telephone number is transmitted to the telephone unit 6 as digital data from CPU module 11, and a telephone call is got automatically, and if a partner comes out, it can talk as it is.

[0090]Send to the telephone number corresponding to the name automatically because utter the name which the user registered and CPU module 11 recognizes this, or, a single figure speaks at a time, and a telephone number to hang is made to recognize, or a user is "person -- are and it does -- " -- the point which recognizes having spoken and telephones can be decided.

[0091][Use of a 2-7. security control unit] The security control unit 5 can also be used alone, and it can also be used for it, making it the telephone unit 6 described above interlocked with. For example, when leaving a car, (drawing 1) and a user operate the security control unit 5, and get down with the transmitter 5c. If the third party who is unrelated to the user of vehicles in any way is going to touch a doorknob, tamper with a keyhole, wrench a door and a suitcase open or is going to move a car without notice, The sensor 5a takes in the shock and vibration by it, and the security control unit 5 which received the signal from the sensor 5a sounds the siren 5b with Ryo Oto, for example. Thereby, the effect of an alarm is brought about to the environment outside a car.

[0092]Since the code decided beforehand will be sent to the security control unit 5 and the function of the security control unit 5 will be canceled if he operates the transmitter 5c which it has when the user itself has returned to the car, A key is not used, or even if it moves a car, a siren does not sound.

[0093]It is further effective if such a security control unit 5 uses making it the telephone unit 6 interlocked with. That is, when the sensor 5a has detected abnormalities, the security control unit 5 starts the car audio system which sends an interrupt signal and it not only sounds a siren, but contains CPU module 11 and the support module 12. In order to enable such

starting, the electronic circuit linked to the power supply and start switch of the car audio system is prepared, What is necessary is to make a power supply and a start switch one immediately, and just to start a car audio system, if this electronic circuit is made to always supervise whether the interrupt signal is coming and an interrupt signal comes it.
[0094]CPU111 started in this way makes it telephone by sending instructions to the telephone unit 6, when the data which tells an abnormal occurrence is received from the security control unit 5. The point which telephones at this time should just be taken as a cellular phone, a security company, etc. which what is necessary is just to set up beforehand as an information destination at the time of abnormalities, and the police and a user have. And abnormalities are told by the thing which hung and which will be told synthesized speech and against the announcement recorded beforehand if a telephone is connected previously. If it does in this way, those who received the notice can hasten at the spot.
[0095][Use of a 2-8. utility program] Like the usual hand-held PC, if functions, such as an address book, a calendar, schedule management, voice recording, a clock, a calculator, and a game, are used as a function of OS or an application program, it will become possible to perform information processing various also in a car. The environment of information processing which suited to itself can be improved by deleting the application program which realizes these functions, changing to a new thing, or adding.
[0096][Use of a 2-9. CompactFlash card] In the car audio system of this embodiment, information can be exchanged between other hand-held PCs, other car audio systems, etc. by using CompactFlash card 13.
[0097]For example, it becomes easy to add a new function, and it to be sufficient to make a new application program and OS read into the flash ROM 113 from CompactFlash card 13, and to update OS. Since it becomes easy for ordinary software makers to make an application program, the functional module of OS, etc. by using general-purpose OS especially, CompactFlash card 13 which recorded it also appears on the market, it becomes easy to get, and the user can use this car audio system now for convenience more also as a computer.
[0098]If individual data like the address book made with other personal computers and hand-held PCs is carried into this car audio system by CompactFlash card 13, the work till then can be continued on this car audio system. Contrary to this, the data made with this car audio system can be moved to other personal computers and hand-held PCs by CompactFlash card 13, and work can also be continued.
[0099]If the backup copy of the data which he made using a utility program which was described above is carried out to CompactFlash card 13, Since the bad condition and others of the car audio system used, even when data disappears, data can be made to be able to read into the main unit 1 from CompactFlash card 13 again, and information processing can be continued.

[0100]If the backup copy of various setting out of the car audio system suitable for itself is carried out to CompactFlash card 13, Even if someone of other families change setting out, inserting in the main unit 1 CompactFlash card 13 which he had, and making the contents read, when he uses a car can use a car audio system by user-friendly original setting out for itself.
[0101][Communication with a 2-10. hand-held PC] At this embodiment, data can be easily exchanged by using the infrared-ray-communication unit 127, without applying the time and effort of taking out and inserting CompactFlash card 13 or connecting by a cable etc., between the hand-held PCs 8. For this reason, update OS and an application program using the file etc. which were recorded in the hand-held PC 8, or. Move to the hand-held PC 8 directly the individual data made on the car audio system, or, Save backup of such individual data in the comparatively big storage area which the hand-held PC 8 has, or, Various usage of moving setting out of a car audio system, etc. to the car audio system of other cars through the hand-held PC 8 also becomes possible.
[0102][3. effect] As mentioned above, the computer which controls a car audio system by this embodiment is provided with general-purpose OS, and it this general-purpose OS, The user interface which carries out the maximum exertion of the capability of a computer by managing resources, such as CPU and a memory, and is not dependent on a program and which it is unific and is easy to use is provided, and an addition and change of a function are also made easy by adding the program of the form decided further beforehand, or changing. For this reason, control of a complicated car audio system becomes easy.
[0103]If it is the program which suited the standard of OS, it will become possible to use a program also with in the car [various], and it will also become possible to process information using apparatus, such as an indicator of a car audio system, an operation key, and a loudspeaker. Of course, a user can save his individual information even in this case using about the same big memory as a hand-held PC, or information can be edited like a personal computer.
[0104]In this embodiment, data is exchanged using the bus CPU of a computer and the apparatus of the car audio system made the mistake in corresponding to a mutual form, and between two buses, if needed, data changes form, wins popularity and is passed. For this reason, even if operation of CPU is quicker than operation of each apparatus, it is not necessary to double CPU with the motion cycle of each apparatus, and complicated processing can be performed at high speed by accessing a memory etc. efficiently. Since the data which CPU exchanges, and the data which apparatus exchanges do not scramble for the communicative competence of the same bus, both a computer and a car audio system can perform each operation smoothly.
[0105]Multitasking of performing another processing using the bus corresponding to the form

of CPU becomes easy simultaneously, reproducing the signal of a sound using the bus for connecting apparatus. Also when changing CPU into the thing of another form, the bus for connecting these apparatus with each apparatus remains as it is, and since what is necessary is to change only the bus corresponding to the form of CPU according to the form of new CPU, it can respond also to change of CPU easily.

[0106]In particular, in this embodiment, two or more apparatus can be connected in daisy chain form one after another, and it can die. For this reason, also when the number of apparatus increases or distributed installation of the apparatus is carried out here and there [in the car], long wiring is not concentrated in one place like a star method, and installation becomes easy. Since wiring becomes intelligible shapely, it also becomes easy to change the composition of a car audio system or to carry out maintenance and repair.

[0107]In addition, since any data is exchanged as digital data and processed through USB etc. in this embodiment regardless of the kind of data whether to be audio information or to be alphabetic data, It is hard to be influenced by the environmental variation or a noise, and an audio characteristic is also stabilized.

[0108][An embodiment] besides 4. This invention is not limited to the embodiment described above, and contains other embodiments which are illustrated next. For example, in the embodiment described above, although Windows CE was mentioned as an example of OS of a computer, since this is only mere illustration, using OS of other kinds which already uses a certain OS or will appear newly from now on is also included in the range of this invention.

[0109]Although the example which controls the car audio system for mount by the embodiment described above was shown, This invention can harness the advantage of this invention that it is also possible to use for controlling electric products, such as a non-portable stereo, new application software is used also in this case, or the whole is small and can be managed in a home.

[0110]Although the standard concrete about various buses and communication circuits was mentioned in the embodiment described above, such a standard is only illustration and can also be transposed to other standards which can do same usage. For example, the 1st bus and 2nd bus can also make a CPU module and a support module an internal bus by one-chip-izing.

[0111]

[Effect of the Invention]As mentioned above, according to this invention, taking advantage of a mutual advantage, a complicated car audio system and how to use a computer by controlling easily can be extended by combining a computer with general-purpose OS, and a car audio system.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention]This invention is combining a small computer with general-purpose OS, and a car audio system, and relates to the art of harnessing a mutual advantage.

[Translation done.]

* NOTICES *

PRIOR ART

[Description of the Prior Art]In recent years, progress with remarkable art of a semiconductor is accomplished and the electronic equipment of various fields has become a miniaturization and highly efficient by using a semiconductor. Thus, one of the electronic equipment made a miniaturization and highly efficient by using a semiconductor has a personal computer (henceforth a "personal computer").
[0003]The small personal computers (it names generically the following "hand-held PC") called [especially] a handheld computer (carried type), a palm top, etc. these days are also increasing in number. Windows(registered trademark of Microsoft Corp.) CE etc. are known, for example as base software (it is called below Operating System: "OS") suitable for such a hand-held PC, i.e., an operating system.
[0004]Such a general-purpose OS realizes advanced throughput by managing finely throughput, a memory, etc. of CPU which the computer has, or, If it is a program of the form which provided the user interface independent of a program which it is unific and is easy to use, or was decided beforehand, it has the advantage that the current update of the function of a computer can be carried out by carrying out a current update freely.
[0005]As another electronic equipment which similarly has been made a miniaturization and highly efficient by using a semiconductor, the car audio system and car-navigation system which are carried in a car are mentioned. Among these, a car audio system is commonly called a car stereo etc., and combines the tuner of a CD player, AM, or FM, etc. with amplifier, a loudspeaker, etc. A car-navigation system is a shown system to which a screen display of the map is carried out to the specified destination, pinpointing the current position of a car using an azimuth magnet, an odometer, GPS, etc.
[0006]These days, since a car-navigation system, a handsfree cellular phone, an anti-theft alarm system, etc. are combined with a car audio system in many cases, the electronic equipment for these mount is hereafter named a "car audio system" generically.

[Translation done.]

* NOTICES *

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damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[3. effect] As mentioned above, the computer which controls a car audio system by this embodiment is provided with general-purpose OS, and it this general-purpose OS, The user interface which carries out the maximum exertion of the capability of a computer by managing resources, such as CPU and a memory, and is not dependent on a program and which it is unific and is easy to use is provided, and an addition and change of a function are also made easy by adding the program of the form decided further beforehand, or changing. For this reason, control of a complicated car audio system becomes easy.
[0103]If it is the program which suited the standard of OS, it will become possible to use a program also with in the car [various], and it will also become possible to process information using apparatus, such as an indicator of a car audio system, an operation key, and a loudspeaker. Of course, a user can save his individual information even in this case using about the same big memory as a hand-held PC, or information can be edited like a personal computer.
[0104]In this embodiment, data is exchanged using the bus CPU of a computer and the apparatus of the car audio system made the mistake in corresponding to a mutual form, and between two buses, if needed, data changes form, wins popularity and is passed. For this reason, even if operation of CPU is quicker than operation of each apparatus, it is not necessary to double CPU with the motion cycle of each apparatus, and complicated processing can be performed at high speed by accessing a memory etc. efficiently. Since the data which CPU exchanges, and the data which apparatus exchanges do not scramble for the communicative competence of the same bus, both a computer and a car audio system can perform each operation smoothly.
[0105]Multitasking of performing another processing using the bus corresponding to the form of CPU becomes easy simultaneously, reproducing the signal of a sound using the bus for connecting apparatus. Also when changing CPU into the thing of another form, the bus for

connecting these apparatus with each apparatus remains as it is, and since what is necessary is to change only the bus corresponding to the form of CPU according to the form of new CPU, it can respond also to change of CPU easily.

[0106]In particular, in this embodiment, two or more apparatus can be connected in daisy chain form one after another, and it can die. For this reason, also when the number of apparatus increases or distributed installation of the apparatus is carried out here and there [in the car], long wiring is not concentrated in one place like a star method, and installation becomes easy. Since wiring becomes intelligible shapely, it also becomes easy to change the composition of a car audio system or to carry out maintenance and repair.

[0107]In addition, since any data is exchanged as digital data and processed through USB etc. in this embodiment regardless of the kind of data whether to be audio information or to be alphabetic data, It is hard to be influenced by the environmental variation or a noise, and an audio characteristic is also stabilized.

[0108][An embodiment] besides 4. This invention is not limited to the embodiment described above, and contains other embodiments which are illustrated next. For example, in the embodiment described above, although Windows CE was mentioned as an example of OS of a computer, since this is only mere illustration, using OS of other kinds which already uses a certain OS or will appear newly from now on is also included in the range of this invention.

[0109]Although the example which controls the car audio system for mount by the embodiment described above was shown, This invention can harness the advantage of this invention that it is also possible to use for controlling electric products, such as a non-portable stereo, new application software is used also in this case, or the whole is small and can be managed in a home.

[0110]Although the standard concrete about various buses and communication circuits was mentioned in the embodiment described above, such a standard is only illustration and can also be transposed to other standards which can do same usage. For example, the 1st bus and 2nd bus can also make a CPU module and a support module an internal bus by one-chip-izing.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]The hand-held PC provided with OS which was described above, and the car audio system were mutual completely separate in the former. That is, although the car audio system which prepared the computer in the large meaning for control existed, the computer in this case is called the embedded system which works only for the specific purpose.
[0008]CPU with necessary minimum capability is used for this embedded system, and it realizes necessary minimum processing to the hardware of receiving an operation switch or operating a disk reproduction mechanism, by the small program using an assembler etc. For this reason, usage of carrying out the change addition of the function by carrying out processing and preservation of data like a personal computer, or carrying out the change addition of the program cannot be done.
[0009]On the other hand, it did not have a function which a hand-held PC sounds music itself, or controls a car audio system. For this reason, although the user might carry the hand-held PC into in the car as a matter of fact, he did not use, having connected with the car audio system.
[0010]By the way, the latest car audio system, Not only in conventional apparatus called the tuner, cassette tape deck, and CD player of radio, Many apparatus is increasingly built into the condition of an MD player, CD, the autochanger of MD, a car-navigation system, the voice recognition equipment that recognizes a user's command, a handsfree cellular phone, and an anti-theft alarm system. And it is dramatically difficult to master the car audio system which becomes complicated in this way only with the switch in which it was provided by each device.
[0011]That is, when a car audio system becomes complicated in this way, many switches, such as an operation key and a dial, will be in various places in the car. For this reason, it is serious to memorize which is what operation key.
[0012]Namely, in order to master the car audio system which becomes complicated. To use for

control an information processor equivalent to the hand-held PC provided with the small computer with the pliability which can carry out the current update of the function about the advanced throughput which controls a complicated system, the user interface, and control which are easy to use, and especially general-purpose OS is desired.
[0013]Even if it thinks from the hand-held PC side, a car is used like the present age in many cases, and in the car is wanted to expand the width of practical use in society also with much traffic congestion. By combining with a car audio system especially, make an operation key and a memory serve a double purpose, or, The information which a user wants to know in the car is made to be read out by the synthesized speech using a computer, If usage of hearing the voice from the loudspeaker of a car audio system, or accessing an external computer network by the circuit of the cellular phone built into the car audio system can be done, the width of practical use can be expanded rather than former.
[0014]When combining high-speed CPU which uses general-purpose OS, and apparatus which is contained in a car audio system, to have a separate bus suitable for each from the difference in both working speed, etc. is desired. In the car audio system which combined a lot of apparatus, two or more apparatus is wanted to be easily connectable with simple refreshed wiring.
[0015]Proposed in order that this invention might solve the problem of conventional technology which was described above, it is combining a small computer with general-purpose OS, and a car audio system, and the purpose is to harness a mutual advantage. Another purpose of this invention is to use two or more buses, and is using both high-speed apparatus of CPU and others smoothly without futility. Another purpose of this invention is to connect various apparatus one after another with a daisy chain mode.

[Translation done.]

* NOTICES *

MEANS

[Means for Solving the Problem]In order to attain the purpose described above, an invention of claim 1 equips a car audio system provided with a computer for control with the following.
A means by which said computer is provided with an operating system and this operating system manages resources on a computer.
A means to control input and output containing a user interface.
A means to execute a program of form decided beforehand.
A computer for mount of claim 6 is provided with the following.
An operating system which realizes environment required in order to execute a program of form decided beforehand.
Car audio system.
A means to control said car audio system.
An invention of claim 11 is what caught an invention of claim 1 from a view of a method, In a control method of a car audio system which controls a car audio system using a computer provided with an operating system, A step which realizes environment which needs said operating system in order to execute a program of form decided beforehand, and a step by which said program controls said car audio system are included. A computer which controls a car audio system by invention of claims 1, 6, and 11 is provided with general-purpose OS, and it this general-purpose OS, A user interface which carries out the maximum exertion of the capability of a computer by managing resources, such as CPU and a memory, and is not dependent on a program and which it is unific and is easy to use is provided, and an addition and change of a function are made easy by adding a program of form decided further beforehand, or changing. For this reason, control of a complicated car audio system becomes easy. It becomes possible for in the car to use various programs, or to process information using apparatus of a car audio system.
[0017]An invention of claim 2 was provided with the 1st bus corresponding to form of CPU

contained in said computer, and the 2nd bus for connecting apparatus contained in said car audio system in a car audio system provided with a computer for control. An invention of claim 7 was provided with the 1st bus corresponding to form of CPU contained in said computer, and the 2nd bus for connecting apparatus contained in said car audio system in a computer for mount provided with a car audio system. An invention of claim 12 is what caught an invention of claim 2 from a view of a method, In a control method of a car audio system which controls a car audio system using a computer, A step with which CPU contained in said computer exchanges data through the 1st bus corresponding to form of this CPU, Apparatus contained in said car audio system contains a step which exchanges data through the 2nd bus for connecting apparatus. An invention of claim 3 was provided with a PCI bus for connecting apparatus contained in said car audio system with a local bus corresponding to form of CPU contained in said computer in a car audio system provided with a computer for control. An invention of claim 8 was provided with a PCI bus for connecting apparatus contained in said car audio system with a local bus corresponding to form of CPU contained in said computer in a computer for mount provided with a car audio system. An invention of claim 4 was provided with a means to change form of data between said each bus, in the car audio system according to claim 2 or 3. An invention of claim 9 was provided with a means to change form of data between said each bus, in the computer for mount according to claim 7 or 8. In an invention of claims 2, 3, 7, 8, and 12, data is exchanged using a bus CPU of a computer and apparatus of a car audio system made the mistake in corresponding to a mutual form, and between two buses, if needed, data changes form, wins popularity and is passed (claims 4 and 9). For this reason, even if operation of CPU is quicker than operation of each apparatus, it is not necessary to double CPU with a motion cycle of each apparatus, and complicated processing can be performed at high speed by accessing a memory etc. efficiently. Since data which CPU exchanges, and data which apparatus exchanges do not scramble for communicative competence of the same bus, it can operate smoothly in both a computer and a car audio system. Multitasking of performing another processing using a bus corresponding to form of CPU becomes easy simultaneously, reproducing a signal of a sound using a bus for connecting apparatus. Also when changing CPU into a thing of another form, a bus for connecting these apparatus with each apparatus remains as it is, and since what is necessary is to change only a bus corresponding to form of CPU according to form of new CPU, it can respond also to change of CPU easily.

[0018]An invention of claim 5 was provided with the 3rd bus for connecting two or more apparatus contained in said car audio system in a car audio system of any one statement of four from claim 1 in daisy chain form. An invention of claim 10 was provided with the 3rd bus for connecting two or more apparatus contained in said car audio system in a computer for mount of any one statement of nine from claim 6 in daisy chain form. In an invention of claims

5 and 10, two or more apparatus can be connected in daisy chain form one after another, and it can die. For this reason, also when the number of apparatus increases or distributed installation of the apparatus is carried out here and there [in the car], long wiring is not concentrated in one place like a star method, and installation becomes easy. Since wiring becomes intelligible shapely, it also becomes easy to change composition or to carry out maintenance and repair.

[0019]

[Embodiment of the Invention]Next, an embodiment of the invention (henceforth a "embodiment") is concretely described with reference to drawings. Although this embodiment is the car audio system provided with various apparatus, such as a CD player, it is provided with the computer provided with general-purpose OS which is used for a hand-held PC, and also performs control of a car audio system by this computer. The same numerals are attached about the member same about each figure used by the following explanation as the figure explained before it, or the same kind of member, and explanation is omitted.

[0020][1. composition]

[Composition of whole 1-1.] First, drawing 1 is a block diagram showing the entire configuration of this embodiment. As shown in this figure, this embodiment as each apparatus which constitutes a car audio system other than the main unit 1, It has the tuner amplifier unit 2, the microphone 3, the GPS antenna 4, the security control unit 5, the telephone unit 6, the CD-ROM autochanger 7, and the auxiliary battery 9 for power supply backup.

[0021]Among these, the main unit 1 is a portion which builds in the computer for control and controls the whole system by this computer. Although the tuner amplifier unit 2 does not carry out the graphic display other than the antenna 2a of AM and FM, it is the portion provided with a radio tuner and the amplifier for sounding a loudspeaker. The microphone 3 is for inputting a user's voice so that operation by speech recognition can be performed. The function of this speech recognition is realized by the program of the computer described above.

[0022][1-1-1. main unit] The main unit 1 is provided with the socket 13S for inserting CompactFlash card 13, and the face plate unit 15 removed [attach and] and made (drawing 1). CompactFlash card 13 is a storage using a flash memory, and data can be written from the main unit 1 by inserting in the socket 13S formed in the main unit 1. This CompactFlash card 13 is used in order to exchange data, a program, etc. with other computers or to back up various information sets in this car audio system.

[0023]The face plate unit 15 attached, removed and made, It has the indicator which displays various information on a user, and the final controlling element which provided the operation key for a user to do various operations etc., and is referred to also as DCP (Detachable Control Panel). The indicator of this face plate unit 15 is large-sized color LCD (liquid crystal display) of 64 dots by 256 dots, etc., for example.

[0024]if it removes and carries out when getting off a car, even if a thief looks for a car audio system, neither use nor resale can do this face plate unit 15, also seeing an important indicator not have a final controlling element -- there are ** and a theft preventive effect of giving up stealing. If the removed face plate unit 15 is put into the case 15a and it carries around, it will damage neither itself nor a surrounding thing.

[0025]Although this face plate unit 15 is not shown in drawing 1, it is provided with the infrared-ray-communication unit for exchanging data in the form of the hand-held PC 8, IrDA, etc.

[0026][Apparatus] besides 1-1-2. The GPS antenna 4 is an antenna for receiving an electric wave from a GPS Satellite. The signal from this GPS antenna 4 is sent to the GPS unit in the main unit 1 through GPS receiver 4a. Although this GPS unit is not shown in drawing 1, it calculates the position on the earth with a receiver from an electric wave. On the computer described above, by a program, the function of a car-navigation system is realized and a calculation result is passed to the function of this car-navigation system.

[0027]The security control unit 5 is the sensor 5a which detects vibration and a shock, and when a theft, a mischief, etc. are detected, it is a portion which carries out correspondence of sounding the siren 5b. The telephone unit 6 is a unit which controls the function of a car telephone, and is a portion which realizes the telephone call using the telephone antenna 6a or the hand set 6b. The CD-ROM autochanger 7 is hanging automatically some CDs set beforehand again, and is a unit which plays the disk which the user chose, and music.

[0028][1-1-3. daisy chain connection] Here, these security control unit 5, the telephone unit 6, and the CD-ROM autochanger 7 are connected to the main unit 1 by USB (Universal Serial Bus). This USB is a serial bus (the 3rd bus) for connecting two or more apparatus in daisy chain form.

[0029]The apparatus connected by USB in this way comprises this embodiment so that data with the exterior may be exchanged in the form of this USB. For example, the CD-ROM autochanger 7, Although it has the hub (HUB) the object for upstreams, and for downstreams and digital data is once read from an audio CD or CD-ROM according to ATAPI form (parallel form) inside this CD-ROM autochanger 7, After the read data is changed into the USB (Universal Serial Bus) form which is serial form by the data converter built in, it is sent out to USB.

[0030]The installation becomes easy when installing these units 5, 6, and 7 in the place distant from the main unit 1, since connection of the units 5 and 6 and the CD-ROM autochanger 7 turns into serial connection with such composition. Although connected in order of the unit 5, the unit 6, and the autochanger 7 in drawing 1, connection order is good also as connection of only arbitrary and required things.

[0031][The internal configuration of a 1-2. main unit] Next, drawing 2 is a block diagram showing the main things among each portion described above, and is especially explained focusing on the concrete composition of main unit 1 inside. This whole figure is divided into four with the dashed line, in the left, CPU module 11 and a center become the support module 12, the upper right becomes the external unit 30, and the lower right has become the option unit 40. Among these, CPU module 11 and the support module 12 are formed in the inside of the main unit 1.

[0032]The external unit 30 and the option unit 40 have pointed out collectively the apparatus of every some connected to the main unit 1. On account of explanation, CompactFlash card 13 is shown in the direction under CPU module 11, and drawing 2 shows the face plate unit 15 to the direction on the external unit 30.

[0033]Among these, CPU module 11 and the support module 12 constitute the computer for control which controls the whole car audio system. Among these, CPU module 11 is a portion which carries out logical data processing centering on CPU111, and the support module 12 is a portion which performs input and output with other apparatus contained in a car audio system.

[0034]The local bus B1 (the 1st bus) formed considering CPU111 as a center is a way with CPU module 11 as [main] data. PCI (Peripheral Component Interconnect) for that it is a way by the support module 12 as [main] data to connect each apparatus on the other hand It is bus B-2 (the 2nd bus).

[0035][Composition of a 1-2-1. CPU module] The local bus B1 of CPU module 11, It is what was doubled with the form of CPU111, and DRAM112, the flash ROM 113, the PCI bus host controller 114, CPU host ASIC115, and PCMCIA-ASIC116 are connected to this local bus B1. Among these, DRAM112 is a portion which provides work areas, such as a variable area, when CPU111 processes information in control of a car audio system, etc.

[0036]The flash ROM 113 is rewritable ROM and is a portion which stores the software in large meanings, such as OS, BIOS, and an application program, here. The function of OS stored here manages the resources on a computer, It is controlling the input and output containing a user interface, executing the program of the form decided beforehand, etc., for example, what used as the base Windows CE which conventional technology described by the way can be considered.

[0037]The PCI bus host controller 114 is a means to change the form of the data which connects the local bus B1 and PCI bus B-2, and is exchanged between these two buses.

[0038]"ASIC", such as CPU host ASIC115, is the abbreviation for Application Specific Integrated Circuit, and points out IC and LSI which were made for specific uses to general-purpose integrated circuits, such as ROM, RAM, and CPU. Specifically, this CPU host ASIC115 is ASIC for the interface of the local bus B1 and the PCI bus host controller 114. This CPU host ASIC115 [that is,], Between PCI bus B-2 and CPU module 11, are a portion which becomes a window of the data exchanged and specifically, Input and output with CPU module

11 and the exterior are performed instead of CPU111, and also it is recognized whether it is a thing of the kind passed to CPU111 about the data sent from PCI bus B-2.

[0039]And although what should pass CPU host ASIC115 to CPU111 is sent to CPU111 through the local bus B1, CPU111 does not need to calculate to the other thing, for example, the sent data, and such a reaction is returned about that for which it is sufficient if the reaction for which it opted beforehand is returned mechanically.

[0040]PCMCIA-ASIC116 CompactFlash card 13, It is a portion for an interface corresponding to being based on the standard of PCMCIA (Personal Computer Memory Card International Association) as what is called a PC card, It is a portion which controls the reading and writing of data to CompactFlash card 13.

[0041][Composition in connection with a 1-2-2. support module] Next, PCI bus B-2 of the support module 12 is a bus for exchanging data among various apparatus which constitutes a car audio system. Here, as apparatus connected to this PCI bus B-2, there are the external unit 30 and the option unit 40, and these have pointed out some apparatus collectively, respectively.

[0042]That is, the external unit 30 is unit with the another main unit 1 shown in drawing 1, and in this example specifically, It is the tuner 21, the amplifier 22, and the microphone 3 which were formed in the face plate unit 15 attached, removed and made from the main unit 1, and the tuner amplifier unit 2. Among these, the face plate unit 15 is provided with the infrared-ray-communication unit 127.

[0043]The option unit 40 is a unit from which it can choose whether to include in this car audio system as an option, and, specifically, are GPS unit 16 and the CD-ROM autochanger 7 in this example. There is the CD-ROM unit 14 in the inside of the main unit 1, and this CD-ROM unit 14 is also connected to PCI bus B-2. This CD-ROM unit 14 is a player for reading digital data from one CD or CD-ROM. These CD-ROM autochanger 7 and the CD-ROM unit 14 have the compatibility that data can also be read from what is called an audio CD, and both can also read data from CD-ROM (it is compatible).

[0044]In the support module 12, in order for PCI bus B-2 to exchange data among these apparatus, Support ASIC121, CODEC circuit 122, DSP unit 123, the buffer memory 124, the parallel / PCI driver 125, and the serial / PCI driver 126 are used.

[0045]Among these, support ASIC121 is a portion which controls traffic in the data where to send the data which came from where between the support module 12 and each apparatus. "CODEC" of CODEC circuit 122 is an abbreviation of "Coder/Decoder", i.e., the coding decryption art of data, and this CODEC circuit 122, For example, it is a portion which performs the A/D conversion etc. which carry out D/A conversion which changes the given digital data into an analog signal, or change an analog signal into digital data conversely.

[0046]"DSP" of DSP unit 123 is an abbreviation to mean a digital sound processor, i.e., the circuit which processes the signal of the sound of digital format specially, and this DSP unit 123, When the digital data showing music etc. can be given, as items, such as balance of the right and left set as the system, volume, Feder, surround, and an equalizer, are reflected in the contents of the sound, it is a portion which processes digital data.

[0047]By audio equipment and PCI bus B-2s, such as a CD-ROM unit, since the buffer memory 124 differs in the cycle which write data, it is a buffer for this difference to be filled up with storing data and taking it out little by little, and comprises SRAM etc.

[0048]Parallel / PCI driver 125 is portions which change into the data format of PCI bus B-2 the digital data of parallel form sent from the CD-ROM unit 14. A serial / PCI driver 126 is portions which change into the data format of PCI bus B-2 the digital data of serial form sent from the CD-ROM autochanger 7.

[0049]The face plate unit 15 containing the infrared-ray-communication unit 127, It is connected to support ASIC121 in a high-speed serial communication circuit, and GPS unit 16 is connected to support ASIC121 in start-stop serial communication circuits, such as UART (UniversalAsynchronous Receiver-Transitter). The CD-ROM unit 14 is connected to parallel / PCI driver 125 by parallel communication circuits, such as ATAPI (AT Attachment Packet Interface). Although a graphic display is not carried out, ASIC which manages an exchange of the data based on infrared rays is provided in the infrared-ray-communication unit 127.

[Translation done.]

OPERATION

[2. operation] This embodiment constituted as stated above works as follows.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The block diagram showing the entire configuration of the embodiment of this invention.
[Drawing 2]The block diagram shown focusing on the internal configuration of a main unit about the embodiment of this invention.
[Description of Notations]
1 -- Main unit 1
11 -- CPU module
111 -- CPU
112 -- DRAM
113 -- Flash ROM
114 -- PCI bus host controller
115 -- CPU host ASIC
116 -- PCMCIA-ASIC
12 -- Support module
121 -- Support ASIC
122 -- CODEC circuit
123 -- DSP unit
124 -- Buffer memory
125 -- Parallel / PCI driver
126 -- A serial / PCI driver
127 -- Infrared-ray-communication unit
13 -- CompactFlash card
13S -- Socket
14 -- CD-ROM unit

15 -- Face plate unit
15a -- Case
16 -- GPS unit
2 -- Tuner amplifier unit
2a -- Antenna
21 -- Tuner
22 -- Amplifier
3 -- Microphone
4 -- GPS antenna
4a -- Receiver
5 -- Security control unit
5a -- Sensor
5b -- Siren
5c -- Transmitter
6 -- Telephone unit
6a -- Antenna
6b -- Hand set
7 -- CD-ROM autochanger
8 -- Hand-held PC
9 -- Auxiliary battery
30 -- External unit
40 -- Option unit

[Translation done.]

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 9809/1/4	**FOR FURTHER ACTION**	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/US03/39493	International filing date *(day/month/year)* 11 December 2003 (11.12.2003)	(Earliest) Priority Date *(day/month/year)* 11 December 2002 (11.12.2002)
Applicant BLITZSAFE OF AMERICA, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the Report**
   a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
   ☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:
   ☐ contained in the international application in written form.
   ☐ filed together with the international application in computer readable form.
   ☐ furnished subsequently to this Authority in written form.
   ☐ furnished subsequently to this Authority in computer readable form.
   ☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   ☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.
2. ☐ **Certain claims were found unsearchable** (See Box I).
3. ☐ **Unity of invention is lacking** (See Box II).
4. With regard to the **title**,
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established by this Authority to read as follows:
5. With regard to the **abstract**,
   ☐ the text is approved as submitted by the applicant.
   ☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. The figure of the **drawings** to be published with the abstract is Figure No. 1
   ☐ as suggested by the applicant. ☐ None of the figures
   ☒ because the applicant failed to suggest a figure.
   ☐ because this figure better characterizes the invention.

Form PCT/ISA/210 (first sheet) (July 1998)

INTERNATIONAL SEARCH REPORT	International application No. PCT/US03/39493

Box III TEXT OF THE ABSTRACT (Continuation of Item 5 of the first sheet)

The technical features mentioned in the abstract do not include a reference sign between parentheses (PCT Rule 8.1(d)).

NEW ABSTRACT

An audio device integration system is provided. One or more after market audio devices, such as a CD player(15), CD changer, MP3 player(30), satellite receiver(25), DAB receiver(25), or the like, is integrated for use with an existing OEM or after-market car stereo system, wherein control commands can be issued at the car stereo (10) and responsive data from the audio device (15,25,30) can be displayed on the stereo. Control commands generated at the car stereo (10) are received, processed, converted into a format recognizable by the audio device (15,25,30), and dispatched to the audio device (15,25,30) for execution. Information from the audio device (15,25,30), including track, disc, song, station, time and other information is received, processed, converted into a format recognizable by the car stereo, and dispatched to the car stereo (10) for display thereon.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/39493

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G06F 17/00; H04B 1/00, 3/00;
US CL : 700/94; 381/86, 77

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)
U.S. : 700/94; 381/86, 77; 455/346,347; D14/434

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 practicable, search terms used)
Databases available through EAST (USPAT, US-PGPUB, EPO, JPO, DERWENT)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 6,396,164 B1 (BARNEA ET AL) 28 May 2002 (28.05.2002), see entire document.	1,2,5,11-21,24-25,27-30,35-36,39-41 ----------- 3,4,6-10,22-23,26,31-34,37-38,42-80
Y, P	US 2003/0007649 A1 (RIGGS) 09 January 2003 (09.01.2003), paragraphs 0037-0040 and 0092-0099.	4,26,38,48-50,57,64,67,73-76, 79
Y	US 6,157,725 A (BECKER) 05 December 2000 (05.12.2000), col. 4, lines 41-58; col. 6, lines 6-46; col 8, line 20-col. 10, line 58.	3,4,6,9-10,26,34-38,44,47-54,61-62,64,66-67,72,75-79
Y	US 5,339,362 A (HARRIS) 16 August 1994 (16.08.1994), col. 3, line 25-col. 4, line 61 and Figures 2,3.	42-46,55-80
Y	US 2001/0044664 A1 (MUELLER et al) 22 November 2001 (22.11.2001), paragraphs 0020-0028,0034-0035.	4,7-12,26,31-38,51-54,61-67,75-76
Y	US 6,330,337 B1 (NICHOLSON) 11 December 2001 (11.12.2001), Figure 2 and col. 3, line 32-col. 4,1 line 28.	22-23,68,80

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"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	Date of mailing of the international search report
07 April 2004 (07.04.2004)	12 MAY 2004
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230	Authorized officer Bill Isen Eugenio Logan Telephone No. 703-305-3900

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,772,079 A (DOUGLAS et al) 20 September 1988 (20.09.1988), col. 3, lines 25-64.	42-46,55-80

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 99879-00011	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US06/08043	International filing date *(day/month/year)* 03 March 2006	(Earliest) Priority Date *(day/month/year)* 03 March 2005
Applicant IRA MARLOWE		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language**, the international search was carried out on the basis of:
      ☒ the international application in the language in which it was filed
      ☐ a translation of the international application into ______________ , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.
2. ☐ **Certain claims were found unsearchable** (see Box No. II)
3. ☒ **Unity of invention is lacking** (see Box No. III)
4. With regard to the **title**,
   ☒ the text is approved as submitted by the applicant
   ☐ the text has been established by this Authority to read as follows:
5. With regard to the **abstract**,
   ☐ the text is approved as submitted by the applicant
   ☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority
6. With regard to the **drawings**,
   a. the figure of the **drawings** to be published with the abstract is Figure No. 10
      ☒ as suggested by the applicant
      ☐ as selected by this Authority, because the applicant failed to suggest a figure
      ☐ as selected by this Authority, because this figure better characterizes the invention
   b. ☐ none of the figures is to be published with the abstract

Form PCT/ISA/210 (first sheet) (April 2005)

INTERNATIONA L SEARCH REPORT

International application No.
PCT/US06/08043

Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)

An multimedia device integration system is provided. One or more aftermarket audio or video devices, such as a CD player, CD changer, digital media device (e:g., MP3 player, MP4 player, WMV player, Apple iPod, portable music 5 center, or other device) satellite receiver (e.g., XM or Sirius receiver), DAB receiver, video device (e.g., DVD player), cellular telephone, or any other device or combinations thereof, is integrated for use with an existing OEM or after-market car stereo or video system, wherein control commands can be issued at the car stereo or video system and data from the after-market device can be displayed on 10 the car stereo or video system. Control commands generated at the car stereo or video system are received, processed, converted into a format recognizable by the after-market device, and dispatched to the after-market device for execution.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US06/08043

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - H04B 1/06 (2007.01)
USPC - 455/345
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)
IPC(8) - H04B 1/06 (2007.01)
USPC - 455/345

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 practicable, search terms used)
MicroPatent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2003/0215102 A1 (MARLOWE) 20 November 2003 (20.11.2003) entire document	1-4, 36 ------------ 5-13
Y	US 2004/0145457 A1 (SCHOFIELD et al) 29 July 2004 (29.07.2004) entire document	5, 8, 11-13
Y	US 2004/0266336 A1 (PATSIOKAS et al) 30 December 2004 (30.12.2004) entire document	6, 7, 9, 10
A	US 6,529,804 B1 (DRAGGON et al) 04 March 2003 (04.03.2003) entire document	1-13, 36

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"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	Date of mailing of the international search report
25 July 2007	24 SEP 2007

Name and mailing address of the ISA/US	Authorized officer:
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US06/08043

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-13 and 36, drawn to controlling after-market-devices in a multimedia device integration system.
Group II, claims 14-31, drawn to protocol conversion in a multimedia device integration system.
Group III, claims 32-35, drawn to a method for retrieving a song from an after-market device from a car stereo system.

The inventions listed as Groups I, II, and III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention is means for processing and dispatching commands for controlling the after-market device from the car multimedia system and displaying data from the aftermarket device and the display of the car multimedia system as claimed therein is not present in the invention of Groups II and III; the special technical feature of the Group II invention is selecting by an interface using settings of the plurality of configuration jumpers an at least one of a plurality protocol conversion software blocks stored in memory in the interface for converting signals from an after-market device into a format compatible with a car multimedia device system (and from the car multimedia system into a format compatible with the after-market device) as claimed therein is not present in the invention of Groups I and III; and the special technical feature of the Group III invention is allowing a user to select a desired song from the list of potentially matching songs for playing the desired song on the car stereo system as claimed therein is not present in the invention of Groups I and II.

Since none of the special technical features of the Group I, II and III inventions is found in more than one of the inventions, unity of invention is lacking.

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
MICHAEL R. FRISCIA
MCCARTER & ENGLISH, LLP
FOUR GATEWAY CENTER
100 MULBERRY STREET
NEWARK, NEW JERSEY 07102

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing (*day/month/year*) 24 SEP 2007

Applicant's or agent's file reference	FOR FURTHER ACTION
99879-00011	See paragraph 2 below

International application No.	International filing date (*day/month/year*)	Priority date (*day/month/year*)
PCT/US06/08043	03 March 2006	03 March 2005

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - H04B 1/06 (2007.01)
USPC - 455/345

Applicant IRA MARLOWE

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer:
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	25 July 2007	Blaine Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (April 2005)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US06/08043

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into ______________ , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material

      ☐ a sequence listing

      ☐ table(s) related to the sequence listing

   b. format of material

      ☐ on paper

      ☐ in electronic form

   c. time of filing/furnishing

      ☐ contained in the international application as filed

      ☐ filed together with the international application in electronic form

      ☐ furnished subsequently to this Authority for the purposes of search

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US06/08043

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the appicable time limit:

   ☐ paid additional fees

   ☐ paid additional fees under protest and, where applicable, the protest fee

   ☐ paid additional fees under protest but the applicable protest fee was not paid

   ☒ not paid additional fees

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

   ☐ complied with

   ☒ not complied with for the following reasons:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-13 and 36, drawn to controlling after-market-devices in a multimedia device integration system.
Group II, claims 14-31, drawn to protocol conversion in a multimedia device integration system.
Group III, claims 32-35, drawn to a method for retrieving a song from an after-market device from a car stereo system.

The inventions listed as Groups I, II, and III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention is means for processing and dispatching commands for controlling the after-market device from the car multimedia system and displaying data from the aftermarket device and the display of the car multimedia system as claimed therein is not present in the invention of Groups II and III; the special technical feature of the Group II invention is selecting by an interface using settings of the plurality of configuration jumpers an at least one of a plurality protocol conversion software blocks stored in memory in the interface for converting signals from an after-market device into a format compatible with a car multimedia device system (and from the car multimedia system into a format compatible with the after-market device) as claimed therein is not present in the invention of Groups I and III; and the special technical feature of the Group III invention is allowing a user to select a desired song from the list of potentially matching songs for playing the desired song on the car stereo system as claimed therein is not present in the invention of Groups I and II.

Since none of the special technical features of the Group I, II and III inventions is found in more than one of the inventions, unity of invention is lacking.

4. Consequently, this opinion has been established in respect of the following parts of the international application:

   ☐ all parts

   ☒ the parts relating to claims Nos. 1-13, 36

Form PCT/ISA/237 (Box No. IV) (April 2005)

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	5-13	YES
	Claims	1-4, 36	NO
Inventive step (IS)	Claims	NONE	YES
	Claims	1-13, 36	NO
Industrial applicability (IA)	Claims	1-13, 36	YES
	Claims	NONE	NO

2. Citations and explanations:

Claims 1-4 and 36 lack novelty under PCT Article 33(2) as being anticipated by Marlowe (US 2003/0215102 A1).

Regarding claim 1, Marlowe discloses a multimedia device integration system comprising: a car stereo (par. 0039, existing car radio or stereo) system; an after-market device (par. 0038, after-market CD player) external to the car stereo system; an interface (Fig. 1, interface 20) positioned within the car stereo system and connected between the car stereo system and the after-market device for exchanging data and audio signals between the car stereo system and the after-market device; means for processing and dispatching commands (par. 0055, dispatches the formatted command to the CD player) for controlling the after-market device from the car stereo system in a format compatible with the after-market device; and means for processing and displaying data (par. 0055, display the formatted data on the display of the car stereo) from the after-market device (par. 0038, after-market CD player) on a display of the car stereo system in a format compatible with the car stereo system.

Regarding claim 2, Marlowe (as discussed in lack of novelty of claim 1 above) discloses the after-market device comprises a CD player (par. 0038, after-market CD player).

Regarding claim 3, Marlowe (as discussed in lack of novelty of claim 2 above) discloses the digital media player comprises an MP3 player (par. 0038, after-market MP3 player).

Regarding claim 4, Marlowe (as discussed in lack of novelty of claim 1 above) further discloses one or more auxiliary input sources (Fig. 1, auxiliary inputs 35) connected to the interface.

