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UTILITY PATENT APPLICATION TRANSMITTAL <small>(Only for new nonprovisional applications under 37 CFR 1.53(b))</small>	Attorney Docket No.	99879-00026
	First Inventor	Ira Marlowe
	Title	Multimedia Device Integration System
	Express Mail Label	EV623706889US

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<p style="text-align: center;">APPLICATION ELEMENTS <small>See MPEP chapter 600 concerning utility patent application contents.</small></p> <p>1. <input type="checkbox"/> Fee Transmittal Form (e.g., PTO/SB/17) <small>(Submit an original and a duplicate for fee processing)</small></p> <p>2. <input checked="" type="checkbox"/> Applicant claims small entity status. <small>See 37 CFR 1.27.</small></p> <p>3. <input checked="" type="checkbox"/> Specification [Total 102] <small>Both the claims and abstract must start on a new page (For information on the preferred arrangement, see MPEP 608.01(a))</small></p> <p>4. <input checked="" type="checkbox"/> Drawing(s) (35 U.S.C. 113) [Total Sheets 36]</p> <p>5. Oath or Declaration [Total Sheets]</p> <p>a. <input checked="" type="checkbox"/> Newly Unexecuted Declaration</p> <p>b. <input type="checkbox"/> Copy from a prior application (37 CFR 1.63(d)) <small>(for continuation/divisional with Box 18 completed)</small></p> <p>i. <input type="checkbox"/> DELETION OF INVENTOR(S) <small>Signed statement attached deleting inventor(s) name in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).</small></p> <p>6. <input type="checkbox"/> Application Data Sheet. See 37 CFR 1.76</p> <p>7. <input type="checkbox"/> CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix) <input type="checkbox"/> Landscape Table on CD</p> <p>8. Nucleotide and/or Amino Acid Sequence Submission <small>(if applicable, items a. - c. are required)</small></p> <p>a. Computer Readable Form (CRF)</p> <p>i. <input type="checkbox"/> Computer Readable Form (CRF)</p> <p>ii. <input type="checkbox"/> Transfer Request (37 CFR 1.821(e))</p> <p>b. Specification Sequence Listing on:</p> <p>i. <input type="checkbox"/> CD-ROM or CD-R (2 copies); or</p> <p>ii. <input type="checkbox"/> Paper</p> <p>c. <input type="checkbox"/> Statements verifying identity of above copies</p>	<p style="text-align: center;">ADDRESS TO: Commissioner for Patents P. O. Box 1450 Alexandria VA 22313-1450</p> <p style="text-align: center;">ACCOMPANYING APPLICATION PARTS</p> <p>9. <input type="checkbox"/> Assignment Papers (cover sheet & document(s)) Name of Assignee _____</p> <p>10. <input type="checkbox"/> 37 CFR 3.73(b) Statement <input type="checkbox"/> Power of Attorney <small>(when there is an assignee)</small></p> <p>11. <input type="checkbox"/> English Translation Document (if applicable)</p> <p>12. <input type="checkbox"/> Information Disclosure Statement (PTO/SB/08 or <input type="checkbox"/> Copies of foreign patent documents, publications, & other information</p> <p>13. <input type="checkbox"/> Preliminary Amendment</p> <p>14. <input checked="" type="checkbox"/> Return Receipt Postcard (MPEP 503) <small>(Should be specifically itemized)</small></p> <p>15. <input type="checkbox"/> Certified Copy of Priority Document(s) <small>(if foreign priority is claimed)</small></p> <p>16. <input type="checkbox"/> Nonpublication Request under 35 U.S.C. 122 <small>(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.</small></p> <p>17. <input checked="" type="checkbox"/> Other: <u>Transmittal Letter</u></p>
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18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:

Continuation Divisional Continuation-in-part (CIP) of prior application No.: 11/071,667

Prior application information: Examiner Edward F. Urban Art Unit: 2618

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This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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Customer No.: 27614

File: 99879-00026
Inventor(s): Ira Marlowe
Title: Multimedia Device Integration System
Express Mail Label No.: EV 623706889 US

Sir:

Enclosed herewith please find the following documents in the above-identified application for Letters Patent of the United States:

102 Pages of Specification including claims 1-91 and 1 page of Abstract
36 Sheets of Drawings (Figs. 1-24)
X Utility Patent Application Transmittal Form PTO/SB/05
X Unexecuted Declaration and Power of Attorney (1 sheet)
X Return-addressed Postcard
X Transmittal Letter (2 sheets)

X Applicant claims small entity status

Basic Filing Fee	\$ 150.00
Additional Fees:	
Utility Search Fee	\$ 250.00
Utility Examination Fee	\$ 100.00
Total number of claims (including multiple dependent claims) <u>91</u>	
Total number of claims in excess of 20, times \$25 <u>71</u>	\$ 1,775.00
Number of independent claims <u>7</u>	
Number of independent claims minus 3, times \$100 <u>4</u>	\$ 400.00
Fee for multiple dependent claims (\$360/\$180)	\$ 0.00
Fee for each additional 50 sheets exceeding 100 (\$125)	\$ 125.00
TOTAL FILING FEES:	\$ 2,800.00

PRIORITY CLAIM:

This is a Continuation X Continuation-in-Part Divisional, of U.S. Application Serial No. 11/071,667 filed March 3, 2005, which is a continuation-in-part of U.S. Application Serial No. 10/732,909 filed December 10, 2003, which is a continuation-in-part of U.S. Application Serial No. 10/316,961 filed December 11, 2002.

Commissioner for Patents
Date June 27, 2006
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Please note that this application is being filed with an unexecuted Declaration and Power of Attorney. Pursuant to 37 C.F.R. 1.53, the United States Patent and Trademark Office is respectfully requested to accept this application and accord a serial number and filing date as of the date that this application is deposited with the U.S. Postal Service for Express Mail. Further, it is respectfully requested that the NOTICE OF MISSING PARTS-FILING DATE GRANTED pursuant to 37 C.F.R. 1.53 be sent to the undersigned attorney.

Respectfully submitted,

McCARTER & ENGLISH, LLP

A handwritten signature in black ink, appearing to read "M. Friscia".

Michael R. Friscia
Reg. No. 33,884

MRF/jf
Enclosures

CERTIFICATE OF MAILING BY EXPRESS MAIL

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. EV623706889 to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on 6/27/06.

A handwritten signature in black ink, appearing to read "Janelle Fava".
Janelle Fava (date)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INVENTOR: IRA MARLOWE

5 TITLE: MULTIMEDIA DEVICE INTEGRATION SYSTEM

SPECIFICATION

10 BACKGROUND OF THE INVENTION

RELATED APPLICATIONS

15 This application is a continuation-in-part of U.S. Patent Application Serial No. 11/071,667, filed March 3, 2005, now U.S. Patent No. _____, which 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
20 applications are each expressly incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to a multimedia device integration system. More
25 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
30 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. Still further, it would be desirable to provide a multimedia device integration system that allows for wireless integration of portable devices for use with car audio and/or video systems, wherein full remote control of the portable device is provided at the controls of the car 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.

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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.

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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.

The present invention further provides a multimedia device integration system that allows for the wireless integration of a portable audio and/or video device with a car audio and/or video system. The portable device could comprise 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), or a cellular telephone. The portable device includes a wireless interface and an integration subsystem positioned within the portable device. The wireless interface establishes a wireless communications channel between the portable device and the car system, and allows for the wireless exchange of control commands, data, video, and audio signals between the portable device and the car system. The integration module receives control commands issued at the car system and transmitted over the wireless channel, processes same

into a format compatible with the portable device, and dispatches same to the portable device for execution thereby. The integration module also receives data from the portable device (including, but not limited to, track information, song information, artist information, time information, and other related information), processes the data into a format compatible with the car system, and transmits same over the wireless channel to the car system for display thereon. 5 Optionally, the integration module could be positioned within the car system.

The integration module could also include a voice recognition subsystem for acquiring spoken commands from a user, converting same into control commands compatible with the portable device, and dispatching the processed control commands to the portable device for 10 execution thereby. The voice commands could be received at the car audio and/or video system (i.e., using a microphone connected to the car audio and/or video system or some other vehicle component), or at the portable device (i.e., using a microphone connected to or forming a part of the portable device). Additionally, the integration module could include a speech synthesizer for 15 generating synthesized speech for conveying data generated by the portable device to a user. The synthesized speech could be channeled to the car audio and/or video system by the integration module to be played through the car audio and/or video system.

The present invention further provides a multimedia device integration system that allows 20 for the integration of a portable audio and/or video device with a car audio and/or video system using a docking slot provided in the car system. The portable device includes an integration module positioned within the portable device and an external interface for allowing electrical communication with the car system via the docking slot. Optionally, the integration module

could be positioned within the car audio or video system. The integration module could also include a voice recognition subsystem for acquiring spoken commands from a user, converting same into control commands compatible with the portable device, and dispatching the processed control commands to the portable device for execution thereby. Additionally, the integration
5 module could include a speech synthesizer for generating synthesized speech for conveying data generated by the portable device to a user.

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:

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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.

5 **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,
10 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.

15 **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
20 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
5 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
10 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
15 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
20 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.

5 **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
10 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
15 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**.

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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.

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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.

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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.

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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.

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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.

5 **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 another embodiment of the present invention, wherein a
10 plurality of external devices are integrated using a single interface.

FIG. 18 is a diagram showing another embodiment of the present invention, wherein wireless integration is provided between a car audio and/or video system and a portable audio and/or video device using a wireless transceiver and an integration module positioned within the
15 portable device.

FIG. 19 is a diagram showing another embodiment of the present invention, wherein wireless integration is provided between a car audio and/or video system and a portable audio and/or video device using a wireless transceiver and an integration module positioned within the
20 car audio and/or video system.

FIG. 20 is a diagram showing another embodiment of the present invention, wherein a docking slot is provided in a car audio and/or video system for receiving a portable audio and/or video device, and an integration module is positioned within the portable device.

5 **FIG. 21** is a diagram showing another embodiment of the present invention, wherein a docking slot is provided in a car audio and/or video system for receiving a portable audio and/or video device, and an integration module is positioned within the car audio and/or video system.

FIG. 22 is a diagram showing another embodiment of the present invention, wherein
10 wireless integration is provided between a car audio and/or video system and a portable audio and/or video device, and the portable device includes an integration module having speech synthesis and recognition capabilities.

FIG. 23 is a diagram showing another embodiment of the present invention, wherein
15 wireless integration is provided between a car audio and/or video system and a portable audio and/or video device, and the car audio and/or video system includes an integration module having speech synthesis and recognition capabilities.

FIG. 24 is a flowchart showing processing logic according to the present invention for
20 wirelessly integrating a portable audio and/or video device for use with a car audio or video system.

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, 5 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, is retrieved from the after-market device, 10 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, 15 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.

20 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.

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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.

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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, 5 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- 10 input configuration of the present 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 15 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 20 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.

10 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
15 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.
20 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.

10 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
5 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
10 **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
15 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
20 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**.

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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

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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
5 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
10 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
15 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
20 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.

5 **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.

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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

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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
5 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**,
10 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
15 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
20 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.

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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 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 5 108, 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 10 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 15 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 20 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.

5 **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,
10 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,
15 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
20 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.

5 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
10 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
15 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.

20 **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.

5

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
10 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.

15

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
20 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.

10

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.

20 **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.

5

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
5 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
10 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.

15
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
20 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 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.

5 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
10 signals from a BMW car stereo into a format understandable by a CD changer:

Table 1

```
15 ; =====  
; Radio requests changer to STOP (exit PLAY mode)  
; Decoding 6805183801004C message  
; =====  
  
Encode_RD_stop_msg:  
  
20 movlw 0x68  
xorwf BMW_Recv_buff,W  
skpz  
return  
  
25 movlw 0x05  
xorwf BMW_Recv_buff+1,W  
skpz  
return  
  
30 movlw 0x18  
xorwf BMW_Recv_buff+2,W  
skpz  
return  
  
35 movlw 0x38  
xorwf BMW_Recv_buff+3,W  
skpz  
return  
  
40 movlw 0x01  
xorwf BMW_Recv_buff+4,W  
skpz
```

```

    return

    tstf  BMW_Recv_buff+5
    skpz
5     return

    movlw 0x4C
    xorwf BMW_Recv_buff+6,W
10    skpz
    return

    bsf   BMW_Recv_STOP_msg
    return

```

15

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
5 ; =====

Load_CD_stop_msg:
    movlw 0x18
    movwf BMW_Send_buff

10
    movlw 0x0A
    movwf BMW_Send_buff+1

    movlw 0x68
15    movwf BMW_Send_buff+2

    movlw 0x39
    movwf BMW_Send_buff+3

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

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

    clrf BMW_Send_buff+6      ;separate field, always =0

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

    clrf BMW_Send_buff+8      ;separate field, always =0

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

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

40    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
45    xorwf BMW_Send_buff+3,W
    xorwf BMW_Send_buff+2,W
    xorwf BMW_Send_buff+1,W
    xorwf BMW_Send_buff,W

50    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

55

```

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
 5 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
 10 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

```

15 //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];
20 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 ) {
25 case 0xC0:
                    if ( ACP_rx_data1 == 0xCA) {
                        if ( ACP_rx_data2 == 0x01 ) {
                            flags.ACP_play_req = 1;
                        }
                        break;
30 }
                    break;
            }
        }
35 }

```

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
10     if ( iPod_play_req == ON ) {
        iPod_play_req = OFF;
        iPod_tx_data[0] = 0x55;
        iPod_tx_data[1] = 0x03;
15     iPod_tx_data[2] = 0x02;
        iPod_tx_data[3] = 0x00;
        iPod_tx_data[4] = 0x01;
        iPod_tx_counter = 5;
        iPod_tx_ready = ON;
20     }
```

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
5 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
10 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
15 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
20 312 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, if 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.

5 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,
10 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.

15

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
20 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.

10

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** of **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

15
20

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.

5 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
10 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.

15 **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
20 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. It should be noted that the docking station 400 could be formed without the top portion 402.

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.

10 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
15 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
20 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 integrated 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 integrated 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 system **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.

5 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
10 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.

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 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
20 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.

5 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
10 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.

15 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
20 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
5 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
10 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
15 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
20 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.

5 **FIG. 17** is a diagram showing 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
10 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.

15 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
20 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
5 provided through the car stereo or video system.

FIG. 18 is a diagram showing another embodiment of the present invention, indicated generally at **900**, wherein wireless integration is provided between a car audio and/or video system **910** and a portable audio and/or video device **924**. The car system **910** could be any
10 OEM or after-market car audio and/or video system. The portable device **924** could comprise a CD player, CD changer, digital media player (e.g., MP3 player, MP4 player, WMV player, Apple iPod, Apple video iPod), portable media center, portable media player, satellite receiver, digital audio broadcast (DAB) receiver (also commonly referred to as a high-definition (HD) radio receiver), video device (e.g., DVD player or digital media player, such as the SONY PSP
15 digital media player), cellular telephone, or any other portable device.

The car system **910** includes system electronics **912** (e.g., circuitry and components provided by an OEM or after-market car audio and/or video system manufacturer), a display **918**, a control panel **920** (e.g., buttons, touch screen display, etc.) for allowing user interaction and
20 control, and a wireless interface or transceiver **916**. The wireless interface **916** could comprise an AT76C551 Bluetooth transceiver manufactured by Atmel, Inc., which includes a Bluetooth baseband controller with an integrated digital signal processor (DSP), and an AT7024 2.4 - 2.5 GHz band RF front end transceiver manufactured by Atmel, Inc., which includes a low-noise

amplifier and transmit / receive switch driver. Any other suitable wireless transceiver (e.g., IEEE 802.11a, 802.11b, or 802.11g) could also be substituted. The display 918 could comprise any display associated with the car system 910, including, but not limited to, a display panel, a seat-back display, a dashboard display, an LCD or plasma display, or any other display in a car or associated with a car audio and/or video system, positioned anywhere within a vehicle.

The portable device 924 includes device electronics 934 (e.g., circuitry and components provided by the portable device manufacturer), a wireless interface or transceiver 926, and an integration subsystem or module 932 positioned within the portable device 924. Optionally, the wireless interface 926 could be positioned external to the portable device 924. The wireless interface 926 is identical to the wireless interface 916, and both interfaces 916 and 926 establish a wireless communications channel or link 922 between the car system 910 and the portable device 924.

The integration subsystem 932 receives control commands that are issued at the car system 910 and wirelessly transmitted to the portable device 924 via the wireless communications link 922, processes the commands into a format compatible with the device electronics 934 of the portable device 924, and dispatches same to the device electronics 934 for execution thereby, so as to provide remote, wireless control of the portable device 924 using the car system 910. For example, a "Play" command could be entered at the car system 910 (which could be a BMW car stereo), wirelessly transmitted to the portable device 924 (which could be an Apple iPod), converted by the integration subsystem 932 into a format recognizable by the device electronics 934, and executed thereby. The integration subsystem 932 also receives data

generated by the device electronics 934 (including, but not limited to, track information, artist information, song title, time information, etc.), processes same into a format compatible with the car system 910, and transmits the processed data to the car system 910 using the wireless link 922 for display thereon using the display 918. For example, playlists or other data generated by the portable device 924 could be processed by the integration subsystem 932 into a format compatible with the car system 910, and wirelessly transmitted thereto for display on the display 918.

Audio and video information generated by the portable device 924 can be transmitted digitally to the car system 910 using the wireless link 922. This information could also be transmitted via one or more analog RF carrier signals, using suitable digital-to-analog and analog-to-digital conversion circuitry known in the art. The integration subsystem 932 could also include conversion circuitry (e.g., using the video format conversion chips discussed above with respect to FIG. 12a) for converting video information generated by the portable device 924 for display on the display 918 of the car system 910 (e.g., by converting composite video signals to red, green, and blue (RGB) video signals, or vice versa). It should be noted that the integration subsystem 932 could also be utilized to process data, video, and audio information provided by the portable device 924 where the portable device 924 is connected to the Internet (e.g., via a wireless Internet connection established by a cellular telephone). In such circumstances, the display 918 of the car system 910 would function as an Internet browser, and the controls 920 of the car system 910 could be utilized to navigate the Internet.

The integration subsystem **932** contains circuitry similar to the circuitry disclosed in the various embodiments of the present invention discussed herein, and could include a PIC16F872 or PIC16F873 microcontroller manufactured by Microchip, Inc. and programmed in accordance with the flowchart discussed below with respect to **FIG. 24**. Additionally, the integration subsystem **932** generates a device presence signal for maintaining the car system **910** in a state responsive to the portable device **924**. It should be noted that a non-wireless connection **930** could be provided between optional external interfaces ports **914** and **928** of the car system **910** and the portable device **924**, respectively, using any suitable wired connection type such as serial, FIREWIRE, CAN/CAN2, USB/USB2, IE Bus, T Bus, I Bus, or any other connection, to allow for wired integration between the car system **910** and the portable device **924**. Additionally, the non-wireless connection **930** could include a fiber-optic connection, such as a D2B or MOST fiber-optic connection. The device presence can be transmitted to the car system **910** using the wireless link **922** or, optionally, the non-wireless connection **930**.

FIG. 19 is a diagram showing another embodiment of the present invention, indicated generally at **1000**, wherein wireless integration is provided between a car audio and/or video system **1010** and a portable audio and/or video device **1024**. The components shown in **FIG. 19** are identical to the components shown in **FIG. 18**, and reference numerals of corresponding components have been increased by 100. In this embodiment, the integration subsystem **1032** is positioned internally within the car system **1010**, which also includes system electronics **1012**, wireless interface **1016**, display **1018**, control panel **1020**, and, optionally, external interface port **1014**. The portable device **1024** includes a wireless interface **1026** in communication with

device electronics **1034**, and optionally, an external interface port **1028** for communicating with the external interface port **1014** of the car system **1010** via non-wireless connection **1030**.

FIG. 20 is a diagram showing another embodiment of the present invention, indicated generally at **1100**, wherein a docking slot **1140** is provided in a car audio and/or video system **1110** for receiving a portable audio and/or video device **1124**. The car system **1110** includes system electronics **1112** (e.g., circuitry and components provided by an OEM or after-market car audio or video system manufacturer), a display **1118**, and a control panel **1120**. The portable device **1124** includes an integration subsystem or module **1132**, device electronics **1134** (e.g., circuitry and components provided by the manufacturer of the portable device **1124**) and an external interface port **1142** that interfaces with the docking slot **1140** to allow electrical communication between the integration subsystem **1132** of the car system **1110** and the device electronics **1134** of the portable device **1124**. The electrical connection formed by the external interface port **1142** and the docking slot **1140** could include a FIREWIRE, CAN/CAN2, USB/USB2, IE Bus, T Bus, or I Bus connection, or any other suitable connection type. Additionally, a fiber-optic connection could be formed between the external interface port **1142** and the docking slot **1140**, using a D2B, MOST, or other suitable fiber-optic connection.