Regarding claim 36, Marlowe discloses a multimedia device integration system comprising: a car audiovisual system (par. 0039, existing car radio or stereo); a plurality of after-market devices (Fig. 1, par. 0038, MP3 player, satellite receiver, DAB receiver, or the like) external to the car audiovisual system; an interface (Fig. 1, interface 20) connected between the car audiovisual system and the plurality of after-market devices for exchanging data, audio, and video signals between the car audiovisual system and the plurality of after-market devices; means for processing and dispatching commands (par. 0038 and par. 0055, dispatches the formatted command to the CD player or other after-market devices) for controlling the plurality of after-market devices from the car audiovisual system in at least one format compatible with at least one of the plurality of after-market devices; and means for processing and displaying data (par. 0038 and par. 0055, display the formatted command to the CD player or other after-market devices on the car stereo) from the plurality of after-market devices on a display of the car audiovisual system in a format compatible with the car audiovisual system.

Claims 5, 8 and 11-13 lack an inventive step under PCT Article 33(3) as being obvious over Marlowe (US 2003/0215102 A1) in view of Schofield et al (US 2004/0145457 A1; hereinafter Schofield).

Regarding claim 5, Marlowe discloses a multimedia device integration system comprising: a car stereo system (par. 0039, existing car radio or stereo); a CD player (par. 0038, after-market CD player) external to the car stereo system; an interface (Fig. 1, interface 20) connected between the car stereo system and the CD player for exchanging data and audio signals between the car stereo system and the cellular telephone; means for processing and dispatching commands (par. 0055, dispatches the formatted command to the CD player) for controlling the CD player from the car stereo system in a format compatible with CD player; and means for processing and displaying data (par. 0055, display the formatted data on the display of the car stereo) from the CD player (par. 0038, after-market CD player) on a display of the car stereo system in a format compatible with the car stereo system. Marlowe lacks a cellular telephone as an after-market device. However, Schofield discloses, in the art of multimedia system, a cellular telephone as an after-market device (Par. 272, cellular phone). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to include a cellular telephone as an after-market device in the device of Marlowe as taught by Schofield in order to enhance the utility of the multimedia device.

(Continued in Supplemental Box)

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:

Box No. V
2. Citations and explanations:

Regarding claim 8, Marlowe discloses a multimedia device integration system comprising: a car stereo system (par. 0039, existing car radio or stereo); a CD player (par. 0038, after-market CD player) external to the car stereo system; an interface (Fig. 1, interface 20) connected between the car stereo system and the CD player for exchanging data and audio signals between the car stereo system and the cellular telephone; means for processing and dispatching commands (par. 0055, dispatches the formatted command to the CD player) for controlling the CD player from the car stereo system in a format compatible with CD player; and means for processing and displaying data (par. 0055, display the formatted data on the display of the car stereo) from the CD player (par. 0038, after-market CD player) on a display of the car stereo system in a format compatible with the car stereo system. Marlowe lacks a car video system and a cellular telephone as an after-market device. However, Schofield discloses, in the art of multimedia system, a car video system (par. 0398, car video display system) and a cellular telephone as an after-market device ((Par. 272, cellular phone) in order to enhance utility of multimedia device. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to include a car video system and a cellular telephone as an after-market device in the device of Marlowe as taught by Schofield in order to enhance the utility of the multimedia device.

Regarding claim 11, Marlowe discloses a multimedia device integration system comprising: a car stereo system (par. 0039, existing car radio or stereo); a CD player (par. 0038, after-market CD player) external to the car stereo system; an interface (Fig. 1, interface 20) connected between the car stereo system and the CD player for exchanging data and audio signals between the car stereo system and the cellular telephone; means for processing and dispatching commands (par. 0055, dispatches the formatted command to the CD player) for controlling the CD player from the car stereo system in a format compatible with CD player; and means for processing and displaying data (par. 0055, display the formatted data on the display of the car stereo) from the CD player (par. 0038, after-market CD player) on a display of the car stereo system in a format compatible with the car stereo system. Marlowe lacks a car video system and video device as an after-market device. However, Schofield discloses, in the art of multimedia system, a car video system (par. 0380, vehicular video display system) and video device as an after-market device (Par. 380, camera device). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to include a car video system and video device as an after-market device in the device of Marlowe as taught by Schofield in order to enhance the utility of the multimedia device.

Regarding claim 12, Marlowe (as discussed in lack of inventive step of claim 11 above) disclose the CD player (par. 0038, after-market CD player) on a display of the car stereo system in a format compatible with the car stereo system. Marlowe lacks the after-market video device comprises a DVD player. However, Schofield discloses, in the art of multimedia system, the after-market video device comprises a DVD player (par. 309, after-market of display element associated with DVD player (par. 0311, DVD video system)). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to include the after-market video device comprises a DVD player in the device of Marlowe as taught by Schofield in order to enhance the utility of the multimedia device.

Regarding claim 13, Marlowe (as discussed in lack of inventive step of claim 11 above) disclose the CD player (par. 0038, after-market CD player) on a display of the car stereo system in a format compatible with the car stereo system. Marlowe lacks the interface is positioned within the car video system. However, Schofield discloses, in the art of multimedia system, the interface is positioned within the car video system (par. 0302, interface associated with control 3580 of car video system). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to include the interface is positioned within the car video system in the device of Marlowe as taught by Schofield in order to enhance utility of multimedia device.

Claims 6, 7, 9 and 10 lack an inventive step under PCT Article 33(3) as being obvious over Marlowe (US 2003/0215102 A1) in view of Patsiokas et al (US 2004/0266336 A1; hereinafter Patsiokas).

Regarding claims 6 and 9, Marlowe in view of Schofield (as discussed in lack of inventive step of claims 5 and 8 above) further discloses songs or music downloadable through the CD player (par. 0042, play song from CD player). Marlowe lacks songs or music downloadable through the cellular telephone. However, Patsiokas discloses, in the art of multimedia system, songs or music downloadable through the cellular telephone (par. 0064, download song file over the cellular phone). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to include songs or music downloadable through the cellular telephone in the device of Marlowe in view of Schofield as taught by Patsiokas in order to enhance utility of multimedia device.

Regarding claims 7 and 10, Marlowe (as discussed in lack of inventive step of claims 6 and 9 above) discloses the songs or music are playable through the car stereo system (par. 0039, existing car radio or stereo) using the interface (Fig. 1, interface 20).

Claims 1-13 and 36 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 99879-00011	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2006/008043	International filing date *(day/month/year)* 03 March 2006 (03.03.2006)	Priority date *(day/month/year)* 03 March 2005 (03.03.2005)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant MARLOWE, Ira		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☒	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 16 October 2007 (16.10.2007)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Nora Lindner e-mail: pt02.pct@wipo.int

Form PCT/IB/373 (January 2004)

AUSTRALIAN PATENT OFFICE

WRITTEN OPINION

	Date of mailing *day/month/year* 28 AUG 2007
Applicant's or agent's file reference LPN/LWC/NJ/M.2006001623	**REPLY DUE** within FIVE MONTHS of the date of the Registrar's letter enclosing the written opinion

Application No.	Application Filing Date *(day/month/year)*	Priority Date *(day/month/year)*
SG 200601303-1	28 February 2006	3 March 2005

International Patent Classification (IPC) (as indicated in the search report)

Int. Cl.

H04B 1/00 (2006.01) ***G06F 17/00*** (2006.01) ***H04B 3/00*** (2006.01)

Applicant

IRA M. MARLOWE

1. This First written opinion consists of a total of 6 sheets.
2. This opinion contains indications relating to the following items:.

I	[X]	Basis of the opinion
II	[ ]	Priority
III	[ ]	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	[X]	Lack of unity of invention
V	[X]	Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	[ ]	Certain documents cited
VII	[ ]	Certain defects in the application
VIII	[X]	Certain observations on the application

3. The search report used was issued by the **Australian Patent Office**, and the date of completion is: **28 August 2006**
4. If no reply is filed, the examination report will be established on the basis of this opinion.
5. The date by which the examination report will be established is: **3 June 2008**

Name and mailing address	Authorized Officer
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile no. 61 2 62853929	**JUZER KHANBHAI**

Form APO/SG/408 (Cover Sheet)(Dec 2006)

AUSTRALIAN PATENT OFFICE

WRITTEN OPINION

Application No.
SG 200601303-1

I. Basis of the opinion

1. This opinion has been drawn on the basis of:

[X] the application as originally filed.

[ ] the description, pages , as originally filed,
pages , filed with the request,
pages , received on with the letter of

[ ] the claims, pages , as originally filed,
pages , filed with the request,
pages , received on with the letter of

[ ] the drawings, sheets/fig. , as originally filed,
sheets/fig. , filed with the request,
sheets/fig. , received on with the letter of

[ ] the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. The amendments have resulted in the cancellation of: pages:
sheets of drawings/figures No :

3 [ ] This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box.

4. Additional observations, if necessary:

AUSTRALIAN PATENT OFFICE.

WRITTEN OPINION

Application No.
SG 200601303-1

IV. Lack of unity of invention

1. This Office found multiple invention in this application, as follows:

The application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion this Office has found that there are two inventions:

1. Claims 1-31 & 36 are directed to a multimedia device integration system including an interface which allows devices to be integrated to an OEM or after-market car stereo and video systems. It is considered that allowing the integration of devices to an OEM or after-market car stereo and video systems comprises a first "special technical feature".
2. Claims 32-35 are directed to a method for retrieving a song from an after-market device from a car stereo system and which allows the user to select a desired song from the list of potentially matching songs for playing the desired song on the car stereo system. It is considered that allowing the selection of a desired song from the list of potentially matching songs for playing the desired song on the car stereo system comprises a second "special technical feature".

Since the abovementioned groups of claims do not share either of the technical features identified, a "technical relationship" between the inventions, as defined in PCT Rule 13.2 does not exist. Accordingly, the application does not relate to one invention or to a single inventive concept.

2. Consequently, the following parts of the application were the subject of examination in establishing this report:

☐ all parts.

☒ the parts relating to claims Nos. **1-31 & 36**

V. Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims **5-7**	YES
	Claims **1-4, 8-31, 36**	NO
Inventive step (IS)	Claims -	YES
	Claims **1-31, 36**	NO
Industrial applicability (IA)	Claims **1-31, 36**	YES
	Claims -	NO

2. Citations and explanations

NOVELTY (N) claims 1-4, 8-31, 36

D1 - WO 2004/053722 A1 (BLITZSAFE OF AMERICA, INC.) 24 June 2004

D1 discloses an Audio device integration system wherein one or more after-market devices, such as a CD player, CD changer, MP3 player, satellite receiver, DAB receiver, or the like is integrated for use with an existing OEM or after-market car stereo system. In this system, control commands can be issued at the car stereo and responsive data from the audio device can be displayed on the stereo.

The above citation D1 discloses all of the features of all the above claims. For example, the features of claim 1, see:

- A multimedia device integration system	fig. 1 and Page 10 line 11
- a car stereo system	Page 10 lines 1 to 2 and lines 13 & 14
- an after-market device external to car stereo system	Page 10 line 25
- an interface positioned within the car stereo system and connected between the car stereo system and the after-market device for exchanging data and audio signals between the car stereo system and the after-market device	Page 10 line 30 to Page 11 line 1

INVENTIVE STEP (IS) claims 1-31, 36

Claims 1-4, 8-31, 36: as above.

Claims 5-7:

D1- WO 2004/053722 A1 (BLITZSAFE OF AMERICA, INC.) 24 June 2004

D2- US 2002/0197954 A1 (SCHMITT et al.) 26 December 2002

D3- US 6058319 A (SADLER) 2 May 2000

D4- US 6052603 A (KINZALOW et al.) 18 April 2000

These citations do not individually disclose all of the features of the claims, but when combined, as would be obvious to a person skilled in the art, disclose all of the features of the claims.

AUSTRALIAN PATENT OFFICE

WRITTEN OPINION

Application No.
SG 200601303-1

Supplemental Box
(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box [No.]: V (2)

Claims 1-13, 24, 27, 28, 31, 36:

D5- US 2003/0007649 A1 (RIGGS) 9 January 2003

D6- US 6396164 B1 (BARNEA et al.) 28 May 2002

D7- US 6330337 B1 (NICHOLSON et al.) 11 December 2001

D8- US 2001/0044664 A1 (MUELLER et al.) 22 November 2001

D9- US 6157725 A (BECKER) 5 December 2000

These citations do not individually disclose all of the features of the claims, but when combined, as would be obvious to a person skilled in the art, disclose all of the features of the claims.

AUSTRALIAN PATENT OFFICE

WRITTEN OPINION

Application No.
SG **200601303-1**

VIII. Certain observations on the application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

[X] The claimed invention is patentable according to Section 13(2); or

[ ] The claimed invention is unpatentable according to Section 13(2) because:

[ ] This application is a Divisional application filed under Section 26(6) of the Patents Act and discloses no additional matter extending beyond that disclosed in the Parent application.

Form APO/SG/408 (Box VIII)(Dec 2006)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 99879-00028	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US07/72182	International filing date (*day/month/year*) 27 June 2007 (27.06.2007)	(Earliest) Priority Date (*day/month/year*) 27 June 2006 (27.06.2006)
Applicant MARLOWE, IRA		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the Report**
   a. With regard to the **language**, the international search was carried out on the basis of:
      ☒ the international application in the language in which it was filed.
      ☐ a translation of the international application into ______________________, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 Rule 43.6 *bis(a)*
   c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.
2. ☐ **Certain claims were found unsearchable** (See Box No. II)
3. ☐ **Unity of invention is lacking** (See Box No. III)
4. With regard to the **title**,
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. With regard to the **drawings**,
   a. the figure of the **drawings** to be published with the abstract is Figure No. 1
      ☐ as suggested by the applicant.
      ☒ as selected by this Authority, because the applicant failed to suggest a figure.
      ☐ as selected by this Authority, because this figure better characterizes the invention.
   b. ☐ none of the figures is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US07/72182

A. CLASSIFICATION OF SUBJECT MATTER

IPC: **H04B 1/00**(2006.01);**G05B 19/02**(2006.01);**G06F 17/00**(2006.01)

USPC: 381/86;340/825.24;700/94

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)
U.S. : 381/86; 340/825.24,825.25; 700/94; 307/9.1,10.1; 455/345,346; 710/303,304; 348/207.1,207.11

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 practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,163,079 (Miyazaki et al) 19 Dec. 2000 (19.12.2000), figure 7	91
Y	US 2002/0084910 A1 (Owens et al) 4 July 2002 (04.07.2002), fig.1	1-70,111-154
Y	US 6,993,615 B2 (Falcon) 31 Jan 2006 (31.01.2006), fig.2-4	1-90, 117-154
Y	US 6,175,789 B1 (Beckert et al) 16 Jan 2001 (16.01.2001), fig.1-2	1-70,78-80,88-90,117-150
Y	US 6,389,560 B1 (Chew) 14 May 2002 (14.05.2002), col.4-5	1-90,92-110,117-154
Y	US 2003/0026440 A1 (Lazzeroni et al) 6 Feb 2003 (06.02.2003), fig.1	13,32,52,68,92-116
Y	US 2005/0172001 A1 (Zaner et al) 4 Aug 2005 (04.08.2005), fig.1	92-103

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"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
12 September 2008 (12.09.2008)

Date of mailing of the international search report
25 SEP 2008

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
Facsimile No. (571) 273-3201

Authorized officer
Jason Kurr
Telephone No. (571) 272-0552

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US07/72182

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2003/0156200 A1 (Romano et al) 21 Aug 2003 (21.08.2003), fig.7	104-110
Y	US 7,288,918 B2 (DiStefano) 30 Oct 2007 (30.10.2007), fig.1	151-154

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
MICHAEL R. FRISCIA
MCCARTER & ENGLISH, LLP
FOUR GATEWAY CENTER
100 MULBERRY STREET
NEWARK, NJ 07102

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing (*day/month/year*) 25 SEP 2008

FOR FURTHER ACTION
See paragraph 2 below

Applicant's or agent's file reference 99879-00028		
International application No. PCT/US07/72182	International filing date (*day/month/year*) 27 June 2007 (27.06.2007)	Priority date (*day/month/year*) 27 June 2006 (27.06.2006)

International Patent Classification (IPC) or both national classification and IPC
IPC: **H04B 1/00**(2006.01);**G05B 19/02**(2006.01);**G06F 17/00**(2006.01)
USPC: 381/86;340/825.24;700/94

Applicant
MARLOWE, IRA

1. This opinion contains indications relating to the following items:

- ☒ Box No. I — Basis of the opinion
- ☐ Box No. II — Priority
- ☐ Box No. III — Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV — Lack of unity of invention
- ☒ Box No. V — Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI — Certain documents cited
- ☐ Box No. VII — Certain defects in the international application
- ☒ Box No. VIII — Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis(b)* that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	12 September 2008 (12.09.2008)	Jason Kurr Telephone No. (571) 272-0552

Form PCT/ISA/237 (cover sheet) (April 2007)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US07/72182

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
   - ☒ the international application in the language in which it was filed
   - ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of:
   - a. type of material
     - ☐ a sequence listing
     - ☐ table(s) related to the sequence listing
   - b. format of material
     - ☐ on paper
     - ☐ in electronic form
   - c. time of filing/furnishing
     - ☐ contained in the international application as filed.
     - ☐ filed together with the international application in electronic form.
     - ☐ furnished subsequently to this Authority for the purposes of search.
4. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Form PCT/ISA/237(Box No. I) (April 2007)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US07/72182

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the questions whether the claims are fully supported by the description, are made:

Claim 10 is objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because claim 10 is indefinite for the following reason(s): Claim 10 may not depend upon itself. For the purposes of examination the Examiner has view claim 10 as if it were dependent upon claim 1.

Form PCT/ISA/237 (Box No. VIII) (April 2007)

International application No.
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Supplemental Box
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V. 2. Citations and Explanations:
Claim 91 lacks novelty under PCT Article 33(2) as being anticipated by Miyazaki et al (US 6,163,079).

With respect to claim 91, Miyazaki discloses a docking station for docking and integrating a portable device for use with a car stereo, comprising: a base portion (fig.7 #50); a bottom member (fig.1 #11) connected to the base portion; a top member (fig.7 #17) removably connected to the base portion, the base portion, bottom member, and top member defining a cavity (fig.7 #51) for receiving a portable device; and an integration device (fig.7 #38) connected to the base portion for integrating the portable device with a car stereo.

Claims 1-12, 14-31, 33-51, 53-67, 69-70 and 117-150 lack an inventive step under PCT Article 33(3) as being obvious over Owens et al (US 2002/0084910 A1) in view of Beckert (US 6,175,789 B1) and in view of Chew (US 6,389,560) and in view of Falcon (US 6,993,615 B2).

With respect to claims 1, 20, 117, 132, 147 Owens discloses a multimedia device integration system comprising: a car audio system (fig.1 #10) having a display; a portable device (fig.1 #42,44,46,48) external to the car audio system; an interface (fig.1 #30,40) in communication with the portable device and the car audio system for transmitting processed video information from the portable device to the car audio system.
Owens does not disclose expressly wherein an integration subsystem processes the video information into a format compatible with the car audio system. Beckert discloses a vehicle computer interface system in cooperation with a vehicles audio system that allows for the operation of incompatible devices (col.1 ln.63-67, col.2 ln.1-30). At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the compatibility processing of Beckert in the interface of Owens. The motivation for doing so would have been allow for a consumer to use external devices from different companies with the car stereo.
Owens does not disclose expressly wherein an integration subsystem generates a device presence signal for maintaining the car audio system in a state responsive to the portable device. Chew discloses a integration subsystem (fig.1 #17,18) for connecting a plurality of external devices to a computing system wherein the subsystem transmits a presence signal ("port number") to the computing system as an indication of a connected external device (col.4 ln.58-67, col.5 ln.1-14). At the time of the invention it would have been obvious to a person of ordinary skill in the art to include the integration subsystem of Chew in the interface of Owens. The motivation for doing so would have been to notify the car audio system of a newly attached or detached external device.
Owens does not disclose expressly wherein the interface communicates wirelessly. Falcon discloses an interfacing system (fig.2 #142,146) for communication a portable device (fig.4 #102) with a car audio system (fig.4 #200) wherein the communication is of a

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wireless nature (col.3 ln.65-67, col.4 ln.1-15). At the time of the invention it would have been obvious to a person of ordinary skill in the art to allow the portable device of Owens to communicate with the car audio system wirelessly. The motivation for doing so would have been to allow a user to move the portable device about the cabin of the vehicle. Falcon also discloses that the portable device may be charged when docked to the audio system (col.3 ln.56-64).

With respect to claims 39, 55 Owens discloses a multimedia device integration system comprising: a car audio/video system (fig.1 #10); a portable device (fig.1 #42,44,46,48) external to the car audio system; an integration system (fig.1 #30,40) in communication with the portable device and the car audio system for transmitting processed information from the portable device to the car audio system.
Owens does not disclose expressly wherein an integration subsystem processes the information into a format compatible with the car audio system. Beckert discloses a vehicle computer interface system in cooperation with a vehicles audio system that allows for the operation of incompatible devices (col.1 ln.63-67, col.2 ln.1-30). At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the compatibility processing of Beckert in the interface of Owens. The motivation for doing so would have been allow for a consumer to use external devices from different companies with the car stereo.
Owens does not disclose expressly wherein an integration subsystem generates a device presence signal for maintaining the car audio system in a state responsive to the portable device. Chew discloses a integration subsystem (fig.1 #17,18) for connecting a plurality of external devices to a computing system wherein the subsystem transmits a presence signal ("port number") to the computing system as an indication of a connected external device (col.4 ln.58-67, col.5 ln.1-14). At the time of the invention it would have been obvious to a person of ordinary skill in the art to include the integration subsystem of Chew in the interface of Owens. The motivation for doing so would have been to notify the car audio system of a newly attached or detached external device.
Owens does not disclose expressly wherein the system comprises a docking slot formed in the car stereo for receiving the portable device. Falcon discloses an interfacing system (fig.2 #142,146) for communication a portable device (fig.4 #102) with a car audio system (fig.4 #200) wherein system comprises a docking slot formed in the car stereo for receiving the portable device (col.3 ln.65-67, col.4 ln.1-15). At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the docking slot of Falcon in the car audio system of Owens. The motivation for doing so would have been to provide a stable mount for the portable device.
With respect to claims 2-3, 21-22, 40-42, 56-58, 118-120, 133-135, 149-150, Owens discloses wherein the integration system processes data into a format compatible with the car audio system (Beckert: col.1 ln.63-67, col.2 ln.1-30) and dispatches commands to the external devices (Owens: pg.2 [0034]) for execution thereby.
With respect to claims 4-6, 23-25, 43-45, 59-61, Owens discloses wherein the integration system is responsive to voice commands (Beckert: col.4 ln.17-32).
With respect to claims 7-8, 26-27, 46-47, 62-63, Owens discloses wherien the car audio system comprises an OEM and after-market car audio system (Owens: fig.1 #10).
With respect to claims 9-10, 28-29, 48-49, 64-65, Owens discloses wherein the portable device comprises a portable receiver (Owens: fig.1 #46).
With respect to claims 11-12, 30-31, 50-51, 66-67, Owens discloses wherein the portable device comprises a portable digital media player (Falcon: fig.3 #102).
With respect to claims 14-16, 33-35, Owens discloses wherein the system comprises a non-wireless connection (Owens: fig.1) and wherein the interface is within the portable device and the car audio system (Falcon: fig.2 #142,146).
With respect to claims 17-19, 36-38, Owens discloses wherien the video information is stored, a picture and comprises a TV signal (Owens: fig.1 #42,44).
With respect to claims 53, 54, 69-70, Owens discloses wherein the interface is within the portable device and the car audio system (Falcon: fig.2 #142,146).
With respect to claim 121-122, 136-137, Owens discloses where the system further comprises a communications port allowing communication between the interface and the portable audio device (Owens: fig.8 #40), and wherein the communication port is USB (Beckert: fig.2 #70).
With respect to claims 123-124, 138-139, see the rejection of claim 117 above (Falcon: fig.2).
With respect to claim 125-128, 140-143, Owens discloses wherein the transmitted signals are recorded by the portable device and the car audio system (Falcon: col.6 ln.54-60).
With respect to claims 129-131, 144-146, Owens discloses wherein the interface comprises a microchip (Owens: fig.9 :Master Processor).
With respect to claim 148, Owens discloses wherein the charging circuit comprises first and second inductive charging circuits associated with the interface and the portable device (Falcon: col.3 ln.56-64).

Claims 13, 32, 52 and 68 lack an inventive step under PCT Article 33(3) as being obvious over Owens et al (US 2002/0084910 A1) in view of Beckert (US 6,175,789 B1) and in view of Chew (US 6,389,560) and in view of Falcon (US 6,993,615 B2) in view of Lazzeroni (US 2003/0026440 A1).

With respect to claims 13, 32, 52, 68, Owens discloses the system of claim 1 however does not disclose expressly wherein the portable device is a cell phone. Lazzeroni discloses an integration system comprising a cell phone (fig.1 #110). At the time of the invention it would have been obvious to a person of ordinary skill in the art intgrate a cell phone into the audio system of Owens. The motivation for doing so would have been to allow a user receive phone calls through the car audio system.

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Claims 71-77 and 81-87 lack an inventive step under PCT Article 33(3) as being obvious over Falcon (US 6,993,615 B2) in view of Chew (US 6,389,560).

With respect to claims 71, 81 Falcon discloses a method for wirelessly integrating a portable device (fig.4 #102) for use with a car audio/video system (fig.4 #200) comprising: establishing a wireless communications link between the car audio system and the portable device (col.3 ln.65-67, col.4 ln.1-15); processing video information into a format compatible with the car audio /video system (col.4 ln.25-42) and transmitting the processed video information generated by the portable device to the car audio/video system (col. 9 ln.13-24 "map"), displaying the processed video information and playing the audio signals over the car stereo system.
Owens does not disclose expressly wherein an integration subsystem generates a device presence signal for maintaining the car audio system in a state responsive to the portable device. Chew discloses a integration subsystem (fig.1 #17,18) for connecting a plurality of external devices to a computing system wherein the subsystem transmits a presence signal ("port number") to the computing system as an indication of a connected external device (col.4 ln.58-67, col.5 ln.1-14). At the time of the invention it would have been obvious to a person of ordinary skill in the art to include the integration subsystem of Chew in the interface of Owens. The motivation for doing so would have been to notify the car audio system of a newly attached or detached external device.
With respect to claims 72-77, 82-87, Falcon discloses wherein the integration system processes data into a format compatible with the car audio system and dispatches commands to the external devices for execution thereby (Falcon: col.3 ln.65-67, col.4 ln.1-42).

Claims 78-80 and 88-90 lack an inventive step under PCT Article 33(3) as being obvious over Falcon (US 6,993,615 B2) in view of Chew (US 6,389,560) in view of Beckert (US 6,175,789 B1).

With respect to claims 78-80, 88-90, Falcon does not disclose expressly receiving spoken control commands. Beckert discloses a method of integrating a portable device with a car audio system wherein spoken commands are received to control the portable device and car ausio system (Beckert: col.4 ln.17-32). At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the voice input system of Beckert in the integration system of Falcon. The motivation for doing so would be to supply a user with a hands free control of the system.

Claims 92-103 lack an inventive step under PCT Article 33(3) as being obvious over Zaner et al (US 2005/0172001 A1) in view of Lazzeroni et al (US 2003/0026440 A1) in view of Chew (US 6,389,560).

With respect to claim 92, Zaner discloses a multimedia device integration system comprising: a audiovisual system (fig.1 #106,108) having a display associated therewith; a cellular telephone (fig.1 #102,104) external to the car audiovisual system, the cellular telephone including a receiver for receiving a broadcast radio transmission transmitted to the cell phone; and an interface in communication with the car audiovisual system that processes the broadcast radio tranmission into a format compatible with the audiovisual system, and transmits the processed radio transmission to the audio visual system for playing (pg.2 [0022]).
Zaner does not disclose expressly wherein the audio visual system is a car audiovisual system. Lazzeroni discloses an integration system for integrating a cell phone with a car audio visual system (pg.3 [0043]). At the time of the invention it would have been obvoius to a person of ordinary skill in the art to allow the cell phone of Zaner to communicate with a car audio system as taught by Lazzeroni. The motivation for doing so would have been to communicate information received by a cell phone to the audio system of a vehicle.
Zaner does not disclose expressly wherein an integration subsystem generates a device presence signal for maintaining the car audio system in a state responsive to the portable device. Chew discloses a integration subsystem (fig.1 #17,18) for connecting a plurality of external devices to a computing system wherein the subsystem transmits a presence signal ("port number") to the computing system as an indication of a connected external device (col.4 ln.58-67, col.5 ln.1-14). At the time of the invention it would have been obvious to a person of ordinary skill in the art to include the integration subsystem of Chew in the interface of Zaner. The motivation for doing so would have been to notify the car audio system of a newly attached or detached external device.
With respect claims 93-98, Zaner discloses wherein the broadcast radio transmission comprises a satellite radio transmission, live radio transmission, streamed audio, video transmission, live video transmission, streamed video transmission (Zaner: pg,2 [0031]).
With respect to claims 99-100, Zaner discloses wherein the received information is processed into a format compatible with the audiovisual system (pg.2 [0032]).
With resepect to claims101-103, Zaner discloses wherein the cell phone receives navigational information (pg.5 [0069]).

Claims 104-110 lack an inventive step under PCT Article 33(3) as being obvious over Romano et al (US 2003/0156200 A1) in view of Lazzeroni et al (US 2003/0026440 A1) in view of Chew (US 6,389,560).

With respect to claim 104, Romano discloses a multimedia device integration system comprising: a visual system (fig.7), a digital camera (fig.7 #332) external to the visual system, and a an interface (fig.7 #342) for processing and transmitting signals in a format compatible with the visual system for display upon the visual system.
Romano does not disclose expressly wherein the the visual system is a car audiovisual system. Lazzeroni discloses an integration system for integrating an external device with a car audio visual system (pg.3 [0043]). At the time of the invention it would have been obvoius to a person of ordinary skill in the art to allow the digital camera of Romano to communicate with a car audio system as taught

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by Lazzeroni. The motivation for doing so would have been to communicate information stored on the camera to the audio system of a vehicle.
Romano does not disclose expressly wherein an integration subsystem generates a device presence signal for maintaining the car audio system in a state responsive to the portable device. Chew discloses a integration subsystem (fig.1 #17,18) for connecting a plurality of external devices to a computing system wherein the subsystem transmits a presence signal ("port number") to the computing system as an indication of a connected external device (col.4 ln.58-67, col.5 ln.1-14). At the time of the invention it would have been obvious to a person of ordinary skill in the art to include the integration subsystem of Chew in the interface of Romano. The motivation for doing so would have been to notify the car audio system of a newly attached or detached external device.
With respect to claims 105-106, Romano discloses wherein the transmitted data is controlled by the visual system, wherein the data is processed into a format compatible with the visual system (Romano: pg.2 [0024]).
With respect to claims 107-110, Romano discloses wherein the data is a video image (pg.3 [0030]).

Claims 111-116 lack an inventive step under PCT Article 33(3) as being obvious over Lazzeroni et al (US 2003/0026440 A1) in view of Owens et al (US 2002/0084910 A1).

With respect to claim 111, Lazzeroni discloses a multimedia device integration ssytem comprising: a car audio visual system (fig.1 #100); a portable navigation device (fig.1 #112) external to the car audio visual system and an interface (fig.1 #120) in electrical communication with the car audiovisual system and the portable device, wherein interface processes data from the navigational unit and transmits them to the car audiovisual system.
Lazzeroni does not disclose expressly wherein the interface transmits video signals to the audio visual system for display. Owens discloses an integration device that transmits video data through car audiovisual system (pg.3 [0037]). At the time of the invention it would have been obvious to a person of ordinary skill in the art to display available auxilairy selections such as "GPS" on the head unit of a car audio system. The motivation for doing so would have been to allow a user a visual display of available auxiliary units.
With respect to claim 112, Lazzeroni discloses wherein the data is processed into a format compatible with the car audio visual system (Lazzeroni: pg.5 [0058]).
With respect to claim 113-116, Lazzeroni discloses wherein the data comprises a map and audio signal for reproduction (Lazzeroni: fig.1 #112).

Claims 151-154 lack an inventive step under PCT Article 33(3) as being obvious over Owens et al (US 2002/0084910 A1) in view of Chew (US 6,389,560) and in view of Falcon (US 6,993,615 B2) in view of DiStefano (US 7,288,918 B2).

With respect to claims 151 Owens discloses a multimedia device integration system comprising: a car audio system (fig.1 #10) having a display; a portable device (fig.1 #42,44,46,48) external to the car audio system; an interface (fig.1 #30,40) in communication with the portable device and the car audio system for transmitting processed video information from the portable device to the car audio system.
Owens does not disclose expressly wherein an integration subsystem generates a device presence signal for maintaining the car audio system in a state responsive to the portable device. Chew discloses a integration subsystem (fig.1 #17,18) for connecting a plurality of external devices to a computing system wherein the subsystem transmits a presence signal ("port number") to the computing system as an indication of a connected external device (col.4 ln.58-67, col.5 ln.1-14). At the time of the invention it would have been obvious to a person of ordinary skill in the art to include the integration subsystem of Chew in the interface of Owens. The motivation for doing so would have been to notify the car audio system of a newly attached or detached external device.
Owens does not disclose expressly wherein the interface communicates wirelessly. Falcon discloses an interfacing system (fig.2 #142,146) for communication a portable device (fig.4 #102) with a car audio system (fig.4 #200) wherein the communication is of a wireless nature (col.3 ln.65-67, col.4 ln.1-15). At the time of the invention it would have been obvious to a person of ordinary skill in the art to allow the portable device of Owens to communicate with the car audio system wirelessly. The motivation for doing so would have been to allow a user to move the portable device about the cabin of the vehicle. Falcon also discloses that the portable device may be charged when docked to the audio system (col.3 ln.56-64).
Falcon does not disclose expressly wherien the charging circuit charges the portable device wirelessly. DiStefano discloses a wireless battery charging circuit (fig.1). At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the wireless battery charging circuit of DiStefano in the invention of Falcon in combination with Owens. The motivation for doing so would have been to charge the portable device when not docket to the car audio system.
With respect to claim 152, Owens discloses wherein the charging circuit comprises first and second inductive charging circuits associated with the interface and the portable device (Falcon: col.3 ln.56-64).
With respect to claims 153-154, Owens discloses wherein the integration system processes data into a format compatible with the car audio system (Beckert: col.1 ln.63-67, col.2 ln.1-30) and dispatches commands to the external devices (Owens: pg.2 [0034]) for execution thereby.

Electronic Patent Application Fee Transmittal

Application Number:	11071667
Filing Date:	03-Mar-2005
Title of Invention:	Multimedia device integration system
First Named Inventor/Applicant Name:	Ira M. Marlowe
Filer:	Mark E. Nikolsky/Janelle Fava
Attorney Docket Number:	99879/00003

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 5 months with $0 paid	2255	1	1175	1175

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
		Total in USD ($)		**1175**

Electronic Acknowledgement Receipt

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International Application Number:	
Confirmation Number:	3531
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First Named Inventor/Applicant Name:	Ira M. Marlowe
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Filer:	Mark E. Nikolsky/Janelle Fava
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Attorney Docket Number:	99879/00003
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Payment was successfully received in RAM	$1175

RAM confirmation Number	729
Deposit Account	503571
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Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	Transmittal.pdf	40165 8a97cbedd4938b23651ec87bc7fba465ffff0271	no	1
Warnings:					
Information:					
2	Extension of Time	Extension.pdf	55093 319586f9ff8e9c2507463f61a9e3685629fb019a	no	1
Warnings:					
Information:					
3	Response to Election / Restriction Filed	Response.pdf	467536 2b63828b6b04b508a8d94eccf4187405f6335f73	no	17
Warnings:					
Information:					
4	Information Disclosure Statement Letter	IDSLetter.pdf	85422 26e5ccce298777024c2ccbcb2322f21c9bfb4198	no	2
Warnings:					
Information:					
5	Information Disclosure Statement (IDS) Filed (SB/08)	IDS.pdf	583757 c2463145fab5f8e022385f23ec91c4f6ed034cb9	no	7
Warnings:					
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6	Foreign Reference	Ref20.pdf	5136983 45bd9200a80aae56b540cf17bdd938a3c2a09abf	no	129
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7	Foreign Reference	Ref21.pdf	3750900 66cd68b966c600c7161f58b13ca2e0029bc3383e	no	108
Warnings:					
Information:					
8	Foreign Reference	Ref22.pdf	2859364 863a37dbaacf7f5c702e98a7749009b2a3d8bff1	no	71
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Information:					
9	Foreign Reference	Ref23.pdf	48125 665c24bafcc351a58daa042fe47c6f0fe1d5810e	no	2
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10	Foreign Reference	Ref24.pdf	50181 9f42f8cc2a0d2d7b93effd8e39435c95b05f93e6	no	1
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11	Foreign Reference	Ref25.pdf	3250394 4f88f73a2103c21a8e1dbb88d4e0f85cb53752f5	no	30
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12	Foreign Reference	Ref30.pdf	7658095 7e1b5f89a43a10bcfe01358d60ebd3489c1f4979	no	55
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15	NPL Documents	Ref33.pdf	40317 9697d26651ce1f3c421a35a3b9fe34e2c3915667	no	1
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38	NPL Documents	Ref56.pdf	3447032 4c691fd4fc7f9dabfe8b8fc3079dce1d5c7bec38	no	52
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39	NPL Documents	Ref57.pdf	60789 0849a047e62f12c98c03d95be0d5a473c81e83c2	no	4
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44	NPL Documents	Ref62.pdf	487654 24df30a28d7bb84d72771ccf17c77b94f412a488	no	20
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45	NPL Documents	Ref63.pdf	727194 ab1c73b225920d4f8ceaeb1978d938d6519276d2	no	28
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Information:					
50	NPL Documents	Ref68.pdf	36903 9aa1de439ab82ce849b99d790090d8c50d899203	no	1
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51	NPL Documents	Ref69.pdf	859301 42003494980987451fab02b3bcae2e258a6921ce	no	21
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52	NPL Documents	Ref70.pdf	155178 ada22cc0a41f932ae992e9305c5a82088a40b4a1	no	6
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53	NPL Documents	Ref71.pdf	141718 e69fc98ab4dde8adfb5230a2db5323d8ad97c3b0	no	3
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Information:					
54	NPL Documents	Ref72.pdf	459849 f781759cccc32ca0d7a80a54778d6c0f1e0ee980	no	7
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55	NPL Documents	Ref73.pdf	2137943 cfb99442a94a3b40824eaa5c8e8b88659680a4ba	no	33
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56	NPL Documents	Ref74.pdf	1025069 519a0723b74994d568fb0dcf14608fa15bfe190c	no	12
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57	NPL Documents	Ref75.pdf	720967 2b6ce21a5955bd15490d755f2adeeb94d1d20436	no	8
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58	NPL Documents	Ref76.pdf	1395102 17b6b8c48996b3876effea909ef9ab1b0e515b5e	no	20
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60	Fee Worksheet (PTO-06)	fee-info.pdf	29665 eb5218886358944963 5ebe7ef04cf77210e3abd0	no	2
Warnings:					
Information:					

Total Files Size (in bytes):	55221355

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Customer No. 27614
Confirmation No. 3531

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Examiner: Kurr, Jason R.
Art Unit: 2614

Re:	Our file:	99879-00003
	Applicant:	Ira Marlowe
	Serial No.:	11/071,667
	Filed:	03/03/2005
	For:	Multimedia Device Integration System

Sir:

Enclosed for filing in the United States Patent and Trademark Office is the following:

1. Response to Restriction Requirement (17 pages)
2. Petition for Extension of Time Under 37 CFR 1.136(a) (1 page)
3. Transmittal of Information Disclosure Statement (2 pages)
4. Form PTO/SB/08A (2 pages)
5. Form PTO/SB/08B (5 pages)
6. Copies of References 20-25 and 30 from Form PTO/SB08A
7. Copies of References 31-77 from Form PTO/SB08B
8. Transmittal Sheet (1 page)

CONDITIONAL PETITION

If any extension of time is required for the submission of the above-identified items, Applicant requests that this be considered a petition therefor. Please charge any additional charges or any other charges relating to this matter, or credit any overpayment, to the Deposit Account of the writer, **Account No. 503571.**

4/2/2009
Date

Respectfully submitted,

Mark E.

Mark E. Nikolsky
Registration No. 48,319
McCarter & English, LLP
Four Gateway Center
100 Mulberry Street
Newark, NJ 07102
Tel: (973) 639-6987
Fax: (973) 297-6624

CERTIFICATE OF ELECTRONIC FILING

I hereby certify that this correspondence is being electronically filed with the United States Patent and Trademark Office (via EFS-Web) on 4/2/09.

Janelle Fava

Janelle Fava

ME1 6864630v.1

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a) (Small Entity)	Docket No. **99879-00003**

In Re Application Of: **Ira Marlowe**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
11/071,667	**03/03/2005**	**Kurr, Jason R.**	**27614**	**2614**	**3531**

Invention: **Multimedia Device Integration System**

COMMISSIONER FOR PATENTS:

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a response to the Office Action of **10/10/2008** (*Date*) in the above-identified application.

The requested extension is as follows (check time period desired):

☐ One month ☐ Two months ☐ Three months ☐ Four months ☒ Five months

from: **11/10/2008** (*Date*) until: **04/10/2009** (*Date*)

☒ Applicant claims small entity status. See 37 CFR 1.27

The fee for the extension of time is **$1,175** and is to be paid as follows:

☐ A check in the amount of the fee is enclosed.

☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account No. **503571**

☒ If an additional extension of time is required, please consider this a petition therefor and charge any additional fees which may be required to Deposit Account No. **503571**

☐ Payment by credit card. Form PTO-2038 is attached.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

Mark E. Nikolsky

Signature

Dated: 4/2/2009

Mark E. Nikolsky
Registration No. 48,319
McCarter & English, LLP
Four Gateway Center
100 Mulberry Street
Newark, NJ 07102
Tel: (973) 639-6987
Fax: (973) 297-6624

I certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to the "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)] on

______________.
(Date)

Signature of Person Mailing Correspondence

Typed or Printed Name of Person Mailing Correspondence

cc:

P12SMALL/REV09

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 11/071,667	Filing Date 03/03/2005	☐ To be Mailed

APPLICATION AS FILED – PART I

FOR	NUMBER FILED (Column 1)	NUMBER EXTRA (Column 2)	SMALL ENTITY ☒ RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
			TOTAL			TOTAL	

* If the difference in column 1 is less than zero, enter “0” in column 2.

APPLICATION AS AMENDED – PART II

AMENDMENT	04/02/2009	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 36	Minus	** 36	= 0	X $26 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 12	Minus	***12	= 0	X $110 =	0	OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD’L FEE	**0**	OR	TOTAL ADD’L FEE	

AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD’L FEE		OR	TOTAL ADD’L FEE	

* If the entry in column 1 is less than the entry in column 2, write “0” in column 3.
** If the “Highest Number Previously Paid For” IN THIS SPACE is less than 20, enter “20”.
*** If the “Highest Number Previously Paid For” IN THIS SPACE is less than 3, enter “3”.
The “Highest Number Previously Paid For” (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/JASON B. EADDY/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/071,667	03/03/2005	Ira M. Marlowe	99879/00003	3531

7590 10/10/2008

Michael R. Friscia
McCarter & English, LLP
Four Gateway Center
100 Mulberry Street
Newark, NJ 07102

EXAMINER	
KURR, JASON RICHARD	

ART UNIT	PAPER NUMBER
2614	

MAIL DATE	DELIVERY MODE
10/10/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Office Action Summary	Application No.	Applicant(s)
	11/071,667	MARLOWE, IRA M.
	Examiner	Art Unit
	JASON R. KURR	2615

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 1 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 March 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) _____ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-36* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-10 and 36, drawn to a multimedia device integration system for interfacing an aftermarket device with a car audio/visual system, classified in class 381, subclass 86.

II. Claims 14-31, drawn to multimedia device integration system comprising protocol conversion software for converting signals from a car audio/visual system into a format compatible with an aftermarket device, classified in class 710, subclass 105.

III. Claims 32-35, drawn to a method of retrieving a song from a database, classified in class 707, subclass 1.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are directed to related products. The related inventions are distinct if: (1) the inventions as claimed are either not capable of use together or can have a materially different design, mode of operation, function, or effect; (2) the inventions do not overlap in scope, i.e., are mutually exclusive; and (3) the inventions as claimed are not obvious variants. See MPEP § 806.05(j). In the instant case, the inventions as claimed have a different design and mode of operation. The invention of group I does not require data protocol translation between the car audio/visual system and the aftermarket device. Group I merely discloses processing and dispatching commands in a compatible format, thus protocol translation is not required.