The portable device **1124** is inserted into the docking slot **1140** in the general direction indicated by arrow **A**. Once docked, the integration subsystem **1132** processes control commands issued at the car system **1110** into a format compatible with the portable device **1124**, and processes data generated by the portable device **1124** into a format compatible with the car system **1110** in the manner described herein. Audio and video signals generated by the portable

device 1124 are channeled by the integration subsystem 1132 to the system electronics 1112, for playing through the car system 1110. The portable device 1124 could comprise a digital media player (e.g., MP3 player, MP4 player, WMV player, Apple iPod, Apple video iPod, or other device), a portable media center, a portable media player, a satellite receiver, a digital audio broadcast (DAB) receiver or high-definition (HD) radio receiver, a portable video device, a cellular telephone, or any other portable device.

FIG. 21 is a diagram showing another embodiment of the present invention, indicated generally at 1200, wherein a docking slot 1240 is provided in a car audio and/or video system 1210 for receiving a portable audio and/or video device 1224. The components shown in FIG. 21 are identical to those disclosed in FIG. 20, and reference numerals of corresponding components have been increased by 100. In this embodiment, the integration subsystem 1232 is positioned within the car system 1210, which also includes system electronics 1212, display 1218, and control panel 1220. The portable device 1224 includes device electronics 1234 and an external interface port 1242 for interfacing with the docking slot 1240 and providing electrical (and/or optical) communication with the integration subsystem 1232.

FIG. 22 is a diagram showing another embodiment of the present invention, indicated generally at 1300, wherein wireless integration is provided between a car audio and/or video system 1310 and a portable audio and/or video device 1324, and voice synthesis and speech recognition capabilities are provided. More particularly, the portable device 1324 includes an integration subsystem or module 1332 having a voice recognition subsystem 1336 and a speech synthesizer 1338. As with the embodiments discussed earlier with respect to FIGS. 18-19, the

car system **1310** includes system electronics **1312** (e.g., circuitry and components provided by an OEM or after-market car audio or video system manufacturer), an optional external interface port **1314**, a wireless interface or transceiver **1316** (which could be a Bluetooth or other suitable wireless transceiver), a display **1318**, and a control panel **1320**.

5

The portable device **1324** could comprise a CD player, CD changer, digital media player (e.g., MP3 player, MP4 player, WMV player, Apple iPod, Apple video iPod, or other device), portable media center, portable media player, satellite receiver, digital audio broadcast (DAB) receiver, high-definition (HD) radio receiver, video device (e.g., DVD player or digital media player, such as the SONY PSP digital media player), cellular telephone, or any other portable device. The portable device **1324** includes a wireless interface **1326** which communicates with the wireless interface **1316** to provide a wireless communications channel or link **1322**, an optional external interface port **1328** for providing a non-wireless connection **1330** with the external interface port **1314** (which could include any suitable wired connection, such as FIREWIRE, CAN/CAN2, USB/USB2, IE Bus, T Bus, I Bus, etc., or any suitable optical connection, such as D2B or MOST), device electronics **1334**, and optional external audio output **1340** and optional external audio input **1342**.

The voice recognition subsystem **1336** of the integration subsystem **1332** could comprise the HM2007 speech recognition processor manufactured by Hualon Microelectric Corporation, the VRP6679 speech recognition processor manufactured by Oki, Inc., or any other suitable speech recognition processor. The voice recognition subsystem **1336** receives control commands that are spoken by a user and are transmitted to the portable device **1324** via the wireless link

1322 or the non-wireless connection 1330 (where the car system 1310 another vehicle component connected to the car system 1310 includes a microphone for receiving voice commands). Optionally, a microphone could be connected to the external audio input 1342 of the portable device 1324 for receiving voice commands. Any desired, spoken commands could
5 be received by the integration subsystem 1332 and processed by the voice recognition subsystem 1336 into a format compatible with the device electronics 1334 of the portable device 1324 for execution thereby. For example, a user could speak a desired artist name, whereupon the voice recognition subsystem 1336 processes the spoken artist name into a digital format, passes the processed artist name to the integration subsystem 1332, and the integration subsystem 1332
10 constructs a query command and passes the query command to the device electronics 1334 along with the processed artist name to the device electronics 1334. The device electronics 1334 then queries the portable device 1324 for all songs (e.g., by searching ID3 tags associated with each song and stored in the portable device 1324) having a matching artist name. The resulting list is then passed to the integration subsystem 1332, whereupon the information is processed into a
15 format compatible with the car system 1310. Then, the information is transmitted to the car system 1310 via the wireless link 1322 or the non-wireless connection 1330 for display on the display 1318 of the car system 1310.

Voice recognition could also be used to retrieve other media files, such as video clips that
20 are stored on the portable device 1324. Such files, one retrieved, could then be processed by the integration subsystem 1332 in the manner described herein, transmitted to the car system 1310 (via the wireless link 1322 or the non-wireless connection 1330), and displayed on the display

1318 of the car system 1310. An index of such files could also be generated by the integration subsystem 1332 for quick browsing and retrieval using car system 1310 or voice commands.

The speech synthesizer 1338 provides synthesized speech corresponding to data produced
5 by the portable device 1324. For example, track lists, artist names, song titles, and other information (e.g., video clip titles, movie titles, etc.) could be retrieved from the portable device 1324 by the integration subsystem 1332 (e.g., in response to a command issued by the user at the car system 1310 or a spoken command processed by the voice recognition subsystem 1336), and synthesized speech corresponding to the retrieved information could be generated by the speech
10 synthesizer 1338 using known text-to-speech software. The speech synthesizer 1338 could include the RC 8650 or RC 8660 speech synthesis chipsets manufactured by RC Systems, Inc., or any other suitable speech synthesizers. Synthesized speech could be transmitted to the car system 1310 via the wireless link 1322 or the non-wireless connection 1330 and played through the car system 1310, or optionally, the speech could be channeled to an external device via the
15 optional external audio output 1340. It should be noted that the voice recognition subsystem 1336 and the speech synthesizer 1338 could be formed on a single integrated circuit forming part of the integration subsystem 1332. Additionally, the integration subsystem 1332 provides full control of the portable device 1324 using the car system 1310 and exchange of data, audio, and video signals between the portable device 1324 and the car system 1310, in the manner described
20 herein.

FIG. 23 is a diagram showing another embodiment of the present invention, indicated generally at 1400, wherein wireless integration is provide between a car audio and/or video

system **1410** and a portable audio and/or video device **1424** and voice recognition and speech synthesis capabilities are provided. The components shown in **FIG. 23** are functionally identical to the components shown in **FIG. 22**, and reference numerals of corresponding components have been increased by 100. In this embodiment, the integration subsystem **1432** is positioned in the
5 car system **1410**, which includes system electronics **1412**, an optional external interface port **1414**, a wireless interface **1416**, a display **1418**, and a control panel **1420**. The integration subsystem **1432** includes a voice recognition subsystem **1436** and a speech synthesizer **1438**, which provide the voice recognition and speech synthesis capabilities described above with reference to **FIG. 22**. The portable device **1424** includes a wireless interface **1426**, and optional
10 external interface port **1428**, device electronics **1434**, an optional external audio output port **1440**, and an optional external audio input port **1442**.

FIG. 24 is a flowchart showing processing logic according to the present invention, indicated generally at **1450**, for wirelessly integrating a portable audio and/or video device for
15 use with a car audio and/or video system. In step **1452**, a wireless link is established between the portable device and the car audio and/or video system. As discussed above, the wireless link could be any suitable wireless communications link, such as a Bluetooth wireless link, an IEEE 802.11 link, or any other suitable link. In step **1454**, the car audio and/or video system type is determined, such as the manufacturer name and/or model identifier. In step **1456**, the portable
20 audio and/or video device type is identified, such as the manufacturer name and/or model identifier. In step **1458**, a protocol conversion software block is loaded from memory, based upon the corresponding device types of the car audio and/or video system and the portable audio and/or video device. The protocol conversion software block includes code for converting

commands issued at the car audio and/or video system into a format compatible with the portable audio and/or video device, as well as code for converting data generated by the portable audio and/or video device into a format compatible with the car audio and/or video system.

5 In step 1460, data generated by the portable audio and/or video device is processed by the protocol conversion software block. Then, in step 1466, the processed data is transmitted to the car audio and/or video system for display thereon, using the wireless link. In step 1462, audio and/or video signal generated by the portable audio and/or video device are channeled to the car audio and/or video system using the wireless link. In step 1464, a determination is made as to
10 whether commands from the car audio and/or video system are to be processed. If a negative determination is made, step 1458 is re-invoked. Otherwise, step 1468 is invoked, wherein the commands are processed using the protocol conversion software block. Then, in step 1470, the processed commands are transmitted to the car audio and/or video system using the wireless link. Step 1458 is then re-invoked, so that additional processing can occur.

15 Importantly, the present invention allows video files in any format (including video clips, movies, pictures, etc.) that are stored on a portable device to be displayed on one or more displays of a car audio and/or video system, and playback of such files to be controlled using the car audio and/or video system. Examples of such files include, but are not limited to, MPEG,
20 WMV, AVI, JPEG, GIF, TIFF, MP4, or any other suitable video format. Such files could be stored on a cell phone, a portable media center, a portable media player, or any other portable device which is integrated by the present invention (through a wired or wireless connection) for use with a car audio and/or video system. Thus, for example, a video clip downloaded to a

cellular telephone or a video clip stored on a portable device (e.g., an Apple video iPod) can be displayed on one or more displays of a car audio and/or video system. Further, the present invention allows for live video streams, such as live television video received by a cellular telephone or other portable device, to be displayed on one or more displays of the car audio
5 and/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 audio system having a display associated therewith;
 - 5 a portable device external to the car audio system;
 - a first wireless interface in communication with the car audio system;
 - a second wireless interface in communication with the portable device, the first and second wireless interfaces establishing a wireless communications link between the car audio system and the portable device; and
 - 10 an integration subsystem for generating a device presence signal for maintaining the car audio system in a state responsive to the portable device, wherein the integration subsystem transmits the device presence signal to the car audio system, channels audio from the portable device to the car audio system using the wireless communications link, processes video information generated by the portable device into a format compatible with the car audio system,
 - 15 and transmits the processed video information to the car audio system using the wireless communications link for displaying the processed video information on the display of the car audio system.