Furthermore, the inventions as claimed do not encompass overlapping subject matter and there is nothing of record to show them to be obvious variants.

Inventions (I or II) and III are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product. See MPEP § 806.05(h). In the instant case the method of retrieving songs from database of songs is not limited to the products of Groups I and II. The products may be used in alternative process, such as exchanging video or GPS information for display by the car audio/visual system.

Restriction for examination purposes as indicated is proper because all these inventions listed in this action are independent or distinct for the reasons given above and there would be a serious search and examination burden if restriction were not required because one or more of the following reasons apply:

(a) the inventions have acquired a separate status in the art in view of their different classification;

(b) the inventions have acquired a separate status in the art due to their recognized divergent subject matter;

(c) the inventions require a different field of search (for example, searching different classes/subclasses or electronic resources, or employing different search queries);

(d) the prior art applicable to one invention would not likely be applicable to another invention;

(e) the inventions are likely to raise different non-prior art issues under 35 U.S.C. 101 and/or 35 U.S.C. 112, first paragraph.

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a invention to be examined even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing the elected invention**.

The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable on the elected invention.

If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

Should applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

This application contains claims directed to the following patentably distinct species of the claimed invention. If an election of Group I is made, a further election of a related species must also be made.

Group I: Species 1 is drawn to a multimedia device integration system for interfacing a car stereo system with a cellular telephone as in figure 11a, claims 5-10.

Group I: Species 2 is drawn to a multimedia device integration system for interfacing a car video system with an after-market video device such as a DVD player as in figure 12a, claims 11-13.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, claims 1-4 and 36 are generic.

There is an examination and search burden for these patentably distinct species due to their mutually exclusive characteristics. The species require a different field of search (e.g., searching different classes/subclasses or electronic resources, or employing different search queries); and/or the prior art applicable to one species would not likely be applicable to another species; and/or the species are likely to raise different non-prior art issues under 35 U.S.C. 101 and/or 35 U.S.C. 112, first paragraph.

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a species to be examined even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing the elected species**, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

The election of the species may be made with or without traverse. To preserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the election of species requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable on the elected species.

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the species unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other species.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which depend from or otherwise require all the limitations of an allowable generic claim as provided by 37 CFR 1.141.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JASON R. KURR whose telephone number is (571)272-0552. The examiner can normally be reached on M-F 10:00am to 6:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on (571) 273-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jason R Kurr/
Examiner, Art Unit 2615

/Vivian Chin/
Supervisory Patent Examiner, Art Unit 2615

Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
	11/071,667	MARLOWE, IRA M.	
	Examiner	**Art Unit**	
	JASON R. KURR	2615	

Index of Claims	Application/Control No.	Applicant(s)/Patent under Reexamination	
	11/071,667	MARLOWE, IRA M.	
	Examiner	**Art Unit**	
	JASON R. KURR	2615	

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
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Claim		Date								
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PATENT & TRADEMARK OFFICE

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Customer No. 27614

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Re:	Our file:	99879-00003	Examiner: Not Yet Assigned
	Applicant:	Ira Marlowe	Art Unit: 2618
	Serial No.:	11/071,667	
	Filing Date:	03/03/2005	
	Title:	Multimedia Device Integration System	

Sir:

Enclosed for filing in the United States Patent and Trademark Office is the following:

1. Transmittal of Information Disclosure Statement
2. Form PTO-1449 (3 pages)
3. Copies of References 10, 11 and 20 from Form PTO-1449
4. Transmittal Sheet
5. Postcard Receipt

CONDITIONAL PETITION

If any extension of time is required for the submission of the above-identified items, Applicant requests that this be considered a petition therefor. Please charge any additional charges or any other charges relating to this matter, or credit any overpayment, to the Deposit Account of the writer, **Account No. 503571.** A duplicate copy of this letter is enclosed.

2/13/07
Date

Respectfully submitted,

Michael R. Fiscia
Registration No. 33,884
McCarter & English, LLP
Four Gateway Center
100 Mulberry Street
Newark, NJ 07102
Tel: (973) 639-8493
Fax: (973) 297-6627

Check One and Complete:

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By: Janelle Fava

TRANSMITTAL OF INFORMATION DISCLOSURE STATEMENT (Under 37 CFR 1.97(b) or 1.97(c))	Docket No. 99879-00003

In Re Application Of: **Ira Marlowe**

FEB 15 2007

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
11/071,667	03/03/2005	Not Yet Assigned	27614	2618	3531

Title: **Multimedia Device Integration System**

Address to:
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

37 CFR 1.97(b)

1. ☒ The Information Disclosure Statement submitted herewith is being filed within three months of the filing of a national application other than a continued prosecution application under 37 CFR 1.53(d); within three months of the date of entry of the national stage as set forth in 37 CFR 1.491 in an international application; before the mailing of a first Office Action on the merits, or before the mailing of a first Office Action after the filing of a request for continued examination under 37 CFR 1.114.

37 CFR 1.97(c)

2. ☐ The Information Disclosure Statement submitted herewith is being filed after the period specified in 37 CFR 1.97(b), provided that the Information Disclosure Statement is filed before the mailing date of a Final Action under 37 CFR 1.113, a Notice of Allowance under 37 CFR 1.311, or an Action that otherwise closes prosecution in the application, and is accompanied by one of:

☐ the statement specified in 37 CFR 1.97(e);

OR

☐ the fee set forth in 37 CFR 1.17(p).

P10A/REV06

TRANSMITTAL OF INFORMATION DISCLOSURE STATEMENT (Under 37 CFR 1.97(b) or 1.97(c))	Docket No. 99879-00003

In Re Application of: **Ira Marlowe**

OIPE FEB 15 2007 PATENT & TRADEMARK OFFICE

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
11/071,667	03/03/2005	Not Yet Assigned	27614	2618	3531

Title: **Multimedia Device Integration System**

Payment of Fee
(Only complete if Applicant elects to pay the fee set forth in 37 CFR 1.17(p))

☐ A check in the amount of is attached.
☒ The Director is hereby authorized to charge and credit Deposit Account No. 503571 as described below.
- ☐ Charge the amount of
- ☒ Credit any overpayment.
- ☒ Charge any additional fee required.

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2/13/07
(Date)

Janelle Fava
Signature of Person Mailing Correspondence

Janelle Fava

Typed or Printed Name of Person Mailing Certificate

***This certificate may only be used if paying by deposit account.**

Signature

Dated: 2/13/07

Michael R. Friscia
Registration No. 33,884
McCarter & English, LLP
Four Gateway Center
100 Mulberry Street
Newark, NJ 07102
Tel: (973) 639-8493
Fax: (973) 297-6627

cc:

P10A/REV06

INFORMATION DISCLOSURE CITATION (Use several sheets if necessary)	Docket Number (Optional): 99879-00003	Application Number: 11/071,667
	Applicant(s): Ira Marlowe	
	Filing Date: 03/03/2005	Group Art Unit: 2618

OIPE FEB 15 2007 PATENT & TRADEMARK OFFICE

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	1	6,993,615	01/31/2006	Falcon	710	303	11/15/2002
	2	6,653,948	11/25/2003	Kunimatsu, et al.	340	995.19	06/05/2000
	3	6,648,661	11/18/2003	Byrne, et al.	439	188	11/08/2002
	4	6,591,085	07/08/2003	Grady	455	42	07/17/2002
	5	6,374,177	04/16/2002	Lee, et al.	701	200	09/20/2000

U.S. PATENT APPLICATION PUBLICATIONS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	6	US 2004/0151327 A1	08/05/2004	Marlowe	381	86	12/10/2003
	7	US 2004/0091123 A1	05/13/2004	Stark, et al.	381	86	11/08/2002
	8	US 2003/0215102 A1	11/20/2003	Marlowe	381	77	12/11/2002
	9	US 2003/0053638 A1	03/20/2003	Yasuhara	381	86	09/13/2002

FOREIGN PATENT DOCUMENTS

	REF	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation YES	Translation NO

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	REF	
	10	"Blitz Safe Offers XM Cables for Radios," printout from website http://www.twice.com/article/CA190041.html?text=blitz+safe (2 pages)
	11	"Integration Products May Impact Satellite Radio," printout from website http://www.twice.com/article/CA200541.html?text=blitz+safe (3 pages)

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Form PTO-A820
(also form PTO-1449)

P09A/REV05

Patent and Trademark Office * U.S. DEPARTMENT OF COMMERCE

SHEET 1 OF 3

INFORMATION DISCLOSURE CITATION (Use several sheets if necessary)	Docket Number (Optional): 99879-00003	Application Number: 11/071,667
	Applicant(s): Ira Marlowe	
	Filing Date: 03/03/2005	Group Art Unit: 2618

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	12	6,346,917	02/12/2002	Fuchs, et al.	343	713	11/09/2000
	13	6,295,033	09/25/2001	Chatzipetros, et al.	343	713	05/25/1999
	14	6,163,079	12/19/2000	Miyazaki, et al.	307	10.1	07/23/1998
	15	6,058,319	05/02/2000	Sadler	455	569	03/05/1997
	16	6,052,603	04/18/2000	Kinzalow, et al.	455	557	09/18/1997

U.S. PATENT APPLICATION PUBLICATIONS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	17	US 2002/0197954 A1	12/26/2002	Schmitt, et al.	455	41	12/31/2001
	18	US 2002/0180767 A1	12/05/2002	Northway, et al.	345	698	06/04/2001
	19	US 2002/0085730 A1	07/04/2002	Holland	381	334	11/19/2001

FOREIGN PATENT DOCUMENTS

	REF	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation YES	Translation NO

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	20	"OEM Integration Poised for Strong Growth," printout from website http://www.twice.com/article/CA200523.html?text=blitz+safe (3 pages)

EXAMINER	DATE CONSIDERED

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(also form PTO-1449)

P09A/REV05

Patent and Trademark Office * U.S. DEPARTMENT OF COMMERCE

INFORMATION DISCLOSURE CITATION *(Use several sheets if necessary)*	Docket Number (Optional) 99879-00003	Application Number 11/071,667
	Applicant(s) Ira Marlowe	
	Filing Date 03/03/2005	Group Art Unit 2618

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	21	5,794,164	08/11/1998	Beckert, et al.	701	1	11/29/1995

U.S. PATENT APPLICATION PUBLICATIONS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE

FOREIGN PATENT DOCUMENTS

	REF	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation YES	Translation NO

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EXAMINER	DATE CONSIDERED

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

OIPE SEP 0 2 2005 IAP85 PATENT & TRADEMARK OFFICE

Customer No. 27614

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Re:	Our file:	99879-00003	Examiner: Not Yet Assigned
	Applicant:	Ira Marlowe	Art Unit: 2681
	Serial No.:	11/071,667	
	Filing Date:	03/03/2005	
	Title:	Multimedia Device Integration System	

Sir:

Enclosed for filing in the United States Patent and Trademark Office is the following:

1. Transmittal of Information Disclosure Statement
2. Form PTO-1449 (10 pages)
3. Copies of References 10-11, 18-19, 25-26 and 31-96 from Form PTO-1449
4. Transmittal Sheet
5. Postcard Receipt

CONDITIONAL PETITION

If any extension of time is required for the submission of the above-identified items, Applicant requests that this be considered a petition therefor. Please charge any additional charges or any other charges relating to this matter, or credit any overpayment, to the Deposit Account of the writer, **Account No. 503571.** A duplicate copy of this letter is enclosed.

Respectfully submitted,

8/31/05
Date

Michael R. Friscia
Registration No. 33,884
McCarter & English, LLP
Four Gateway Center
100 Mulberry Street
Newark, NJ 07102
Tel: (973) 639-8493
Fax: (973) 297-6627

Check One and Complete:

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By: Janelle Fava
Janelle Fava

TRANSMITTAL OF INFORMATION DISCLOSURE STATEMENT (Under 37 CFR 1.97(b) or 1.97(c))	Docket No. 99879-00003

In Re Application Of: **Ira Marlowe**

O I P E
SEP 0 2 2005
PATENT & TRADEMARK OFFICE

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
11/071,667	03/03/2005	Not Yet Assigned	27614	2681	3531

Title: **Multimedia Device Integration System**

Address to:
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

37 CFR 1.97(b)

1. ☒ The Information Disclosure Statement submitted herewith is being filed within three months of the filing of a national application other than a continued prosecution application under 37 CFR 1.53(d); within three months of the date of entry of the national stage as set forth in 37 CFR 1.491 in an international application; before the mailing of a first Office Action on the merits, or before the mailing of a first Office Action after the filing of a request for continued examination under 37 CFR 1.114.

37 CFR 1.97(c)

2. ☐ The Information Disclosure Statement submitted herewith is being filed after the period specified in 37 CFR 1.97(b), provided that the Information Disclosure Statement is filed before the mailing date of a Final Action under 37 CFR 1.113, a Notice of Allowance under 37 CFR 1.311, or an Action that otherwise closes prosecution in the application, and is accompanied by one of:

   ☐ the statement specified in 37 CFR 1.97(e);

   OR

   ☐ the fee set forth in 37 CFR 1.17(p).

P10A/REV05

TRANSMITTAL OF INFORMATION DISCLOSURE STATEMENT (Under 37 CFR 1.97(b) or 1.97(c))	Docket No. 99879-00003

In Re Application of: **Ira Marlow**

SEP 0 2 2005 OIPE PATENT & TRADEMARK OFFICE

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
11/071,667	03/03/2005	Not Yet Assigned	27614	2681	3531

Title: **Multimedia Device Integration System**

Payment of Fee

(Only complete if Applicant elects to pay the fee set forth in 37 CFR 1.17(p))

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(Date)

Signature of Person Mailing Correspondence

Janelle Fava

Typed or Printed Name of Person Mailing Certificate

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Signature

Dated: 8/31/05

Michael R. Friscia
Registration No. 33,884
McCarter & English, LLP
Four Gateway Center
100 Mulberry Street
Newark, NJ 07102
Tel: (973) 639-8493
Fax: (973) 297-6627

cc:

P10A/REV05

INFORMATION DISCLOSURE CITATION (Use several sheets if necessary)	Docket Number (Optional): 99879-00003	Application Number: 11/071,667
	Applicant(s): Ira Marlowe	
	Filing Date: 03/03/2005	Group Art Unit: 2681

OIPE SEP 0 2 2005 PATENT & TRADEMARK OFFICE

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	1	6,629,197	09/30/2003	Bhogal, et al.	711	111	11/03/2000
	2	6,396,164	05/28/2002	Barnea, et al.	307	10.1	10/20/1999
	3	6,389,332	05/14/2002	Hess, et al.	701	1	05/01/2000
	4	6,330,337	12/11/2001	Nicholson, et al.	381	86	01/19/2000
	5	6,278,697	08/21/2001	Brody, et al.	370	310	07/29/1997

U.S. PATENT APPLICATION PUBLICATIONS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	6	US 2002/0091863 A1	07/11/2002	Schug	709	250	10/19/2001
	7	US 2002/0133610 A1	09/19/2002	Hadland	709	230	05/03/2002
	8	US 2003/0086699 A1	05/08/2003	Benyamin, et al.	386	96	02/15/2002
	9	US 2003/0007649 A1	01/09/2003	Riggs	381	86	06/14/2002

FOREIGN PATENT DOCUMENTS

	REF	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation YES	Translation NO

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	REF	
	10	"Blitzsafe Overview," from Blitzsafe.com website-"The Worldwide Leader in Aftermarket Interfaces and OEM Engineering" (1 page).
	11	"Delphi XM SKYFI(TM) RADIO," product description from XM Satellite Radio website (2 pages).

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

INFORMATION DISCLOSURE CITATION (Use several sheets if necessary)	Docket Number (Optional): 99879-00003	Application Number: 11/071,667
	Applicant(s): Ira Marlowe	
	Filing Date: 03/03/2005	Group Art Unit: 2681

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	12	6,157,725	12/05/2000	Becker	381	86	12/10/1997
	13	6,005,488	12/21/1999	Symanov, et al.	340	825.56	12/03/1997
	14	5,410,675	04/25/1995	Shreve, et al.	395	500	09/17/1993
	15	5,339,362	08/16/1994	Harris	381	86	01/07/1992
	16	4,943,978	07/24/1990	Rice	375	1	01/17/1989

U.S. PATENT APPLICATION PUBLICATIONS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	17	US 2001/0044664 A1	11/22/2001	Mueller, et al.	700	94	03/23/2001

FOREIGN PATENT DOCUMENTS

	REF	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation YES	Translation NO

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	18	The New Delphi XM SKYFi Radio Add it to Any Car or Home Audio System, product description from www.xmradio.com (1 page).
	19	Mobile Electronics: News, "Soundgate to Release New GM and BMW Interfaces," December 2, 2002, ME-Mag.com (1 page).

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

INFORMATION DISCLOSURE CITATION *(Use several sheets if necessary)*	Docket Number (Optional) 99879-00003	Application Number 11/071,667
	Applicant(s) Ira Marlowe	
	Filing Date 03/03/2005	Group Art Unit 2681

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	20	4,817,130	03/28/1989	Frimmel, Jr.	379	88	12/05/1986
	21	Re. 34,536	02/08/1994	Frimmel, Jr.	379	88	06/28/1990
	22	4,772,079	09/20/1988	Douglas, et al.	312	257	09/26/1986
	23	4,562,533	12/31/1985	Hodel, et al.	364	200	08/20/1984
	24	4,234,919	11/18/1980	Bruce, et al.	364	200	10/31/1978

U.S. PATENT APPLICATION PUBLICATIONS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE

FOREIGN PATENT DOCUMENTS

	REF	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation YES	Translation NO

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	25	"Welcome to Ventura Technology," from Venturatechnology.com (2 pages).
	26	Ventura Technology product descriptions from www.venturatechnoogy.net (1 page).

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

INFORMATION DISCLOSURE CITATION *(Use several sheets if necessary)*	Docket Number (Optional) 99879-00003	Application Number 11/071,667
	Applicant(s) Ira Marlowe	
	Filing Date 03/03/2005	Group Art Unit 2681

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	27	4,091,455	05/23/1978	Woods, et al.	364	200	12/20/1976
	28	4,068,104	01/10/1978	Werth, et al.	179	175.3	05/14/1976
	29	4,047,162	09/06/1977	Dorey, et al.	364	200	04/28/1975
	30	3,940,743	02/24/1976	Fitzgerald	340	172.5	11/05/1973

U.S. PATENT APPLICATION PUBLICATIONS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE

FOREIGN PATENT DOCUMENTS

	REF	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation YES	Translation NO

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	REF	
	31	"Phatnoice Digital Media Players," product description from http:\\www.phatnoise.com
	32	"Automedia," magazine pages from June/July 1996 issue (2 pages).

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

INFORMATION DISCLOSURE CITATION *(Use several sheets if necessary)*	Docket Number (Optional) 99879-00003	Application Number 11/071,667
	Applicant(s) Ira Marlowe	
	Filing Date 03/03/2005	Group Art Unit 2681

*EXAMINER INITIAL		OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*
	33	"Automedia," magazine pages from January 1998 issue (2 pages).
	34	"Automedia," magazine pages from February 1998 issue (2 pages).
	35	"Automedia," magazine pages from July 1998 issue (2 pages).
	36	"Automedia," magazine pages from September 1998 issue (2 pages).
	37	"Automedia," magazine pages from November 1998 issue (12 pages).
	38	"Automedia," magazine pages from February 1999 issue (2 pages).
	39	"Automedia," magazine pages from February 1999 issue (2 pages).
	40	"Car Stereo Review," magazine pages from June 1998 issue (5 pages).
	41	"Car Stereo Review," magazine pages from January 1999 issue (2 pages).
	42	"Car Stereo Review," magazine pages from April 1999 issue (3 pages).
	43	"Car Audio and Electronics," magazine pages from December 1998 issue (2 pages).
	44	"Car Audio and Electronics," magazine pages from April 1999 issue (2 pages).

EXAMINER	DATE CONSIDERED

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P09B/REV04

INFORMATION DISCLOSURE CITATION *(Use several sheets if necessary)*	Docket Number (Optional) 99879-00003	Application Number 11/071,667
	Applicant(s) Ira Marlowe	
	Filing Date 03/03/2005	Group Art Unit 2681

*EXAMINER INITIAL		OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*
	45	"Car Audio and Electronics," magazine pages from June 1999 issue (2 pages).
	46	"Carsound," magazine pages from May/June 1999 issue (2 pages).
	47	"Mobile Electronics Retailer," magazine pages from August 1997 issue (4 pages).
	48	"Mobile Electronics Retailer," magazine pages from July 1999 issue (7 pages).
	49	"Mobile Electronics Retailer," magazine pages from August 2000 issue (2 pages).
	50	"Cesmobile," magazine pages from January 1999 issue (3 pages).
	51	"The 12 Volt News," magazine pages from March 2002 issue (2 pages).
	52	"P.I.E. Millennium Price Guide Make the Precision Decision," Precision Interface Electronics, Inc. (6 pages).
	53	"PIE 1999 Price Guide," Precision Interface Electronics, Inc. (4 pages).
	54	"Design & Engineering Showcase Award," award presented to Precision Interface Electronics, Inc. for DPX Technology Digital Protocol Converter FRDN/PC-KNW, 2000 International CES.
	55	"Design & Engineering Showcase Award," award presented to Precision Interface Electronics, Inc. for DPX Technology Digital Protocol Converter GM9/PC-KNW, 2000 International CES.
	56	Invoice dated January 28, 1998 from Precision Interface Electronics, Inc. for "Ford FCU-Sanyo Protocol," and "Ford RCU Sanyo Protocol."

EXAMINER	DATE CONSIDERED

*EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

INFORMATION DISCLOSURE CITATION (Use several sheets if necessary)	Docket Number (Optional) 99879-00003	Application Number 11/071,667
	Applicant(s) Ira Marlowe	
	Filing Date 03/03/2005	Group Art Unit 2681

*EXAMINER INITIAL		OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)
	57	Invoice dated January 29, 1999 from Precision Interface Electronics, Inc. for "Ford NCU-Sanyo Protocol."
	58	Invoice dated April 26, 1999 from Precision Interface Electronics, Inc. for "9 Pin GM-Kenwood Protocol," and "10 Pin GM-Kenwood Protocol."
	59	Invoice dated April 27, 1999 from Precision Interface Electronics, Inc. for "9 Pin GM-Kenwood Protocol."
	60	Invoice dated May 27, 1999 from Precision Interface Electronics, Inc. for "10 Pin GM-Kenwood Protocol," and "9 Pin GM-Kenwood Protocol."
	61	Invoice dated March 20, 2000 from Precision Interface Electronics, Inc. for "98-2000 Pre-Wired VW 6 DIS."
	62	Invoice dated March 20, 2000 from Precision Interface Electronics, Inc. for "98-2000 Pre-Wired VW 8 DIS," and "1998-2000 Audi to Pan 8 PC."
	63	Invoice dated December 17, 2001 from Precision Interface Electronics, Inc. for "98-02 Ford/Lincoln/Mercury."
	64	Invoice dated December 17, 2001 from Precision Interface Electronics, Inc. for "98-02 Ford/Lincoln/Mercury."
	65	Invoice dated May 29, 2002 from Precision Interface Electronics, Inc. for "95-01 GMC/Chev/Pontiac AUX," and "98-02 Ford/Lincoln/Merc AU."
	66	Toyota/Avox Interface Rev. Eng., Peripheral Model TIAS, created February 15, 1998 (1 page).
	67	GM/Kenwood Translator diagram, created February 4, 1999 (2 pages).
	68	Ford/Audiovox Translator diagram, created December 29, 1997 (2 pages).

EXAMINER	DATE CONSIDERED

*EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

P09B/REV04

INFORMATION DISCLOSURE CITATION (Use several sheets if necessary)	Docket Number (Optional) 99879-00003	Application Number 11/071,667
	Applicant(s) Ira Marlowe	
	Filing Date 03/03/2005	Group Art Unit 2681

*EXAMINER INITIAL		OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)
	69	Component Side Silkscreen, created December 31, 1997 (2 pages).
	70	Component Xray, created February 4, 1999 (2 pages).
	71	SoundGate, Ventura Announce Sophisticated OEM-Integration Interfaces, article from The 12 Volt News, December 2002 (1 page).
	72	XMDirect Smart Digital Adapter, product description (3 pages).
	73	Breaking Protocol A Look at BlitzSafe's New DMX Protocol Converter Technology, November 1998 printout from http://www.blitzsafe.com/blitz_news/news101998/body_news101998.html (2 pages).
	74	PIE Virtual Catalog, printout from http://web.archive.org/web/19981205005802/http:/www.pie.net/sec12sb1.htm (2 pages).
	75	The UniLink Project, printout from website (2 pages)
	76	CD Changer Interfaces, printout from http://web.archive.org/web/19991012021952/soundgate.com/cd-inter.html (1 page).
	77	Digital Obsessions A Spotlight on Audio Gadgetry, ZDNet Music: The PhatNoise Car Audio System, printout from http://web.archive.org/web/20000817164605/music.gamespot.com/features/phatnoise/ (3 pages).
	78	Bypassing and Switching With the CD4053 CMOS Analog MUX, printout from website (4 pages).
	79	Device Profile: Phatnoise PhatBox Car MP3 Player, November 1, 2000, printout from http://techupdate.zdnet.com/techupdate/stories/main/0,14179,2649276,00.html (4 pages).
	80	The EZ Protoboard, printout from http://web.archive.org/web/20010613095105/http:/www.ajusd.org/~edward/ezproto/ (2 pages).

EXAMINER	DATE CONSIDERED

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P09B/REV04

INFORMATION DISCLOSURE CITATION *(Use several sheets if necessary)*	Docket Number (Optional) 99879-00003	Application Number 11/071,667
	Applicant(s) Ira Marlowe	
	Filing Date 03/03/2005	Group Art Unit 2681

*EXAMINER INITIAL		OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*
	81	TDIClub Forums: Reverse Engineering CD Changer Progress, April 3, 2001, printout from website (3 pages).
	82	TDIClub Forums: Reverse Engineering CD Changer Progress Reports, April 5, 2001, printout from website (8 pages).
	83	Multi Technology Equipment - Home of the Neo MP3 Player, printout from http://web.archive.org/web/20010413222617/ssiamerica.com/products/neo35/ (1 page).
	84	TDIClub Forums: Reverse Engineering CD Changer Protocol Update, April 18, 2001, printout from website (3 pages).
	85	The Car CD Changer Interface Page, printout from website (10 pages).
	86	SourceForge.net: Project Info - GNUlink, printout from http://sourceforge.net/projects/gnunilink/ (3 pages).
	87	EZ Protoboard News, printout from website (3 pages).
	88	GNUnilink - For All Your AUX-IN Needs..., printout from http://gnunilink.sourceforge.net/ (4 pages).
	89	VWCDPIC News, printout from http://web.archive.org/web/20020701101541/http:/www.ajusd.org/~edward/vwcdpic/ (8 pages).
	90	VWCDPIC News, printout from http://web.archive.org/web/20021009014959/http:/www.ajusd.org/~edward/vwcdpic/ (10 pages).
	91	Neo Car Jukebox MP3 Player, printout from website (3 pages).
	92	Mobile Electronic E-Newsletter dated January 13, 2005 (4 pages).

EXAMINER	DATE CONSIDERED

*EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

P09B/REV04

INFORMATION DISCLOSURE CITATION (Use several sheets if necessary)	Docket Number (Optional) 99879-00003	Application Number 11/071,667
	Applicant(s) Ira Marlowe	
	Filing Date 03/03/2005	Group Art Unit 2681

*EXAMINER INITIAL		OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)
	93	"Axxess Introduces Two iPod Integration Units" product description dated January 19, 2005 (1 page).
	94	"Even More iPod Adapters On the Way," printout from twice.com website (2 pages).
	95	"Alpine Showing First MOST-Ready Product," printout from twice.com website (2 pages).
	96	"Bluetooth Gradually Enters Car Audio," prinout from twice.com website (2 pages).

EXAMINER	DATE CONSIDERED

*EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

P09B/REV04

SHEET 10 OF 10

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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APPLICATION NUMBER	FILING OR 371(c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/071,667	03/03/2005	Ira M. Marlowe	99879/00003

CONFIRMATION NO. 3531

WITHDRAWAL NOTICE

OC000000016462099

Michael R. Friscia
McCarter & English, LLP
Four Gateway Center
100 Mulberry Street
Newark, NJ 07102

Date Mailed: 07/07/2005

WITHDRAWAL OF PREVIOUSLY SENT NOTICE

It has come to the attention of the Office that the Notice mailed on 06/02/2005 was sent in error. The Notice is hereby withdrawn. The application is complete and will be processed for examination. The Official Filing Receipt is enclosed. The office regrets any inconvenience the error may have caused.

A copy of this notice MUST be returned with the reply.

C. M. Haywood

Customer Service Center
Initial Patent Examination Division (703) 308-1202

PART 3 - OFFICE COPY

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
11/071,667	03/03/2005	Ira M. Marlowe	99879/00003

CONFIRMATION NO. 3531

FORMALITIES LETTER

OC000000016165667

Michael R. Friscia
McCarter & English, LLP
Four Gateway Center
100 Mulberry Street
Newark, NJ 07102

Date Mailed: 06/02/2005

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- A $50.00 processing fee is required since your check was returned without payment (37 CFR 1.21(m)).

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is **$.00** for a Small Entity

- **$.00** Surcharge for bounced check.

Replies should be mailed to: Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

A copy of this notice MUST be returned with the reply.

Office of Initial Patent Examination (703) 308-1202

PART 3 - OFFICE COPY

Express Mail Label No. EV623709633US

030305 15866 U.S. PTO

UTILITY PATENT APPLICATION TRANSMITTAL
(Small Entity)

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Docket No.
99879/00003
Total Pages in this Submission
123

COMMISSIONER FOR PATENTS
P.O. Box 1450
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Transmitted herewith for filing under 35 U.S.C. 111(a) and 37 C.F.R. 1.53(b) is a new utility patent application for an invention entitled:

Multimedia Device Integration System

112959 U.S. PTO 11/071667 030305

and invented by:

Ira Marlowe

If a CONTINUATION APPLICATION, *check appropriate box and supply the requisite information:*

☐ **Continuation** ☐ **Divisional** ☒ **Continuation-in-part (CIP)** of prior application No.: 10/732,909

Which is a:

☐ **Continuation** ☐ **Divisional** ☒ **Continuation-in-part (CIP)** of prior application No.: 10/316,961

Which is a:

☐ **Continuation** ☐ **Divisional** ☐ **Continuation-in-part (CIP)** of prior application No.: ______

Enclosed are:

Application Elements

1. ☒ Filing fee as calculated and transmitted as described below

2. ☒ Specification having 82 pages and including the following:

   a. ☒ Descriptive Title of the Invention

   b. ☒ Cross References to Related Applications *(if applicable)*

   c. ☐ Statement Regarding Federally-sponsored Research/Development *(if applicable)*

   d. ☐ Reference to Sequence Listing, a Table, or a Computer Program Listing Appendix

   e. ☒ Background of the Invention

   f. ☒ Brief Summary of the Invention

   g. ☒ Brief Description of the Drawings *(if filed)*

   h. ☒ Detailed Description

   i. ☒ Claim(s) as Classified Below

   j. ☒ Abstract of the Disclosure

UTILITY PATENT APPLICATION TRANSMITTAL
(Small Entity)

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Docket No.
99879/00003

Total Pages in this Submission
123

Application Elements (Continued)

3. ☒ Drawing(s) *(when necessary as prescribed by 35 USC 113)*
   - a. ☐ Formal Number of Sheets ____________
   - b. ☒ Informal Number of Sheets **34**
4. ☒ Oath or Declaration
   - a. ☒ Newly executed *(original or copy)* ☐ Unexecuted
   - b. ☐ Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional application only)*
   - c. ☒ With Power of Attorney ☐ Without Power of Attorney
   - d. ☐ DELETION OF INVENTOR(S)
     Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. 1.63(d)(2) and 1.33(b).
5. ☐ Incorporation By Reference *(usable if Box 4b is checked)*
   The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. ☐ CD ROM or CD-R in duplicate, large table or Computer Program (Appendix)
7. ☐ Application Data Sheet (See 37 CFR 1.76)
8. ☐ Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all must be included)*
   - a. ☐ Computer Readable Form (CFR)
   - b. ☐ Specification Sequence Listing on:
     - i. ☐ CD-ROM or CD-R (2 copies); or
     - ii. ☐ Paper
   - c. ☐ Statement(s) Verifying Identical Paper and Computer Readable Copy

Accompanying Application Parts

9. ☐ Assignment Papers (cover sheet & document(s))
10. ☐ 37 CFR 3.73(B) Statement (when there is an assignee)
11. ☐ English Translation Document (if applicable)
12. ☐ Information Disclosure Statement/PTO-1449 ☐ Copies of IDS Citations
13. ☐ Preliminary Amendment
14. ☒ Return Receipt Postcard (MPEP 503) (Should be specifically itemized)
15. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)
16. ☒ Certificate of Mailing
    ☐ First Class ☒ Express Mail *(Specify Label No.)*: **EV623709633US**

UTILITY PATENT APPLICATION TRANSMITTAL (Small Entity) *(Only for new nonprovisional applications under 37 CFR 1.53(b))*	Docket No. 99879/00003
	Total Pages in this Submission 123

Accompanying Application Parts (Continued)

17. ☒ Applicant claims small entity status. See 37 CFR 1.27.
    - ☐ (Optional) Small Entity Statement(s) - Specify Number of Statements Submitted: ____________

18. ☐ Additional Enclosures *(please identify below)*:

Request That Application Not Be Published Pursuant To 35 U.S.C. 122(b)(2)

19. ☐ Pursuant to 35 U.S.C. 122(b)(2), Applicant hereby requests that this patent application not be published pursuant to 35 U.S.C. 122(b)(1). Applicant hereby certifies that the invention disclosed in this application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication of applications 18 months after filing of the application.

Warning

An applicant who makes a request not to publish, but who subsequently files in a foreign country or under a multilateral international agreement specified in 35 U.S.C. 122(b)(2)(B)(i), must notify the Director of such filing not later than 45 days after the date of the filing of such foreign or international application. A failure of the applicant to provide such notice within the prescribed period shall result in the application being regarded as abandoned, unless it is shown to the satisfaction of the Director that the delay in submitting the notice was unintentional.

UTILITY PATENT APPLICATION TRANSMITTAL
(Small Entity)

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Docket No.
99879/00003

Total Pages in this Submission
123

Fee Calculation and Transmittal

CLAIMS AS FILED					
For	#Filed	#Allowed	#Extra	Rate	Fee
Total Claims	36	- 20 =	16	x $25.00	$400.00
Indep. Claims	12	- 3 =	9	x $100.00	$900.00
Multiple Dependent Claims (check if applicable) ☐					$0.00
Total # of Pages in Specification	82	**Total # of Drawing Sheets**	34		
Total # of Pages	116			**Application Size Fee**	$125.00
				Basic Fee	$150.00
				Search Fee	$250.00
				Examination Fee	$100.00
OTHER FEE *(specify purpose)*					$0.00
				TOTAL FILING FEE	$1,925.00

☒ A check in the amount of **$1,775.00** to cover the filing fee is enclosed.

☒ The Director is hereby authorized to charge and credit Deposit Account No. **501402** as described below.

- ☒ Charge the amount of **$150.00** as filing fee.
- ☐ Credit any overpayment.
- ☒ Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.
- ☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.311(b).

☐ Payment by credit card. Form PTO-2038 is attached.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

Dated: 3/3/05

Signature

Michael R. Friscia
Registration No. 33,884
McCarter & English, LLP
Four Gateway Center
100 Mulberry Street
Newark, NJ 07102
Tel: (973) 639-8493

Customer Number: **27614**

cc:

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Re: Our file: 99879/00003
Applicant: Ira Marlowe
Serial No.:
Filing Date:
Title: Multimedia Device Integration System

Sir:

Enclosed for filing in the United States Patent and Trademark Office is the following:

1. Utility Patent Application (82 pages)
2. Drawings, FIGS. 1-17 (34 pages)
3. Utility Patent Application Transmittal (Small Entity)
4. Declaration and Power of Attorney
5. Check No. 3371 for $1775.00
6. Transmittal Sheet
7. Postcard Receipt

CONDITIONAL PETITION

If any extension of time is required for the submission of the above-identified items, Applicant requests that this be considered a petition therefor. Please charge any additional charges or any other charges relating to this matter to deposit account of the writer, **Account No. 501402.** A duplicate copy of this letter is enclosed.

Respectfully submitted,

3/3/05
Date

Michael R. Friscia
Registration No. 33,884
McCarter & English, LLP
Four Gateway Center
100 Mulberry Street
Newark, NJ 07102
Tel: (973) 639-8493
Fax: (973) 624-7070

I hereby certify that this correspondence is being deposited with the United States Postal Service, postage prepaid, as "Express Mail Post Office to Addressee," Mailing Label No. EV623709633US to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on 3/3/05.

By: Janelle Fava
Janelle Fava

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INVENTOR: IRA MARLOWE

TITLE: MULTIMEDIA DEVICE INTEGRATION SYSTEM

SPECIFICATION

BACKGROUND OF THE INVENTION

RELATED APPLICATIONS

This application is a continuation-in-part of U.S. Patent Application Serial No. 10/732,909 filed December 10, 2003, now U.S. Patent No. _______, which is a continuation-in-part of U.S. Patent Application Serial No. 10/316,961 filed December 11, 2002, now U.S. Patent No. ________, the entire disclosures of which applications are both expressly incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to a multimedia device integration system. More specifically, the present invention relates to a multimedia device integration system for integrating after-market components such as satellite receivers, CD players, CD changers, digital media devices (*e.g.*, MP3 players, MP4 players, WMV players, Apple iPod devices, portable media centers, and other devices), Digital Audio Broadcast (DAB) receivers, auxiliary audio sources, video devices (*e.g.*, DVD players), cellular telephones, and other devices for use with factory-installed (OEM) or after-market car stereo and video systems.

RELATED ART

Automobile audio systems have continued to advance in complexity and the number of options available to automobile purchasers. Early audio systems offered a simple AM and/or FM tuner, and perhaps an analog tape deck for allowing cassettes, 8-tracks, and other types of tapes to be played while driving. Such early systems were closed, in that external devices could not be easily integrated therewith.

With advances in digital technology, CD players have been included with automobile audio systems. Original Equipment Manufacturers (OEMs) often produce car stereos having CD players and/or changers for allowing CDs to be played while driving. However, such systems often include proprietary buses and protocols that do not allow after-market audio systems, such as satellite receivers (e.g., XM satellite tuners), digital audio broadcast (DAB) receivers, digital media players (*e.g.*, Apple iPod, MP3, MP4, WMV, etc.), CD changers, auxiliary input sources, video devices (*e.g.*, DVD players), cellular telephones, and the like, to be easily integrated therewith. Thus, automobile purchasers are frequently forced to either entirely replace the OEM audio system, or use same throughout the life of the vehicle or the duration of ownership. Even if the OEM radio is replaced with an after-market radio, the after-market radio also frequently is not operable with an external device.

A particular problem with integrating after-market audio and video systems with existing car stereo and video systems is that signals generated by both systems are in proprietary formats, and are not capable of being processed by the after-market system. Additionally, signals generated by the after-market system are also in a proprietary format that is not recognizable by the car stereo or video system. Thus, in order to integrate after-market systems with existing car stereo and video systems, it is necessary to convert signals between such systems.

It known in the art to provide one or more expansion modules for OEM and after-market car stereos for allowing external audio products to be integrated with the car stereo. However, such expansion modules only operate with and allow integration of external audio products manufactured by the same manufacturer as the OEM / after-market car stereo. For example, a satellite receiver manufactured by PIONEER, Inc., cannot be integrated with an OEM car radio manufactured by TOYOTA or an after-market car radio manufactured by CLARION, Inc. Thus, existing expansion modules only serve the limited purpose of integrating equipment by the same manufacturer as the car stereo. Thus, it would be desirable to provide an integration system that allows any audio device of any manufacture to be integrated with any OEM or after-market radio system. Further, radio-frequency (RF) transmitters and cassette tape adapters have been developed for allowing music from a device external to a car radio, such as a portable CD player, to be played through the car radio using the FM receiver or the cassette deck of the radio. However, such systems are often prone to interference, and do not provide high fidelity.

Moreover, it would be desirable to provide an integration system that not only achieves integration of various audio and video devices that are alien to a given OEM or after-market car stereo or video system, but also allows for information to be exchanged between the after-market device and the car stereo or video system. For example, it would be desirable to provide a system wherein station, track, time, and song information can be retrieved from the after-market device, formatted, and transmitted to the car stereo or video system for display thereby, such as at an LCD panel of the car stereo or on one or more display panels of a car video system. Such information could be transmitted and displayed on both hardwired car stereo and video systems (*e.g.*, radios installed in dashboards or at other locations within the car), or integrated for display on one or more software or graphically-driven radio systems operable with graphical display panels. Additionally, it would be desirable to provide a multimedia device integration system that allows a user to control more than one device, such as a CD or satellite receiver and one or more auxiliary sources, and to quickly and conveniently switch between same using the existing controls of the car stereo or video system.

Accordingly, the present invention addresses these needs by providing a multimedia device integration system that allows a plurality of after-market devices, such as CD players, CD changers, digital media devices (*e.g.*, MP3 players, MP4 players, Apple iPod, WMV players, portable media centers, and other devices), satellite receivers, DAB receivers, auxiliary input sources, video devices (*e.g.*, DVD players), cellular telephones, or any combination thereof, to be integrated into existing car stereo and video systems while allowing information to be displayed on, and control to be provided from, the car stereo or video system.

SUMMARY OF THE INVENTION

The present invention relates to a multimedia device integration system. One or more after-market audio devices, such as CD players, CD changers, digital media devices (*e.g.*, MP3 players, MP4 players, WMV players, Apple iPod devices, portable media centers, and other devices), satellite receivers (*e.g.*, XM or Sirius receivers), digital audio broadcast (DAB) receiver, or auxiliary input sources, can be connected to and operate with an existing stereo system in an automobile, such as an OEM car stereo system or an after-market car stereo system installed in the automobile. The integration system connects to and interacts with the car stereo at any available port of the car stereo, such as a CD input port, a satellite input, or other known type of connection. If the car stereo system is an after-market car stereo system, the present invention generates a signal that is sent to the car stereo to keep same in an operational state and responsive to external data and signals. Commands generated at the control panel are received by the present invention and converted into a format recognizable by the after-market device. The formatted commands are executed by the after-market device, and audio therefrom is channeled to the car stereo. Information from the after-market device is received by the present invention, converted into a format recognizable by the car stereo, and forwarded to the car stereo for display thereby. The formatted information could include information relating to a CD or MP3 track being played, channel, song, and artist information from a satellite receiver or DAB receiver, or video information from one or more external devices connected to the present invention. The information can be presented as one or more menus, textual, or graphical prompts for display on an LCD display of the radio, allowing interaction with the user at the radio. A docking port may be provided for allowing portable external audio devices to be connected to the interface of the present invention.

In an embodiment of the present invention, a dual-input device is provided for integrating both an external audio device and an auxiliary input with an OEM or after-market car stereo. The user can select between the external audio device and the auxiliary input using the controls of the car stereo. The invention can automatically detect the type of device connected to the auxiliary input, and integrate same with the car stereo.

In another embodiment of the present invention, an interface is provided for integrating a plurality of auxiliary input sources with an existing car stereo system. A user can select between the auxiliary sources using the control panel of the car stereo. One or more after-market audio devices can be integrated with the auxiliary input sources, and a user can switch between the audio device and the auxiliary input sources using the car stereo. Devices connected to the auxiliary input sources are inter-operable with the car stereo, and are capable of exchanging commands and data via the interface.

In another embodiment of the present invention, an interface is provided for integrating an external device for use with a car stereo or video system, wherein the interface is positioned within the car stereo or video system. The system comprises a car stereo or video system; an after-market device external to the car stereo or video system; an interface positioned within the car stereo or video system and connected between the car stereo or video system and the after-market device for exchanging data and audio or video signals between the car stereo or video system and the after-market device; means for processing and dispatching commands for controlling the after-market device from the car stereo or video system in a format compatible with the after-market device; and means for processing and displaying data from the after-market device on a display of the car stereo or video system in a format compatible with the car stereo or video system. The after-market device could comprise one or more of a CD changer, CD player, satellite receiver (*e.g.*, XM or Sirius), digital media device (*e.g.*, MP3, MP4, WMV, or Apple iPod device), video device (*e.g.*, DVD player), cellular telephone, or any combination thereof.