2. The system of Claim 1, wherein the integration subsystem processes data generated by
20 the portable device into a format compatible with the car audio system and displays the processed data on the display of the car audio system.

3. The system of Claim 1, wherein the integration subsystem receives control commands issued at the car audio system and transmitted over the wireless communications link, processes the commands into a format compatible with the portable device, and dispatches the processed commands to the portable device for execution thereby.

5

4. The system of Claim 1, wherein the integration subsystem further comprises a voice recognition subsystem for processing spoken control commands issued by a user.

5. The system of Claim 4, wherein the integration subsystem retrieves an audio file or a video file from the portable device in response to a spoken command.

10

6. The system of Claim 4, wherein the integration subsystem further comprises a speech synthesizer for generating synthesized speech corresponding to data generated by the portable device.

15

7. The system of Claim 1, wherein the car audio system comprises an OEM car audio system.

8. The system of Claim 1, wherein the car audio system comprises an after-market car audio system.

20

9. The system of Claim 1, wherein the portable device comprises a portable receiver.

10. The system of Claim 10, wherein the portable receiver comprises a digital audio broadcast (DAB) receiver, a high-definition (HD) radio receiver, or a satellite receiver.

5

11. The system of Claim 1, wherein the portable device comprises a portable digital media player.

12. The system of Claim 11, wherein the portable digital media player comprises a video
10 device, a portable media center, a portable media player, an MP3 player, an MP4 player, a WMV
player, an Apple iPod, or an Apple video iPod.

13. The system of Claim 1, wherein the portable device comprises a cellular telephone.

15 14. The system of Claim 1, further comprising a non-wireless connection established
between the car audio system and the portable device for exchanging data, commands, audio and
video signals between the car audio system and the portable device.

15. The system of Claim 1, wherein the integration subsystem is positioned within the portable device.

16. The system of Claim 1, wherein the integration subsystem is positioned within the car audio system.

17. The system of Claim 1, wherein the video information comprises a video file stored on the portable device.

18. The system of Claim 1, wherein the video information comprises a picture stored on the portable device.

19. The system of Claim 1, wherein the video information comprises a television signal received by the portable device.

15

20. A multimedia device integration system comprising:

a car video system having a display associated therewith;

a portable device external to the car video system;

a first wireless interface in communication with the car video system;

5 a second wireless interface in communication with the portable device, the first and second wireless interfaces establishing a wireless communications link between the car video system and the portable device; and

an integration subsystem for generating a device presence signal for maintaining the car video system in a state responsive to the portable device, wherein the integration subsystem
10 transmits the device presence signal to the car video system, channels audio from the portable device to the car video system using the wireless communications link, processes video information generated by the portable device into a format compatible with the car video system, and transmits the processed video information to the car video system using the wireless communications link for displaying the processed video information on the display of the car
15 video system.

21. The system of Claim 20, wherein the integration subsystem processes data generated by the portable device into a format compatible with the car video system and displays the processed data on the display of the car video system.

20

22. The system of Claim 20, wherein the integration subsystem receives control commands issued at the car video system and transmitted over the wireless communications link, processes the commands into a format compatible with the portable device, and dispatches the processed commands to the portable device for execution thereby.

5

23. The system of Claim 20, wherein the integration subsystem further comprises a voice recognition subsystem for processing spoken control commands issued by a user.

24. The system of Claim 23, wherein the integration subsystem retrieves an audio file or a video file from the portable device in response to a spoken command.

10

25. The system of Claim 23, wherein the integration subsystem further comprises a speech synthesizer for generating synthesized speech corresponding to data generated by the portable device.

15

26. The system of Claim 20, wherein the car video system comprises an OEM car video system.

20

27. The system of Claim 20, wherein the car video system comprises an after-market car video system.

28. The system of Claim 20, wherein the portable device comprises a portable receiver.

29. The system of Claim 28, wherein the portable receiver comprises a digital audio broadcast (DAB) receiver, a high-definition (HD) radio receiver, or a satellite receiver.

5

30. The system of Claim 20, wherein the portable device comprises a portable digital media player.

31. The system of Claim 30, wherein the portable digital media player comprises a video
10 device, a portable media center, a portable media player, an MP3 player, an MP4 player, a WMV
player, an Apple iPod, or an Apple video iPod.

32. The system of Claim 20, wherein the portable device comprises a cellular telephone.

15 33. The system of Claim 20, further comprising a non-wireless connection established
between the car video system and the portable device for exchanging data, commands, audio and
video signals between the car video system and the portable device.

34. The system of Claim 20, wherein the integration subsystem is positioned within the portable device.

35. The system of Claim 20, wherein the integration subsystem is positioned within the car
5 video system.

36. The system of Claim 20, wherein the video information comprises a video file stored on the portable device.

10 37. The system of Claim 20, wherein the video information comprises a picture stored on the portable device.

38. The system of Claim 20, wherein the video information comprises a television signal received by the portable device.

15

39. A multimedia device integration system comprising:

a car audio system;

a portable device external to the car audio system;

a docking slot formed in the car audio system for receiving the portable device and

5 establishing electrical communication between the car audio system and the portable device; and

an integration subsystem for generating a device presence signal for maintaining the car
audio system in a state responsive to the portable device, wherein the integration subsystem
receives data generated by the portable device, processes the data into a format compatible with
the car audio system, and transmits the processed data, the device presence signal, and audio
10 signals to the car audio system.

40. The system of Claim 39, wherein the processed data is displayed on a display of the car
audio system.

15 41. The system of Claim 39, wherein the integration subsystem processes a video file stored
on the portable device into a format compatible with the car audio system and transmits the video
file to the car audio system for displaying the video file on a display of the car audio system.

42. The system of Claim 39, wherein the integration subsystem receives control commands issued at the car audio system, processes the commands into a format compatible with the portable device, and dispatches the processed commands to the portable device for execution thereby.

5

43. The system of Claim 39, wherein the integration subsystem further comprises a voice recognition subsystem for processing spoken control commands issued by a user.

44. The system of Claim 43, wherein the integration subsystem retrieves an audio file or a video file from the portable device in response to a spoken command.

10

45. The system of Claim 43, wherein the integration subsystem further comprises a speech synthesizer for generating synthesized speech corresponding to data generated by the portable device.

15

46. The system of Claim 39, wherein the car audio system comprises an OEM car audio system.

20

47. The system of Claim 39, wherein the car audio system comprises an after-market car audio system.

48. The system of Claim 39, wherein the portable device comprises a portable receiver.

49. The system of Claim 48, wherein the portable receiver comprises a digital audio broadcast (DAB) receiver, a high-definition (HD) radio receiver, or a satellite receiver.

5

50. The system of Claim 39, wherein the portable device comprises a portable digital media player.

51. The system of Claim 50, wherein the portable digital media player comprises a video
10 device, a portable media center, a portable media player, an MP3 player, an MP4 player, a WMV
player, an Apple iPod, or an Apple video iPod.

52. The system of Claim 39, wherein the portable device comprises a cellular telephone.

15 53. The system of Claim 39, wherein the integration subsystem is positioned within the
portable device.

54. The system of Claim 39, wherein the integration subsystem is positioned within the car
audio system.

55. A multimedia device integration system comprising:

a car video system;

a portable device external to the car video system;

a docking slot formed in the car video system for receiving the portable device and

5 establishing electrical communication between the car video system and the portable device; and

an integration subsystem for generating a device presence signal for maintaining the car video system in a state responsive to the portable device, wherein the integration subsystem receives data generated by the portable device, processes the data into a format compatible with the car video system, and transmits the processed data, the device presence signal, audio signals,
10 and video signals to the car video system.

56. The system of Claim 55, wherein the processed data is displayed on a display of the car video system.

15 57. The system of Claim 55, wherein the integration subsystem processes a video file stored on the portable device into a format compatible with the car video system and transmits the video file to the car video system for displaying the video file on a display of the car video system.

58. The system of Claim 55, wherein the integration subsystem receives control commands issued at the car video system, processes the commands into a format compatible with the portable device, and dispatches the processed commands to the portable device for execution thereby.

5

59. The system of Claim 55, wherein the integration subsystem further comprises a voice recognition subsystem for processing spoken control commands issued by a user.

60. The system of Claim 59, wherein the integration subsystem retrieves an audio file or a video file from the portable device in response to a spoken command.

10

61. The system of Claim 59, wherein the integration subsystem further comprises a speech synthesizer for generating synthesized speech corresponding to data generated by the portable device.

15

62. The system of Claim 55, wherein the car video system comprises an OEM car video system.

63. The system of Claim 55, wherein the car video system comprises an after-market car video system.

20

64. The system of Claim 55, wherein the portable device comprises a portable receiver.

65. The system of Claim 64, wherein the portable receiver comprises a digital audio broadcast (DAB) receiver, a high-definition (HD) radio receiver, or a satellite receiver.

5

66. The system of Claim 55, wherein the portable device comprises a portable digital media player.

67. The system of Claim 66, wherein the portable digital media player comprises a video
10 device, a portable media center, a portable media player, an MP3 player, an MP4 player, a WMV
player, an Apple iPod, or an Apple video iPod.

68. The system of Claim 55, wherein the portable device comprises a cellular telephone.

15 69. The system of Claim 55, wherein the integration subsystem is positioned within the
portable device.

70. The system of Claim 55, wherein the integration subsystem is positioned within the car
video system.

71. A method for wirelessly integrating a portable device for use with a car audio system comprising:

establishing a wireless communications link between the car audio system and the portable device;

5 generating a device presence signal for maintaining the car audio system in a state responsive to the portable device;

transmitting the device presence signal to the car audio system over the wireless communications link;

10 processing video information generated by the portable device into a format compatible with the car audio system;

transmitting the processed video information and audio signals generated by the portable device to the car audio system over the wireless communications link;

displaying the processed video information on a display of the car audio system; and

playing the audio signals over the car audio system.

15

72. The method of Claim 71, further comprising processing data generated by the portable device into a format compatible with the car audio system.

73. The method of Claim 72, further comprising transmitting the processed data over the wireless communications link to the car audio system.