In another embodiment of the present invention, an interface is provided for integrating a cellular telephone for use with a car stereo or video system. The system comprises a car stereo or video system; a cellular telephone external to the car stereo or video system; an interface connected between the car stereo or video system and the cellular telephone for exchanging data and audio or video signals between the car stereo or video system and the cellular telephone; means for processing and dispatching commands for controlling the cellular telephone from the car stereo or video system in a format compatible with the cellular telephone; and means for processing and displaying data from the cellular telephone on a display of the car stereo or video system in a format compatible with the car stereo or video system.

In another embodiment of the present invention, an interface is provided for integrating an external video system for use with a car video system. The system comprises a car video system; an after-market video device external to the car video system; an interface connected between the car video system and the after-market video device for exchanging data, audio, and video signals between the car video system and the after-market video device; means for processing and dispatching commands for controlling the after-market video device from the car video system in a format compatible with the after-market video device; and means for processing and displaying data from the after-market video device on a display of the car video system in a format compatible with the car video system.

The present invention also provides an interface for integrating a plurality of after-market devices for use with a car stereo or video system using a single interface. In one embodiment, the system comprises an interface in electrical communication with a car stereo or video system and an after-market device; a plurality of configuration jumpers in the interface for specifying a first device type corresponding to the car stereo or video system and a second device type corresponding to the after-market device; and a plurality of protocol conversion software blocks stored in memory in the interface for converting signals from the after-market device into a first format compatible with the car stereo or video system and for converting signals from the car stereo or video system into a second format compatible with the after-market device, wherein at least one of the protocol conversion software blocks are selected by the interface using settings of the plurality of configuration jumpers. In another embodiment, the system comprises an interface in electrical communication with a car stereo or video system and an after-market device; first and second wiring harnesses attached to the interface, wherein the first wiring harness includes a first electrical configuration corresponding to the car stereo or video system and the second wiring harness includes a second electrical configuration corresponding to the after-market device; and a plurality of protocol conversion software blocks stored in memory in the interface for converting signals from the after-market device into a first format compatible with the car stereo or video system and for converting signals from the car stereo or video system into a second format compatible with the after-market device, wherein at least one of the protocol conversion software blocks are selected by the interface using the first and second electrical configurations of the first and second wiring harnesses. A plurality of wiring harnesses can be provided for integrating a plurality of devices.

The present invention also provides a method for integrating an after-market device for use with a car stereo or video system, comprising the steps of interconnecting the car stereo or video system and the after-market device with an interface; determining a first device type corresponding to the car stereo or video system and a second device type corresponding to the after-market device; loading a protocol conversion software block from memory in the interface using the first and second device types; converting signals from the after-market device into a first format compatible with the car stereo or video system using the protocol conversion software block; and converting signals from the car stereo or video system into a second format compatible with the after-market device using the protocol conversion software block.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other important objects and features of the invention will be apparent from the following Detailed Description of the Invention, taken in connection with the accompanying drawings, in which:

FIG. 1 is a block diagram showing the multimedia device integration system of the present invention.

FIG. 2a is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein a CD player is integrated with a car radio.

FIG. 2b is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein a MP3 player is integrated with a car radio.

FIG. 2c is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein a satellite or DAB receiver is integrated with a car radio.

FIG. 2d is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein a plurality of auxiliary input sources are integrated with a car radio.

FIG. 2e is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein a CD player and a plurality of auxiliary input sources are integrated with a car radio.

FIG. 2f is a block diagram showing an alternate embodiment of the present invention, wherein a satellite or DAB receiver and a plurality of auxiliary input source are integrated with a car radio.

FIG. 2g is a block diagram showing an alternate embodiment of the present invention, wherein a MP3 player and a plurality of auxiliary input sources are integrated with a car radio.

FIG. 2h is a block diagram showing an alternate embodiment of the present invention, wherein a plurality of auxiliary interfaces and an audio device are integrated with a car stereo.

FIG. 3a is a circuit diagram showing a device according to the present invention for integrating a CD player or an auxiliary input source with a car radio.

FIG. 3b is a circuit diagram showing a device according to the present invention for integrating both a CD player and an auxiliary input source with a car radio, wherein the CD player and the auxiliary input are switchable by a user.

FIG. 3c is a circuit diagram showing a device according to the present invention for integrating a plurality of auxiliary input sources with a car radio.

FIG. 3d is a circuit diagram showing a device according to the present invention for integrating a satellite or DAB receiver with a car radio.

FIG. 4a is a flowchart showing processing logic according to the present invention for integrating a CD player with a car radio.

FIG. 4b is a flowchart showing processing logic according to the present invention for integrating a MP3 player with a car radio.

FIG. 4c is a flowchart showing processing logic according to the present invention for integrating a satellite receiver with a car radio.

FIG. 4d is a flowchart showing processing logic according to the present invention for integrating a plurality of auxiliary input sources with a car radio.

FIG. 4e is a flowchart showing processing logic according to the present invention for integrating a CD player and one or more auxiliary input sources with a car radio.

FIG. 4f is a flowchart showing processing logic according to the present invention for integrating a satellite or DAB receiver and one or more auxiliary input sources with a car radio.

FIG. 4g is a flowchart showing processing logic according to the present invention for integrating a MP3 player and one or more auxiliary input sources with a car stereo.

FIG. 5 is a flowchart showing processing logic according to the present invention for allowing a user to switch between an after-market audio device and one or more auxiliary input sources.

FIG. 6 is a flowchart showing processing logic according to the present invention for determining and handling various device types connected to the auxiliary input ports of the invention.

FIG. 7a is a perspective view of a docking station according to the present invention for retaining an audio device within a car.

FIG. 7b is an end view of the docking station of **FIG. 7a**.

FIGS. 8a-8b are perspective views of another embodiment of the docking station of the present invention, which includes the multimedia device integration system of the present invention incorporated therewith.

FIG. 9 is a block diagram showing the components of the docking station of **FIGS. 8a-8b**.

FIG. 10 is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein the interface is incorporated within a car stereo or car video system.

FIG. 11a is a diagram showing an alternate embodiment of the multimedia device integration system of the present invention for integrating a cellular telephone for use with a car stereo or video system; **FIG. 11b** is a flowchart showing processing logic for integrating a cellular telephone for use with a car stereo or video system.

FIG. 12a is a diagram showing an alternate embodiment of the multimedia device integration system of the present invention for integrating an after-market video device for use with a car video system; **FIG. 12b** is a flowchart showing processing logic for integrating an after-market video device for use with a car video system.

FIG. 13a is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein configuration jumpers and protocol conversion software blocks are provided for integrating after-market devices of various types using a single interface.

FIG. 13b is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein wiring harnesses and protocol conversion software blocks are provided for integrating after-market devices of various types using a single interface.

FIG. 14 is a flowchart showing processing logic of the multimedia device integration system of the present invention for integrating after-market devices of various types using a single interface.

FIG. 15 is a flowchart showing processing logic of the multimedia device integration system of the present invention for allowing a user to specify one or more after-market device types for integration using a single interface.

FIG. 16 is a flowchart showing processing logic of the multimedia device integration system of the present invention for allowing a user to quickly navigate through a list of songs on one or more after-market devices using the controls of a car stereo or video system.

FIG. 17 is a diagram showing an another embodiment of the present invention, wherein a plurality of external devices are integrated using a single interface.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a multimedia device integration system. One or more after-market devices, such as a CD player, CD changer, digital media player (*e.g.*, MP3 player, MP4 player, WMV player, Apple iPod, portable media center, or other device), satellite receiver, digital audio broadcast (DAB) receiver, video device (*e.g.*, DVD player), cellular telephone, or the like, can be integrated with an existing car radio or car video device, such as an OEM or after-market car stereo or video system. Control of the after-market device is enabled using the car stereo or car video system, and information from the after-market device, such as channel, artist, track, time, song, and other information information, is retrieved form the after-market device, processed, and forwarded to the car stereo or car video system for display thereon. The information channeled to the car stereo or video system can include video from the external device, as well as graphical and menu-based information. A user can review and interact with information via the car stereo. Commands from the car stereo or video system are received, processed by the present invention into a format recognizable by the after-market device device, and transmitted thereto for execution. One or more auxiliary input channels can be integrated by the present invention with the car stereo or video system. The user can switch between one or more after-market devices and one or more auxiliary input channels using the control panel buttons of the car stereo or video system.

As used herein, the term "integration" or "integrated" is intended to mean connecting one or more external devices or inputs to an existing car stereo or video system via an interface, processing and handling signals, audio, and/or video information, allowing a user to control the devices via the car stereo or video system, and displaying data from the devices on the car stereo or video system. Thus, for example, integration of a CD player with a car stereo system allows for the CD player to be remotely controlled via the control panel of the stereo system, and data from the CD player to be sent to the display of the stereo. Of course, control of after-market devices can be provided at locations other than the control panel of the car stereo or video system without departing from the spirit or scope of the present invention. Further, as used herein, the term "inter-operable" is intended to mean allowing the external audio or video device to receive and process commands that have been formatted by the interface of the present invention, as well as allowing a car stereo or video system to display information that is generated by the external audio or video device and processed by the present invention. Additionally, by the term "inter-operable," it is meant allowing a device that is alien to the environment of an existing OEM or after-market car stereo or video system to be utilized thereby.

Also, as used herein, the terms "car stereo" and "car radio" are used interchangeably and are intended to include all presently existing car stereos, radios, video systems, such as physical devices that are present at any location within a vehicle, in addition to software and/or graphically- or display-driven receivers. An example of such a receiver is a software-driven receiver that operates on a universal LCD panel within a vehicle and is operable by a user via a graphical user interface displayed on the universal LCD panel. Further, any future receiver, whether a hardwired or a software/graphical receiver operable on one or more displays, is considered within the definition of the terms "car stereo" and "car radio," as used herein, and is within the spirit and scope of the present invention. Moreover, the term "car" is not limited to any specific type of automobile, but rather, includes all automobiles. Additionally, by the term "after-market," it is meant any device not installed by a manufacturer at the time of sale of the car.

FIG. 1 is a block diagram showing the multimedia device integration (or interface) system of the present invention, generally indicated at **20**. A plurality of devices and auxiliary inputs can be connected to the interface **20**, and integrated with an OEM or after-market car radio **10**. A CD player or changer **15** can be integrated with the radio **10** via interface **20**. A satellite radio or DAB receiver **25**, such as an XM or Sirius radio satellite receiver or DAB receiver known in the art, could be integrated with the radio **10**, via the interface **20**. Further, an MP3 player **30** could also be integrated with the radio **10** via interface **20**. The MP3 player **30** could be any known digital media device, such as an Apple iPod or any other digital media device. Moreover, a plurality of auxiliary input sources, illustratively indicated as auxiliary input sources **35** (comprising input sources 1 through *n*, *n* being any number), could also be integrated with the car radio **10** via interface **20**. Optionally, a control head **12**, such as that commonly used with after-market CD changers and other similar devices, could be integrated with the car radio **10** via interface **20**, for controlling any of the car radio **10**, CD player/changer **15**, satellite/DAB receiver **25**, MP3 player **30**, and auxiliary input sources **35**. Thus, as can be readily appreciated, the interface **20** of the present invention allows for the integration of a multitude of devices and inputs with an OEM or after-market car radio or stereo.

FIG. 2a is a block diagram of an alternate embodiment of the multimedia device interface system of the present invention, wherein a CD player/changer **15** is integrated with an OEM or after-market car radio **10**. The CD player **15** is electrically connected with the interface

20, and exchanges data and audio signals therewith. The interface **20** is electrically connected with the car radio **10**, and exchanges data and audio signals therewith. In a preferred embodiment of the present invention, the car radio **10** includes a display **13** (such as an alphanumeric, electroluminescent display) for displaying information, and a plurality of control panel buttons **14** that normally operate to control the radio **10**. The interface **20** allows the CD player **15** to be controlled by the control buttons **14** of the radio **10**. Further, the interface **20** allows information from the CD player **15**, such as track, disc, time, and song information, to be retrieved therefrom, processed and formatted by the interface **20**, sent to the display **13** of the radio **10**.

Importantly, the interface **20** allows for the remote control of the CD player **15** from the radio **10** (e.g., the CD player **15** could be located in the trunk of a car, while the radio **10** is mounted on the dashboard of the car). Thus, for example, one or more discs stored within the CD player **15** can be remotely selected by a user from the radio **10**, and tracks on one or more of the discs can be selected therefrom. Moreover, standard CD operational commands, such as pause, play, stop, fast forward, rewind, track forward, and track reverse (among other commands) can be remotely entered at the control panel buttons **14** of the radio **10** for remotely controlling the CD player **15**.

FIG. 2b is a block diagram showing an alternate embodiment of the present invention, wherein an MP3 player **30** is integrated with an OEM or after-market car radio **10** via interface **20**. As mentioned earlier, the interface **20** of the present invention allows for a plurality of disparate audio devices to be integrated with an existing car radio for use therewith. Thus, as shown in **FIG. 2b**, remote control of the MP3 player **30** via radio **10** is provided for via interface **20**. The MP3 player **30** is electronically interconnected with the interface **20**, which itself is electrically interconnected with the car radio **10**. The interface **20** allows data and audio signals to be exchanged between the MP3 player **30** and the car radio **10**, and processes and formats signals accordingly so that instructions and data from the radio **10** are processable by the MP3 player **30**, and vice versa. Operational commands, such as track selection, pause, play, stop, fast forward, rewind, and other commands, are entered via the control panel buttons **14** of car radio **10**, processed by the interface **20**, and formatted for execution by the MP3 player **30**. Data from the MP3 player, such as track, time, and song information, is received by the interface **20**, processed thereby, and sent to the radio **10** for display on display **13**. Audio from the MP3 player **30** is selectively forwarded by the interface **20** to the radio **10** for playing.

FIG. 2c is a block diagram showing an alternate embodiment of the present invention, wherein a satellite receiver or DAB receiver **25** is integrated with an OEM or after-market car radio **10** via the interface **20**. Satellite/DAB receiver **25** can be any satellite radio receiver known in the art, such as XM or Sirius, or any DAB receiver known in the art. The satellite/DAB receiver **25** is electrically interconnected with the interface **20**, which itself is electrically interconnected with the car radio **10**. The satellite/DAB receiver **25** is remotely operable by the control panel buttons **14** of the radio **10**. Commands from the radio **10** are received by the interface **20**, processed and formatted thereby, and dispatched to the satellite/DAB receiver **25** for execution thereby. Information from the satellite/DAB receiver **25**, including time, station, and song information, is received by the interface **20**, processed, and transmitted to the radio **10** for display on display **13**. Further, audio from the satellite/DAB receiver **25** is selectively forwarded by the interface **20** for playing by the radio **10**.

FIG. 2d is a block diagram showing an alternate embodiment of the present invention, wherein one or more auxiliary input sources **35** are integrated with an OEM or after-market car radio **10**. The auxiliary inputs **35** can be connected to analog sources, or can be digitally coupled with one or more audio devices, such as after-market CD players, CD changers, MP3 players, satellite receivers, DAB receivers, and the like, and integrated with an existing car stereo. Preferably, four auxiliary input sources are connectable with the interface **20**, but any number of auxiliary input sources could be included. Audio from the auxiliary input sources **35** is selectively forwarded to the radio **10** under command of the user. As will be discussed herein in greater detail, a user can select a desired input source from the auxiliary input sources **35** by depressing one or more of the control panel buttons **14** of the radio **10**. The interface **20** receives the command initiated from the control panel, processes same, and connects the corresponding input source from the auxiliary input sources **35** to allow audio therefrom to be forwarded to the radio **10** for playing. Further, the interface **20** determines the type of audio devices connected to the auxiliary input ports **35**, and integrates same with the car stereo **10**.

As mentioned previously, the present invention allows one or more external audio devices to be integrated with an existing OEM or after-market car stereo, along with one or more auxiliary input sources, and the user can select between these sources using the controls of the car stereo. Such "dual input" capability allows operation with devices connected to either of the inputs of the device, or both. Importantly, the device can operate in "plug and play" mode, wherein any device connected to one of the inputs is automatically detected by the present invention, its device type determined, and the device automatically integrated with an existing OEM or after-market car stereo. Thus, the present invention is not dependent any specific device type to be connected therewith to operate. For example, a user can first purchase a CD changer, plug same into a dual interface, and use same with the car stereo. At a point later in time, the user could purchase an XM tuner, plug same into the device, and the tuner will automatically be detected and integrated with the car stereo, allowing the user to select from and operate both devices from the car stereo. It should be noted that such plug and play capability is not limited to a dual input device, but is provided for in every embodiment of the present invention. The dual-input configuration of the preset invention is illustrated in **FIGS. 2e-2h** and described below.

FIG. 2e is a block diagram showing an alternate embodiment of the present invention, wherein an external CD player/changer **15** and one or more auxiliary input sources **35** are integrated with an OEM or after-market car stereo **10**. Both the CD player **15** and one or more of the auxiliary input sources **35** are electrically interconnected with the interface **20**, which, in turn, is electrically interconnected to the radio **10**. Using the controls **14** of the radio **10**, a user can select between the CD player **15** and one or more of the inputs **35** to selectively channel audio from these sources to the radio. The command to select from one of these sources is received by the interface **20**, processed thereby, and the corresponding source is channeled to the radio **10** by the interface **20**. As will be discussed later in greater detail, the interface **20** contains internal processing logic for selecting between these sources.

FIG. 2f is a block diagram of an alternate embodiment of the present invention, wherein a satellite receiver or DAB receiver and one or more auxiliary input sources are integrated by the interface **20** with an OEM or after-market car radio **10**. Similar to the embodiment of the present invention illustrated in **FIG. 2e** and described earlier, the interface **20** allows a user to select between the satellite/DAB receiver **25** and one or more of the auxiliary input sources **35** using the controls **14** of the radio **10**. The interface **20** contains processing logic, described in greater detail below, for allowing switching between the satellite/DAB receiver **25** and one or more of the auxiliary input sources **35**.

FIG. 2g is a block diagram of an alternate embodiment of the present invention, wherein a MP3 player **30** and one or more auxiliary input sources **35** are integrated by the interface **20** with an OEM or after-market car radio **10**. Similar to the embodiments of the present invention illustrated in **FIGS. 2e** and **2f** and described earlier, the interface **20** allows a user to select between the MP3 player **30** and one or more of the auxiliary input sources **35** using the controls **14** of the radio **10**. The interface **20** contains processing logic, as will be discussed later in greater detail, for allowing switching between the MP3 player **30** and one or more of the auxiliary input sources **35**.

FIG. 2h is a block diagram showing an alternate embodiment of the present invention, wherein a plurality of auxiliary interfaces **40** and **44** and an audio device **17** are integrated with an OEM or after-market car stereo **10**. Importantly, the present invention can be expanded to allow a plurality of auxiliary inputs to be connected to the car stereo **10** in a tree-like fashion. Thus, as can be seen in **FIG. 2h**, a first auxiliary interface **40** is connected to the interface **20**, and allows data and audio from the ports **42** to be exchanged with the car radio **10**. Connected to one of the ports **42** is another auxiliary interface **44**, which, in turn, provides a plurality of input ports **46**. Any device connected to any of the ports **42** or **46** can be integrated with the car radio **10**. Further, any device connected to the ports **42** or **46** can be inter-operable with the car radio **10**, allowing commands to be entered from the car radio **10** (*e.g.*, such as via the control panel **14**) for commanding the device, and information from the device to be displayed by the car radio **10**. Conceivably, by configuring the interfaces **40**, **44**, and successive interfaces in a tree configuration, any number of devices can be integrated using the present invention.

The various embodiments of the present invention described above and shown in **FIGS. 1** through **2h** are illustrative in nature and are not intended to limit the spirit or scope of the present invention. Indeed, any conceivable audio device or input source, in any desired combination, can be integrated by the present invention into existing car stereo systems. Further, it is conceivable that not only can data and audio signals be exchanged between the car stereo and any external device, but also video information that can be captured by the present invention, processed thereby, and transmitted to the car stereo for display thereby and interaction with a user thereat.

Various circuit configurations can be employed to carry out the present invention. Examples of such configurations are described below and shown in **FIGS. 3a-3d**.

FIG. 3a is an illustrative circuit diagram according to the present invention for integrating a CD player or an auxiliary input source with an existing car stereo system. A plurality of ports **J1C1, J2A1, X2, RCH,** and **LCH** are provided for allowing connection of the interface system of the present invention between an existing car radio, an after-market CD player or changer, or an auxiliary input source. Each of these ports could be embodied by any suitable electrical connector known in the art. Port **J1C1** connects to the input port of an OEM car radio, such as that manufactured by TOYOTA, Inc. Conceivably, port **J1C1** could be modified to allow connection to the input port of an after-market car radio. Ports **J2A1, X2, RCH,** and **LCH** connect to an after-market CD changer, such as that manufactured by PANASONIC, Inc., or to an auxiliary input source.

Microcontroller **U1** is in electrical communication with each of the ports **J1C1**, **J2A1**, and **X2**, and provides functionality for integrating the CD player or auxiliary input source connected to the ports **J2A1, X2, RCH,** and **LCH**. For example, microcontroller **U1** receives control commands, such as button or key sequences, initiated by a user at control panel of the car radio and received at the connector **J1C1**, processes and formats same, and dispatches the formatted commands to the CD player or auxiliary input source via connector **J2A1**. Additionally, the microcontroller **U1** receives information provided by the CD player or auxiliary input source via connector **J2A1**, processes and formats same, and transmits the formatted data to the car stereo via connector **J1C1** for display on the display of the car stereo. Audio signals provided at the ports **J2A1, X2, RCH** and **LCH** is selectively channeled to the car radio at port **J1C1** under control of one or more user commands and processing logic, as will be discussed in greater detail, embedded within microcontroller **U1**.

In a preferred embodiment of the present invention, the microcontroller **U1** comprises the 16F628 microcontroller manufactured by MICROCHIP, Inc. The 16F628 chip is a CMOS, flash-based, 8-bit microcontroller having an internal, 4 MHz internal oscillator, 128 bytes of EEPROM data memory, a capture/compare/PWM, a USART, 2 comparators, and a programmable voltage reference. Of course, any suitable microcontroller known in the art can be substituted for microcontroller **U1** without departing from the spirit or scope of the present invention.

A plurality of discrete components, such as resistors **R1** through **R13**, diodes **D1** through **D4**, capacitors **C1** and **C2**, and oscillator **Y1**, among other components, are provided for interfacing the microcontroller **U1** with the hardware connected to the connectors **J1C1, J2A1, X2, RCH**, and **LCH**. These components, as will be readily appreciated to one of ordinary skill in the art, can be arranged as desired to accommodate a variety of microcontrollers, and the numbers and types of discrete components can be varied to accommodate other similar controllers. Thus, the circuit shown in **FIG. 3a** and described herein is illustrative in nature, and modifications thereof are considered to be within the spirit and scope of the present invention.

FIG. 3b is a diagram showing an illustrative circuit configuration according to the present invention, wherein one or more after-market CD changers / players and an auxiliary input source are integrated with an existing car stereo, and wherein the user can select between the CD changer/player and the auxiliary input using the controls of the car stereo. A plurality of connectors are provided, illustratively indicated as ports **J4A**, **J4B**, **J3**, **J5L1**, **J5R1**, **J1,** and **J2**. Ports **J4A, J4B,** and **J3** allow the audio device interface system of the present invention to be connected to one or more existing car stereos, such as an OEM car stereo or an after-market car stereo. Each of these ports could be embodied by any suitable electrical connector known in the art. For example, ports **J4A** and **J4B** can be connected to an OEM car stereo manufactured by BMW, Inc. Port **J3** can be connected to a car stereo manufactured by LANDROVER, Inc. Of course, any number of car stereos, by any manufacturer, could be provided. Ports **J1** and **J2** allow connection to an after-market CD changer or player, such as that manufactured by ALPINE, Inc., and an auxiliary input source. Optionally, ports **J5L1** and **J5R1** allow integration of a standard analog (line-level) source. Of course, a single standalone CD player or auxiliary input source could be connected to either of ports **J1** or **J2**.

Microcontroller **DD1** is in electrical communication with each of the ports **J4A**, **J4B**, **J3**, **J5L1**, **J5R1**, **J1**, and **J2**, and provides functionality for integrating the CD player and auxiliary input source connected to the ports **J1** and **J2** with the car stereo connected to the ports **J4A** and **J4B** or **J3**. For example, microcontroller **DD1** receives control commands, such as button or key sequences, initiated by a user at control panel of the car radio and received at the connectors **J4A** and **J4B** or **J3**, processes and formats same, and dispatches the formatted commands to the CD player and auxiliary input source via connectors **J1** or **J2**. Additionally, the microcontroller **DD1** receives information provided by the CD player and auxiliary input source via connectors **J1** or **J2**, processes and formats same, and transmits the formatted data to the car stereo via connectors **J4A** and **J4B** or **J3** for display on the display of the car stereo. Further, the microcontroller **DD1** controls multiplexer **DA3** to allow selection between the CD player/changer and the auxiliary input. Audio signals provided at the ports **J1**, **J2**, **J5L1** and **J5R1** is selectively channeled to the car radio at ports **J4A** and **J4B** or **J3** under control of one or more user commands and processing logic, as will be discussed in greater detail, embedded within microcontroller **DD1**.

In a preferred embodiment of the present invention, the microcontroller **DD1** comprises the 16F872 microcontroller manufactured by MICROCHIP, Inc. The 16F872 chip is a CMOS, flash-based, 8-bit microcontroller having 64 bytes of EEPROM data memory, self-programming capability, an ICD, 5 channels of 10 bit Analog-to-Digital (A/D) converters, 2 timers, capture/compare/PWM functions, a USART, and a synchronous serial port configurable as either a 3-wire serial peripheral interface or a 2-wire inter-integrated circuit bus. Of course, any suitable microcontroller known in the art can be substituted for microcontroller **DD1** without departing from the spirit or scope of the present invention. Additionally, in a preferred embodiment of the present invention, the multiplexer **DA3** comprises the CD4053 triple, two-channel analog multiplexer/demultiplexer manufactured by FAIRCHILD SEMICONDUCTOR, Inc. Any other suitable multiplexer can be substituted for **DA3** without departing from the spirit or scope of the present invention.

A plurality of discrete components, such as resistors **R1** through **R18**, diodes **D1** through **D3**, capacitors **C1-C11,** and **G1-G3**, transistors **Q1-Q3,** transformers **T1** and **T2**, amplifiers **LCH:A** and **LCH:B,** oscillator **XTAL1**, among other components, are provided for interfacing the microcontroller **DD1** and the multiplexer **DA3** with the hardware connected to the connectors **J4A, J4B, J3, J5L1, J5R1, J1,** and **J2**. These components, as will be readily appreciated to one of ordinary skill in the art, can be arranged as desired to accommodate a variety of microcontrollers and multiplexers, and the numbers and types of discrete components can be varied to accommodate other similar controllers and multiplexers. Thus, the circuit shown in **FIG. 3b** and described herein is illustrative in nature, and modifications thereof are considered to be within the spirit and scope of the present invention.

FIG. 3c is a diagram showing an illustrative circuit configuration for integrating a plurality of auxiliary inputs using the controls of the car stereo. A plurality of connectors are provided, illustratively indicated as ports **J1**, **RCH1**, **LCH1**, **RCH2**, **LCH2**, **RCH3, LCH3, RCH4,** and **LCH4**. Port **J1** allows the multimedia device integration system of the present invention to be connected to one or more existing car stereos. Each of these ports could be embodied by any suitable electrical connector known in the art. For example, port **J1** could be connected to an OEM car stereo manufactured by HONDA, Inc., or any other manufacturer. Ports **RCH1**, **LCH1**, **RCH2**, **LCH2**, **RCH3**, **LCH3, RCH4,** and **LCH4** allow connection with the left and right channels of four auxiliary input sources. Of course, any number of auxiliary input sources and ports/connectors could be provided.

Microcontroller **U1** is in electrical communication with each of the ports **J1, RCH1, LCH1**, **RCH2**, **LCH2**, **RCH3**, **LCH3**, **RCH4,** and **LCH4,** and provides functionality for integrating one or more auxiliary input sources connected to the ports **RCH1**, **LCH1**, **RCH2, LCH2**, **RCH3**, **LCH3**, **RCH4,** and **LCH4** with the car stereo connected to the port **J1**. Further, the microcontroller **U1** controls multiplexers **DA3** and **DA4** to allow selection amongst any of the auxiliary inputs using the controls of the car stereo. Audio signals provided at the ports **RCH1**, **LCH1**, **RCH2**, **LCH2**, **RCH3**, **LCH3**, **RCH4,** and **LCH4** are selectively channeled to the car radio at port **J1** under control of one or more user commands and processing logic, as will be discussed in greater detail, embedded within microcontroller **U1**. In a preferred embodiment of the present invention, the microcontroller **U1** comprises the 16F872 microcontroller discussed earlier. Additionally, in a preferred embodiment of the present invention, the multiplexers **DA3** and **DA4** comprises the CD4053 triple, two-channel analog multiplexer/demultiplexer, discussed earlier. Any other suitable microcontroller and multiplexers can be substituted for **U1, DA3,** and **DA4** without departing from the spirit or scope of the present invention.

A plurality of discrete components, such as resistors **R1** through **R15**, diodes **D1** through **D3**, capacitors **C1-C5,** transistors **Q1-Q2,** amplifiers **DA1:A** and **DA1:B,** and oscillator **Y1,** among other components, are provided for interfacing the microcontroller **U1** and the multiplexers **DA3** and **DA4** with the hardware connected to the ports **J1**, **RCH1**, **LCH1**, **RCH2**, **LCH2**, **RCH3**, **LCH3**, **RCH4**, and **LCH4**. These components, as will be readily appreciated to one of ordinary skill in the art, can be arranged as desired to accommodate a variety of microcontrollers and multiplexers, and the numbers and types of discrete components can be varied to accommodate other similar controllers and multiplexers. Thus, the circuit shown in **FIG. 3c** and described herein is illustrative in nature, and modifications thereof are considered to be within the spirit and scope of the present invention.

FIG. 3d is an illustrative circuit diagram according to the present invention for integrating a satellite receiver with an existing OEM or after-market car stereo system. Ports **J1** and **J2** are provided for allowing connection of the integration system of the present invention between an existing car radio and a satellite receiver. These ports could be embodied by any suitable electrical connector known in the art. Port **J2** connects to the input port of an existing car radio, such as that manufactured by KENWOOD, Inc. Port **1** connects to an after-market satellite receiver, such as that manufactured by PIONEER, Inc.

Microcontroller **U1** is in electrical communication with each of the ports **J1** and **J2**, and provides functionality for integrating the satellite receiver connected to the port **J1** with the car stereo connected to the port **J2**. For example, microcontroller **U1** receives control commands, such as button or key sequences, initiated by a user at control panel of the car radio and received at the connector **J2**, processes and formats same, and dispatches the formatted commands to the satellite receiver via connector **J2**. Additionally, the microcontroller **U1** receives information provided by the satellite receiver via connector **J1**, processes and formats same, and transmits the formatted data to the car stereo via connector **J2** for display on the display of the car stereo. Audio signals provided at the port **J1** is selectively channeled to the car radio at port **J2** under control of one or more user commands and processing logic, as will be discussed in greater detail, embedded within microcontroller **U1**.

In a preferred embodiment of the present invention, the microcontroller **U1** comprises the 16F873 microcontroller manufactured by MICROCHIP, Inc. The 16F873 chip is a CMOS, flash-based, 8-bit microcontroller having 128 bytes of EEPROM data memory, self-programming capability, an ICD, 5 channels of 10 bit Analog-to-Digital (A/D) converters, 2 timers, 2 capture/compare/PWM functions, a synchronous serial port that can be configured as a either a 3-wire serial peripheral interface or a 2-wire inter-integrated circuit bus, and a USART. Of course, any suitable microcontroller known in the art can be substituted for microcontroller **U1** without departing from the spirit or scope of the present invention.

A plurality of discrete components, such as resistors **R1** through **R7**, capacitors **C1** and **C2**, and amplifier **A1**, among other components, are provided for interfacing the microcontroller **U1** with the hardware connected to the connectors **J1** and **J2**. These components, as will be readily appreciated to one of ordinary skill in the art, can be arranged as desired to accommodate a variety of microcontrollers, and the numbers and types of discrete components can be varied to accommodate other similar controllers. Thus, the circuit shown in **FIG. 3d** and described herein is illustrative in nature, and modifications thereof are considered to be within the spirit and scope of the present invention.

FIGS. 4a through **6** are flowcharts showing processing logic according to the present invention. Such logic can be embodied as software and/or instructions stored in a read-only memory circuit (*e.g.*, and EEPROM circuit), or other similar device. In a preferred embodiment of the present invention, the processing logic described herein is stored in one or more microcontrollers, such as the microcontrollers discussed earlier with reference to **FIGS. 3a-3d**. Of course, any other suitable means for storing the processing logic of the present invention can be employed.

FIG. 4a is a flowchart showing processing logic, indicated generally at **100**, for integrating a CD player or changer with an existing OEM or after-market car stereo system. Beginning in step **100**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **104** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **106** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the car stereo. If a negative determination is made, step **106** is re-invoked.

If a positive determination is made in step **106**, a CD handling process, indicated as block **108**, is invoked, allowing the CD player/changer to exchange data and audio signals with any existing car stereo system. Beginning in step **110**, a signal is generated by the present invention indicating that a CD player/changer is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. If the car radio is an OEM car radio, the CD player presence signal need not be generated. Further, the signal need not be limited to a CD player device presence signal, but rather, could be any type of device presence signal (*e.g.*, MP3 player device presence signal, satellite receiver presence signal, video device presence signal, cellular telephone presence signal, or any other type of device presence signal). Concurrently with step **110**, or within a short period of time before or after the execution of step **110**, steps **112** and **114** are invoked. In step **112**, the audio channels of the CD player/changer are connected (channeled) to the car stereo system, allowing audio from the CD player/changer to be played through the car stereo. In step **114**, data is retrieved by the present invention from the CD player/changer, including track and time information, formatted, and transmitted to the car stereo for display by the car stereo. Thus, information produced by the external CD player/changer can be quickly and conveniently viewed by a driver by merely viewing the display of the car stereo. After steps **110**, **112**, and **114** have been executed, control passes to step **116**.

In steps **116**, the present invention monitors the control panel buttons of the car stereo for CD operational commands. Examples of such commands include track forward, track reverse, play, stop, fast forward, rewind, track program, random track play, and other similar commands. In step **118**, if a command is not detected, step **116** is re-invoked. Otherwise, if a command is received, step **118** invokes step **120**, wherein the received command is converted into a format recognizable by the CD player/changer connected to the present invention. For example, in this step, a command issued from a GM car radio is converted into a format recognizable by a CD player/changer manufactured by ALPINE, Inc. Any conceivable command from any type of car radio can be formatted for use by a CD player/changer of any type or manufacture. Once the command has been formatted, step **122** is invoked, wherein the formatted command is transmitted to the CD player/changer and executed. Step **110** is then re-invoked, so that additional processing can occur.

FIG. 4b is a flowchart showing processing logic, indicated generally at **130**, for integrating an MP3 player with an existing car stereo system. Examples of MP3 players that can be integrated by the present invention include, but are not limited to, the Apple iPod and other types of digital media devices. Beginning in step **132**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **134** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **136** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the car stereo. If a negative determination is made, step **136** is re-invoked.

If a positive determination is made in step **136**, an MP3 handling process, indicated as block **138**, is invoked, allowing the MP3 player to exchange data and audio signals with any existing car stereo system. Beginning in step **140**, a signal is generated by the present invention indicating that an MP3 player is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. In step **142**, the audio channels of the MP3 player are connected (channeled) to the car stereo system, allowing audio from the MP3 player to be played through the car stereo. In step **144**, data is retrieved by the present invention from the MP3 player, including track, time, title, and song information, formatted, and transmitted to the car stereo for display by the car stereo. Thus, information produced by the MP3 player can be quickly and conveniently viewed by a driver by merely viewing the display of the car stereo. After steps **140**, **142**, and **144** have been executed, control passes to step **146**.

In steps **146**, the present invention monitors the control panel buttons of the car stereo for MP3 operational commands. Examples of such commands include track forward, track reverse, play, stop, fast forward, rewind, track program, random track play, and other similar commands. In step **148**, if a command is not detected, step **146** is re-invoked. Otherwise, if a command is received, step **148** invokes step **150**, wherein the received command is converted into a format recognizable by the MP3 player connected to the present invention. For example, in this step, a command issued from a HONDA car radio is converted into a format recognizable by an MP3 player manufactured by PANASONIC, Inc. Any conceivable command from any type of car radio can be formatted for use by an MP3 player of any type or manufacture. Once the command has been formatted, step **152** is invoked, wherein the formatted command is transmitted to the MP3 player and executed. Step **140** is then re-invoked, so that additional processing can occur.

FIG. 4c is a flowchart showing processing logic, indicated generally at **160**, for integrating a satellite receiver or a DAB receiver with an existing car stereo system. Beginning in step **162**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **164** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **166** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the car stereo. If a negative determination is made, step **166** is re-invoked.

If a positive determination is made in step **166**, a satellite/DAB receiver handling process, indicated as block **168**, is invoked, allowing the satellite/DAB receiver to exchange data and audio signals with any existing car stereo system. Beginning in step **170**, a signal is generated by the present invention indicating that a satellite or DAB receiver is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. In step **172**, the audio channels of the satellite/DAB receiver are connected (channeled) to the car stereo system, allowing audio from the satellite receiver or DAB receiver to be played through the car stereo. In step **174**, data is retrieved by the present invention from the satellite/DAB receiver, including channel number, channel name, artist name, song time, and song title, formatted, and transmitted to the car stereo for display by the car stereo. The information could be presented in one or more menus, or via a graphical interface viewable and manipulable by the user at the car stereo. Thus, information produced by the receiver can be quickly and conveniently viewed by a driver by merely viewing the display of the car stereo. After steps **170**, **172**, and **174** have been executed, control passes to step **176**.

In steps **176**, the present invention monitors the control panel buttons of the car stereo for satellite/DAB receiver operational commands. Examples of such commands include station up, station down, station memory program, and other similar commands. In step **178**, if a command is not detected, step **176** is re-invoked. Otherwise, if a command is received, step **178** invokes step **180**, wherein the received command is converted into a format recognizable by the satellite/DAB receiver connected to the present invention. For example, in this step, a command issued from a FORD car radio is converted into a format recognizable by a satellite receiver manufactured by PIONEER, Inc. Any conceivable command from any type of car radio can be formatted for use by a satellite/DAB receiver of any type or manufacture. Once the command has been formatted, step **182** is invoked, wherein the formatted command is transmitted to the satellite/DAB receiver and executed. Step **170** is then re-invoked, so that additional processing can occur.

FIG. 4d is a flowchart showing processing logic, indicated generally at **190**, for integrating a plurality of auxiliary input sources with a car radio. Beginning in step **192**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **194** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **196** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the car stereo. If a negative determination is made, step **196** is re-invoked.

If a positive determination is made in step **196**, an auxiliary input handling process, indicated as block **198**, is invoked, allowing one or more auxiliary inputs to be connected (channeled) to the car stereo. Further, if a plurality of auxiliary inputs exist, the logic of block **198** allows a user to select a desired input from the plurality of inputs. Beginning in step **200**, a signal is generated by the present invention indicating that an external device is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. Then, in step **202**, the control panel buttons of the car stereo are monitored.

In a preferred embodiment of the present invention, each of the one or more auxiliary input sources are selectable by selecting a CD disc number on the control panel of the car radio. Thus, in step **204**, a determination is made as to whether the first disc number has been selected. If a positive determination is made, step **206** is invoked, wherein the first auxiliary input source is connected (channeled) to the car stereo. If a negative determination is made, step **208** is invoked, wherein a second determination is made as to whether the second disc number has been selected. If a positive determination is made, step **210** is invoked, wherein the second auxiliary input source is connected (channeled) to the car stereo. If a negative determination is made, step

212 is invoked, wherein a third determination is made as to whether the third disc number has been selected. If a positive determination is made, step **214** is invoked, wherein the third auxiliary input source is connected (channeled) to the car stereo. If a negative determination is made, step **216** is invoked, wherein a fourth determination is made as to whether the fourth disc number has been selected. If a positive determination is made, step **218** is invoked, wherein the fourth auxiliary input source is connected (channeled) to the car stereo. If a negative determination is made, step **200** is re-invoked, and the process disclosed for block **198** repeated. Further, if any of steps **206**, **210**, **214**, or **218** are executed, then step **200** is re-invoked and block **198** repeated.

The process disclosed in block **198** allows a user to select from one of four auxiliary input sources using the control buttons of the car stereo. Of course, the number of auxiliary input sources connectable with and selectable by the present invention can be expanded to any desired number. Thus, for example, 6 auxiliary input sources could be provided and switched using corresponding selection key(s) or keystroke(s) on the control panel of the radio. Moreover, any desired keystroke, selection sequence, or button(s) on the control panel of the radio, or elsewhere, can be utilized to select from the auxiliary input sources without departing from the spirit or scope of the present invention.

FIG. 4e is a flowchart showing processing logic, indicated generally at **220**, for integrating a CD player and one or more auxiliary input sources with a car radio. Beginning in step **222**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **224** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **226** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the cars stereo. If a negative determination is made, step **226** is re-invoked.

If a positive determination is made in step **226**, then step **228** is invoked, wherein a signal is generated by the present invention indicating that an external device is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. Then, in step **230**, a determination is made as to whether a CD player is present (*i.e.*, whether an external CD player or changer is connected to the multimedia device integration system of the present invention). If a positive determination is made, steps **231** and **232** are invoked. In step **231**, the logic of block **108** of **FIG. 4a** (the CD handling process), described earlier, is invoked, so that the CD player/changer can be integrated with the car stereo and utilized by a user. In step **232**, a sensing mode is ,initiated, wherein the present invention monitors for a selection sequence (as will be discussed in greater detail) initiated by the user at the control panel of the car stereo for switching from the external CD player/changer to one or more auxiliary input sources. Step **234** is then invoked, wherein a determination is made as to whether such a sequence has been initiated. If a negative determination is made, step **234** re-invokes step **228**, so that further processing can occur. Otherwise, if a positive determination is made (*i.e.*, the user desires to switch from the external CD player/changer to one of the auxiliary input sources), step **236** is invoked, wherein the audio channels of the CD player/changer are disconnected from the car stereo. Then, step **238** is invoked, wherein the logic of block **198** of

FIG. 4d (the auxiliary input handling process), discussed earlier, is executed, allowing the user to select from one of the auxiliary input sources. In the event that a negative determination is made in step **230** (no external CD player/changer is connected to the present invention), then step **238** is invoked, and the system goes into auxiliary mode. The user can then select from one or more auxiliary input sources using the controls of the radio.

FIG. 4f is a flowchart showing processing logic, indicated generally at **240**, for integrating a satellite receiver or DAB receiver and one or more auxiliary input sources with a car radio. Beginning in step **242**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **244** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **246** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the car stereo. If a negative determination is made, step **246** is re-invoked.

If a positive determination is made in step **246**, then step **248** is invoked, wherein a signal is generated by the present invention indicating that an external device is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. Then, in step **250**, a determination is made as to whether a satellite receiver or DAB receiver is present (*i.e.*, whether an external satellite receiver or DAB receiver is connected to the multimedia device integration system of the present invention). If a positive determination is made, steps **231** and **232** are invoked. In step **251**, the logic of block **168** of

FIG. 4c (the satellite/DAB receiver handling process), described earlier, is invoked, so that the satellite receiver can be integrated with the car stereo and utilized by a user. In step **252**, a sensing mode is initiated, wherein the present invention monitors for a selection sequence (as will be discussed in greater detail) initiated by the user at the control panel of the car stereo for switching from the external satellite receiver to one or more auxiliary input sources. Step **254** is then invoked, wherein a determination is made as to whether such a sequence has been initiated. If a negative determination is made, step **254** re-invokes step **258**, so that further processing can occur. Otherwise, if a positive determination is made (*i.e.*, the user desires to switch from the external satellite/DAB receiver to one of the auxiliary input sources), step **256** is invoked, wherein the audio channels of the satellite receiver are disconnected from the car stereo. Then, step **258** is invoked, wherein the logic of block **198** of **FIG. 4d** (the auxiliary input handling process), discussed earlier, is executed, allowing the user to select from one of the auxiliary input sources. In the event that a negative determination is made in step **250** (no external satellite/DAB receiver is connected to the present invention), then step **258** is invoked, and the system goes into auxiliary mode. The user can then select from one or more auxiliary input sources using the controls of the radio.