74. The method of Claim 73, further comprising displaying the processed data on a display of
5 the car audio system.

75. The method of Claim 71, further comprising transmitting control commands issued by a user at the car audio system over the wireless communications link.

10 76. The method of Claim 75, further comprising receiving the control commands at the portable device and processing the control commands into a format compatible with the portable device.

77. The method of Claim 76, further comprising dispatching the processed control commands
15 to the portable device for execution thereby.

78. The method of Claim 71, further comprising receiving spoken control commands with a voice recognition subsystem and processing the spoken control commands into a format compatible with the portable device.

79. The method of Claim 78, further comprising dispatching the processed control commands to the portable device for execution thereby.

80. The method of Claim 71, further comprising generating synthesized speech
5 corresponding to data generated by the portable device.

81. A method for wirelessly integrating a portable device for use with a car video system comprising:

10 establishing a wireless communications link between the car video system and the portable device;

generating a device presence signal for maintaining the car video system in a state responsive to the portable device;

transmitting the device presence signal to the car video system over the wireless communications link;

15 processing video information generated by the portable device into a format compatible with the car video system;

transmitting the processed video information and audio signals generated by the portable device to the car video system over the wireless communications link;

displaying the processed video information on a display of the car video system; and

playing the audio signals over the car video system.

82. The method of Claim 81, further comprising processing data generated by the portable device into a format compatible with the car video system.

5

83. The method of Claim 82, further comprising transmitting the processed data over the wireless communications link to the car video system.

84. The method of Claim 83, further comprising displaying the processed data on a display of
10 the car video system.

85. The method of Claim 81, further comprising transmitting control commands issued by a user at the car video system over the wireless communications link.

15 86. The method of Claim 85, further comprising receiving the control commands at the portable device and processing the control commands into a format compatible with the portable device.

87. The method of Claim 86, further comprising dispatching the processed control commands to the portable device for execution thereby.

88. The method of Claim 81, further comprising receiving spoken control commands with a voice recognition subsystem and processing the spoken control commands into a format compatible with the portable device.

89. The method of Claim 88, further comprising dispatching the processed control commands to the portable device for execution thereby.

10

90. The method of Claim 81, further comprising generating synthesized speech corresponding to data generated by the portable device.

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

a base portion;

a bottom member connected to the base portion;

5 a top member removably 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 connected to the base portion for integrating the portable device with a car stereo.

10

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 media 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. Wireless integration between the portable audio or video device and a car stereo or video system is provided, and voice recognition and speech synthesis capabilities are provided in the portable audio or video device or the car stereo or video system.

20

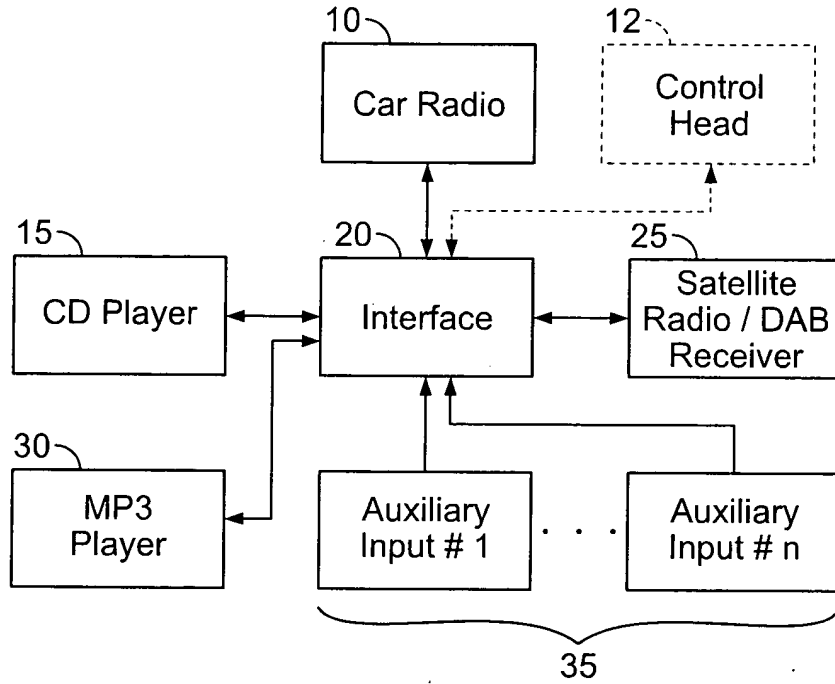


FIG. 1

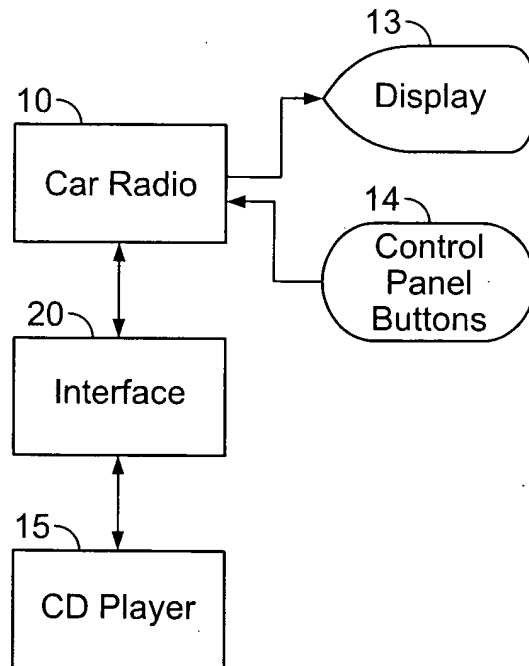


FIG. 2A

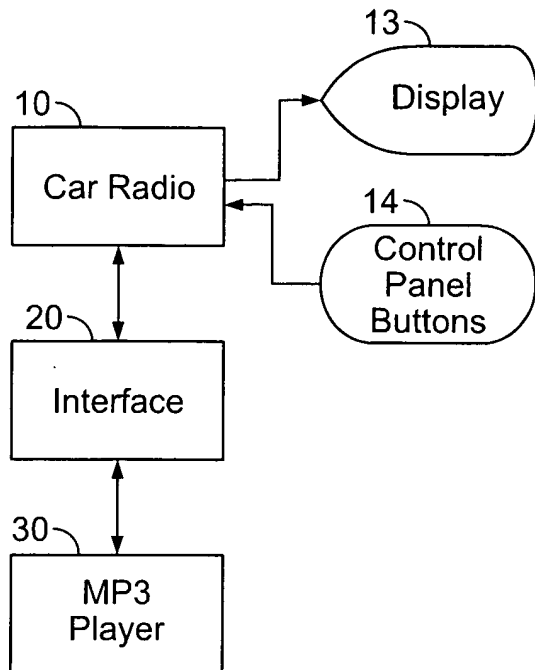


FIG. 2B

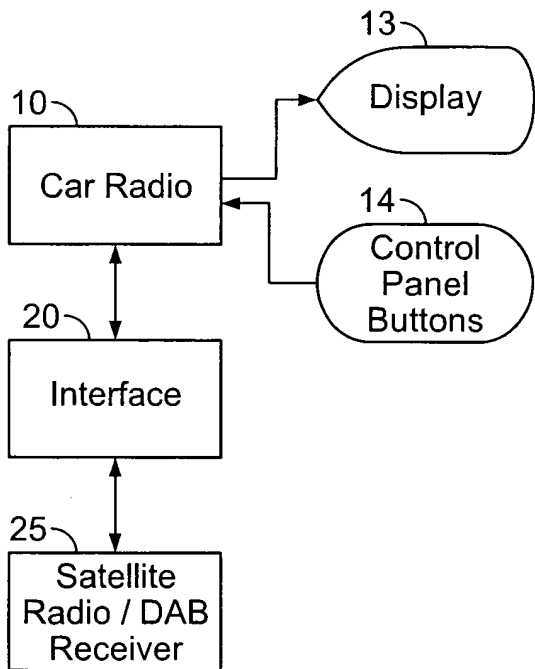


FIG. 2C

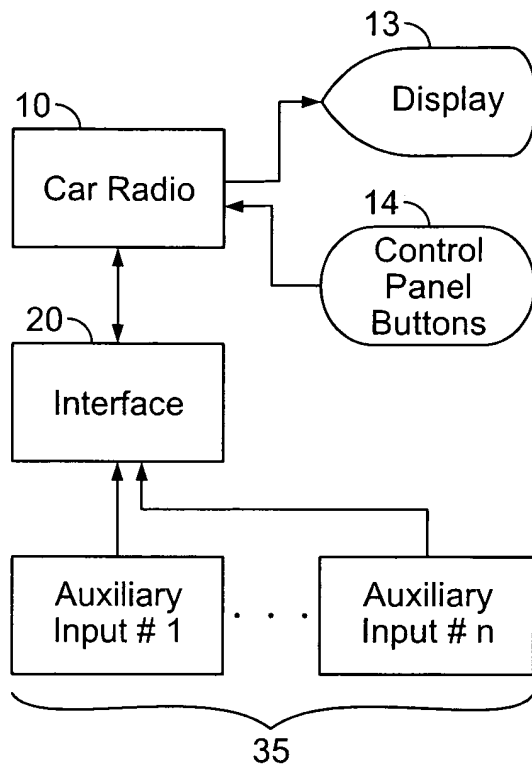


FIG. 2D