FIG. 4g is a flowchart showing processing logic according to the present invention for integrating an MP3 player and one or more auxiliary input sources with a car stereo. Beginning in step **262**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **264** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **266** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the car stereo. If a negative determination is made, step **266** is re-invoked.

If a positive determination is made in step **266**, then step **268** is invoked, wherein a signal is generated by the present invention indicating that an external device is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. Then, in step **270**, a determination is made as to whether an MP3 player is present (*i.e.*, whether an external MP3 player is connected to the multimedia device integration system of the present invention). If a positive determination is made, steps **271** and **272** are invoked. In step **271**, the logic of block **138** of **FIG. 4b** (the MP3 handling process), described earlier, is invoked, so that the CD player/changer can be integrated with the car stereo and utilized by a user. In step **272**, a sensing mode is initiated, wherein the present invention monitors for a selection sequence (as will be discussed in greater detail) initiated by the user at the control panel of the car stereo for switching from the external CD player/changer to one or more auxiliary input sources. Step **274** is then invoked, wherein a determination is made as to whether such a sequence has been initiated. If a negative determination is made, step **274** re-invokes step **278**, so that further processing can occur. Otherwise, if a positive determination is made (*i.e.*, the user desires to switch from the external MP3 player to one of the auxiliary input sources), step **276** is invoked, wherein the audio channels of the MP3 player are disconnected from the car stereo. Then, step **278** is invoked, wherein the logic of block **198** of **FIG. 4d** (the auxiliary input handling process), discussed earlier, is executed, allowing the user to select from one of the auxiliary input sources. In the event that a negative determination is made in step **270** (no external MP3 player is connected to the present invention), then step **278** is invoked, and the system goes into auxiliary mode. The user can then select from one or more auxiliary input sources using the controls of the radio.

As mentioned previously, to enable integration, the present invention contains logic for converting command signals issued from an after-market or OEM car stereo into a format compatible with one or more external audio devices connected to the present invention. Such logic can be applied to convert any car stereo signal for use with any external device. For purposes of illustration, a sample code portion is shown in **Table 1**, below, for converting control signals from a BMW car stereo into a format understandable by a CD changer:

Table 1

```
;     ==============================================
;     Radio requests changer to STOP (exit PLAY mode)
;     Decoding 6805183801004C message
;     ==============================================

Encode_RD_stop_msg:

      movlw 0x68
      xorwf BMW_Recv_buff,W
      skpz
      return

      movlw 0x05
      xorwf BMW_Recv_buff+1,W
      skpz
      return

      movlw 0x18
      xorwf BMW_Recv_buff+2,W
      skpz
      return

      movlw 0x38
      xorwf BMW_Recv_buff+3,W
      skpz
      return

      movlw 0x01
      xorwf BMW_Recv_buff+4,W
      skpz
```

```
return

tstf  BMW_Recv_buff+5
skpz
return

movlw 0x4C
xorwf BMW_Recv_buff+6,W
skpz
return

bsf   BMW_Recv_STOP_msg
return
```

The code portion shown in **Table 1** receives a STOP command issued by a BMW stereo, in a format proprietary to BMW stereos. Preferably, the received command is stored in a first buffer, such as BMW_Recv_buff. The procedure "Encode_RD_stop_msg" repetitively applies an XOR function to the STOP command, resulting in a new command that is in a format compatible with the after-market CD player. The command is then stored in an output buffer for dispatching to the CD player.

Additionally, the present invention contains logic for retrieving information from an after-market audio device, and converting same into a format compatible with the car stereo for display thereby. Such logic can be applied to convert any data from the external device for display on the car stereo. For purposes of illustration, a sample code portion is shown in **Table 2**, below, for converting data from a CD changer into a format understandable by a BMW car stereo:

Table 2

```
;      ========================================
;      Changer replies with STOP confirmation
;      Encoding 180A68390002003F0001027D message
;      ========================================

Load_CD_stop_msg:
       movlw 0x18
       movwf BMW_Send_buff

       movlw 0x0A
       movwf BMW_Send_buff+1

       movlw 0x68
       movwf BMW_Send_buff+2

       movlw 0x39
       movwf BMW_Send_buff+3

       movlw 0x00              ;current status_XX=00, power off
       movwf BMW_Send_buff+4

       movlw 0x02              ;current status_YY=02, power off
       movwf BMW_Send_buff+5

       clrf  BMW_Send_buff+6   ;separate field, always =0

       movfw BMW_MM_stat       ;current status_MM , magazine config
       movwf BMW_Send_buff+7

       clrf  BMW_Send_buff+8   ;separate field, always =0

       movfw BMW_DD_stat       ;current status_DD , current disc
       movwf BMW_Send_buff+9

       movfw BMW_TT_stat       ;current status_TT , current track
       movwf BMW_Send_buff+10

       xorwf BMW_Send_buff+9,W ;calculate check sum
       xorwf BMW_Send_buff+8,W
       xorwf BMW_Send_buff+7,W
       xorwf BMW_Send_buff+6,W
       xorwf BMW_Send_buff+5,W
       xorwf BMW_Send_buff+4,W
       xorwf BMW_Send_buff+3,W
       xorwf BMW_Send_buff+2,W
       xorwf BMW_Send_buff+1,W
       xorwf BMW_Send_buff,W

       movwf BMW_Send_buff+11  ;store check sum
       movlw D'12'             ;12 bytes total
       movwf BMW_Send_cnt
       bsf   BMW_Send_on       ;ready to send
       return
```

The code portion shown in **Table 2** receives a STOP confirmation message from the CD player, in a format proprietary to the CD player. Preferably, the received command is stored in a first buffer, such as BMW_Send_buff. The procedure "Load_CD_stop_msg" retrieves status information, magazine information, current disc, and current track information from the CD changer, and constructs a response containing this information. Then, a checksum is calculated and stored in another buffer. The response and checksum are in a format compatible with the BMW stereo, and are ready for dispatching to the car stereo.

The present invention also includes logic for converting signals from an OEM car stereo system for use with a digital media device such as an MP3, MP4, or Apple iPod player. Shown below are code samples for allowing commands and data to be exchanged between a Ford car stereo and an Apple iPod device:

Table 3

```
//decoding Ford "play" command :41-C0-80-CA-01+

        if ( ACP_rx_ready == ON ) {
                ACP_rx_ready = OFF;
                ACP_rx_taddr = ACP_rx_buff[1];
                ACP_rx_saddr = ACP_rx_buff[2];
                ACP_rx_data1 = ACP_rx_buff[3];
                ACP_rx_data2 = ACP_rx_buff[4];
                ACP_rx_data3 = ACP_rx_buff[5];
                if ( (ACP_rx_saddr == 0x80) ) {
                        switch ( ACP_rx_taddr ) {
                                case 0xC0:
                                        if ( ACP_rx_data1 == 0xCA) {
                                                if ( ACP_rx_data2 == 0x01 ) {
                                                      flags.ACP_play_req = 1;
                                                }
                                                break;
                                        }
                                        break;
                        }
                }
```

In the code portion shown in **Table 3**, a "Play" command selected by a user at the controls of a Ford OEM car stereo is received, and portions of the command are stored in one or more buffer arrays. Then, as shown below in **Table 4**, the decoded portions of the command stored in the one or more buffer arrays are used to construct a "Play/Pause" command in a format compatible with the Apple iPod device, and the command is sent to the Apple iPod for execution thereby:

Table 4

```
// encoding iPod "play/pause" command 0xFF 0x55 0x03 0x02 0x00 0x01 0xFA

        if ( iPod_play_req == ON ) {
                iPod_play_req = OFF;
                iPod_tx_data[0] = 0x55;
                iPod_tx_data[1] = 0x03;
                iPod_tx_data[2] = 0x02;
                iPod_tx_data[3] = 0x00;
                iPod_tx_data[4] = 0x01;
                iPod_tx_counter = 5;
                iPod_tx_ready = ON;
        }
```

While the code portions shown in **Tables 1-2** are implemented using assembler language, and the code portions shown in **Tables 3-4** are implemented using the C programming language, it is to be expressly understood that any low or high level language known in the art could be utilized without departing from the spirit or scope of the invention. It will be appreciated that various other code portions can be developed for converting signals from any after-market or OEM car stereo for use by an after-market external audio device, and vice versa.

FIG. 5 is a flowchart showing processing logic, indicated generally at **300** for allowing a user to switch between an after-market audio device, and one or more auxiliary input sources. As was discussed earlier, the present invention allows a user to switch from one or more connected audio devices, such as an external CD player/changer, MP3 player, satellite receiver, DAB receiver, or the like, and activate one or more auxiliary input sources. A selection sequence, initiated by the user at the control panel of the car stereo, allows such switching. Beginning in step **302**, the buttons of the control panel are monitored. In step **304**, a determination is made as to whether a "Track Up" button or sequence has been initiated by the user. The "Track Up" button or sequence can for a CD player, MP3 player, or any other device. If a negative determination is made, step **306** is invoked, wherein the sensed button or sequence is processed in accordance with the present invention and dispatched to the external audio device for execution. Then, step **302** is re-invoked, so that additional buttons or sequences can be monitored.

In the event that a positive determination is made in step **304**, step **308** is invoked, wherein the present invention waits for a predetermined period of time while monitoring the control panel buttons for additional buttons or sequences. In a preferred embodiment of the present invention, the predetermined period of time is 750 milliseconds, but of course, other time durations are considered within the spirit and scope of the present invention. In step **310**, a determination is made as to whether the user has initiated a "Track Down" button or sequence at the control panel of the car stereo within the predetermined time period. These sequences can be used for a CD player, MP3 player, or any other device. If a negative determination is made, step **312** is invoked. In step **312**, a determination is made as to whether a timeout has occurred (*e.g.*, whether the predetermined period of time has expired). If a negative determination is made, step **308** is re-invoked. Otherwise, is a positive determination is made, step **312** invokes step **306**, so that any buttons or key sequences initiated by the user that are not a "Track Down" command are processed in accordance with the present invention and dispatched to the audio device for execution.

In the event that a positive determination is made in step **310** (a "Track Down" button or sequence has been initiated within the predetermined time period), then step **314** is invoked. In step **314**, the audio channels of the audio device are disconnected, and then step **316** is invoked. In step **316**, the logic of block **198** of **FIG. 4d** (the auxiliary input handling process), discussed earlier, is invoked, so that the user can select from one of the auxiliary input sources in accordance with the present invention. Thus, at this point in time, the system has switched, under user control, from the audio device to a desired auxiliary input. Although the foregoing description of the process **300** has been described with reference to "Track Up" and "Track Down" buttons or commands initiated by the user, it is to be expressly understood that any desired key sequence, keystroke, button depress, or any other action, can be sensed in accordance with the present invention and utilized for switching modes.

When operating in auxiliary mode, the present invention provides an indication on the display of the car stereo corresponding to such mode. For example, the CD number could be displayed as "1", and the track number displayed as "99," thus indicating to the user that the system is operating in auxiliary mode and that audio and data is being supplied from an auxiliary input source. Of course, any other indication could be generated and displayed on the display of the car stereo, such as a graphical display (*e.g.*, an icon) or textual prompt.

FIG. 6 is a flowchart showing processing logic, indicated generally at **320**, for determining and handling various device types connected to the auxiliary input ports of the invention. The present invention can sense device types connected to the auxiliary input ports, and can integrate same with the car stereo using the procedures discussed earlier. Beginning in step **322**, the control panel buttons of the car stereo are monitored for a button or sequence initiated by the user corresponding to an auxiliary input selection (such as the disc number method discussed earlier with reference to **FIG. 4d**). In response to an auxiliary input selection, step **324** is invoked, wherein the type of device connected to the selected auxiliary input is sensed by the present invention. Then, step **326** is invoked.

In step **326**, a determination is made as to whether the device connected to the auxiliary input is a CD player/changer. If a positive determination is made, step **328** is invoked, wherein the logic of block **108** of **FIG. 4a** (the CD handling process), discussed earlier, is executed, and the CD player is integrated with the car stereo. If a negative determination is made in step **326**, then step **330** is invoked. In step **330**, a determination is made as to whether the device connected to the auxiliary input is an MP3 player. If a positive determination is made, step **334** is invoked, wherein the logic of block **138** if **FIG. 4b** (the MP3 handling process), discussed earlier, is executed, and the MP3 player is integrated with the car stereo. If a negative determination is made in step **330**, then step **336** is invoked. In step **336**, a determination is made as to whether the device connected to the auxiliary input is a satellite receiver or a DAB receiver. If a positive determination is made, step **338** is invoked, wherein the logic of block **168** of **FIG. 4c** (the satellite/DAB receiver handling process), discussed earlier, is executed, and the satellite receiver is integrated with the car stereo. If a negative determination is made in step

336, step **322** is re-invoked, so that additional auxiliary input selections can be monitored and processed accordingly. Of course, process **320** can be expanded to allow other types of devices connected to the auxiliary inputs of the present invention to be integrated with the car stereo.

The present invention can be expanded for allowing video information generated by an external device to be integrated with the display of an existing OEM or after-market car stereo. In such a mode, the invention accepts RGB (red/green/blue) input signals from the external device, and converts same to composite signals. The composite signals are then forwarded to the car stereo for display thereby, such as on an LCD panel of the stereo. Additionally, the present invention can accept composite input signals from an external device, and convert same to RGB signals for display on the car stereo. Further, information from the external device can be formatted and presented to the user in one or more graphical user interfaces or menus capable of being viewed and manipulated on the car stereo.

FIG. 7a is a perspective view of a docking station **400** according to the present invention for retaining an audio device within a car. Importantly, the present invention can be adapted to allow portable audio devices to be integrated with an existing car stereo. The docking station **400** allows such portable devices to be conveniently docked and integrated with the car stereo. The docking station **400** includes a top portion **402** hingedly connected at a rear portion **408** to a bottom portion **404**, preferably in a clam-like configuration. A portable audio device **410**, such as the SKYFI radio distributed by DELPHI, Inc., is physically and electrically connected with the docking portion **412**, and contained within the station **100**. A clasp **406** can be provided for holding the top and bottom portions in a closed position to retain the device **410**. Optionally, a video device could also be docked using the docking station **400**, and tabs **413** can be provided for holding the docking station **400** in place against a portion of a car. Conceivably, the docking station **400** could take any form, such as a sleeve-like device for receiving and retaining a portable audio device and having a docking portion for electrically and mechanically mating with the audio device.

FIG. 7b is an end view showing the rear portion **408** of the docking station **400** of **FIG. 7a**. A hinge **414** connects the top portion and the bottom portions of the docking station **400**. A data port **416** is provided for interfacing with the audio device docked within the station **400**, and is in electrical communication therewith. In a preferred embodiment of the present invention, the data port **416** is an RS-232 serial or USB data port that allows for the transmission of data with the audio device, and which connects with the multimedia device integration system of the present invention for integrating the audio device with an OEM or after-market car stereo. Any known bus technology can be utilized to interface with any portable audio or video device contained within the docking station **400**, such as FIREWIRE, D2B, MOST, CAN, USB/USB2, IE Bus, T Bus, I Bus, or any other bus technology known in the art. It should be noted that the present invention can be operated without a docking station, *i.e.*, a portable audio or video device can be plugged directly into the present invention for integration with a car stereo or video system.

FIGS. 8a-8b are perspective views of another embodiment of the docking station of the present invention, indicated generally at **500**, which includes the multimedia device integration system of the present invention, indicated generally at **540**, incorporated therewith. As shown in

FIG. 8a, the docking station **500** includes a base portion **530**, a bottom member **515** interconnected with the base portion **530** at an edge thereof, and a top member **510** hingedly interconnected at an edge to the base portion **530**. The top member **510** and the bottom member **515** define a cavity for docking and storing a portable audio device **520**, which could be a portable CD player, MP3 player, satellite (*e.g.*, XM, SIRIUS, or other type) tuner, or any other portable audio device. The docking station **500** would be configured to accommodate a specific device, such as an IPOD from Apple Computer, Inc., or any other portable device.

The multimedia device integration system **540**, in the form of a circuit board, is housed within the base portion **530** and performs the integration functions discussed herein for integrating the portable device **520** with an existing car stereo or car video system. The integration system **540** is in communication with the portable device **520** via a connector **550**, which is connected to a port on the device **520**, and a cable **555** interconnected between the connector **550** and the integration system **540**. The connector **550** could be any suitable connector and can vary according to the device type. For example, a MOLEX, USB, or any other connector could be used, depending on the portable device. The integration system **540** is electrically connected with a car stereo or car video system by cable **560**. Alternatively, the integration system could wirelessly communicate with the car stereo or car video system. A transmitter could be used at the integration system to communicate with a receiver at the car stereo or car video system. Where automobiles include Bluetooth systems, such systems can be used to communicate with the integration system. As can be readily appreciated, the docking station **500** provides a convenient device for docking, storing, and integrating a portable device for use with a car stereo. Further, the docking station **500** could be positioned at any desired location within a vehicle, including, but not limited to, the vehicle trunk.

As shown in **FIG. 8b**, the top member **510** can be opened in the general direction indicated by arrow **A** to allow for access to the portable audio device **520**. In this fashion, the device **520** can be quickly accessed for any desired purpose, such as for inserting and removing the device **520** from the docking station **500**, as well as for providing access to the controls of the device **520**.

FIG. 9 is a block diagram showing the components of the docking station of **FIGS. 8a-8b**. The docking station **500** houses both a portable audio or video device **520** and a multimedia device integration system (or interface) **540**. The shape and configuration of the docking station **500** can be varied as desired without departing from the spirit or scope of the present invention.

The integration system of the present invention provides for control of a portable audio or video device, or other device, through the controls of the car stereo or video system system. As such, controls on the steering wheel, where present, may also be used to control the portable audio device or other device. Further, in all embodiments of the present invention, communication between the after-market device and a car stereo or video system can be accomplished using known wireless technologies, such as Bluetooth.

FIG. 10 is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, indicated generally at **600**, wherein the interface **630**

is incorporated within a car stereo or car video system **610**. The interface **630** is in electrical communication with the control panel buttons **620**, display **615**, and associated control circuitry **625** of the car stereo or video system **610**. The interface **630** could be manufactured on a separate printed circuit board positioned within the stereo or video system **610**, or on one or more existing circuit boards of the stereo or video system **610**. An after-market device **635** can be put into electrical communication with the interface **630** via a port or connection on the car stereo or video system **610**, and integrated for use with the car stereo or video system **610**.

The device **635** can be controlled using the control panel buttons **620** of the car stereo or video system **610**, and information from the device **635** is formatted by the interface **630** and displayed in the display **615** of the car stereo or video system **610**. Additionally, control commands generated at the car stereo or car video device **610** are converted by the interface **630** into a format (protocol) compatible with the multimedia device **635**, and are dispatched thereto for execution. A plurality of multimedia devices could be intergrated using the interface **630**, as well as one or more auxiliary input sources **640**. The after-market device **635** could comprise any audio, video, or telecommunications device, including, but not limited to, a CD player, CD changer, digital media player (*e.g.*, MP3 player, MP4 player, WMV player, Apple iPod, or any other player), satellite radio (*e.g.*, XM, Sirius, Delphi, etc.), video device (*e.g.*, DVD player), cellular telephone, or any other type of device or combinations thereof. Additionally, one or more interfaces could be connected to the interface **630** ("daisy-chained") to allow multiple products to be integrated. The device **600** could include one or more of the circuits disclosed in **FIGS. 3a-3d** and modified depending upon the type of the after-market device **635**.

FIG. 11a is a diagram showing an alternate embodiment of the present invention, indicated generally at **645**, wherein a cellular telephone **670** is intergrated for use with a car stereo. The telephone **670** is in electrical communication with the interface **665**, which receives data from the cellular telephone and formats same for displaying on the display **650** of the car stereo or video system **660**. Commands for controlling the telephone **670** can be entered using the control panel buttons **655** of the car stereo or video system **660**. The commands are processed by the interface **665**, converted into a format (protocol) compatible with the telephone **670**, and transmitted to the telephone **670** for processing thereby. Additionally, audio from the telephone **670** can be channeled to the car stereo or video system **660** via the interface **665** and played through the speakers of the car stereo or video system **660**. For example, if the telephone **670** is provided with the ability to download songs or music, such songs or music can be selected using the car stereo or video system **660** and played therethrough using the interface **665**. It should be noted that control of the cellular telephone could be provided using one or more displays (*e.g.*, LCD) of a car video system. Moreover, control of the cellular telephone **670** is not limited to the use of buttons on the car stereo or video ststem **660**, and indeed, a software or graphically-driven menu or interface can be used to control the cellular telephone. The device **645** could include one or more of the circuits disclosed in **FIGS. 3a-3d** and modified for use with the cellular telephone **670**.

FIG. 11b is a flowchart showing processing logic, indicated generally at **647**, for integrating a cellular telephone with a car radio. Beginning in step **649**, a determination is made as to whether the existing car stereo is powered on. If a negative determination is made, step **651** is invoked, wherein the present invention enters a standby mode and waits for the car stereo to be powered on. If a positive determination is made, step **653** is invoked, wherein a second determination is made as to whether the car stereo is in a state responsive to signals external to the car stereo. If a negative determination is made, step **649** is re-invoked.

If a positive determination is made in step **653**, a cellular telephone handling process, indicated as block **661**, is invoked. Beginning in step **654**, a signal is generated by the present invention indicating that a satellite or DAB receiver is present, and the signal is continuously transmitted to the car stereo. Importantly, this signal prevents the car stereo from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. In step **657**, the audio channels of the cellular telephone are connected (channeled) to the car stereo system, allowing audio from the cellular telephone to be played through the car stereo. In step **659**, data is retrieved by the present invention from the cellular telephone, such as song information corresponding to one or more songs downloaded onto the cellular telephone. After steps **654**, **657**, and **659** have been executed, control passes to step **663**.

In steps **663**, the present invention monitors the control panel buttons of the car stereo for cellular telephone operational commands. In step **664**, if a command is not detected, step **663** is re-invoked. Otherwise, if a command is received, step **663** invokes step **667**, wherein the received command is converted into a format recognizable by the cellular telephone connected to the present invention. Once the command has been formatted, step **669** is invoked, wherein the formatted command is transmitted to the cellular telephone and executed. Step **654** is then re-invoked, so that additional processing can occur.

FIG. 12a is a diagram showing an alternate embodiment of the present invention, indicated generally at **675**, wherein an after-market video device **695** is integrated for use with a car video system **685**. The after-market video device **695** could comprise a portable DVD player, digital video (DV) camera, digital camera, or any other video device. The interface **690** receives output video signals from the device **695**, and converts same for display on one or more displays **680** (*e.g.*, LCD seat-back displays in a minivan, fold-down displays mounted on the roof of a vehicle, vehicle navigation displays, etc.) of the car video system **685**. The interface **690** could convert between composite and red/green/blue (RGB) video signals, and vice versa, using commercially-available video format conversion chips such as the TDA8315, TDA4570, TDA3567, TDA3566A, and TDA3569A video conversion chips manufactured by Philips Corp., and the AL251 and AL250 video conversion chips manufactured by Averlogic Technologies, Inc., or any other suitable video conversion chips. Commands issued by a user using the car video system **685** or display(s) **680** for controlling the device **695** are received by the interface **690**, converted into a format compatible with the device **695**, and transmitted thereto for processing. The device **675** could include one or more of the circuits disclosed in **FIGS. 3a-3d** and modified for use with the video device **695**.

FIG. 12b is a flowchart showing processing logic, indicated generally at **671**, for integrating an after-market video device with a car video system. Beginning in step **673**, a determination is made as to whether the existing car video system is powered on. If a negative determination is made, step **674** is invoked, wherein the present invention enters a standby mode and waits for the car video system to be powered on. If a positive determination is made, step **677** is invoked, wherein a second determination is made as to whether the car video system is in a state responsive to signals external to the car video system. If a negative determination is made, step **673** is re-invoked.

If a positive determination is made in step **677**, an after-market video device handling process, indicated as block **687**, is invoked. Beginning in step **679**, a signal is generated by the present invention indicating that an external device is present, and the signal is continuously transmitted to the car video system. Importantly, this signal prevents the car video system from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. In step **681**, the audio and video channels of the after-market device are connected (channeled) to the car video system, allowing audio and video from the after-market device to be played through the car video system. In step **684**, the display(s) of the car video system are updated with data from the after-market device. After steps **679**, **681**, and **684** have been executed, control passes to step **683**.

In step **683**, the present invention monitors the car video system for after-market video device operational commands. In step **689**, if a command is not detected, step **683** is re-invoked. Otherwise, if a command is received, step **689** invokes step **691**, wherein the received command is converted into a format recognizable by the after-market video device connected to the present invention. Once the command has been formatted, step **693** is invoked, wherein the formatted command is transmitted to the after-market video device and executed. Step **679** is then re-invoked, so that additional processing can occur.

FIG. 13a is a block diagram showing an alternate embodiment of the multimedia device integration system **710** of the present invention, wherein configuration jumpers **720** and protocol conversion software blocks **724** are provided for integrating after-market devices of various types using a single interface. The jumpers **720** can be set to a plurality of different settings, each of which corresponds to an after-market device of a specific type (*e.g.*, CD changer, CD player, digital media player, satellite radio, video device, cellular telephone, etc.) or from a specific manufacturer. Additionally, the jumpers **720** can be used to specify one or more device or manufacturer types for the car stereo or video system **705**. The settings of the configuration jumpers **720** correspond to one or more protocol conversion software blocks **724** stored in memory (*e.g.*, programmable flash memory, ROM, EEPROM, etc.) **725** of the interface **710**. Each of the software blocks **724** controls the interface circuitry **715** and contains instructions for converting data from the device **707** into a format compatible with the car stereo or video system **705**, and vice versa. For example, a first block could contain software for allowing communication between an Apple iPod and an in-dash car stereo manufactured by Sony, and a second block could contain software for allowing communication between a DVD player and a car video system. Any desired number of blocks could be stored in the memory **725** and can be selected as desired by the user via configuration jumpers **720**. As such, a single interface **710** can be used for integrating numerous devices of various types and manufactures for use with one or more car stereo or video systems. The device **710** could include one or more of the circuits shown in **FIGS. 3a-3d**, with modifications depending upon the device types of the devices **705** and **707**.

FIG. 13b is a block diagram showing an alternate embodiment of the multimedia device integration system of the present invention, wherein wiring harnesses **727** and **728** and protocol conversion software blocks **729** are provided for integrating multimedia devices of various types using a single interface **726**. In this embodiment, the electrical configurations (pinouts) of each of the harnesses **727** and **728** correspond to car stereo / video systems and after-market devices of specific types and made by specific manufacturers (*e.g.*, harness **727** could correspond to a BMW car stereo, and harness **728** could correspond to an ALPINE satellite tuner). The electrical configurations (pinouts) of the harnesses are utilized by the interface **726** to retrieve a specific protocol conversion software block **729** that allows communication between the devices. The interface **726** could be provided with a plurality of protocol conversion software blocks pre-loaded into memory in the interface, and could be provided with any desired harnesses. The interface **726** could include one or more of the circuits shown in **FIGS. 3a-3d**, with modification depending upon the device types of the devices attached to the wiring harnesses **727** and **728**.

FIG. 14 is a flowchart showing processing logic, indicated generally at **730**, of the multimedia device integration system of the present invention for integrating after-market devices of various types using a single interface. In step **735**, the interface determines types of devices that are connected thereto, including the car stereo or video system and one or more after-market devices to be integrated therewith. This could be achieved by the configuration jumper settings or the harness types connected to the interface and discussed with respect to **FIGS. 13a** and **13b**. Then, in step **740**, a protocol conversion software block is selected from blocks of conversion software (*e.g.*, from the blocks **725** and **729** shown in **FIGS. 13a** and **13b**).

In step **745**, instructions are converted using the selected conversion block to allow the car stereo or video system to operate with the multimedia device.

FIG. 15 is a flowchart showing processing logic, indicated generally at **750**, of the multimedia device integration system of the present invention for allowing a user to specify one or more after-market device types for integration using a single interface. In step **770**, a user is provided with one or more lists of devices to be integrated, which are displayed on the display **760** of the car stereo or video device **755**. Then, in step **775**, using the buttons **765** of the car video device, the user can specify the type of multimedia device to be integrated (*e.g.*, by scrolling through the lists). Additionally, the device type could be specified using a graphical or software menu displayed on the car stereo or car video system. In step **780**, a determination is made as to whether a timeout has occurred (*e.g.*, the user has not selected a device type within a predetermined period of time). If a positive determination is made, step **785** occurs, wherein a protocol conversion software block is selected from memory corresponding to the last device type displayed by the car stereo or video system. If a negative determination is made, step **790** is invoked, wherein a determination is made as to whether the user has specified a device type. If a negative determination is made, step 775 is re-invoked so that the user can specify a device type. If a positive determination is made, step **795** is invoked, wherein a protocol conversion software block is selected from memory corresponding to the device specified by the user. In step **800**, the protocol conversion software block is mapped to a logical address in memory. Then, in step **805**, instructions to be exchanged between the car stereo or video system and the after-market device are converted using the software block to allow communication between the devices using compatible formats. Accordingly, the logic of **FIG. 15** allows a single interface having multiple protocol conversion software blocks to be used integrate a plurality of after-market devices with a car stereo or video system.

FIG. 16 is a flowchart showing processing logic of the multimedia device integration system of the present invention, indicated generally at **810**, for allowing a user to quickly navigate through a list of songs on one or more after-market devices using the controls of a car stereo or video system (fast navigation technique). This method allows a user to quickly select a song from a list of songs available on an after-market device for playing on the car stereo or video system, and could be applied for use with any type of after-market device, including, but not limited to, a digital media player such as an MP3 player or Apple iPod player. Beginning in step **812**, a user is provided with a list of alphanumeric characters on a display of the car stereo or video system. This list could include the letters A through Z, as well as the numbers 0 through 9. In step **814**, the user can specify a desired alphanumeric character, which can be specified by scrolling through the list using one or more controls of the car stereo or video system and pressing a button once the desired character has been highlighted, or optionally, if an alphanumeric keypad (or touchscreen interface) is provided on the car stereo or video system, the user can directly enter the desired alphanumeric character.

When the desired alphanumeric character has been specified, in step **816** a remote database is queried using the alphanumeric character. The remote database could comprise a list of songs stored in one or more after-market devices integrated by the present invention for use with the car stereo or video system. In step **818**, a list of potentially matching songs is retrieved from the database and presented on the display of the car stereo or video system for perusal by the user. For example, if the user specified the letter "A," the list could include all songs in the remote database having titles (or artists) beginning with the letter "A." In step **820**, a determination is made as to whether a desired song appears in the list and is immediately viewable by the user, without requiring the user to scroll through the list. If a positive determination is made, step **822** is invoked, wherein the desired song is selected by the user and retrieved from the after-market device for playing on the car stereo or video system.

In the event that a negative determination is made in step **820**, step **824** is invoked, wherein the user can specify an additional alphanumeric character using the car stereo or video system. For example, if the user initially specified the letter "A" and the desired song is not visible in the list of songs without scrolling, the user can refine the query by adding an additional alphanumeric character. Thus, for example, the user can specify the letters "AN" to search for songs having titles (or artists) beginning with the letters "AN." In step **826**, the remote database of the after-market device is queried using the specified letters. In step **828**, a list of potential matches is presented to the user at the car stereo or video system. In step **830**, a determination is made as to whether the desired song appears in the list and is immediately viewable without requiring the user to scroll through the list. If a positive determination is made, step **822** is invoked, wherein the user can select the desired song for retrieval from the after-market device and playing on the car stereo or video system. If a negative determination is made, step **832** is invoked, wherein a determination is made as to whether a threshold number of alphanumeric characters has been specified by the user. For example, a maximum threshold of 3 alphanumeric characters could be specified, or any other desired number. If a negative determination is made, steps **824-832** are re-invoked in the manner disclosed herein to allow the user to specify additional alphanumeric characters for querying the remote database. If a positive determination is made (threshold met), then processing terminates and the user must scroll through the list of retrieved songs or repeat the processing disclosed in **FIG. 16** to begin a new query.

FIG. 17 is a diagram showing an another embodiment of the present invention, indicated generally at **850**, wherein a plurality of external devices are integrated using a single interface **852**. Any desired number or combination of devices can be integrated for use with a car stereo or video system using the interface **852**. The interface **852** houses a plurality of ports **858** for connecting any desired number of external devices, and a port **856** for connection with a car stereo or video system. The ports **858** and **856** could be any suitable type of input port, and could vary depending upon the types of devices to be integrated. Additionally, the interface **852** includes integration electronics **854**, which could include any desired electronics disclosed herein for integrating a plurality of external devices.

As shown in **FIG. 17**, a CD player **860**, a digital media device **862**, a satellite tuner **864**, a video device **866**, a cellular phone **868**, and an auxiliary input **870** are connected to the interface **852** and integrated for use with a car stereo or video system. The CD player **860** could comprise any desired CD player or changer. The digital media device **862** could comprise any portable digital media device, such as an Apple iPod, MP3 player, MP4, player, WMV player, portable music center, or any other desired device. The satellite tuner **864** could comprise any desired satellite tuner, such as an XM or Sirius tuner. The video device **866** could comprise any desired video device, such as a DVD player. The cellular phone **868** could comprise any cellular telephone capable of downloading and storing music or video files. The auxiliary input **870** could comprise any desired external device. Any desired number of interfaces **852** could be interconnected ("daisy-chained"). Further, the interface **852** could form part of an existing car stereo or video system. Control of the external devices connected to the interface **852** is provided through the car stereo or video system.

Having thus described the invention in detail, it is to be understood that the foregoing description is not intended to limit the spirit and scope thereof.

CLAIMS

What is claimed is:

1. A multimedia device integration system comprising:

a car stereo system;

an after-market device external to the car stereo system;

an interface positioned within the car stereo system and connected between the car stereo system and the after-market device for exchanging data and audio signals between the car stereo system and the after-market device;

means for processing and dispatching commands for controlling the after-market device from the car stereo system in a format compatible with the after-market device; and

means for processing and displaying data from the after-market device on a display of the car stereo system in a format compatible with the car stereo system.

2 The apparatus of claim 1, wherein the after-market device comprises a CD player, CD changer, digital media player, Digital Audio Broadcast (DAB) receiver, satellite receiver, or a cellular telephone.

3. The apparatus of claim 2, wherein the digital media player comprises an MP3 player, an MP4 player, WMV player, or an Apple iPod.

4. The apparatus of claim 1, further comprising one or more auxiliary input sources connected to the interface.

5. A multimedia device integration system comprising:

a car stereo system;

a cellular telephone external to the car stereo system;

an interface connected between the car stereo system and the cellular telephone for exchanging data and audio signals between the car stereo system and the cellular telephone;

means for processing and dispatching commands for controlling the cellular telephone from the car stereo system in a format compatible with the cellular telephone; and

means for processing and displaying data from the cellular telephone on a display of the car stereo system in a format compatible with the car stereo system.

6. The apparatus of claim 5, further comprising songs or music downloadable through the cellular telephone.

7. The apparatus of claim 6, wherein the songs or music are playable through the car stereo system using the interface.

8. A multimedia device integration system comprising:

a car video system;

a cellular telephone external to the car video system;

an interface connected between the car video system and the cellular telephone for exchanging data, audio, and video signals between the car video system and the cellular telephone;

means for processing and dispatching commands for controlling the cellular telephone from the car video system in a format compatible with the cellular telephone; and

means for processing and displaying data from the cellular telephone on a display of the car video system in a format compatible with the car video system.

9. The apparatus of claim 8, further comprising songs or music downloadable through the cellular telephone.

10. The apparatus of claim 9, wherein the songs or music are playable through the car video system using the interface.

11. A multimedia device integration system comprising:

a car video system;

an after-market video device external to the car video system;

an interface connected between the car video system and the after-market video device for exchanging data, audio, and video signals between the car video system and the after-market video device;

means for processing and dispatching commands for controlling the after-market video device from the car video system in a format compatible with the after-market video device; and

means for processing and displaying data from the after-market video device on a display of the car video system in a format compatible with the car video system.

12. The apparatus of claim 11, wherein the after-market video device comprises a DVD player.

13. The appataus of claim 11, wherein the interface is positioned within the car video system.

14. A multimedia device integration system comprising:

an interface in electrical communication with a car stereo system and an after-market device;

a plurality of configuration jumpers in the interface for specifying a first device type corresponding to the car stereo system and a second device type corresponding to the after-market device; and

a plurality of protocol conversion software blocks stored in memory in the interface for converting signals from the after-market device into a first format compatible with the car stereo system and for converting signals from the car stereo system into a second format compatible with the after-market device, wherein at least one of the protocol conversion software blocks are selected by the interface using settings of the plurality of configuration jumpers.

15. The system of claim 14, wherein the plurality of protocol conversion software blocks allow a plurality of after-market devices to integrated with the car stereo system.

16. The system of claim 14, wherein the plurality of configuration jumpers are settable by a user.

17. A multimedia device integration system comprising:

an interface in electrical communication with a car video system and an after-market device;

a plurality of configuration jumpers in the interface for specifying a first device type corresponding to the car video system and a second device type corresponding to the after-market device; and

a plurality of protocol conversion software blocks stored in memory in the interface for converting signals from the after-market device into a first format compatible with the car video system and for converting signals from the car video system into a second format compatible with the after-market device, wherein at least one of the protocol conversion software blocks are selected by the interface using settings of the plurality of configuration jumpers.

18. The system of claim 17, wherein the plurality of protocol conversion software blocks allow a plurality of after-market devices to integrated with the car video system.

19. The system of claim 17, wherein the plurality of configuration jumpers are settable by a user.

20. A multimedia device integration system comprising:

an interface in electrical communication with a car stereo system and an after-market device;

first and second wiring harnesses attached to the interface, wherein the first wiring harness includes a first electrical configuration corresponding to the car stereo system and the second wiring harness includes a second electrical configuration corresponding to the after-market device; and

a plurality of protocol conversion software blocks stored in memory in the interface for converting signals from the after-market device into a first format compatible with the car stereo system and for converting signals from the car stereo system into a second format compatible with the after-market device, wherein at least one of the protocol conversion software blocks are selected by the interface using the first and second electrical configurations of the first and second wiring harnesses.

21. The system of claim 20, further comprising a plurality of wiring harnesses corresponding to additional device types and connectable to the interface.

22. A multimedia device integration system comprising:

an interface in electrical communication with a car video system and an after-market device;

first and second wiring harnesses attached to the interface, wherein the first wiring harness includes a first electrical configuration corresponding to the car video system and the second wiring harness includes a second electrical configuration corresponding to the after-market device; and

a plurality of protocol conversion software blocks stored in memory in the interface for converting signals from the after-market device into a first format compatible with the car video system and for converting signals from the car video system into a second format compatible with the after-market device, wherein at least one of the protocol conversion software blocks are selected by the interface using the first and second electrical configurations of the first and second wiring harnesses.

23. The system of claim 22, further comprising a plurality of wiring harnesses corresponding to additional device types and connectable to the interface.

24. A method for integrating an after-market device for use with a car stereo system comprising:

interconnecting the car stereo system and the after-market device with an interface;

determining a first device type corresponding to the car stereo system and a second device type corresponding to the after-market device;

loading a protocol conversion software block from memory in the interface using the first and second device types;

converting signals from the after-market device into a first format compatible with the car stereo system using the protocol conversion software block;

converting signals from the car stereo system into a second format compatible with the after-market device using the protocol conversion software block; and

exchanging converted signals between the car stereo system and the after-market device.

25. The method of claim 24, wherein the step of determining the first and second device types comprises determining jumper settings of the interface, wherein the jumper settings correspond to the first and second device types.

26. The method of claim 24, wherein the step of determining the first and second device types comprises determining electrical configurations of wiring harnesses attached to the interface, wherein the electrical configurations correspond to the first and second device types.

27. The method of claim 24, wherein the step of determining the first and second device types comprises allowing the user to specify a device type of the after-market device using the car stereo system.

28. A method for integrating an after-market device for use with a car video system comprising:

interconnecting the car video system and the after-market device with an interface;

determining a first device type corresponding to the car video system and a second device type corresponding to the after-market device;

loading a protocol conversion software block from memory in the interface using the first and second device types;

converting signals from the after-market device into a first format compatible with the car video system using the protocol conversion software block;

converting signals from the car video system into a second format compatible with the after-market device using the protocol conversion software block; and

exchanging converted signals between the car video system and the after-market device.

29. The method of claim 28, wherein the step of determining the first and second device types comprises determining jumper settings of the interface, wherein the jumper settings correspond to the first and second device types.

30. The method of claim 28, wherein the step of determining the first and second device types comprises determining electrical configurations of wiring harnesses attached to the interface, wherein the electrical configurations correspond to the first and second device types.

31. The method of claim 28, wherein the step of determining the first and second device types comprises allowing the user to specify a device type of the after-market device using the car video system.

32. A method for retrieving a song from an after-market device from a car stereo system comprising:

allowing a user to specify an alphanumeric character using controls of the car stereo system;

querying a database of songs in the after-market device using the alphanumeric character;

displaying a list of potentially matching songs in the after-market device on a dsplay of the car stereo system; and

allowing the user to select a desired song from the list of potentially matching songs for playing the desired song on the car stereo system.

33. The method of claim 32, further comprising allowing the user to specify one or more additional alphanumeric characters using the controls of the car stereo system.

34. The method of claim 33, further comprising querying the remote database using the one or more additional alphanumeric characters and displaying a second list of potentially matching songs on the display of the car stereo system.

35. The method of claim 32, wherein the step of allowing the user to specify the alphanumeric character comprises providing the user with a list of alphanumeric characters on the display of the car stereo and allowing the user to select a desired character from the list of alphanumeric characters.

36. A multimedia device integration system comprising:

a car audiovisual system;

a plurality of after-market devices external to the car audiovisual system;

an interface connected between the car audiovisual system and the plurality of after-market devices for exchanging data, audio, and video signals between the car audiovisual system and the plurality of after-market devices;

means for processing and dispatching commands for controlling the plurality of after-market devices from the car audiovisual system in at least one format compatible with at least one of the plurality of after-market devices; and

means for processing and displaying data from the plurality of after-market devices on a display of the car audiovisual system in a format compatible with the car audiovisual system.

ABSTRACT

An multimedia device integration system is provided. One or more after-market audio or video devices, such as a CD player, CD changer, digital media device (*e.g.,* MP3 player, MP4 player, WMV player, Apple iPod, portable music center, or other device) satellite receiver (*e.g.*, XM or Sirius receiver), DAB receiver, video device (*e.g.*, DVD player), cellular telephone, or any other device or combinations thereof, is integrated for use with an existing OEM or after-market car stereo or video system, wherein control commands can be issued at the car stereo or video system and data from the after-market device can be displayed on the car stereo or video system. Control commands generated at the car stereo or video system are received, processed, converted into a format recognizable by the after-market device, and dispatched to the after-market device for execution. Information from the after-market device is converted into a format recognizable by the car stereo or video system, and dispatched to the car stereo or video system for display thereon. One or more auxiliary input sources can be integrated with the car stereo or video system, and selected using the controls of the car stereo or video system. A docking station is provided for docking a portable audio or video device for integration with the car stereo or video system.