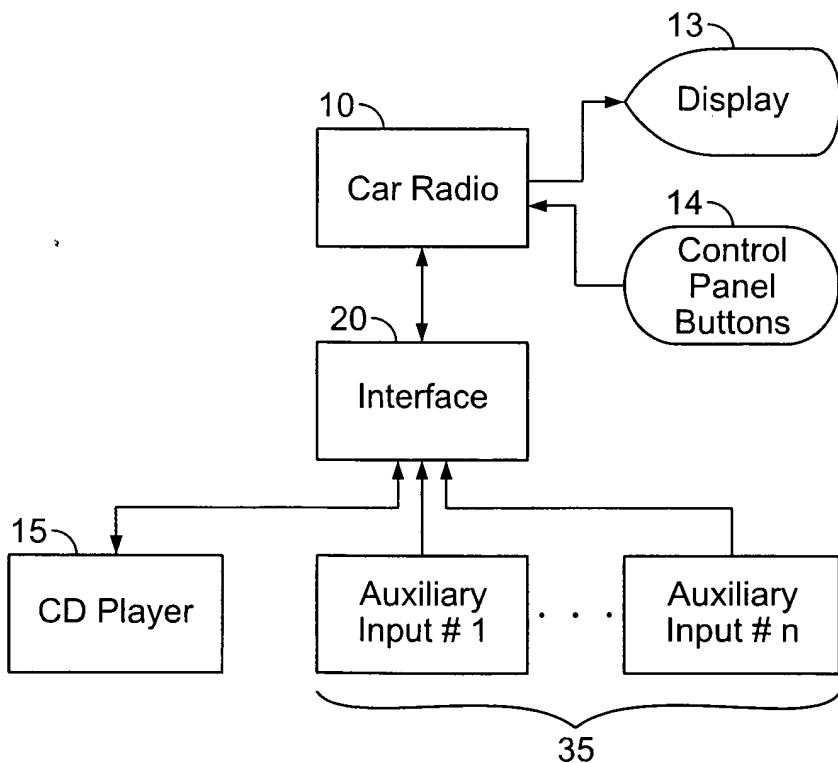


FIG. 2E

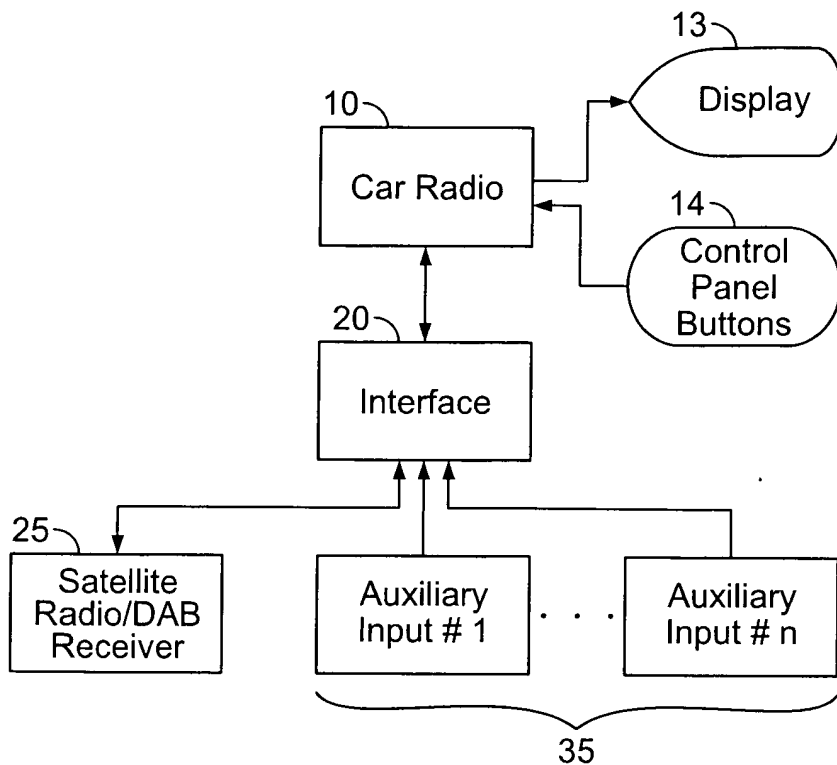


FIG. 2F

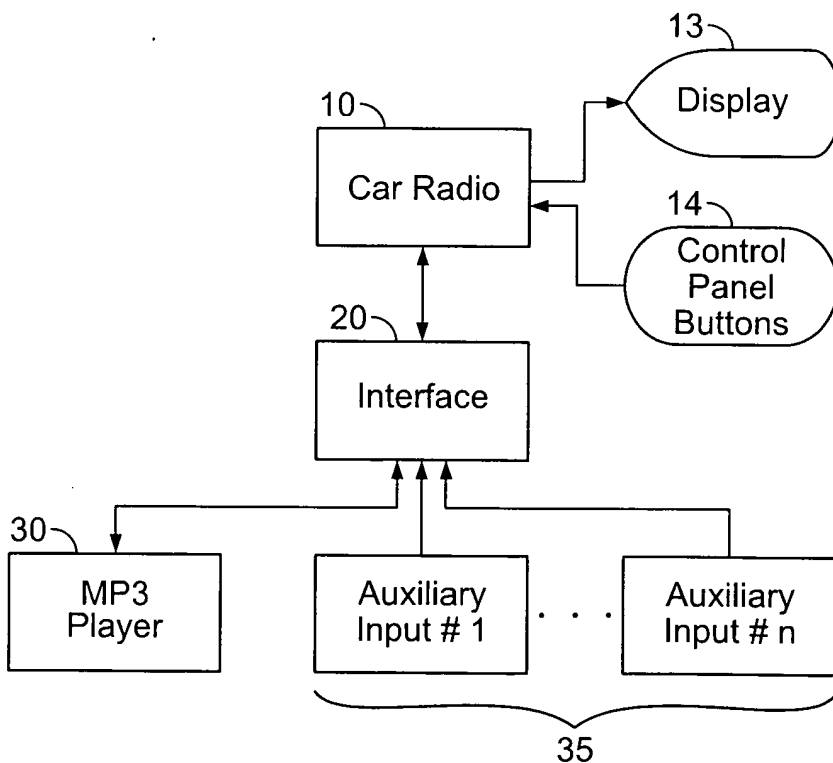


FIG. 2G

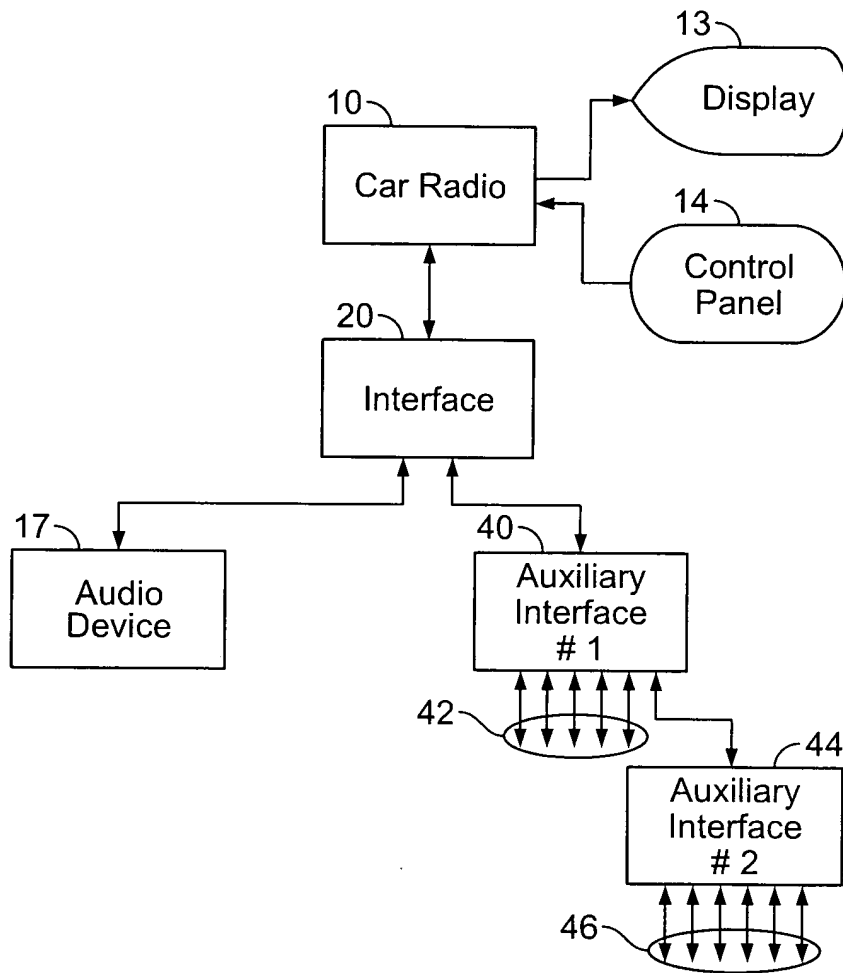


FIG. 2H

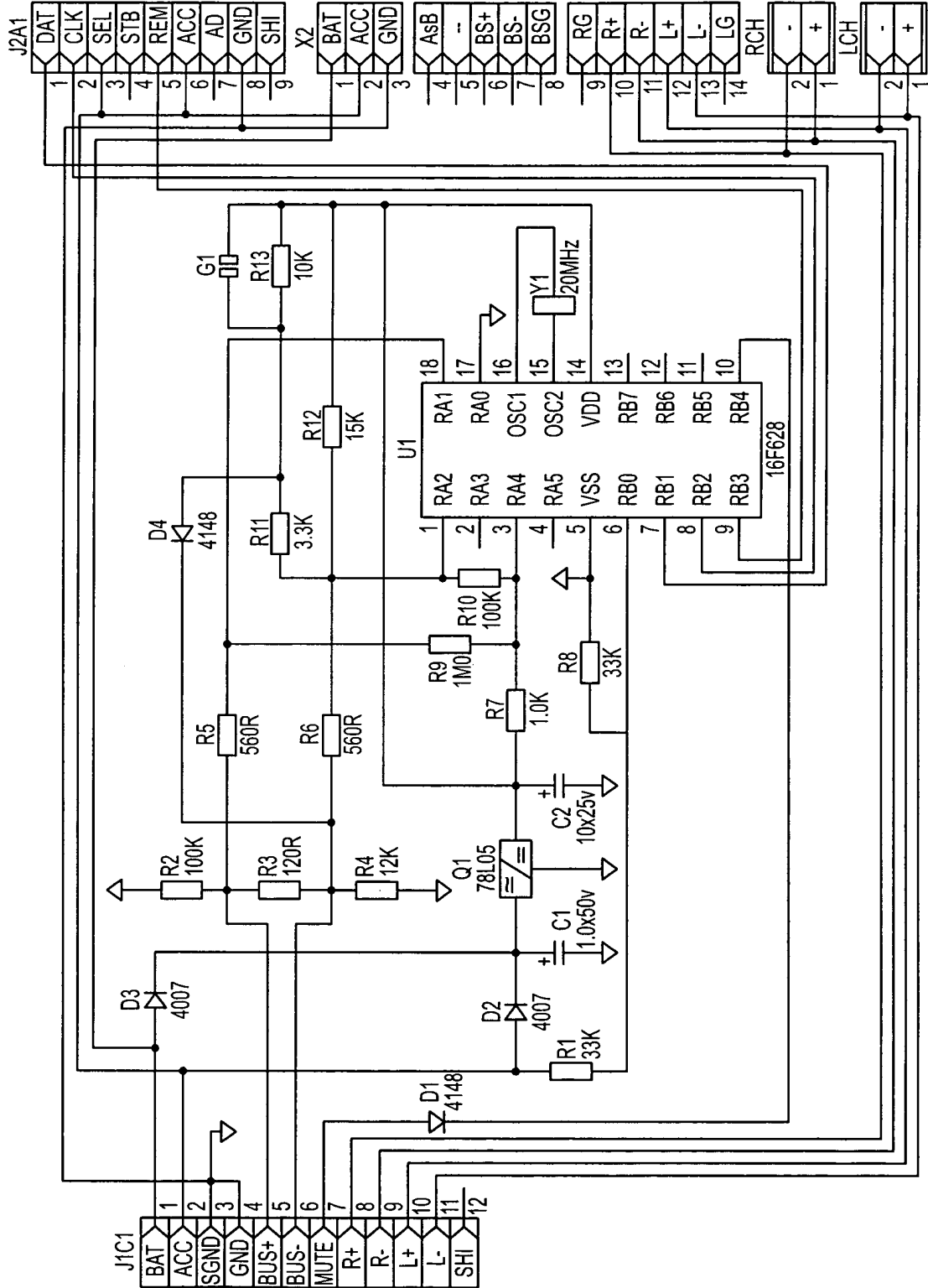


FIG. 3A