NWK2: 1272340.01

FIG. 1

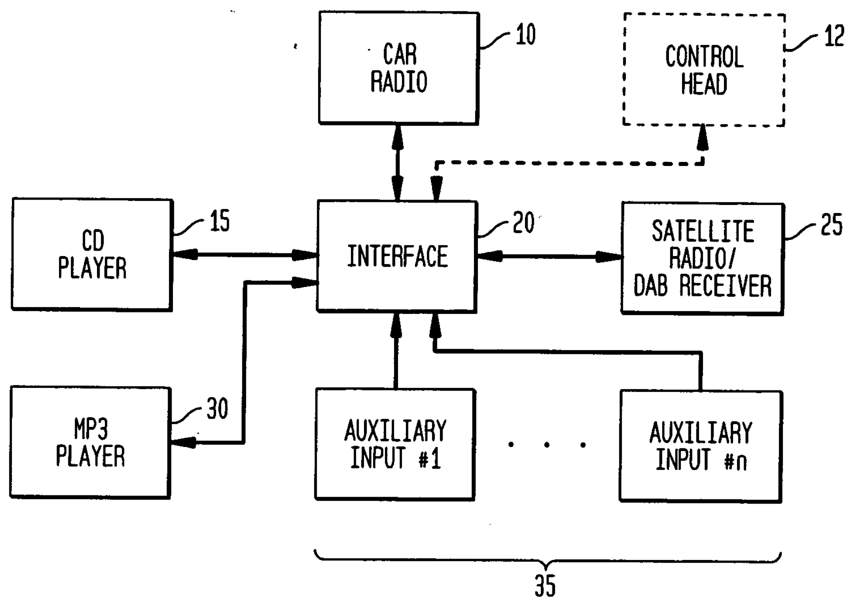

CAR RADIO
10
CONTROL HEAD
12
CD PLAYER
15
INTERFACE
20
SATELLITE RADIO/ DAB RECEIVER
25
MP3 PLAYER
30
AUXILIARY INPUT #1
. . .
AUXILIARY INPUT #n
35

FIG. 2A

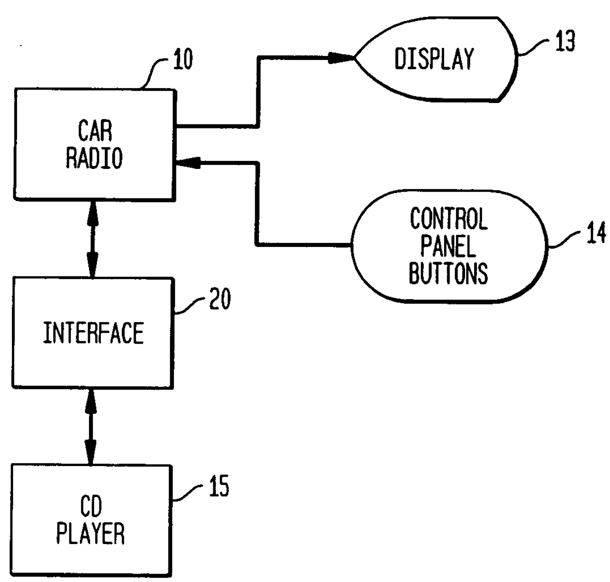

10
CAR RADIO
DISPLAY
13
CONTROL PANEL BUTTONS
14
INTERFACE
20
CD PLAYER
15

FIG. 2B

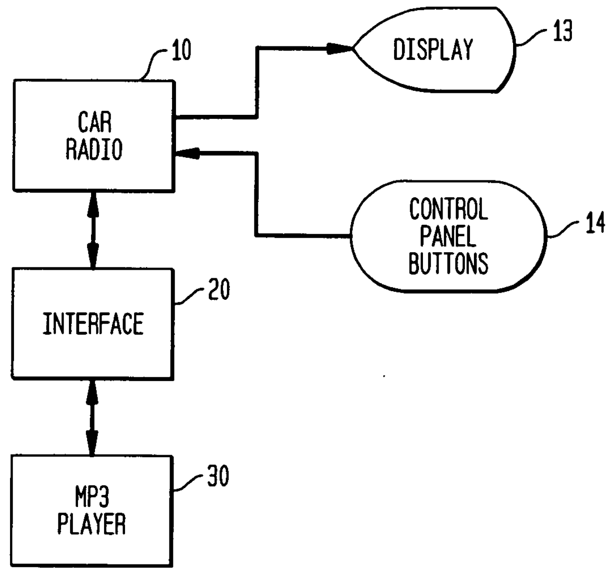

CAR RADIO
10
DISPLAY
13
CONTROL PANEL BUTTONS
14
INTERFACE
20
MP3 PLAYER
30

FIG. 2C

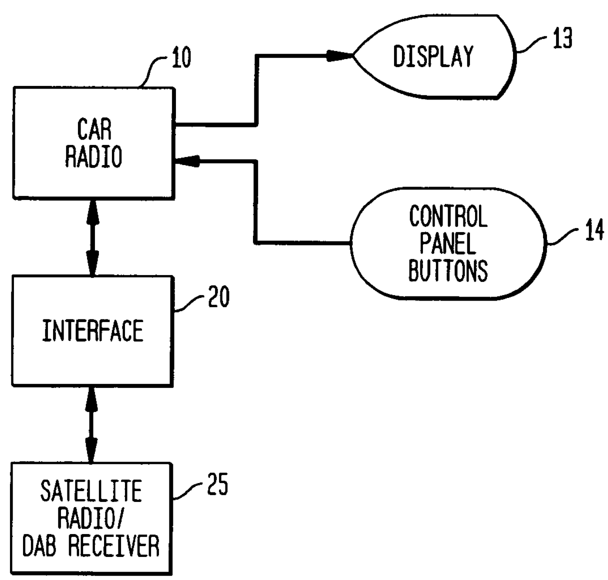
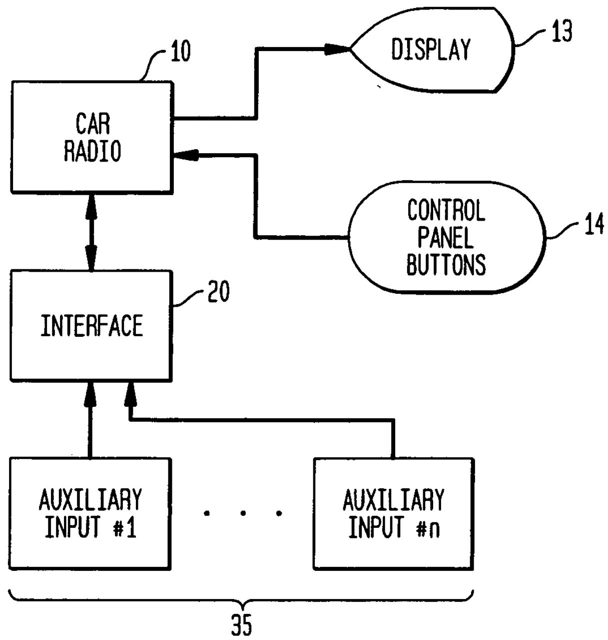
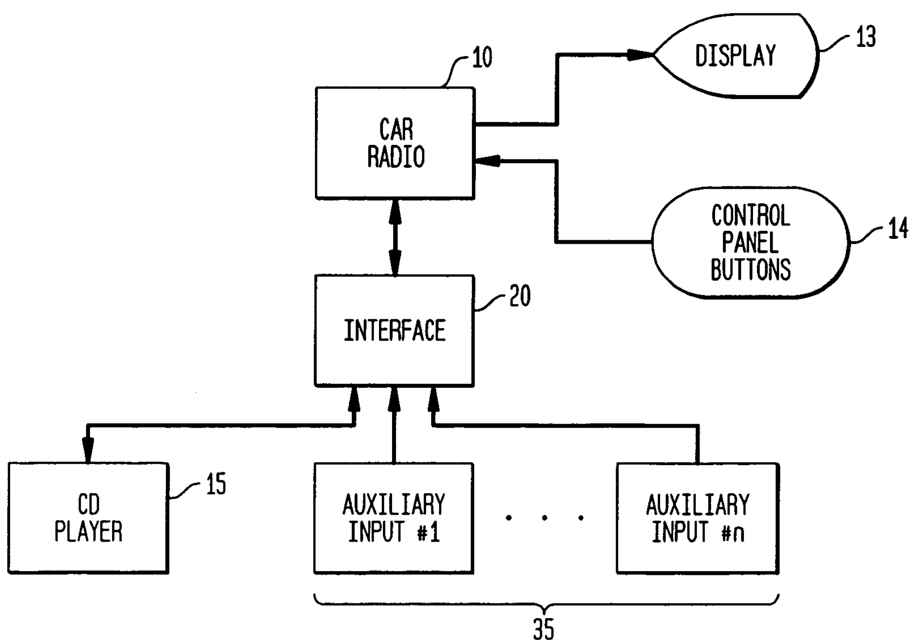

CAR RADIO
10
DISPLAY
13
CONTROL PANEL BUTTONS
14
INTERFACE
20
SATELLITE RADIO/ DAB RECEIVER
25

FIG. 2D



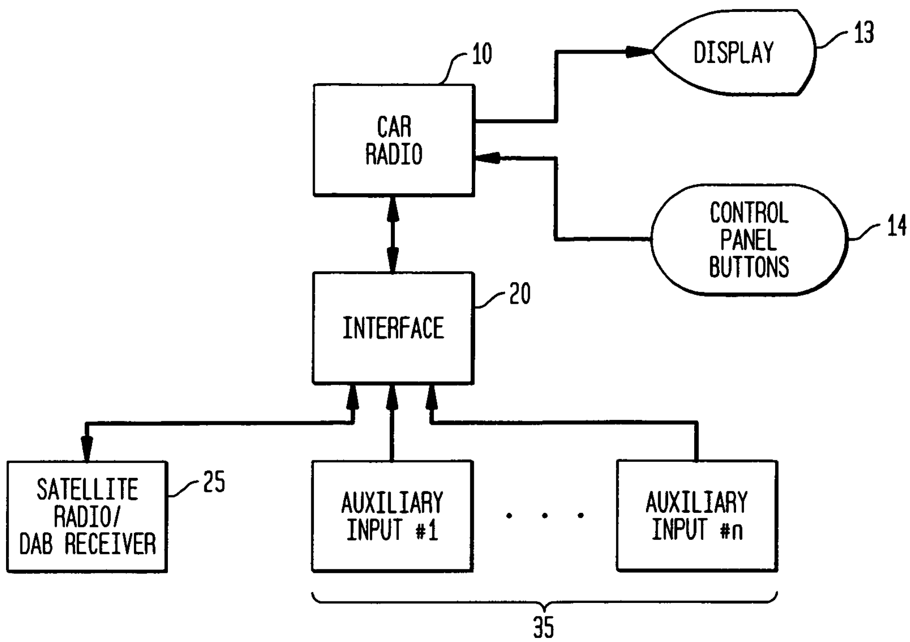
DISPLAY
13
10
CAR RADIO
CONTROL PANEL BUTTONS
14
INTERFACE
20
AUXILIARY INPUT #1
AUXILIARY INPUT #n
35

FIG. 2E



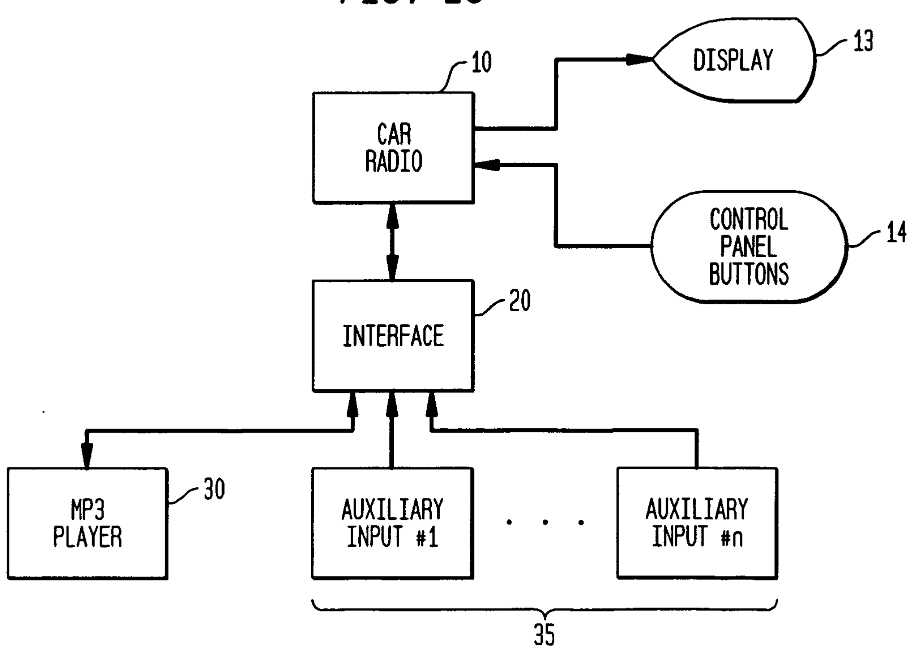
DISPLAY
13
10
CAR RADIO
CONTROL PANEL BUTTONS
14
INTERFACE
20
CD PLAYER
15
AUXILIARY INPUT #1
AUXILIARY INPUT #n
35

FIG. 2F



CAR RADIO
10
DISPLAY
13
CONTROL PANEL BUTTONS
14
INTERFACE
20
SATELLITE RADIO/ DAB RECEIVER
25
AUXILIARY INPUT #1
AUXILIARY INPUT #n
35

FIG. 2G



CAR RADIO
10
DISPLAY
13
CONTROL PANEL BUTTONS
14
INTERFACE
20
MP3 PLAYER
30
AUXILIARY INPUT #1
AUXILIARY INPUT #n
35

FIG. 2H

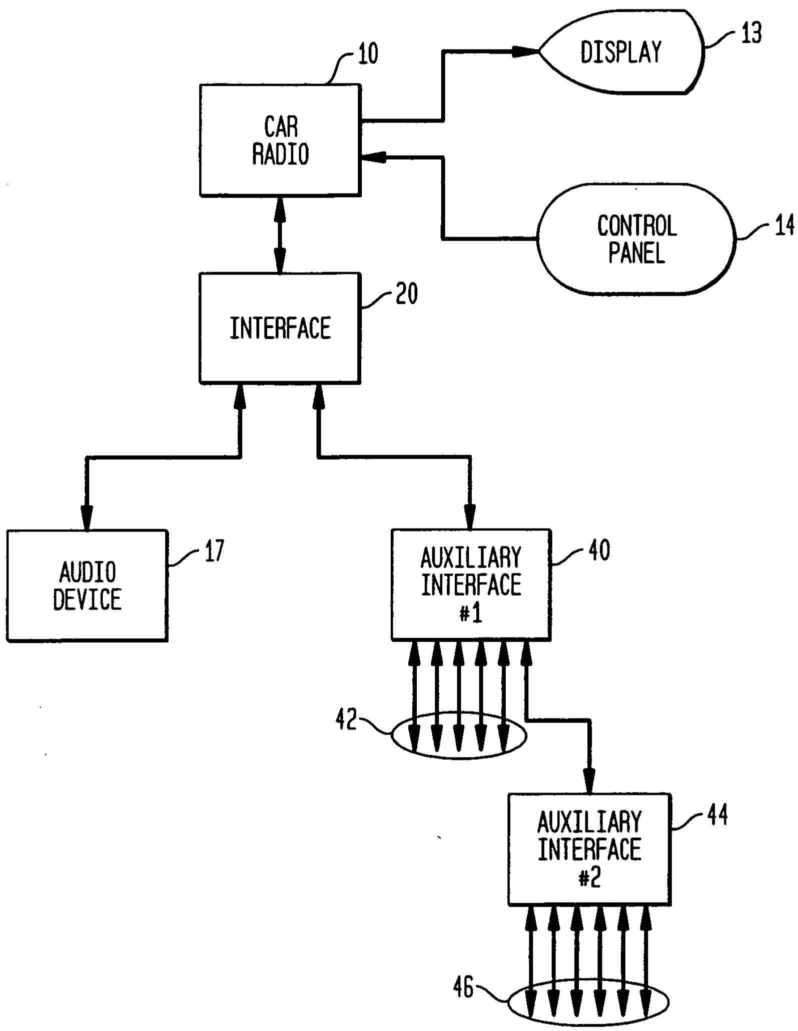

CAR
RADIO
10
DISPLAY
13
CONTROL
PANEL
14
INTERFACE
20
AUDIO
DEVICE
17
AUXILIARY
INTERFACE
#1
40
42
AUXILIARY
INTERFACE
#2
44
46

FIG. 3A

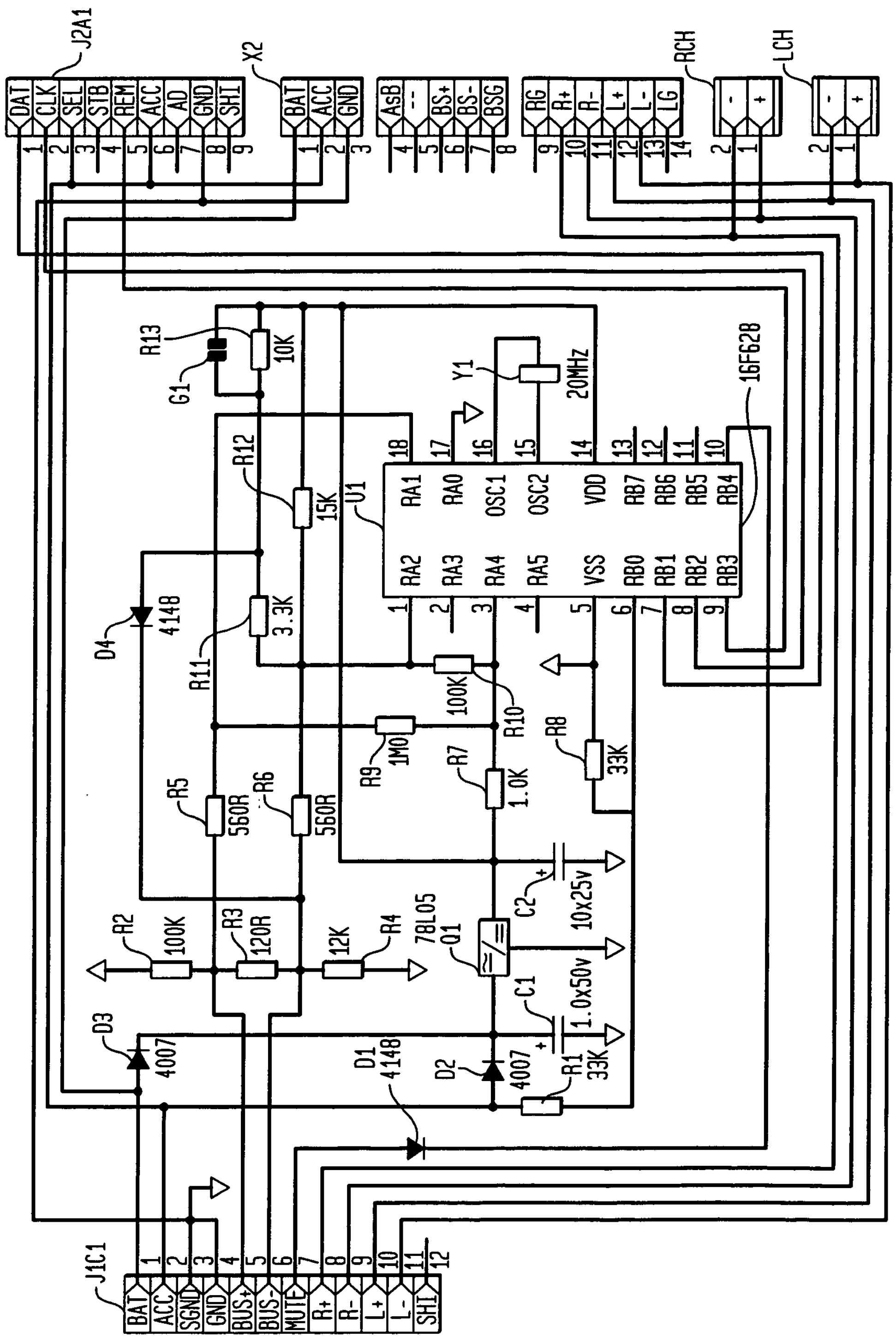

J2A1
DAT
CLK
SEL
STB
REM
ACC
AD
GND
SHI
X2
BAT
ACC
GND
AsB
--
BS+
BS-
BSG
RG
R+
R-
L+
L-
LG
RCH
LCH
R13
10K
G1
Y1
20MHz
16F628
U1
RA1
RA0
OSC1
OSC2
VDD
RB7
RB6
RB5
RB4
RA2
RA3
RA4
RA5
VSS
RB0
RB1
RB2
RB3
R12
15K
D4
4148
R11
3.3K
R10
100K
R9
1M0
R8
33K
R7
1.0K
R5
560R
R6
560R
C2
10x25v
R2
100K
R3
120R
R4
12K
78L05
Q1
C1
1.0x50v
D3
4007
D1
4148
D2
4007
R1
33K
J1C1
BAT
ACC
SGND
GND
BUS+
BUS-
MUTE
R+
R-
L+
L-
SHI

FIG. 3B1

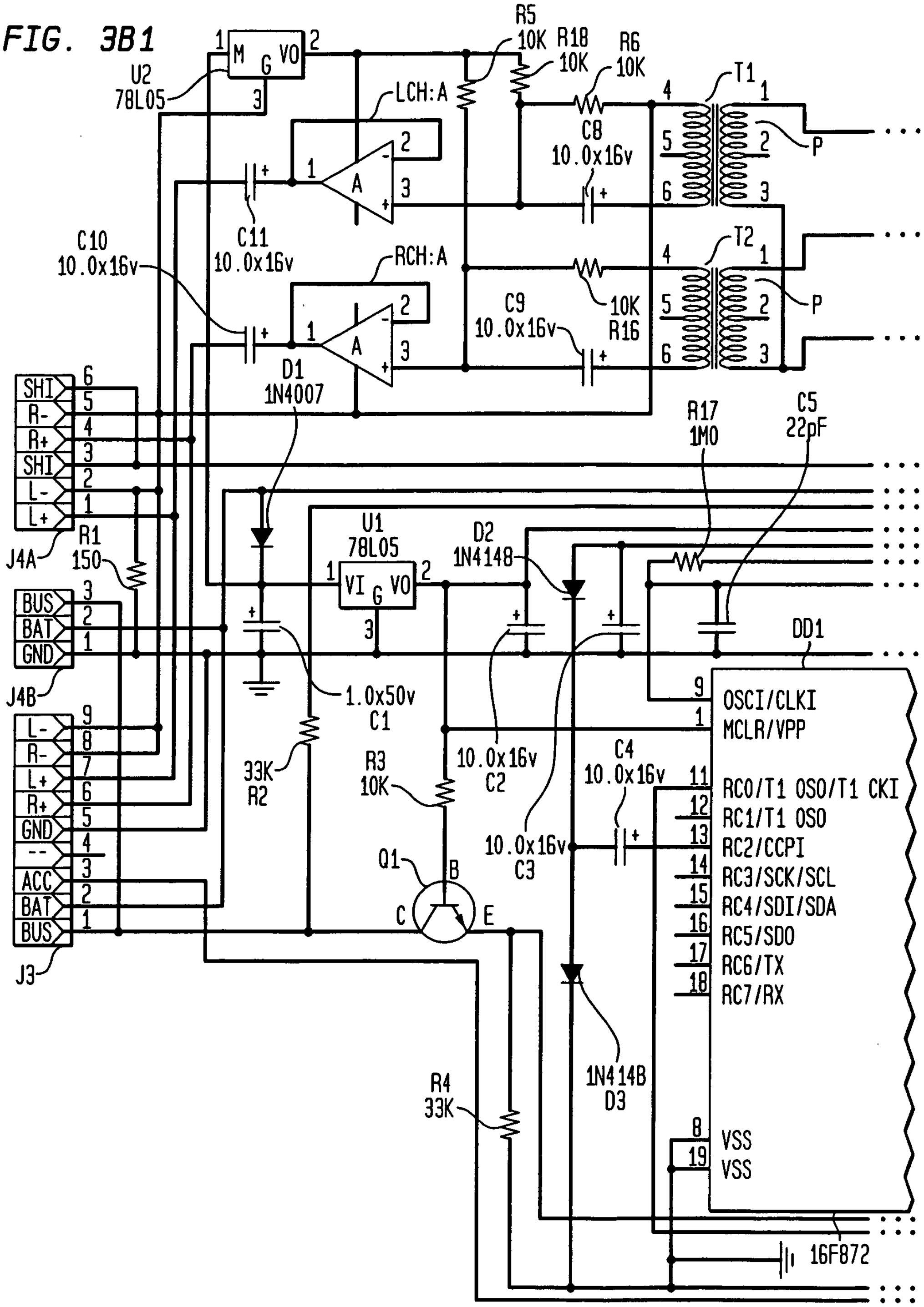
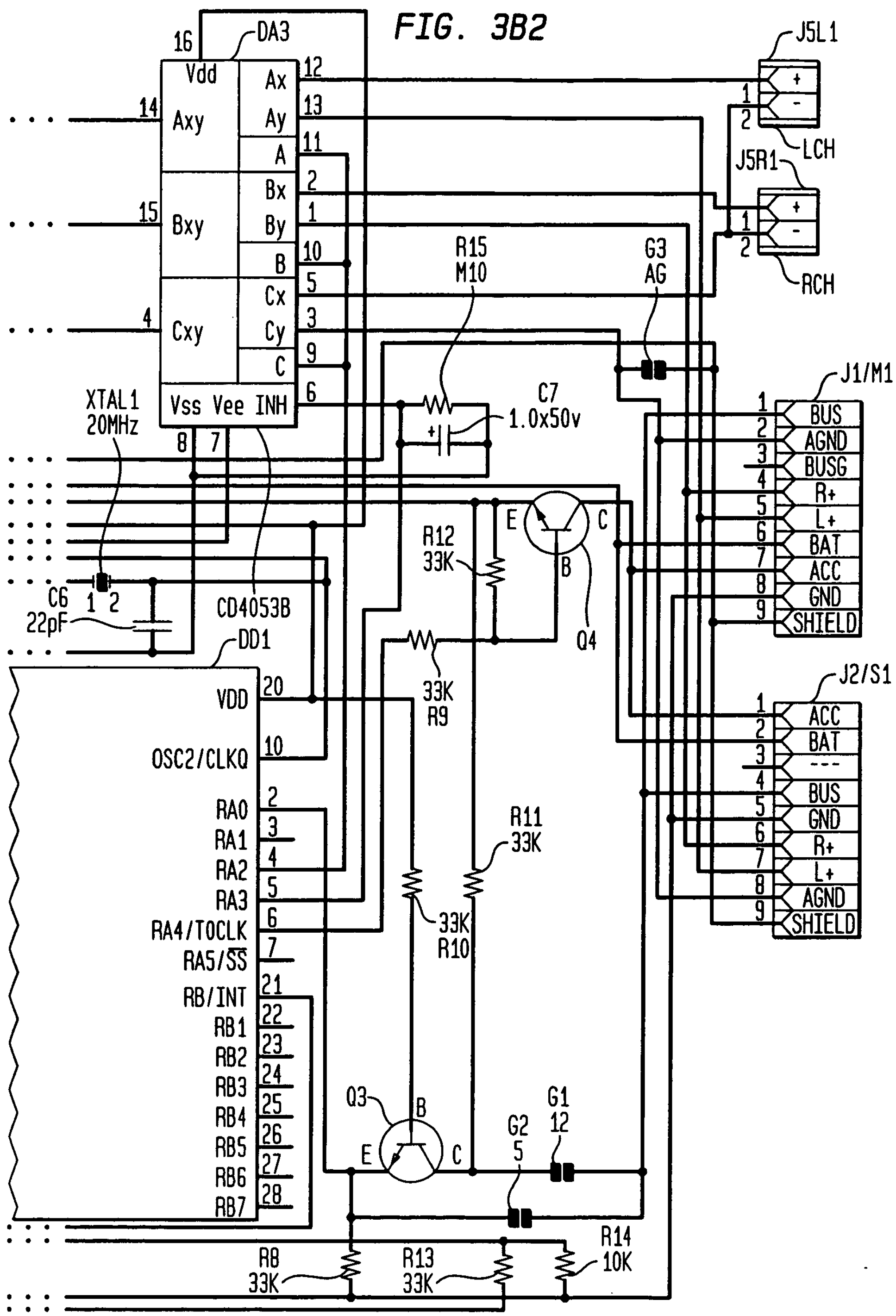

U2
78L05
LCH:A
RCH:A
R5
10K
R18
10K
R6
10K
C8
10.0x16v
C9
10.0x16v
10K
R16
T1
T2
P
C10
10.0x16v
C11
10.0x16v
D1
1N4007
SHI
R-
R+
L-
L+
J4A
R1
150
BUS
BAT
GND
J4B
J3
ACC
U1
78L05
D2
1N4148
R17
1M0
C5
22pF
DD1
1.0x50v
C1
33K
R2
R3
10K
10.0x16v
C2
10.0x16v
C3
C4
10.0x16v
Q1
OSCI/CLKI
MCLR/VPP
RC0/T1 OSO/T1 CKI
RC1/T1 OSO
RC2/CCPI
RC3/SCK/SCL
RC4/SDI/SDA
RC5/SDO
RC6/TX
RC7/RX
VSS
VSS
R4
33K
1N414B
D3
16F872

FIG. 3B2


DA3
Vdd
Axy
Bxy
Cxy
Vss Vee INH
Ax
Ay
A
Bx
By
B
Cx
Cy
C
CD4053B
XTAL1
20MHz
C6
22pF
DD1
VDD
OSC2/CLKO
RA0
RA1
RA2
RA3
RA4/T0CLK
RA5/SS
RB/INT
RB1
RB2
RB3
RB4
RB5
RB6
RB7
R15
M10
G3
AG
C7
1.0x50v
R12
33K
Q4
33K
R9
R11
33K
33K
R10
Q3
G1
12
G2
5
R8
33K
R13
33K
R14
10K
J5L1
LCH
J5R1
RCH
J1/M1
BUS
AGND
BUSG
R+
L+
BAT
ACC
GND
SHIELD
J2/S1
ACC
BAT

BUS
GND
R+
L+
AGND
SHIELD

FIG. 3C1

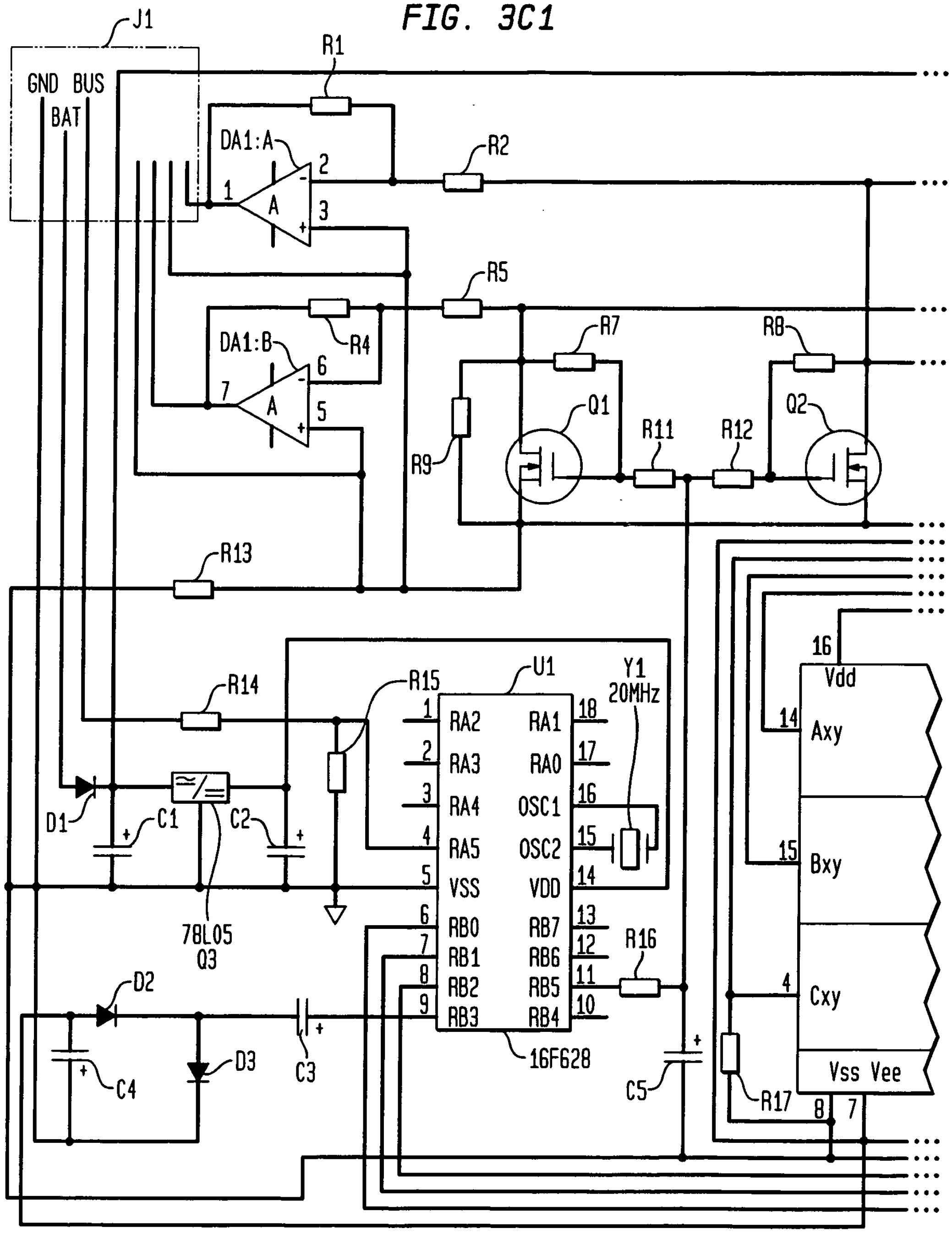

J1
GND BUS
BAT
R1
R2
DA1:A
A
R5
R4
DA1:B
R7
R8
Q1
Q2
R9
R11
R12
R13
R14
R15
U1
Y1
20MHz
RA2
RA3
RA4
RA5
VSS
RB0
RB1
RB2
RB3
RA1
RA0
OSC1
OSC2
VDD
RB7
RB6
RB5
RB4
16F628
R16
D1
C1
C2
78L05
Q3
D2
D3
C3
C4
C5
R17
Vdd
Axy
Bxy
Cxy
Vss Vee

FIG. 3C2

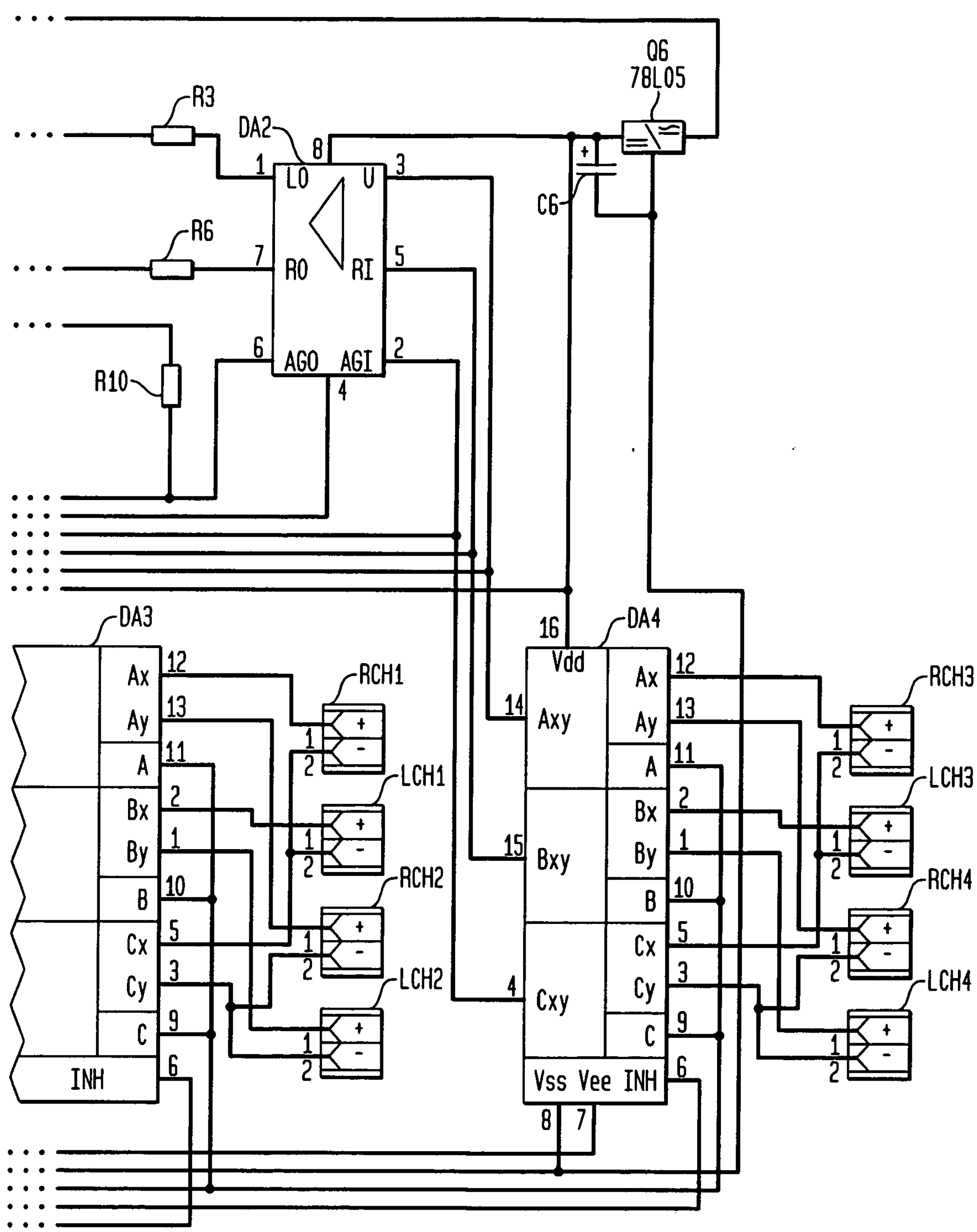

Q6
78L05
R3
DA2
8
1
LO
U
3
C6
R6
7
RO
RI
5
R10
6
AGO
AGI
2
4
DA3
Ax
12
Ay
13
A
11
Bx
2
By
1
B
10
Cx
5
Cy
3
C
9
INH
6
RCH1
LCH1
RCH2
LCH2
16
DA4
Vdd
14
Axy
15
Bxy
4
Cxy
Vss
Vee
INH
8
7
RCH3
LCH3
RCH4
LCH4

FIG. 3D

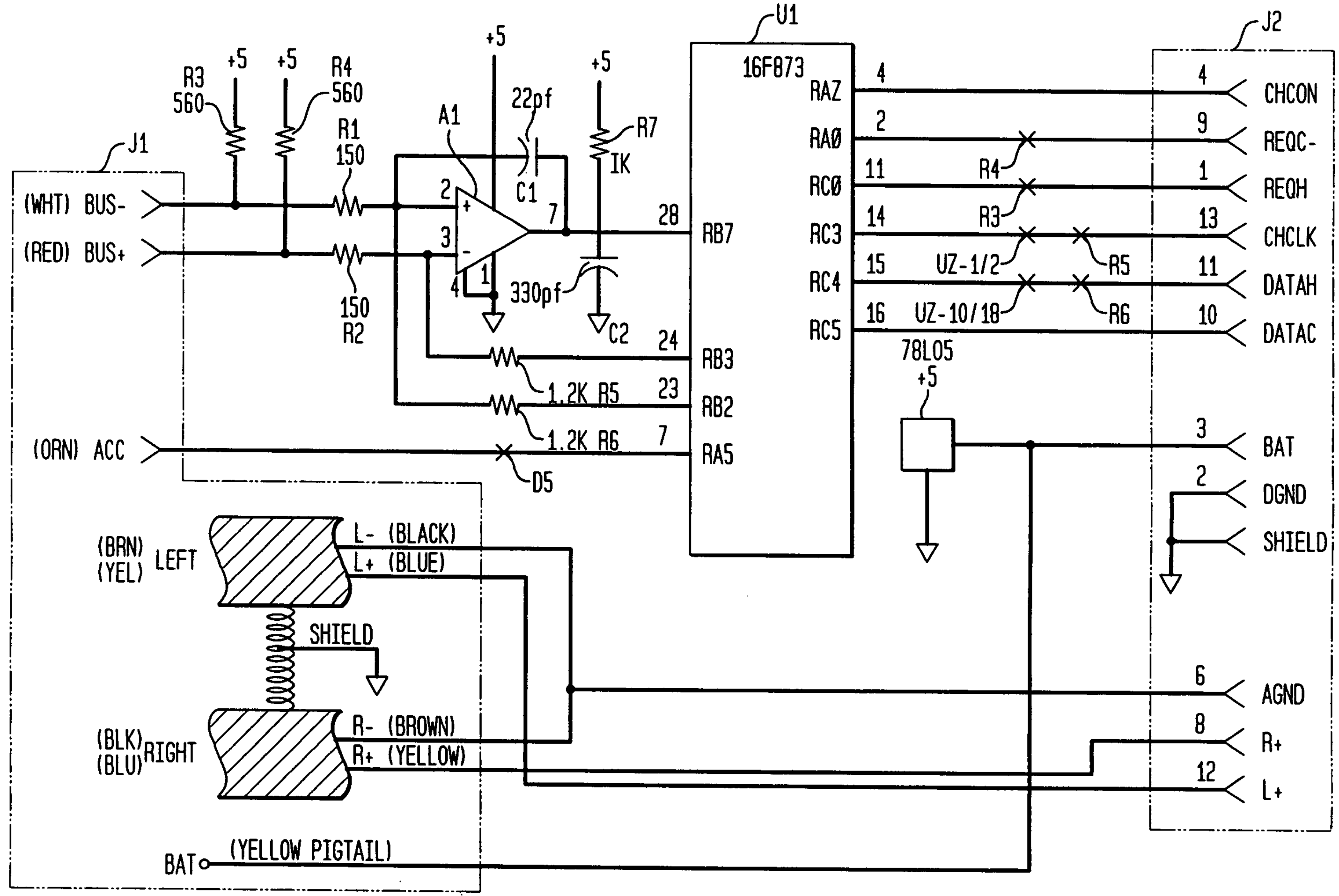

J1
(WHT) BUS-
(RED) BUS+
(ORN) ACC
R3
560
R4
560
+5
R1
150
150
R2
A1
22pf
C1
330pf
C2
R7
IK
1.2K R5
1.2K R6
D5
U1
16F873
RAZ
RAØ
RCØ
RC3
RC4
RC5
RB7
RB3
RB2
RA5
R4
R3
UZ-1/2
UZ-10/18
R5
R6
78L05
J2
CHCON
REQC-
REQH
CHCLK
DATAH
DATAC
BAT
DGND
SHIELD
AGND
R+
L+
(BRN)
(YEL) LEFT
(BLK)
(BLU) RIGHT
L- (BLACK)
L+ (BLUE)
R- (BROWN)
R+ (YELLOW)
SHIELD
BAT
(YELLOW PIGTAIL)

FIG. 4A

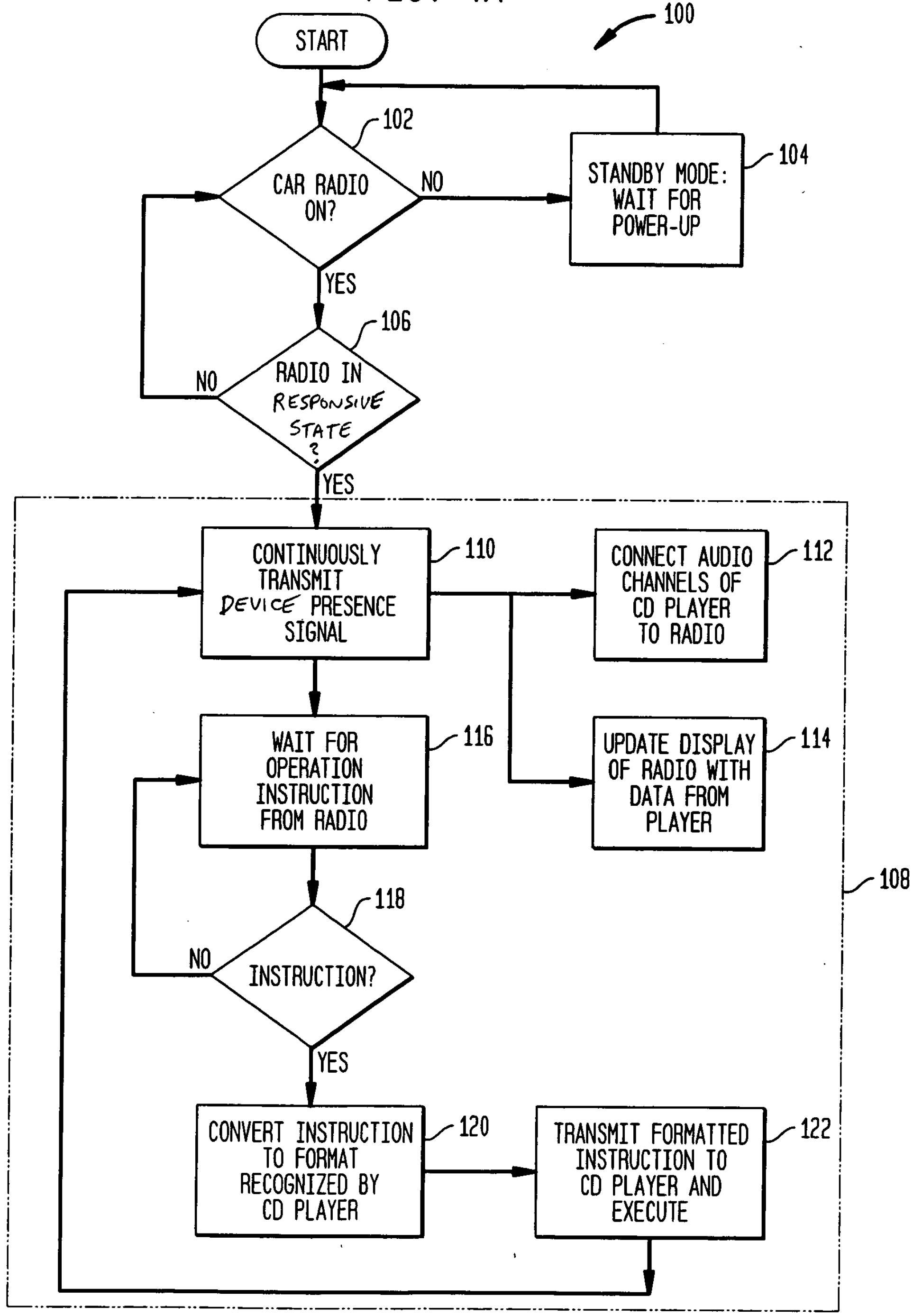

100
START
CAR RADIO ON?
102
NO
STANDBY MODE: WAIT FOR POWER-UP
104
YES
RADIO IN RESPONSIVE STATE ?
106
NO
YES
CONTINUOUSLY TRANSMIT DEVICE PRESENCE SIGNAL
110
CONNECT AUDIO CHANNELS OF CD PLAYER TO RADIO
112
WAIT FOR OPERATION INSTRUCTION FROM RADIO
116
UPDATE DISPLAY OF RADIO WITH DATA FROM PLAYER
114
108
INSTRUCTION?
118
NO
YES
CONVERT INSTRUCTION TO FORMAT RECOGNIZED BY CD PLAYER
120
TRANSMIT FORMATTED INSTRUCTION TO CD PLAYER AND EXECUTE
122

FIG. 4B

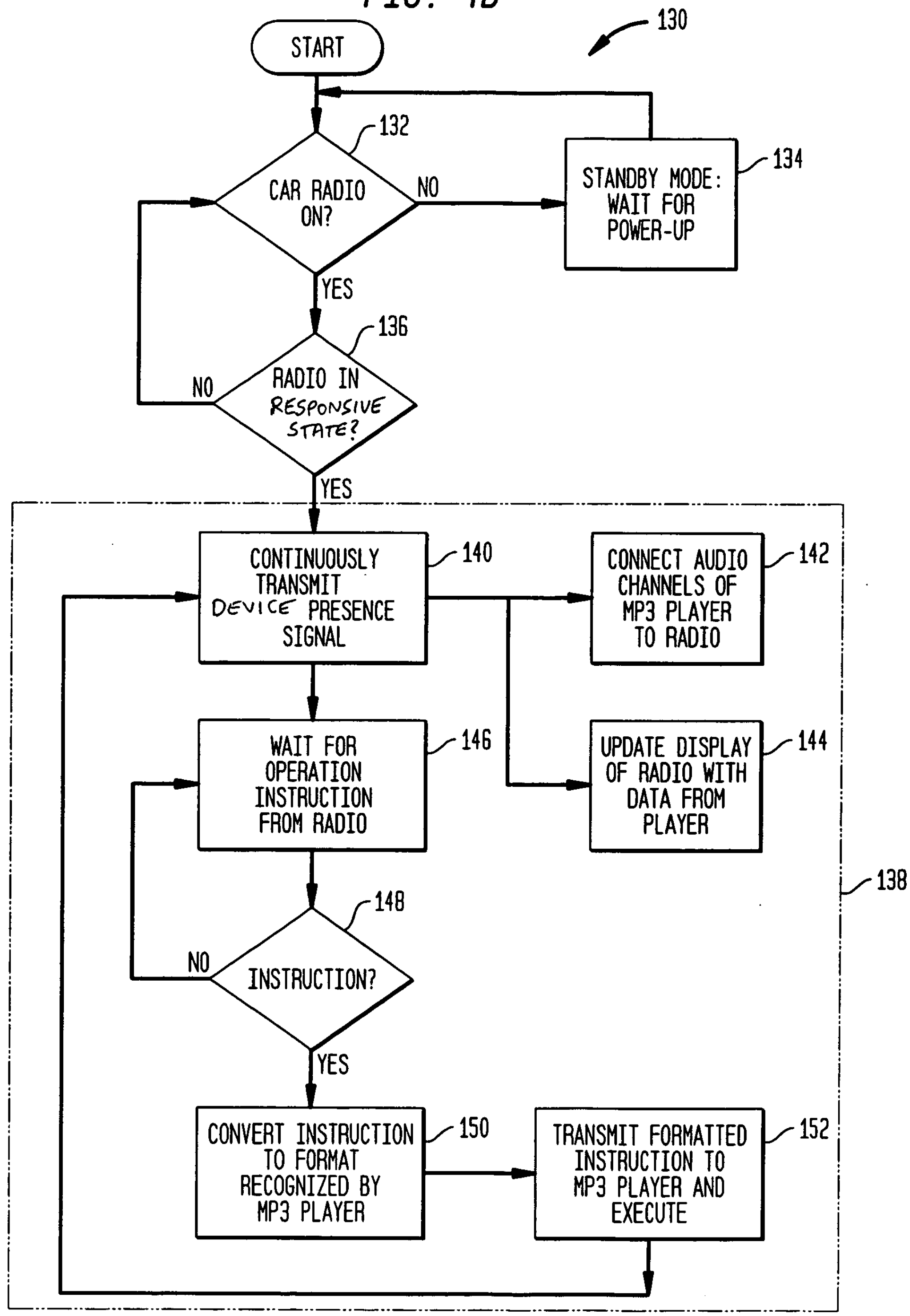
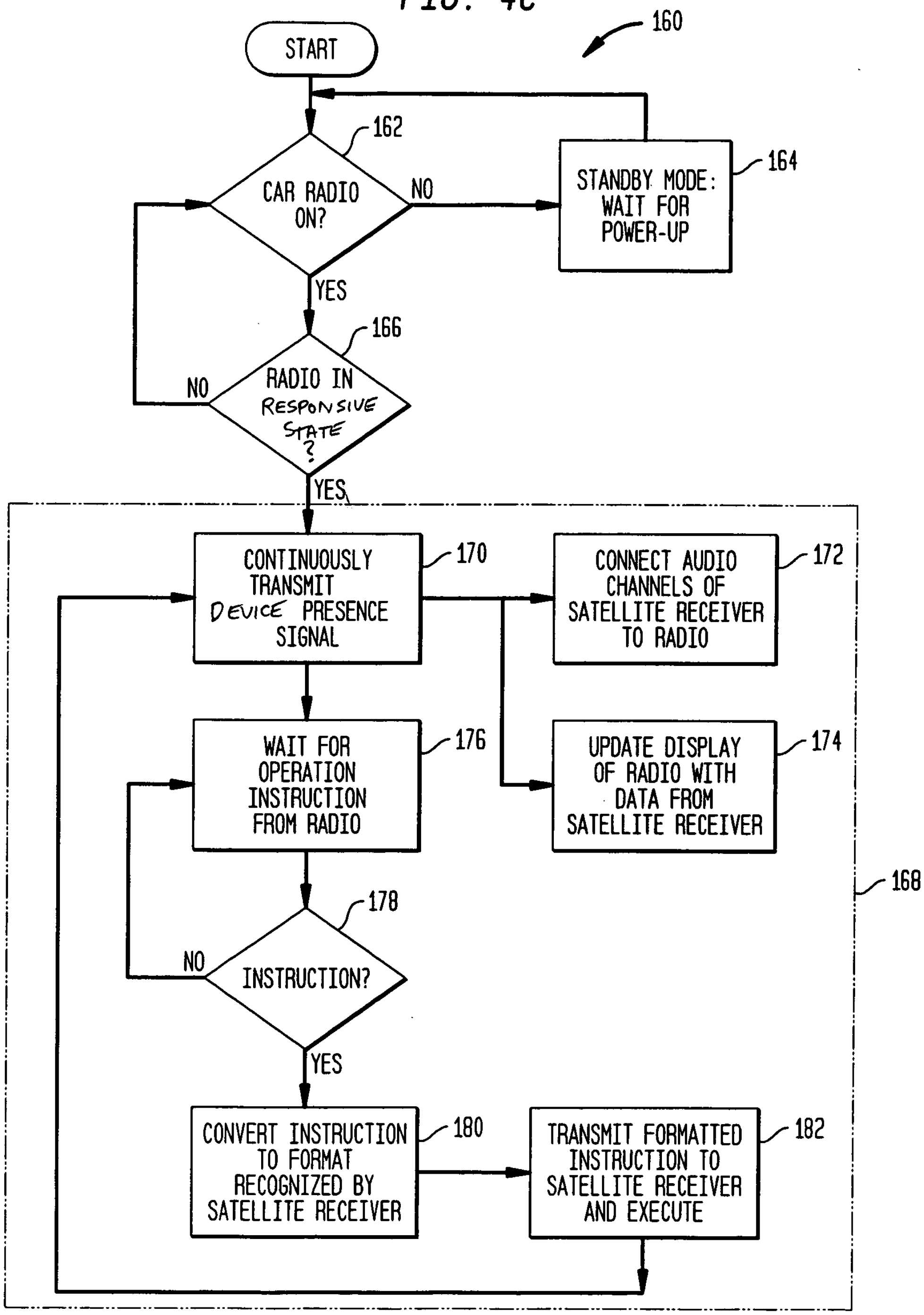
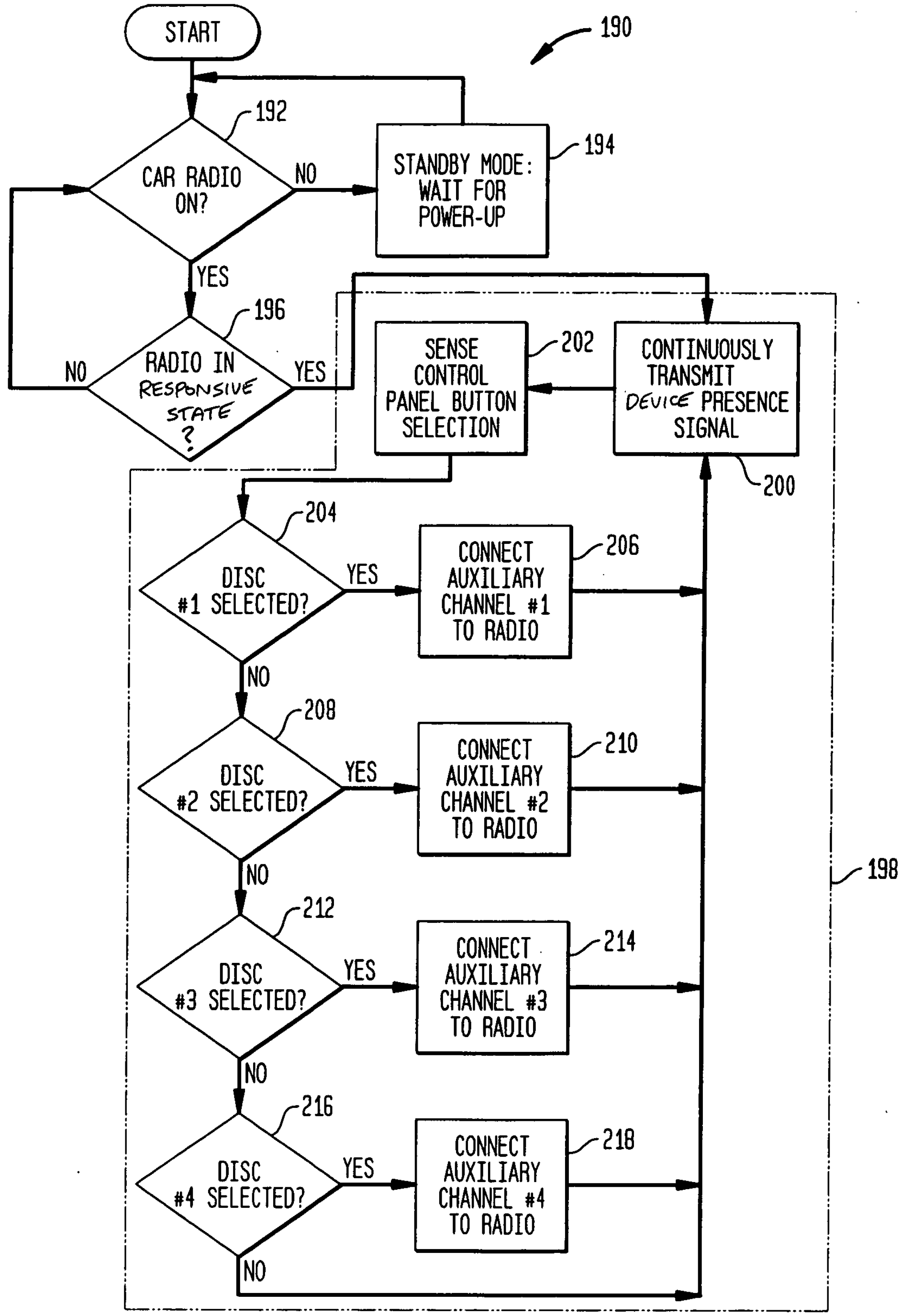

130
START
132
CAR RADIO ON?
NO
YES
STANDBY MODE: WAIT FOR POWER-UP
134
136
RADIO IN RESPONSIVE STATE?
NO
YES
CONTINUOUSLY TRANSMIT DEVICE PRESENCE SIGNAL
140
CONNECT AUDIO CHANNELS OF MP3 PLAYER TO RADIO
142
WAIT FOR OPERATION INSTRUCTION FROM RADIO
146
UPDATE DISPLAY OF RADIO WITH DATA FROM PLAYER
144
138
148
INSTRUCTION?
NO
YES
CONVERT INSTRUCTION TO FORMAT RECOGNIZED BY MP3 PLAYER
150
TRANSMIT FORMATTED INSTRUCTION TO MP3 PLAYER AND EXECUTE
152

FIG. 4C



160
START
CAR RADIO ON?
162
NO
STANDBY MODE: WAIT FOR POWER-UP
164
YES
RADIO IN RESPONSIVE STATE ?
166
NO
YES
CONTINUOUSLY TRANSMIT DEVICE PRESENCE SIGNAL
170
CONNECT AUDIO CHANNELS OF SATELLITE RECEIVER TO RADIO
172
WAIT FOR OPERATION INSTRUCTION FROM RADIO
176
UPDATE DISPLAY OF RADIO WITH DATA FROM SATELLITE RECEIVER
174
168
INSTRUCTION?
178
NO
YES
CONVERT INSTRUCTION TO FORMAT RECOGNIZED BY SATELLITE RECEIVER
180
TRANSMIT FORMATTED INSTRUCTION TO SATELLITE RECEIVER AND EXECUTE
182

FIG. 4D



190
START
192
CAR RADIO ON?
NO
STANDBY MODE: WAIT FOR POWER-UP
194
YES
196
RADIO IN RESPONSIVE STATE ?
NO
YES
SENSE CONTROL PANEL BUTTON SELECTION
202
CONTINUOUSLY TRANSMIT DEVICE PRESENCE SIGNAL
200
204
DISC #1 SELECTED?
YES
CONNECT AUXILIARY CHANNEL #1 TO RADIO
206
NO
208
DISC #2 SELECTED?
YES
CONNECT AUXILIARY CHANNEL #2 TO RADIO
210
NO
212
DISC #3 SELECTED?
YES
CONNECT AUXILIARY CHANNEL #3 TO RADIO
214
NO
216
DISC #4 SELECTED?
YES
CONNECT AUXILIARY CHANNEL #4 TO RADIO
218
NO
198

FIG. 4E

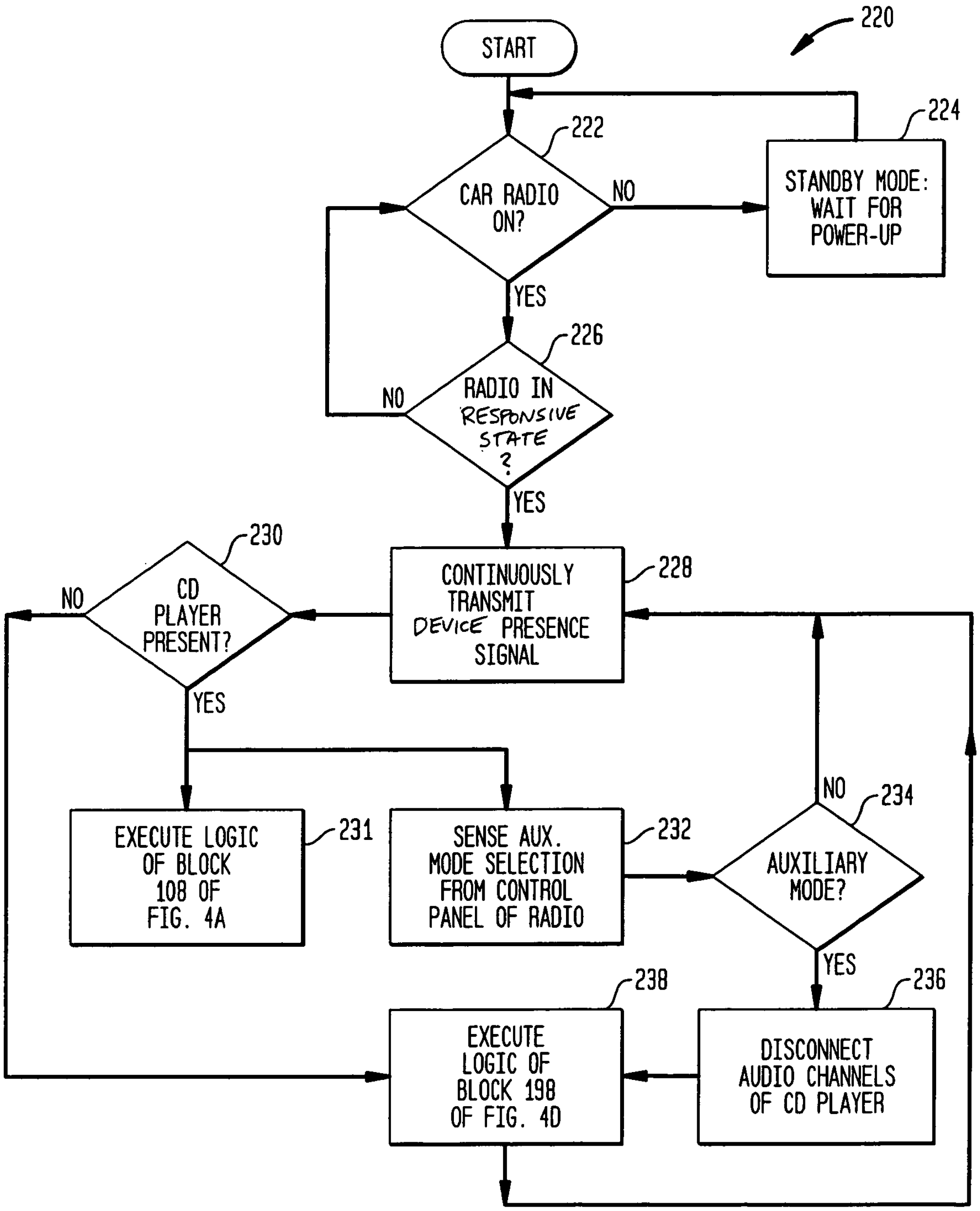
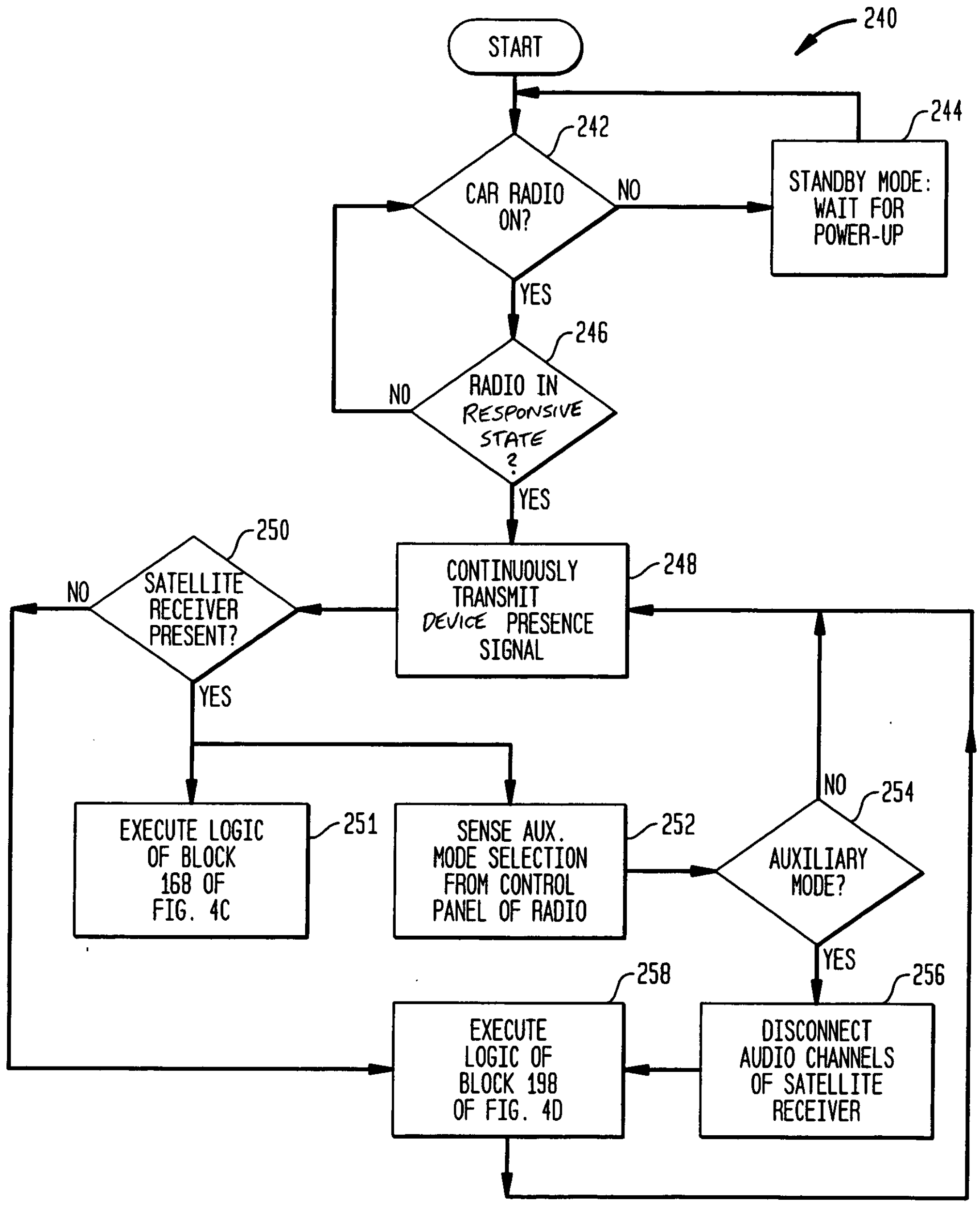
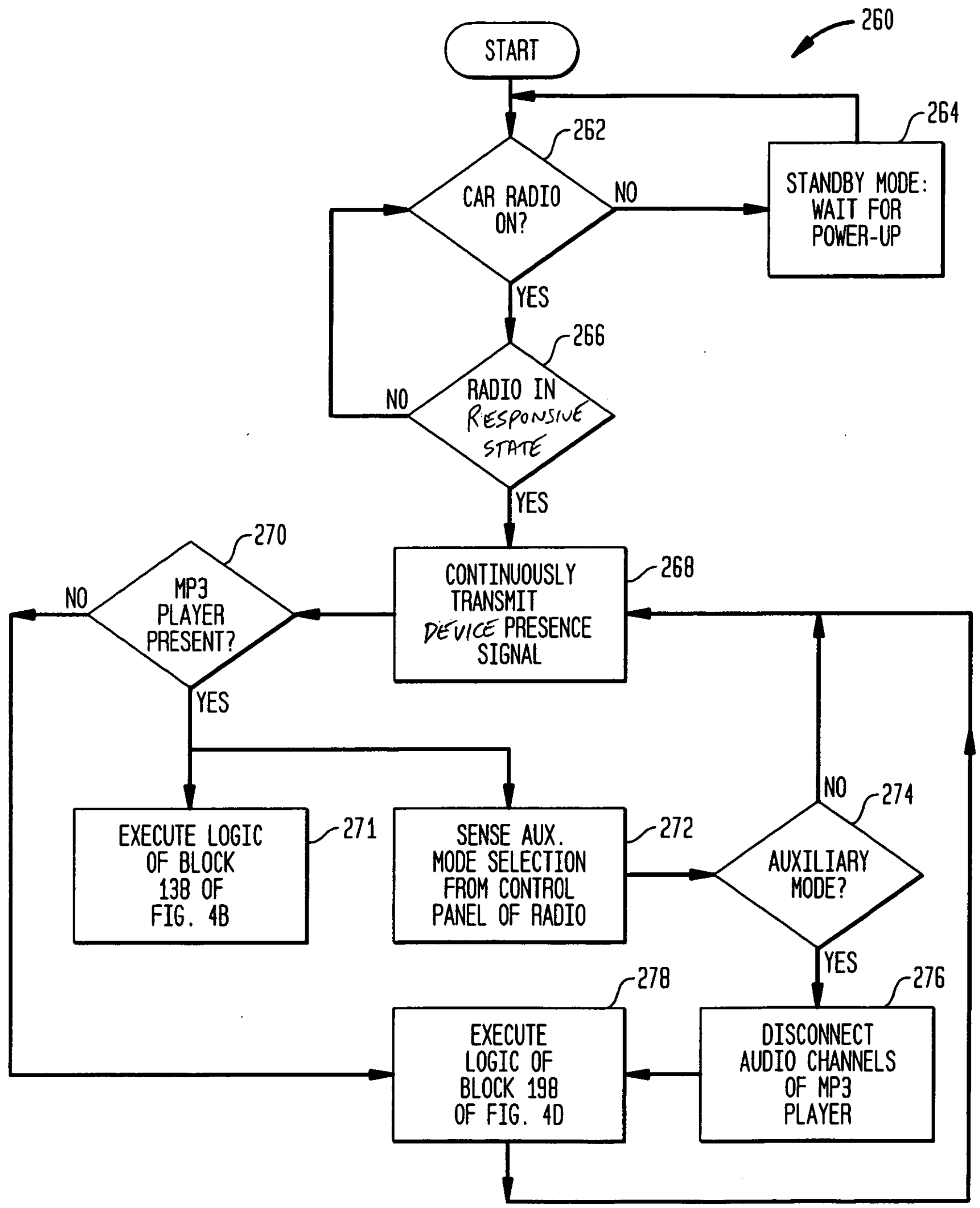

220
START
222
CAR RADIO ON?
NO
224
STANDBY MODE: WAIT FOR POWER-UP
YES
226
RADIO IN RESPONSIVE STATE ?
NO
YES
228
CONTINUOUSLY TRANSMIT DEVICE PRESENCE SIGNAL
230
CD PLAYER PRESENT?
NO
YES
231
EXECUTE LOGIC OF BLOCK 108 OF FIG. 4A
232
SENSE AUX. MODE SELECTION FROM CONTROL PANEL OF RADIO
234
AUXILIARY MODE?
NO
YES
236
DISCONNECT AUDIO CHANNELS OF CD PLAYER
238
EXECUTE LOGIC OF BLOCK 198 OF FIG. 4D

FIG. 4F



240
START
242
CAR RADIO ON?
NO
244
STANDBY MODE: WAIT FOR POWER-UP
YES
246
RADIO IN RESPONSIVE STATE ?
NO
YES
248
CONTINUOUSLY TRANSMIT DEVICE PRESENCE SIGNAL
250
SATELLITE RECEIVER PRESENT?
NO
YES
251
EXECUTE LOGIC OF BLOCK 168 OF FIG. 4C
252
SENSE AUX. MODE SELECTION FROM CONTROL PANEL OF RADIO
254
AUXILIARY MODE?
NO
YES
256
DISCONNECT AUDIO CHANNELS OF SATELLITE RECEIVER
258
EXECUTE LOGIC OF BLOCK 198 OF FIG. 4D

FIG. 4G



260
START
262
CAR RADIO ON?
NO
YES
264
STANDBY MODE: WAIT FOR POWER-UP
266
RADIO IN RESPONSIVE STATE
NO
YES
268
CONTINUOUSLY TRANSMIT DEVICE PRESENCE SIGNAL
270
MP3 PLAYER PRESENT?
NO
YES
271
EXECUTE LOGIC OF BLOCK 138 OF FIG. 4B
272
SENSE AUX. MODE SELECTION FROM CONTROL PANEL OF RADIO
274
AUXILIARY MODE?
NO
YES
276
DISCONNECT AUDIO CHANNELS OF MP3 PLAYER
278
EXECUTE LOGIC OF BLOCK 198 OF FIG. 4D

FIG. 5

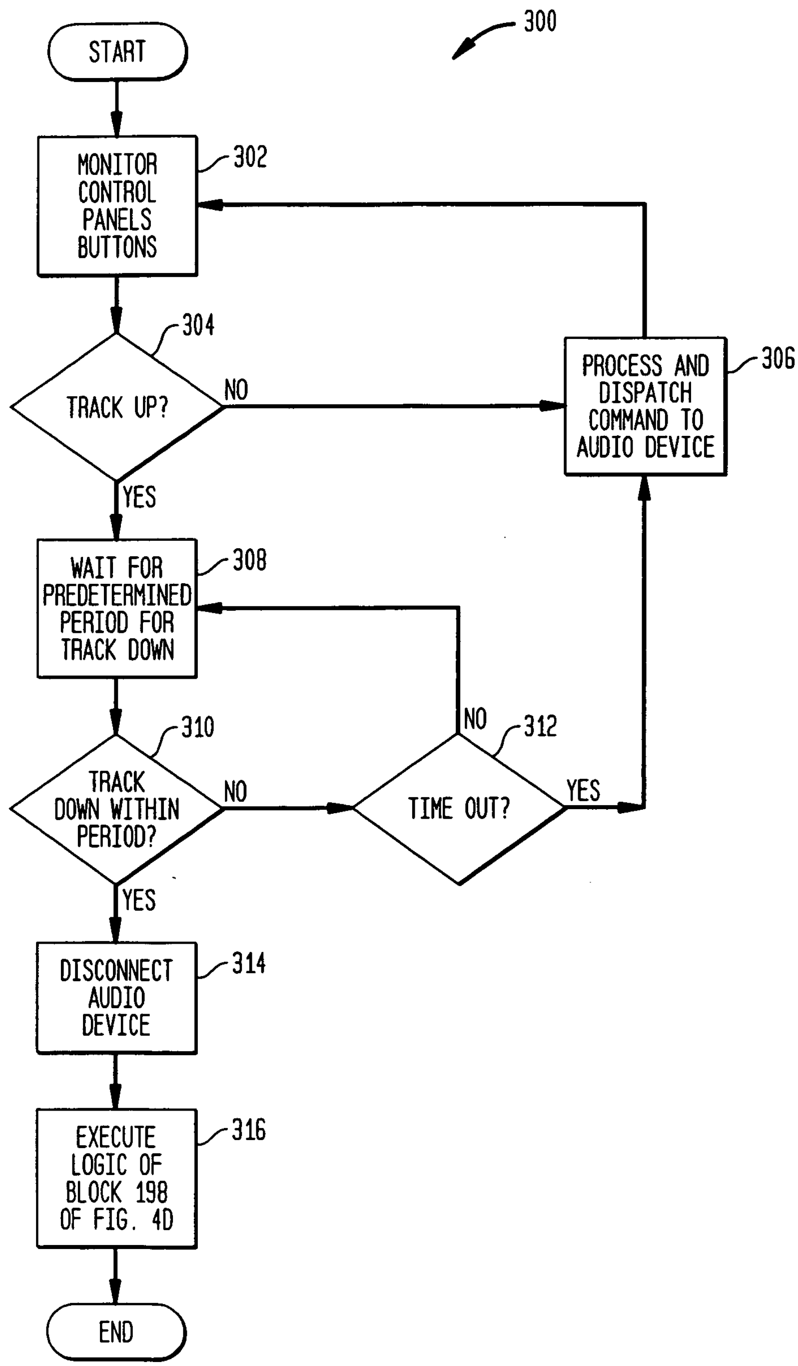

300
START
MONITOR CONTROL PANELS BUTTONS
302
304
TRACK UP?
NO
YES
PROCESS AND DISPATCH COMMAND TO AUDIO DEVICE
306
WAIT FOR PREDETERMINED PERIOD FOR TRACK DOWN
308
310
TRACK DOWN WITHIN PERIOD?
NO
YES
312
TIME OUT?
NO
YES
DISCONNECT AUDIO DEVICE
314
EXECUTE LOGIC OF BLOCK 198 OF FIG. 4D
316
END

FIG. 6

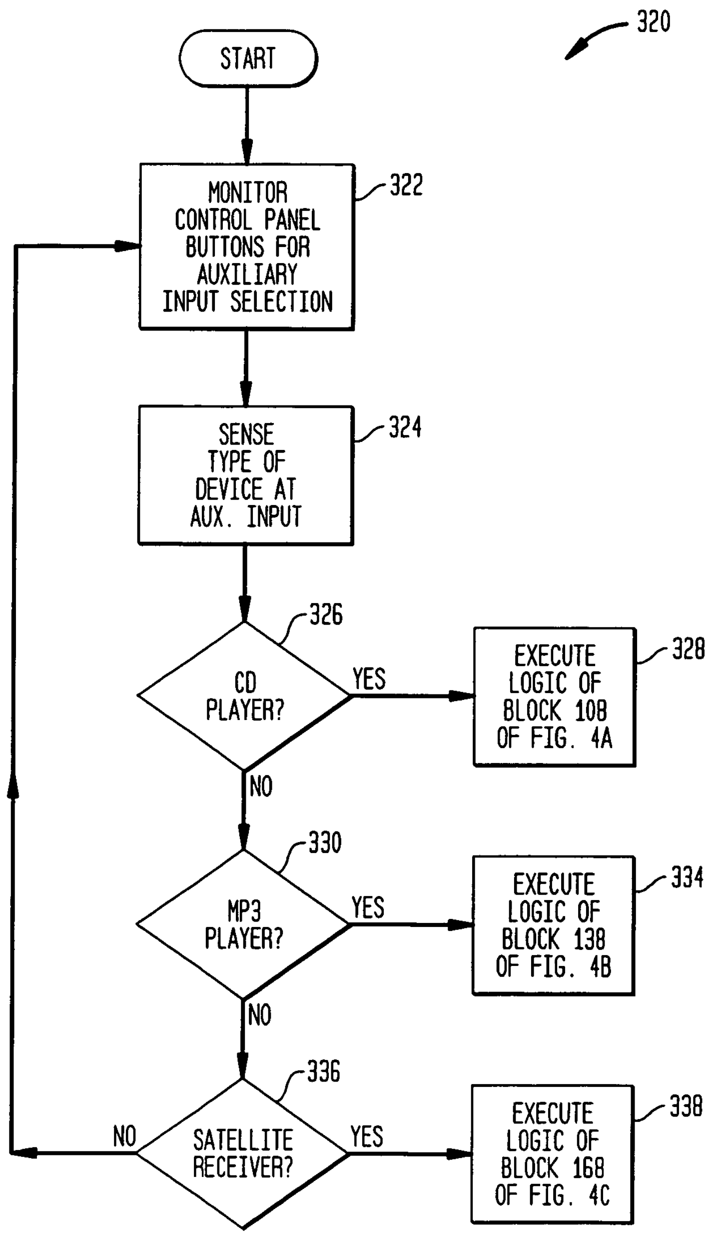

320
START
MONITOR CONTROL PANEL BUTTONS FOR AUXILIARY INPUT SELECTION
322
SENSE TYPE OF DEVICE AT AUX. INPUT
324
326
CD PLAYER?
YES
NO
EXECUTE LOGIC OF BLOCK 108 OF FIG. 4A
328
330
MP3 PLAYER?
YES
NO
EXECUTE LOGIC OF BLOCK 138 OF FIG. 4B
334
336
SATELLITE RECEIVER?
NO
YES
EXECUTE LOGIC OF BLOCK 168 OF FIG. 4C
338

FIG. 7A

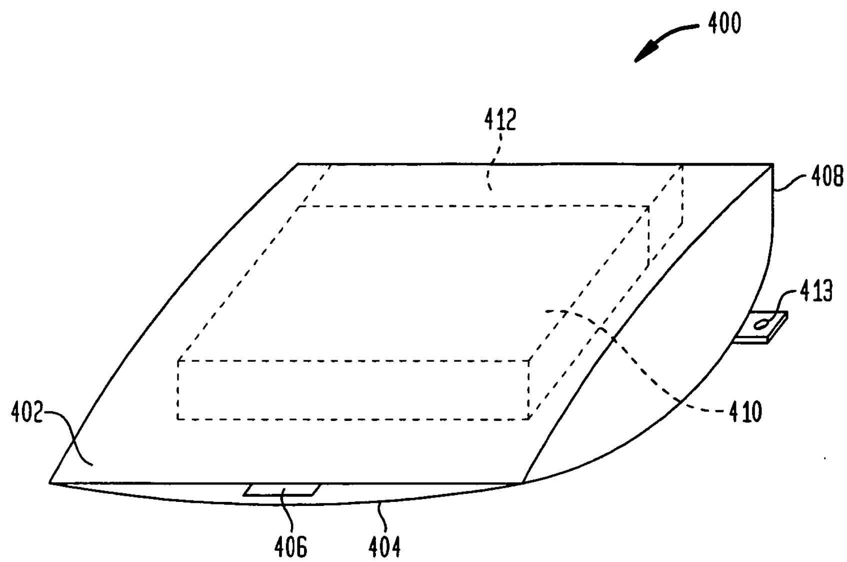


FIG. 7B

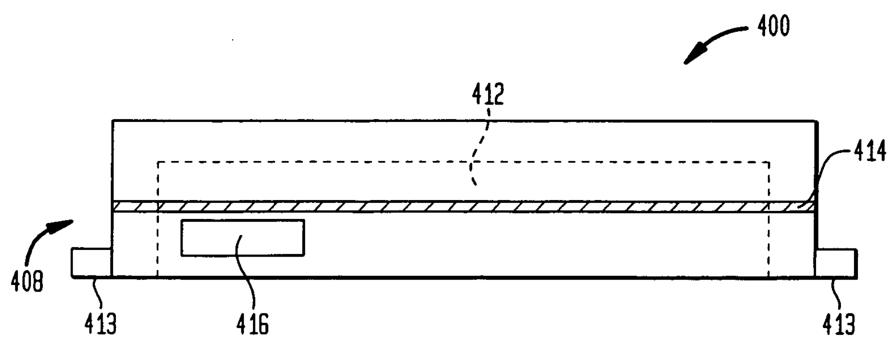


FIG. 8A

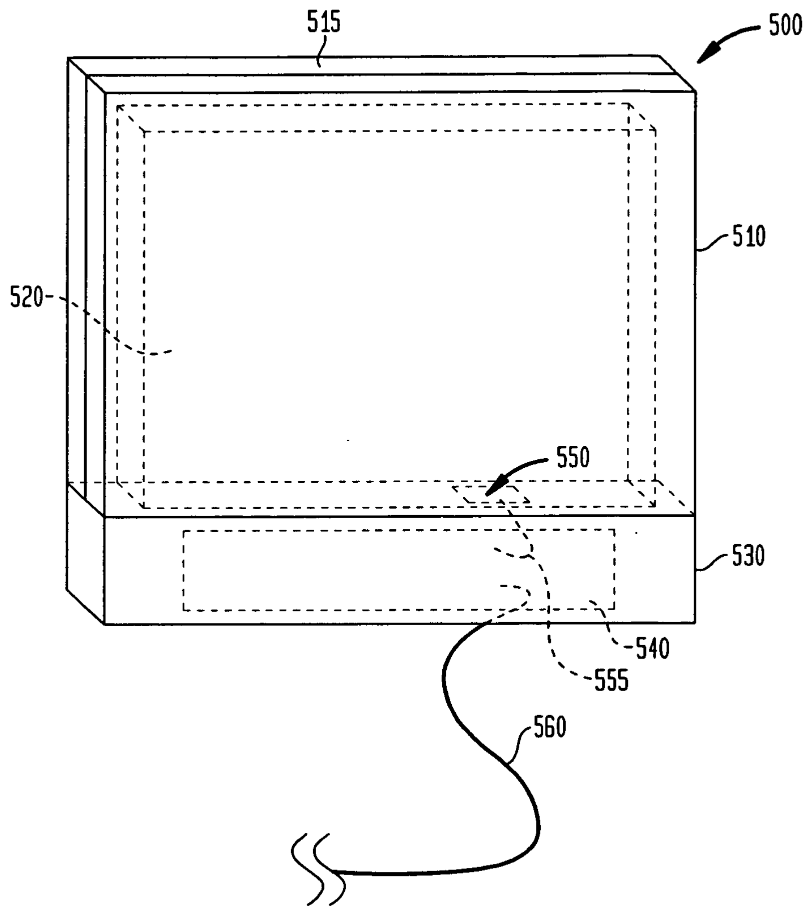


FIG. 8B

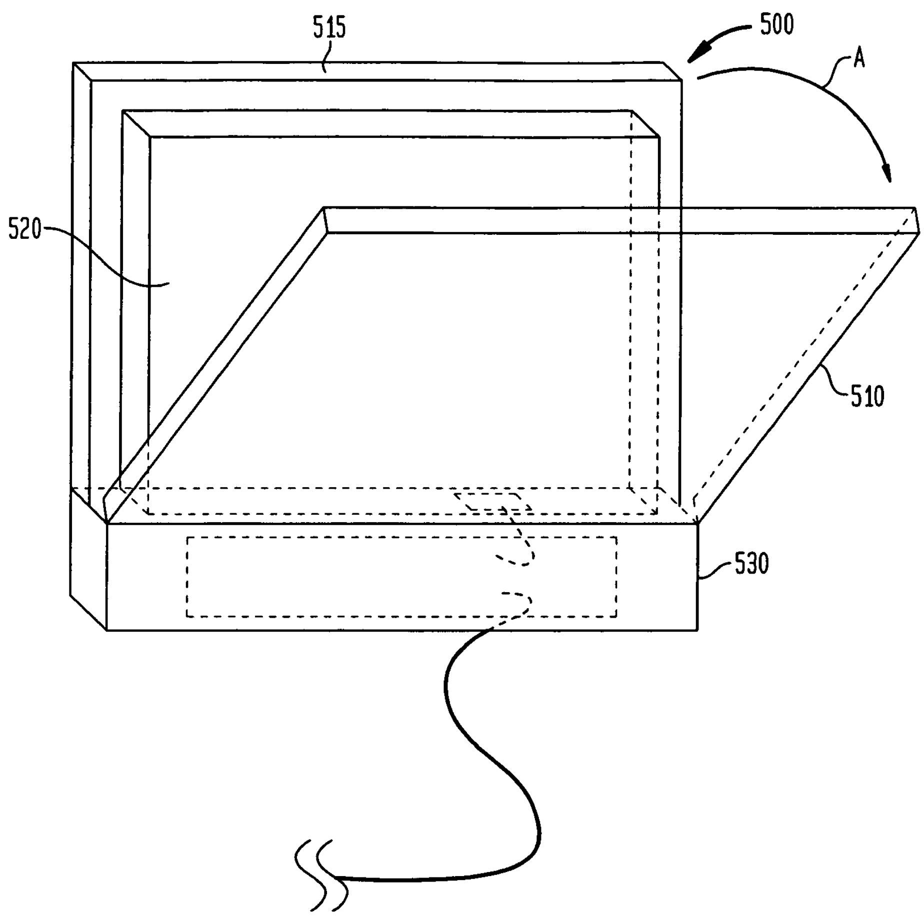

515
500
A
520
510
530

FIG. 9

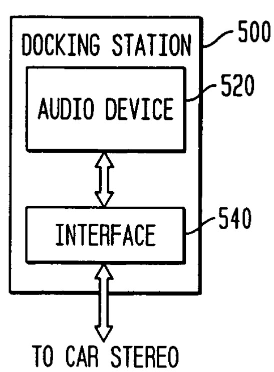

DOCKING STATION
500
AUDIO DEVICE
520
INTERFACE
540
TO CAR STEREO

FIG. 10

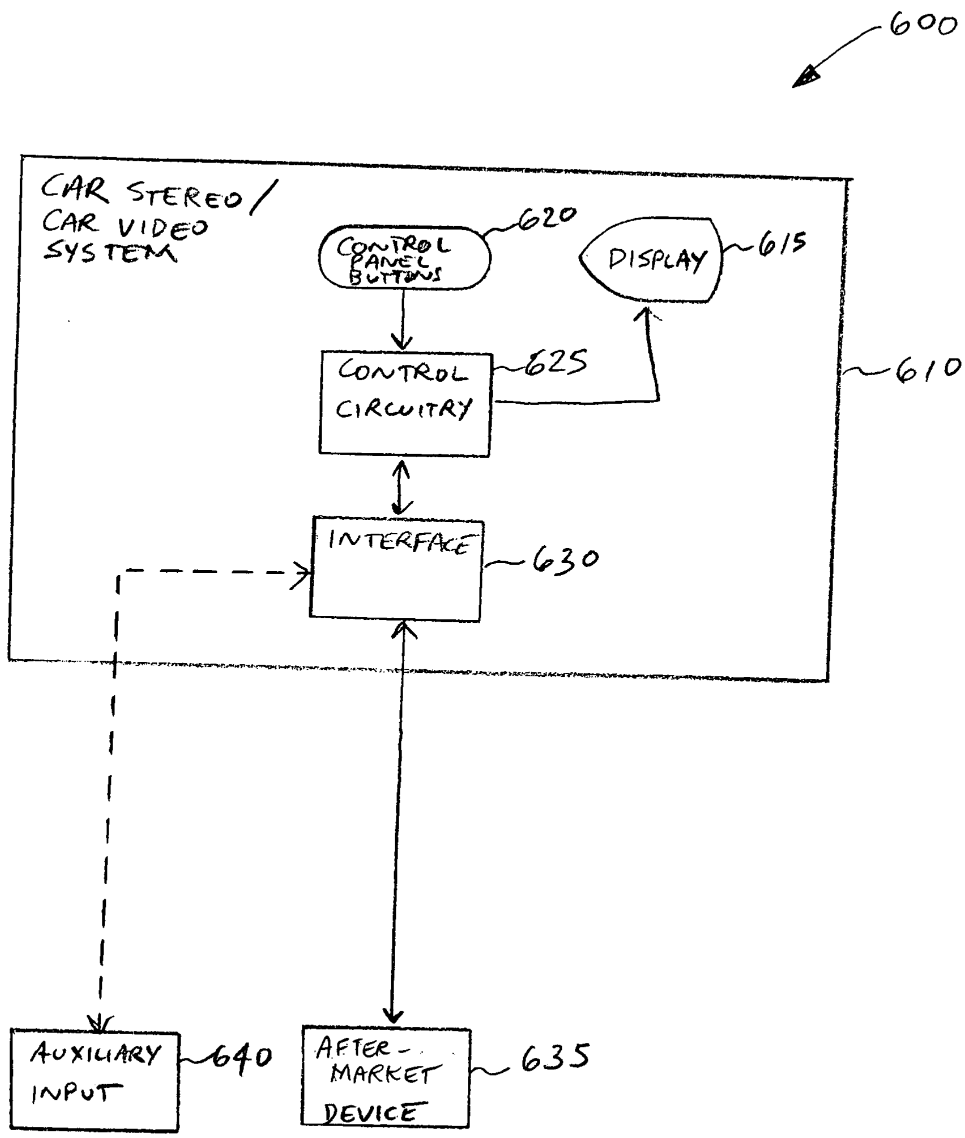

600
CAR STEREO/
CAR VIDEO
SYSTEM
CONTROL PANEL BUTTONS
620
DISPLAY
615
CONTROL CIRCUITRY
625
610
INTERFACE
630
AUXILIARY INPUT
640
AFTER-MARKET DEVICE
635

FIG. 11a

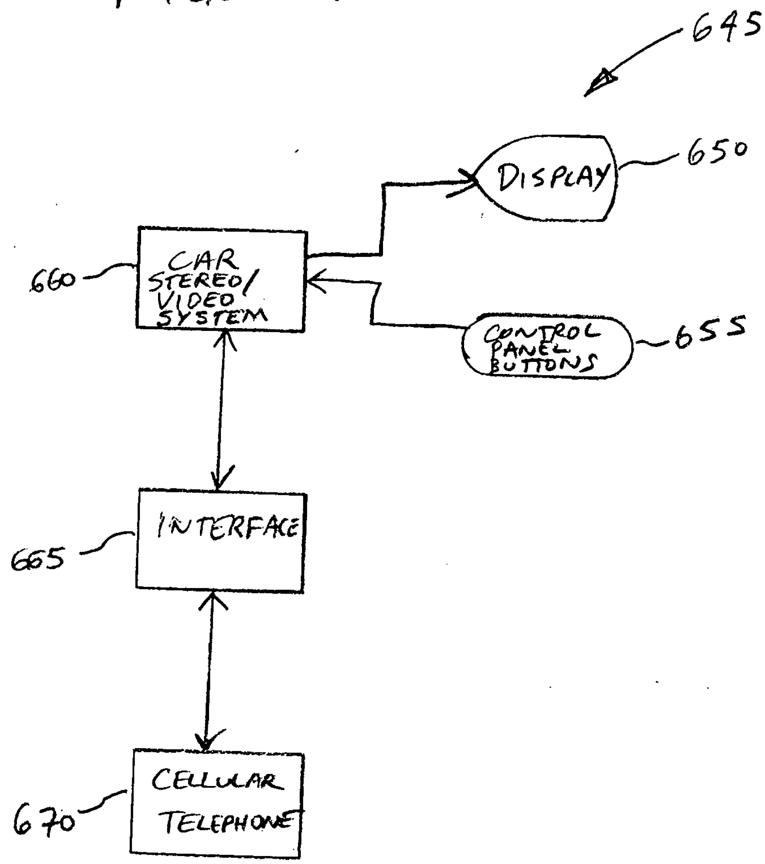

645
DISPLAY
650
660
CAR STEREO/ VIDEO SYSTEM
CONTROL PANEL BUTTONS
655
665
INTERFACE
670
CELLULAR TELEPHONE

FIG. 116

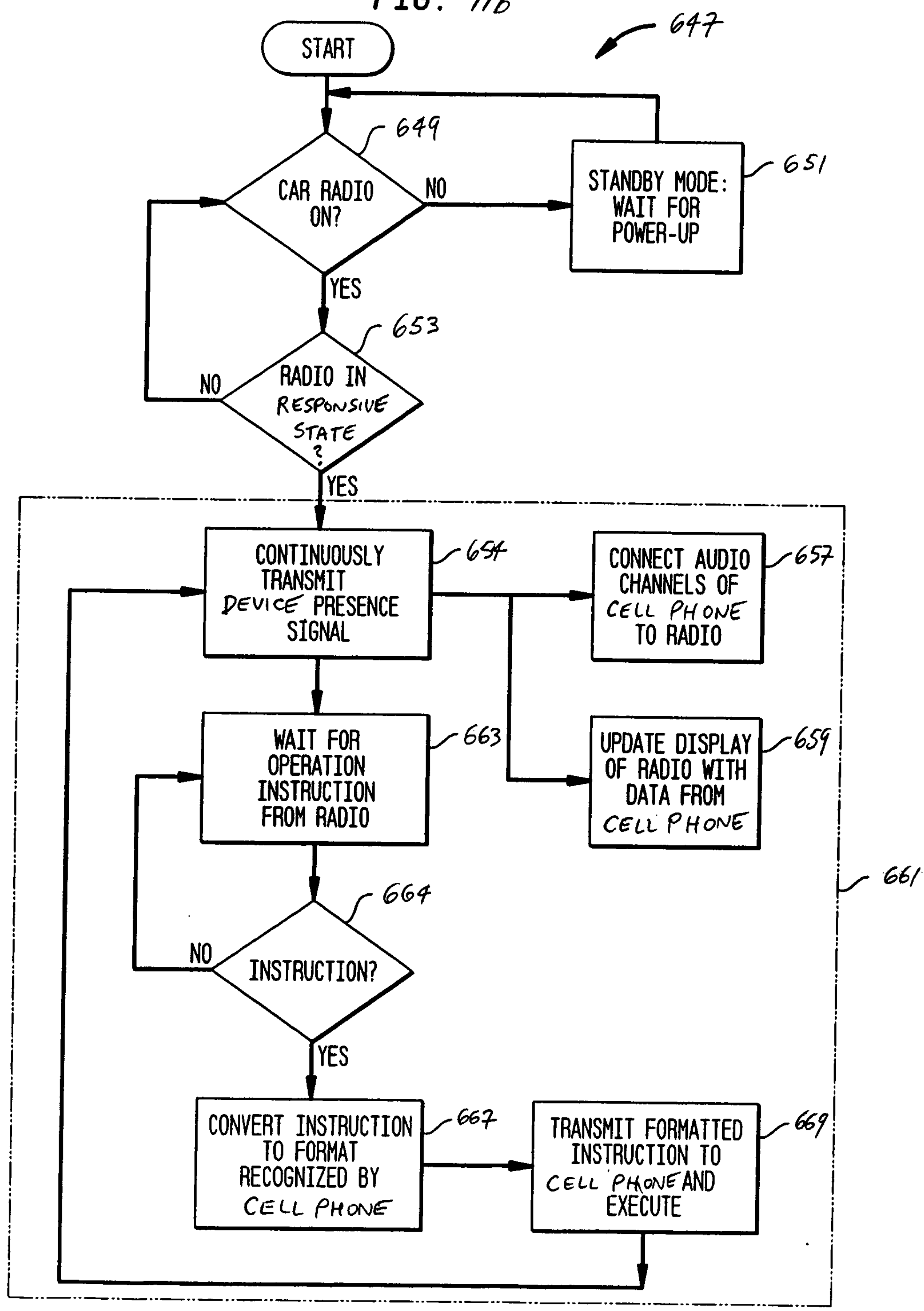

647
START
649
CAR RADIO ON?
NO
STANDBY MODE: WAIT FOR POWER-UP
651
YES
653
NO
RADIO IN RESPONSIVE STATE ?
YES
CONTINUOUSLY TRANSMIT DEVICE PRESENCE SIGNAL
654
CONNECT AUDIO CHANNELS OF CELL PHONE TO RADIO
657
WAIT FOR OPERATION INSTRUCTION FROM RADIO
663
UPDATE DISPLAY OF RADIO WITH DATA FROM CELL PHONE
659
661
664
NO
INSTRUCTION?
YES
CONVERT INSTRUCTION TO FORMAT RECOGNIZED BY CELL PHONE
667
TRANSMIT FORMATTED INSTRUCTION TO CELL PHONE AND EXECUTE
669

FIG. 12a

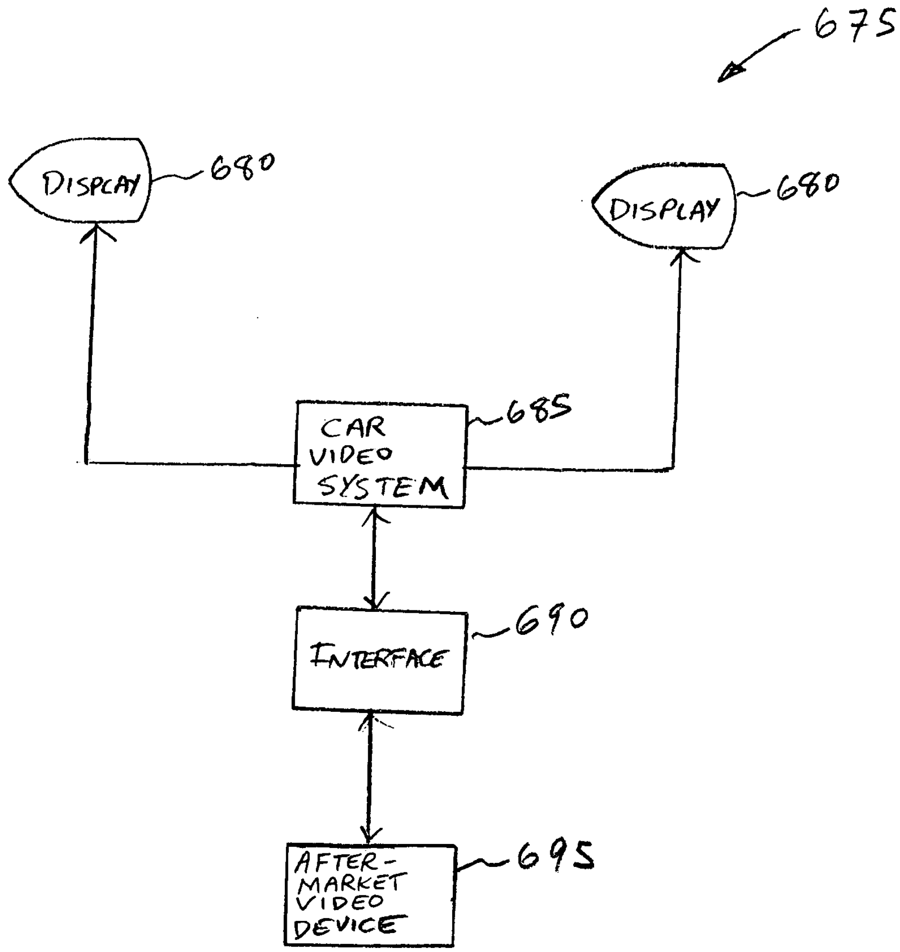

675
DISPLAY
680
DISPLAY
680
CAR VIDEO SYSTEM
685
INTERFACE
690
AFTER-MARKET VIDEO DEVICE
695

FIG. 12b

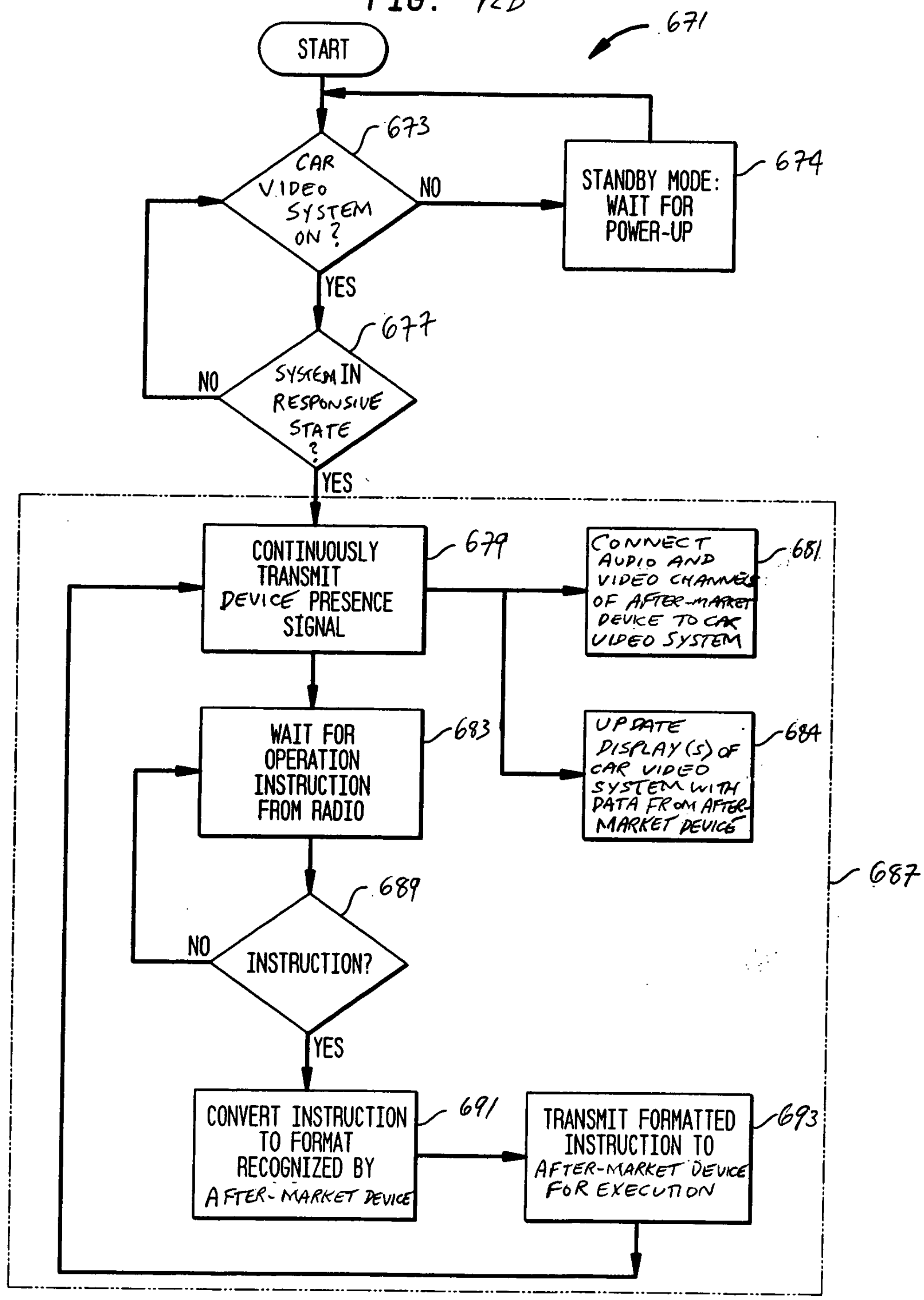
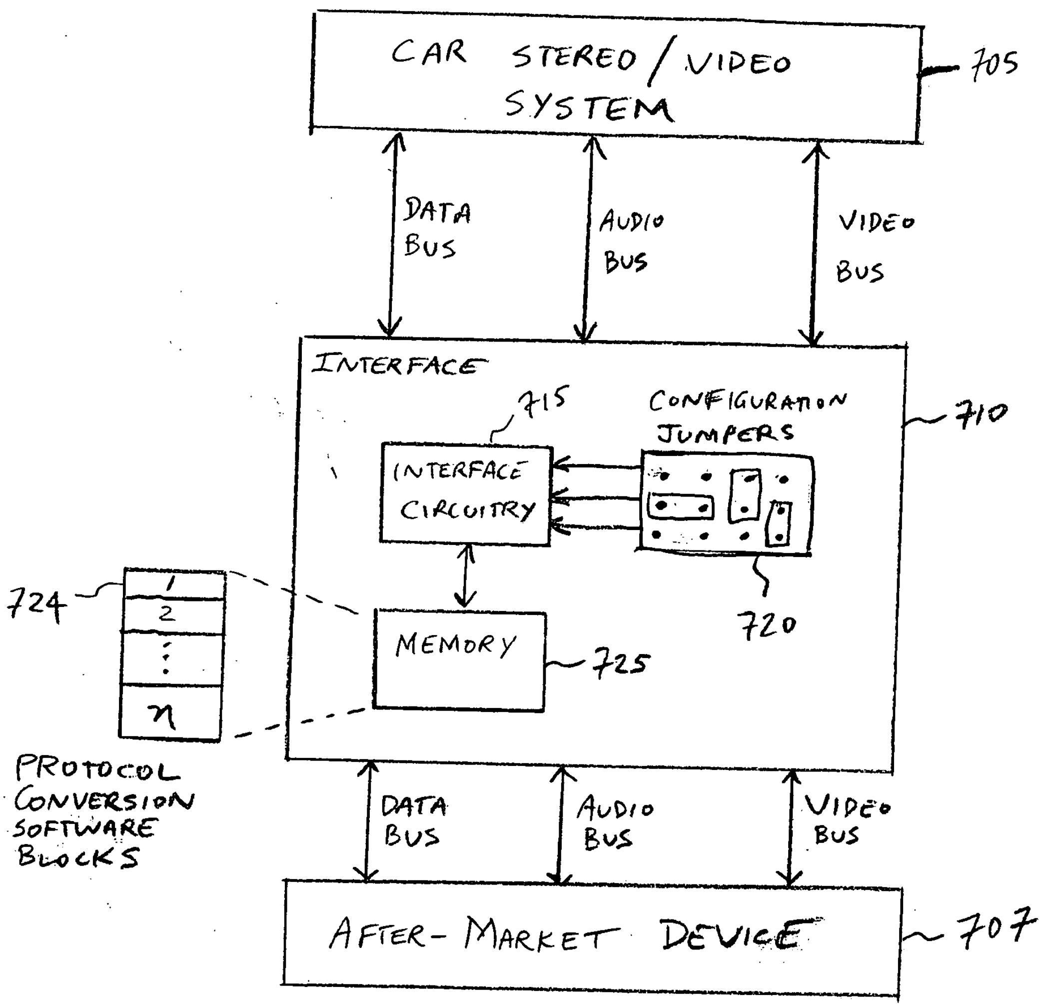

671
START
673
CAR VIDEO SYSTEM ON ?
NO
YES
STANDBY MODE: WAIT FOR POWER-UP
674
677
SYSTEM IN RESPONSIVE STATE ?
NO
YES
CONTINUOUSLY TRANSMIT DEVICE PRESENCE SIGNAL
679
CONNECT AUDIO AND VIDEO CHANNELS OF AFTER-MARKET DEVICE TO CAR VIDEO SYSTEM
681
WAIT FOR OPERATION INSTRUCTION FROM RADIO
683
UPDATE DISPLAY(S) OF CAR VIDEO SYSTEM WITH DATA FROM AFTER-MARKET DEVICE
684
687
689
NO
INSTRUCTION?
YES
CONVERT INSTRUCTION TO FORMAT RECOGNIZED BY AFTER-MARKET DEVICE
691
TRANSMIT FORMATTED INSTRUCTION TO AFTER-MARKET DEVICE FOR EXECUTION
693

FIG. 13a



CAR STEREO / VIDEO SYSTEM
705
DATA BUS
AUDIO BUS
VIDEO BUS
INTERFACE
715
CONFIGURATION JUMPERS
710
INTERFACE CIRCUITRY
724
1
2
n
MEMORY
725
720
PROTOCOL CONVERSION SOFTWARE BLOCKS
DATA BUS
AUDIO BUS
VIDEO BUS
AFTER-MARKET DEVICE
707

FIG. 13b

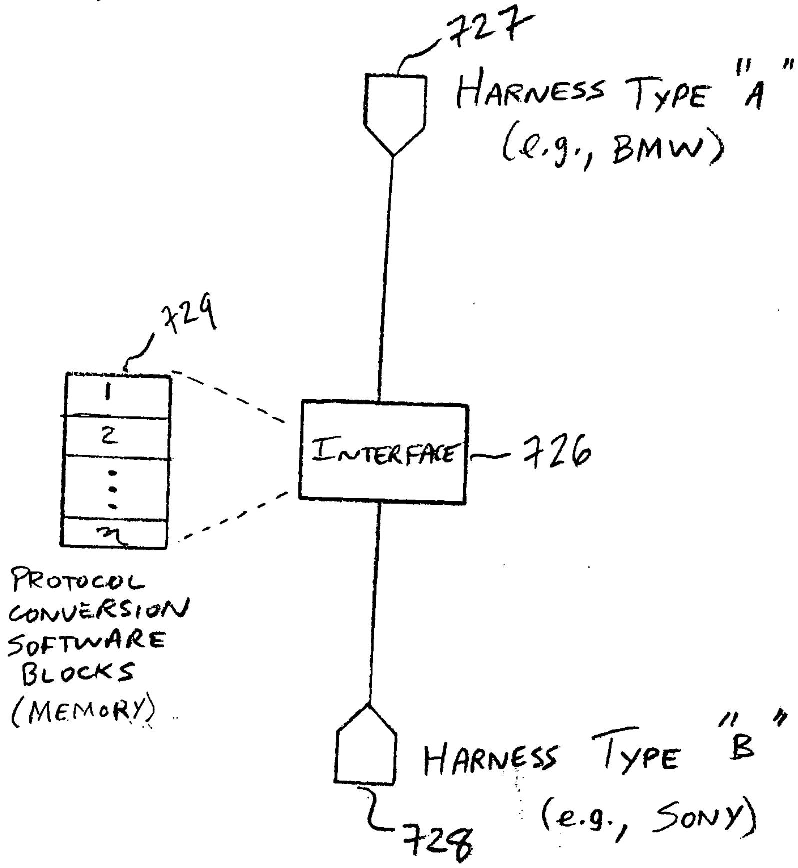

727
HARNESS TYPE "A"
(e.g., BMW)
729
1
2
n
INTERFACE
726
PROTOCOL
CONVERSION
SOFTWARE
BLOCKS
(MEMORY)
HARNESS TYPE "B"
(e.g., SONY)
728

FIG. 14

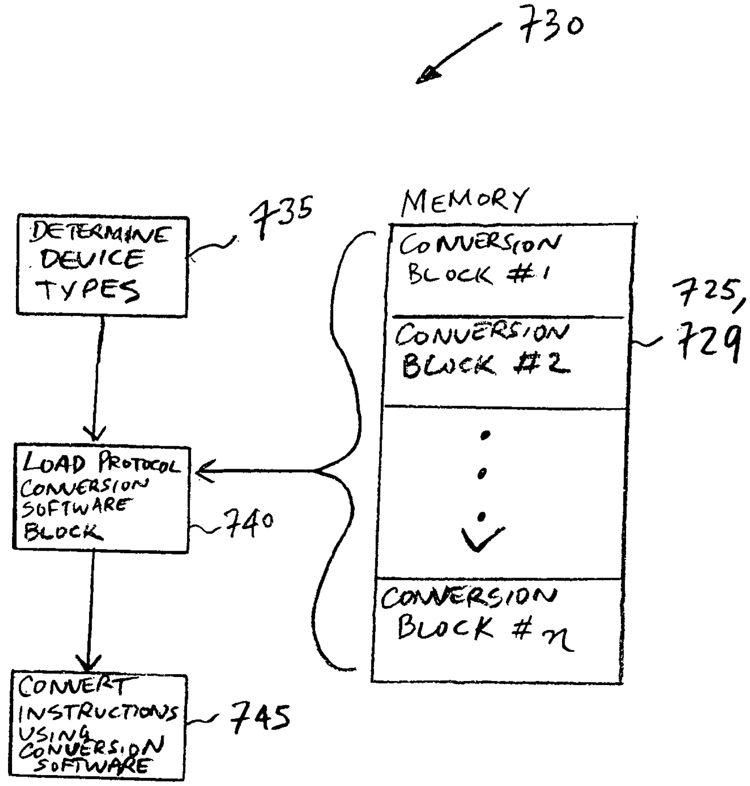
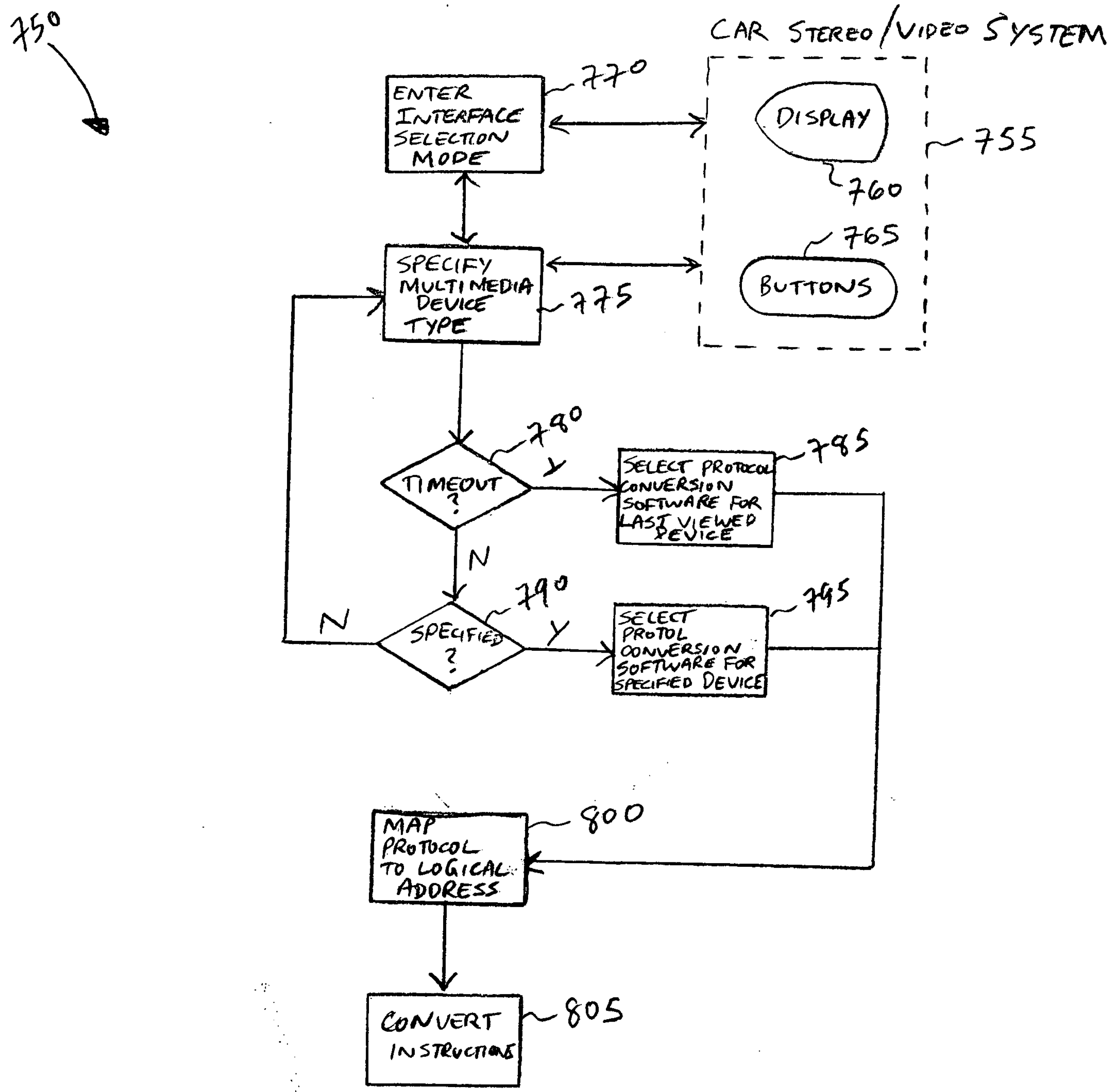

730
MEMORY
DETERMINE DEVICE TYPES
735
CONVERSION BLOCK #1
CONVERSION BLOCK #2
725, 729
LOAD PROTOCOL CONVERSION SOFTWARE BLOCK
740
CONVERSION BLOCK #n
CONVERT INSTRUCTIONS USING CONVERSION SOFTWARE
745

FIG. 15

750



CAR STEREO/VIDEO SYSTEM
ENTER INTERFACE SELECTION MODE
770
DISPLAY
760
755
765
BUTTONS
SPECIFY MULTIMEDIA DEVICE TYPE
775
780
TIMEOUT ?
Y
SELECT PROTOCOL CONVERSION SOFTWARE FOR LAST VIEWED DEVICE
785
N
790
SPECIFIED ?
Y
N
SELECT PROTOL CONVERSION SOFTWARE FOR SPECIFIED DEVICE
795
MAP PROTOCOL TO LOGICAL ADDRESS
800
CONVERT INSTRUCTIONS
805

FIG. 16

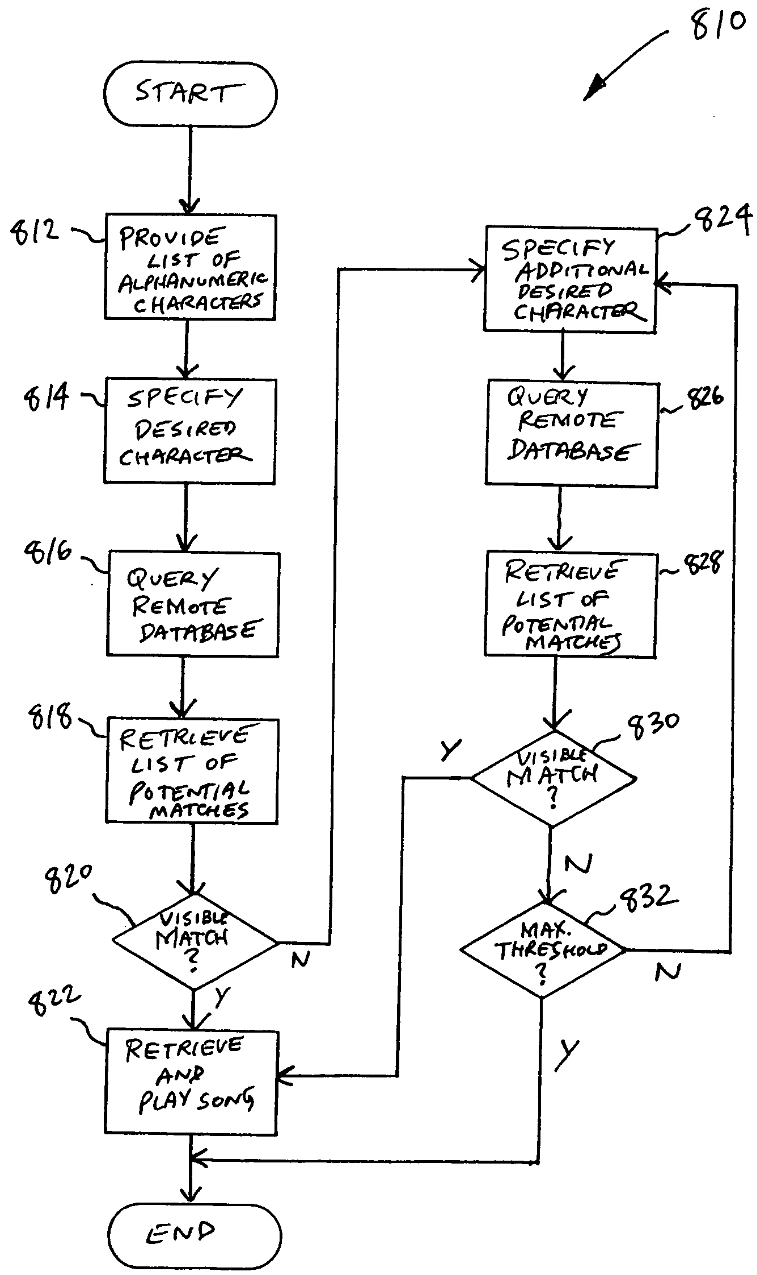
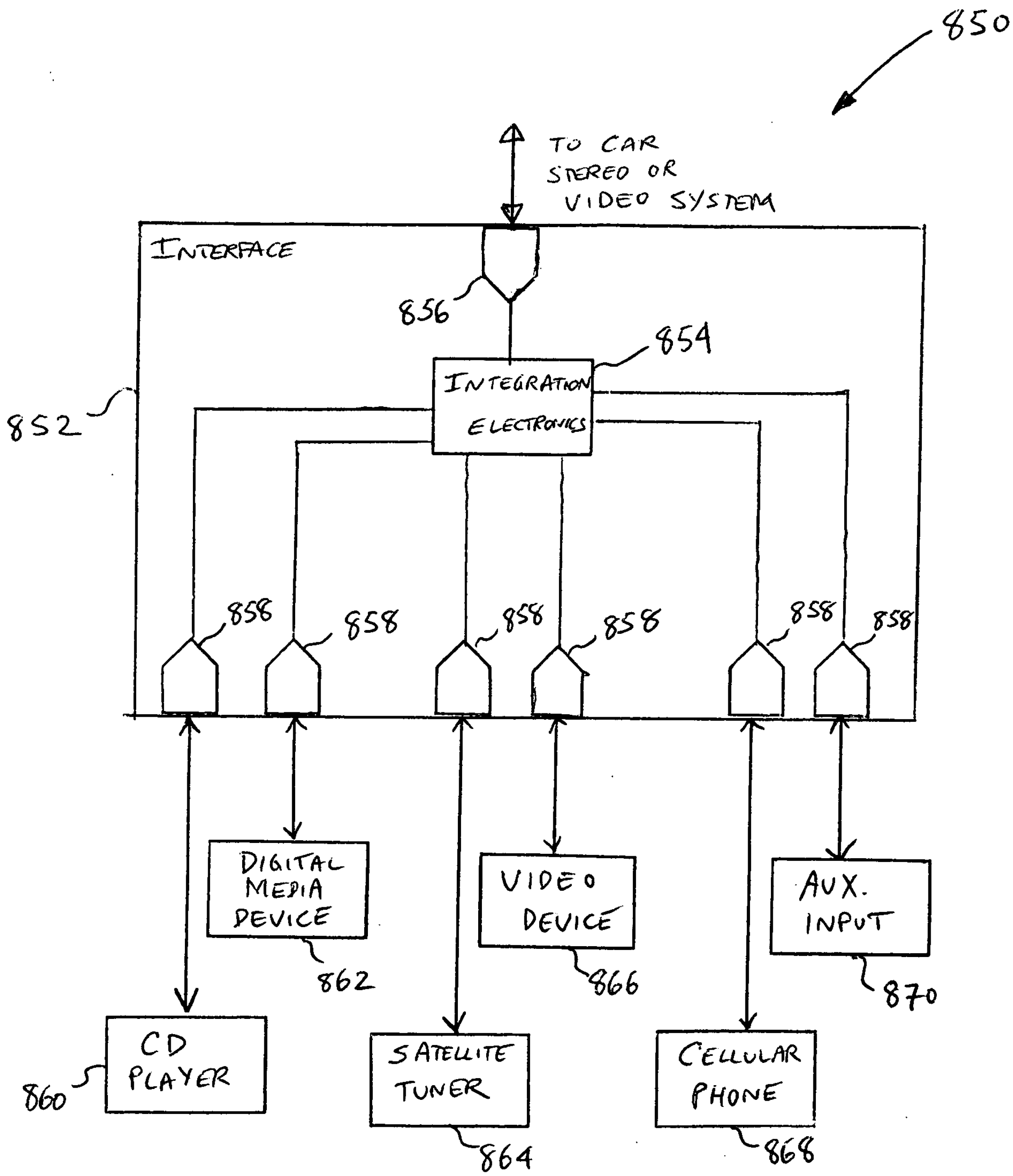

810
START
812
PROVIDE LIST OF ALPHANUMERIC CHARACTERS
814
SPECIFY DESIRED CHARACTER
816
QUERY REMOTE DATABASE
818
RETRIEVE LIST OF POTENTIAL MATCHES
820
VISIBLE MATCH ?
N
Y
822
RETRIEVE AND PLAY SONG
END
824
SPECIFY ADDITIONAL DESIRED CHARACTER
826
QUERY REMOTE DATABASE
828
RETRIEVE LIST OF POTENTIAL MATCHES
830
VISIBLE MATCH ?
Y
N
832
MAX. THRESHOLD ?
N
Y

FIG. 17


850
TO CAR
STEREO OR
VIDEO SYSTEM
INTERFACE
856
854
INTEGRATION
ELECTRONICS
852
858
858
858
858
858
858
DIGITAL
MEDIA
DEVICE
862
VIDEO
DEVICE
866
AUX.
INPUT
870
CD
PLAYER
860
SATELLITE
TUNER
864
CELLULAR
PHONE
868

EV623709633US

Attorney Docket No. 99879-00003

DECLARATION AND POWER OF ATTORNEY
(Patent, Design or C-I-P Application)

As a below-named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name.
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are stated below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: Multimedia Device Integration System, the specification of which

__X__ is attached hereto
_____ was filed on ________ as Application Serial No. ________ and was amended on ________ (if applicable)

I hereby state that I have reviewed and understand the contents of the above-entitled specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. §1.56.
I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN APPLICATION(S)

COUNTRY	APPLICATION NO.	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119
			YES __ NO __
			YES __ NO __

LISTING OF FOREIGN APPLICATIONS CONTINUED ON PAGE 2 HEREOF: YES __ NO __

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

__________ (Application Serial No.) __________ (Filing Date)

I hereby claim the benefit under 35 U.S.C. §120 of any United States application(s), or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application or PCT International application in the manner provided by the first page of 35 U.S.C. §112, I acknowledge the duty to disclose material information as defined in 37 C.F.R. §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status: patented, pending, abandoned)
10/732,909	12/10/2003	Pending
10/316,961	12/11/2002	Pending

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

RALPH W. SELITTO, JR., Reg. No. 26,996; MICHAEL R. FRISCIA, Reg. No. 33,884; JOHN K. KIM, Reg. No. 37,002; and all other practitioners associated with Customer Number 27614.

SEND CORRESPONDENCE TO:	Michael R. Friscia McCarter & English, LLP Four Gateway Center 100 Mulberry Street Newark, NJ 07102	DIRECT TELEPHONE CALLS TO:	(973) 639-8493

Full Name of Inventor #1	Last Name: Marlowe	First Name: Ira	Middle Name: M
Residence & Citizenship	City: Fort Lee	State or Foreign Country: NJ	Country of Citizenship: USA
Post Office Address	Post Office Address: 6403 Hilltop Ct	City: Fort Lee	State or Country and Zip Code: NJ 07024
Full Name of Inventor #2	Last Name:	First Name:	Middle Name:
Residence & Citizenship	City:	State or Foreign Country:	Country of Citizenship:
Post Office Address	Post Office Address:	City:	State or Country and Zip Code:

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signature of Inventor #1 [signature]	Signature of Inventor #2
Date: 3/2/05	Date:

LISTING OF INVENTORS CONTINUED ON PAGE 2 HEREOF: YES __ NO X

BEST AVAILABLE COPY

PATENT APPLICATION SERIAL NO. ____________________

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

03/08/2005 AADOFO1 00000038 501402 11071667

01	FC:2011		150.00 OP
02	FC:2111		250.00 OP
03	FC:2311		100.00 OP
04	FC:2201		900.00 OP
05	FC:2202	25.00 DA	375.00 OP
06	FC:2081	125.00 DA	

PTO-1556
(5/87)

*U.S. Government Printing Office: 2002 — 489-267/69033

PATENT APPLICATION FEE DETERMINATION RECORD
Effective December 8, 2004

11071667

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	36	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	36 minus 20=	* 16
INDEPENDENT CLAIMS	12 minus 3 =	* 9
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐ OR OTHER THAN SMALL ENTITY

RATE	FEE		RATE	FEE
BASIC FEE	150.00	OR	BASIC FEE	300.00
X$ 25=	400	OR	X$50=	
X100=	900	OR	X200=	
+180=		OR	+360=	
TOTAL	1450	OR	TOTAL	

CLAIMS AS AMENDED - PART II

SMALL ENTITY OR OTHER THAN SMALL ENTITY

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 25=		OR	X$50=	
X100=		OR	X200=	
+180=		OR	+360=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 25=		OR	X$50=	
X100=		OR	X200=	
+180=		OR	+360=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 25=		OR	X$50=	
X100=		OR	X200=	
+180=		OR	+360=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
***If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

FORM PTO-875 (Rev. 10/04)

Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

PATENT APPLICATION SERIAL NO. ____________________

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

Best Available Copy

03/08/2005 AADOFO1 00000038 501402 11071667

01	FC:2011		150.00 OP
02	FC:2111		250.00 OP
03	FC:2311		100.00 OP
04	FC:2201		900.00 OP
05	FC:2202	25.00 DA	375.00 OP
06	FC:2081	125.00 DA	

06/01/2005 AGDITOM 00000021 501402 11071667

01	FC:2011	150.00 DA
02	FC:2111	250.00 DA
03	FC:2311	100.00 DA
04	FC:2201	900.00 DA
05	FC:2202	400.00 DA
06	FC:9101	50.00 DA

PTO-1556
(5/87)

*U.S. Government Printing Office: 2002 — 489-267/69033