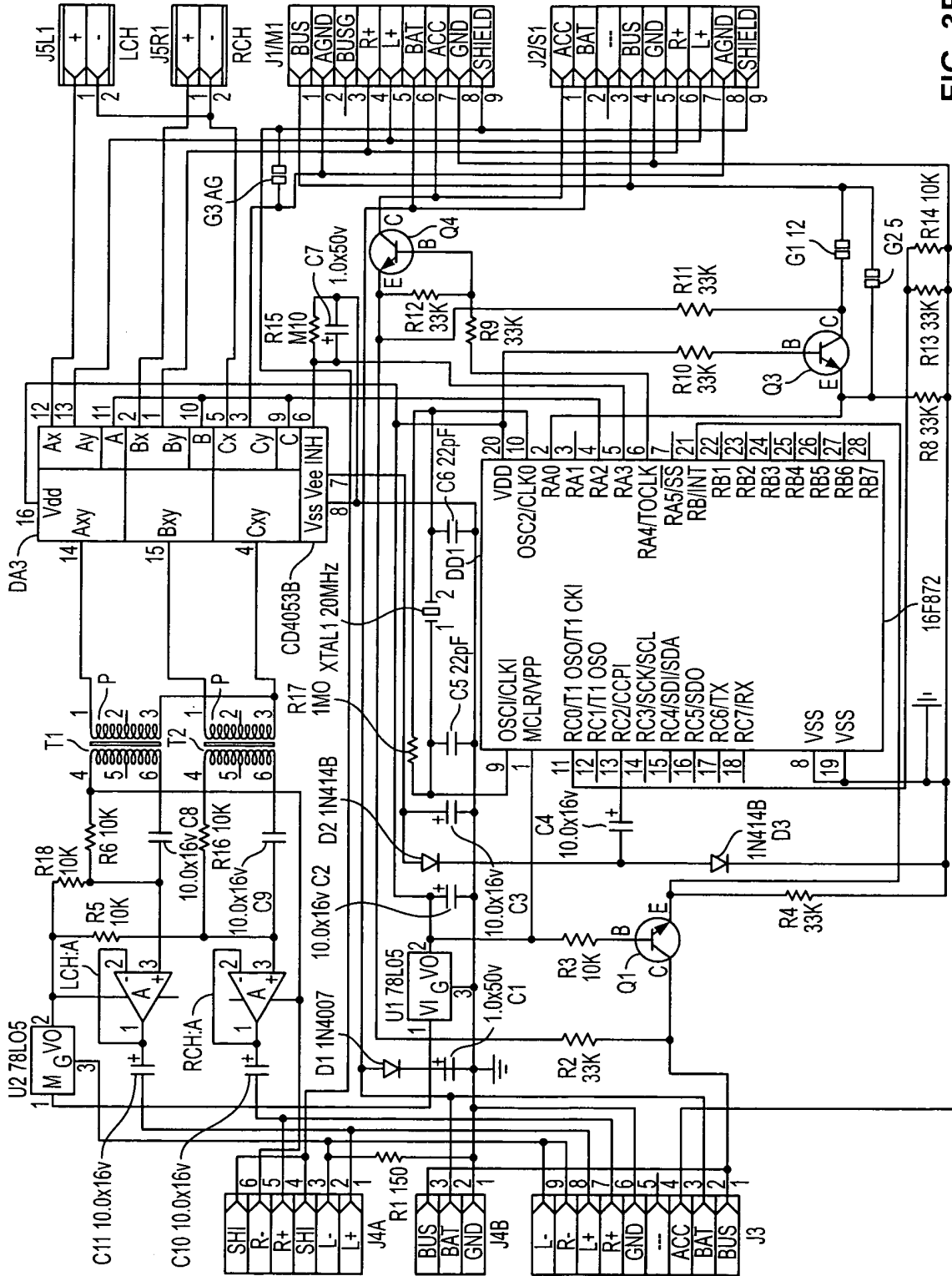


FIG. 3B

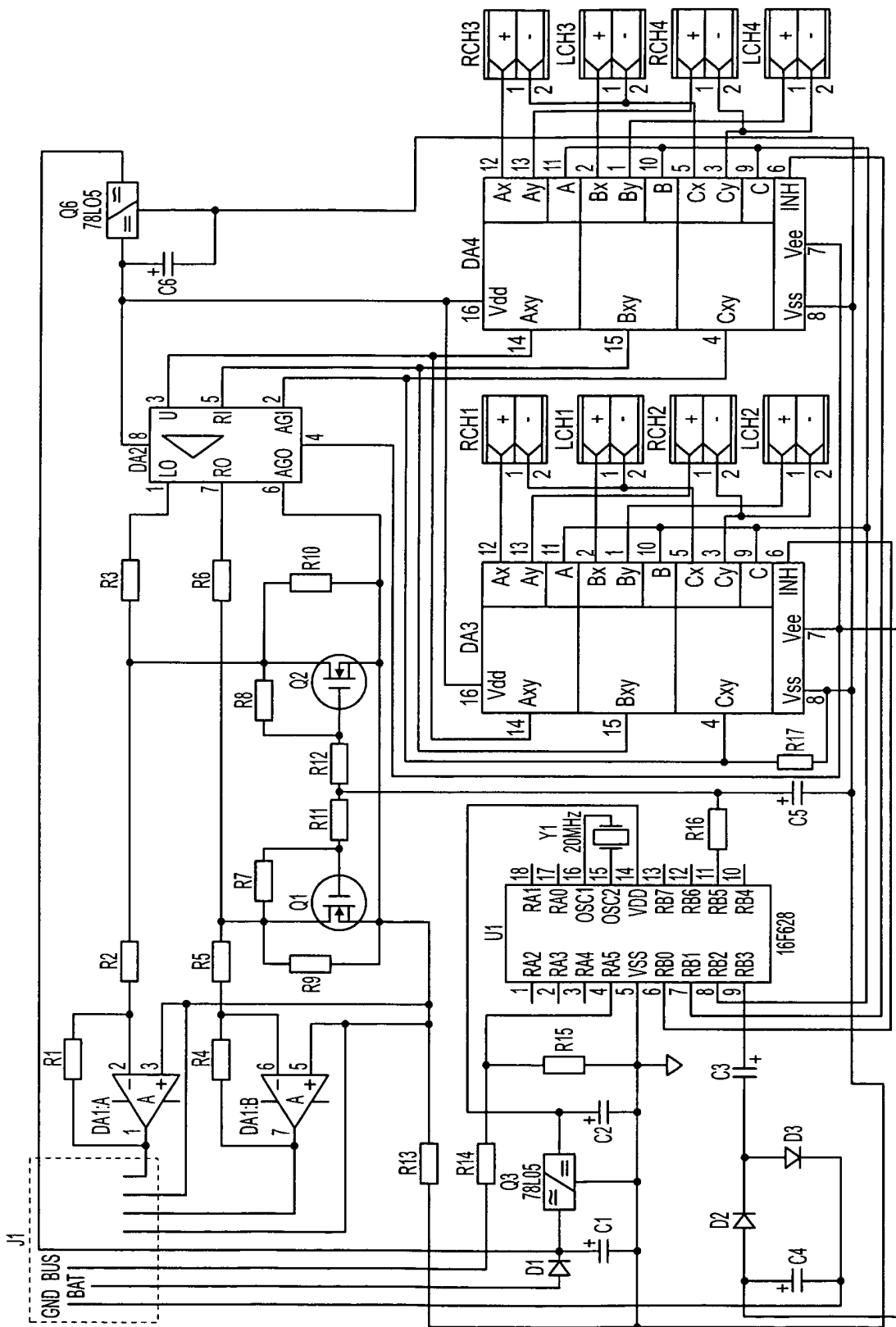


FIG. 3C

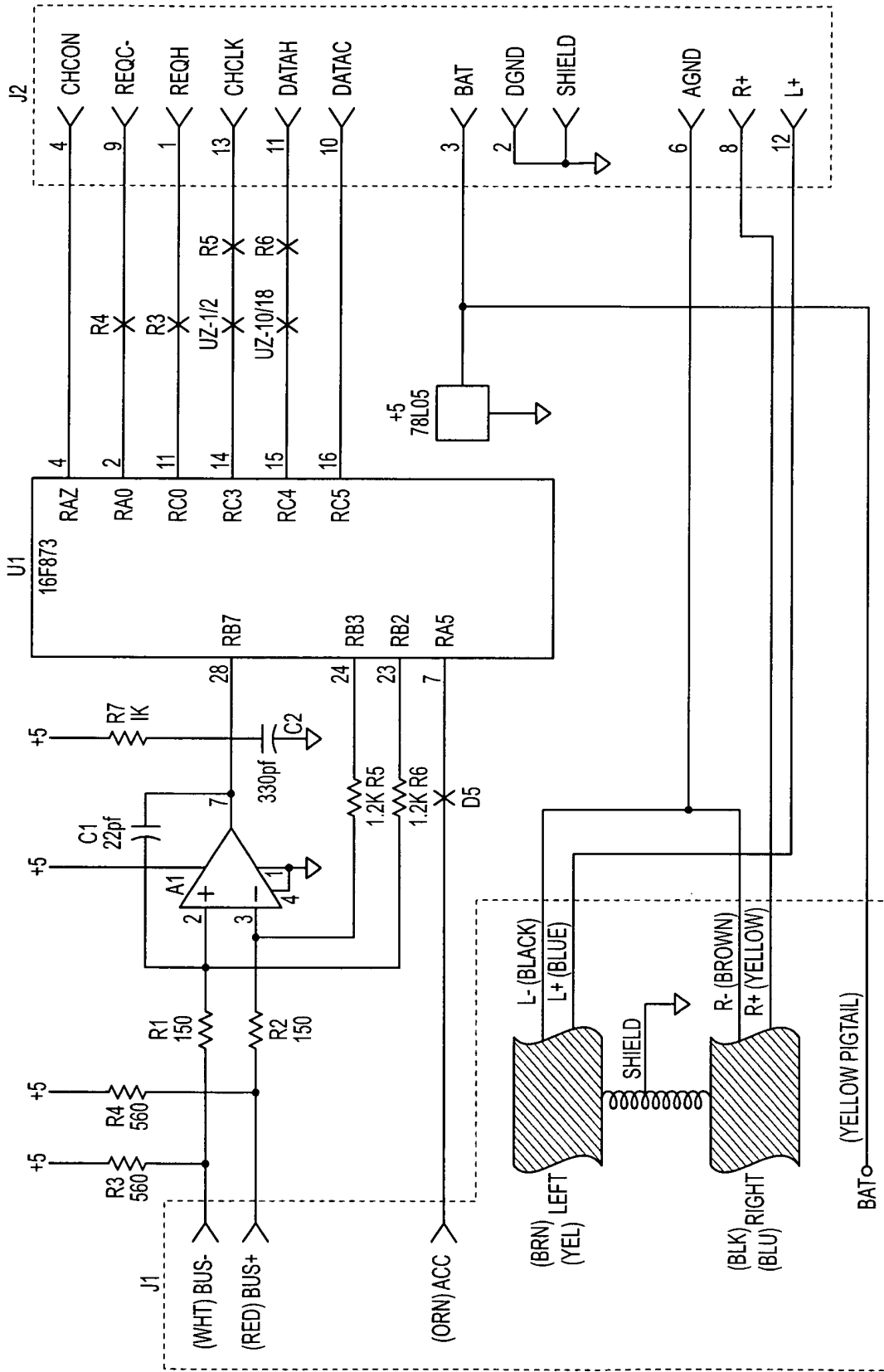


FIG. 3D

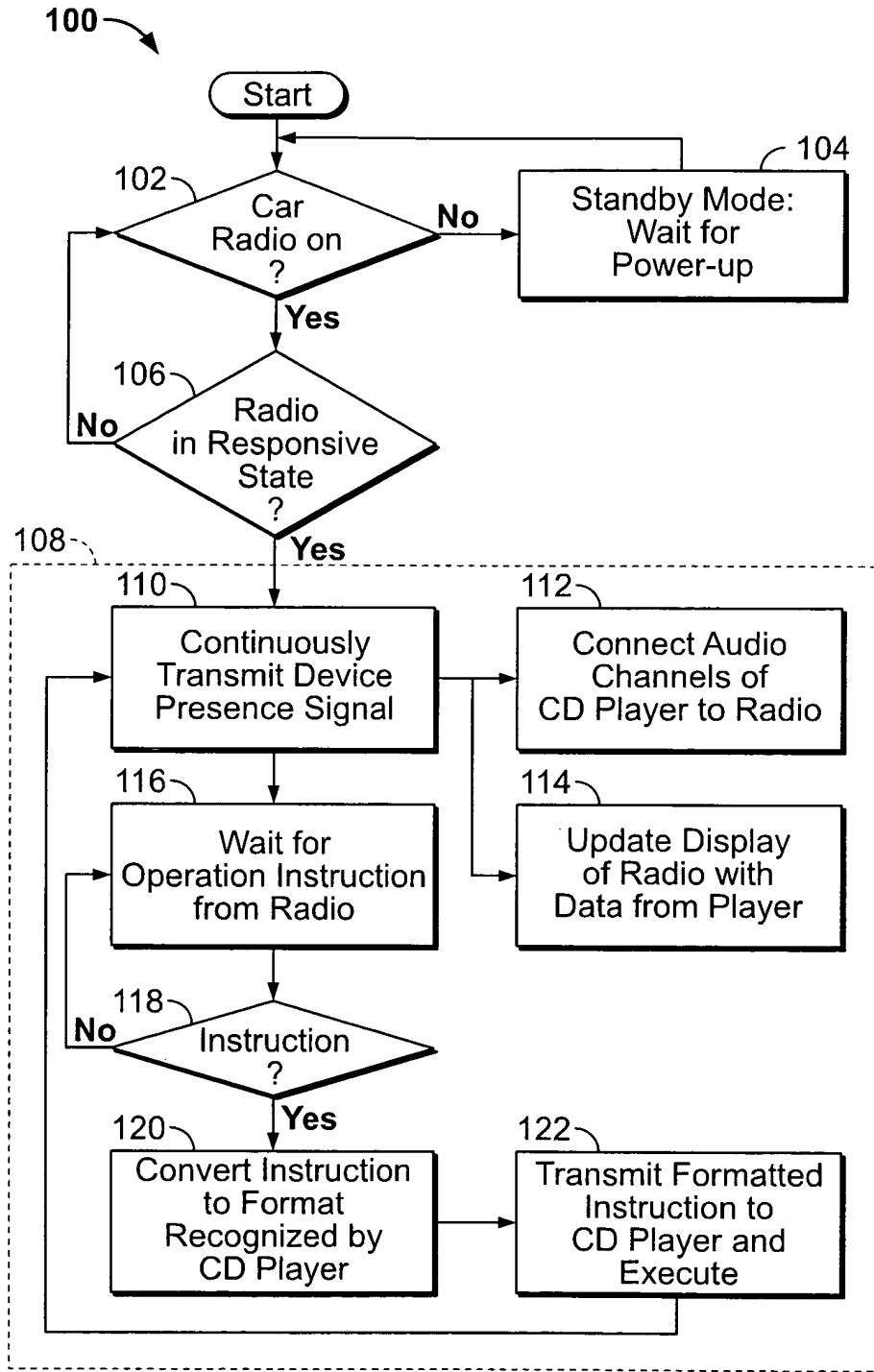


FIG. 4A

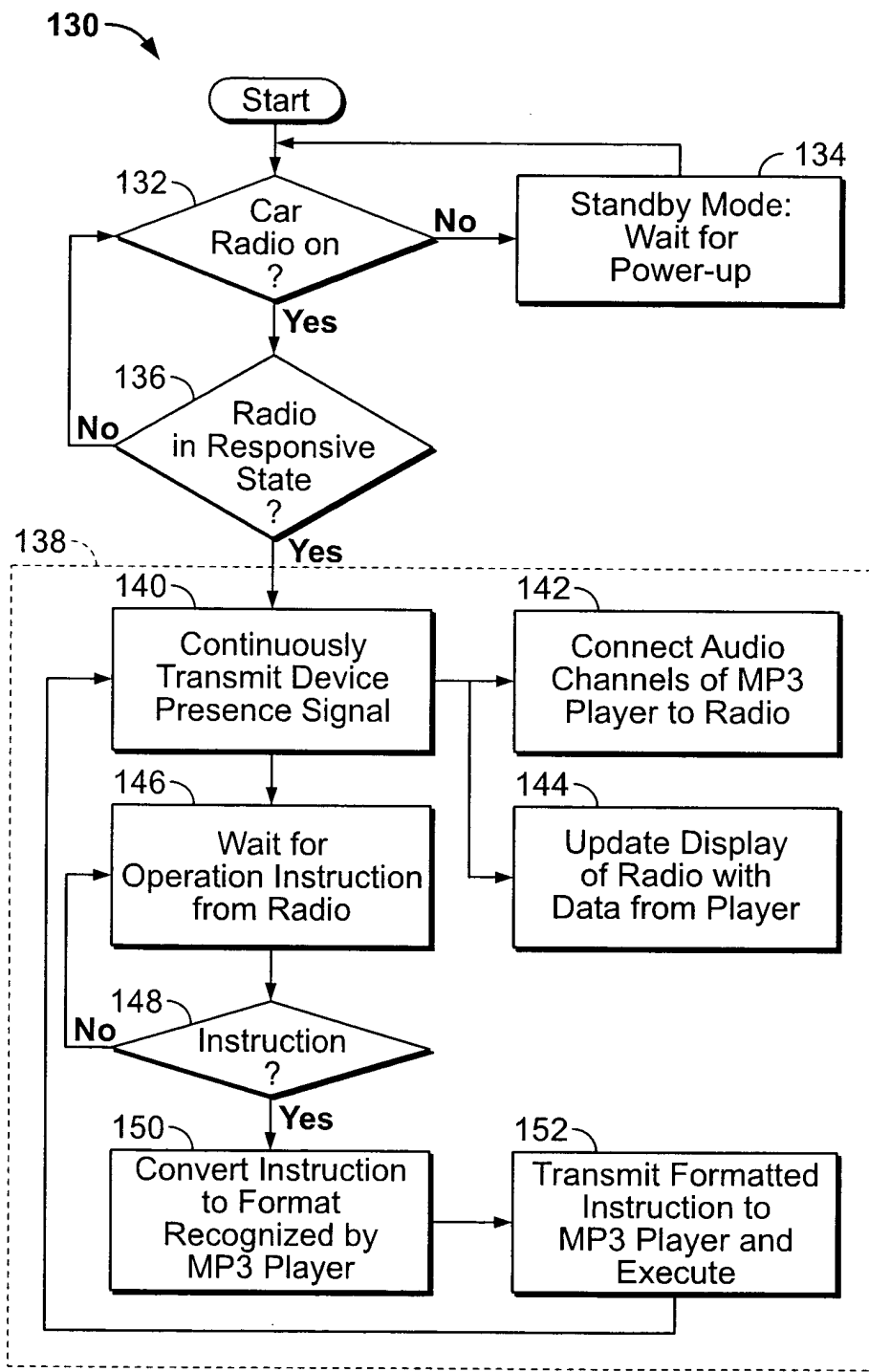


FIG. 4B

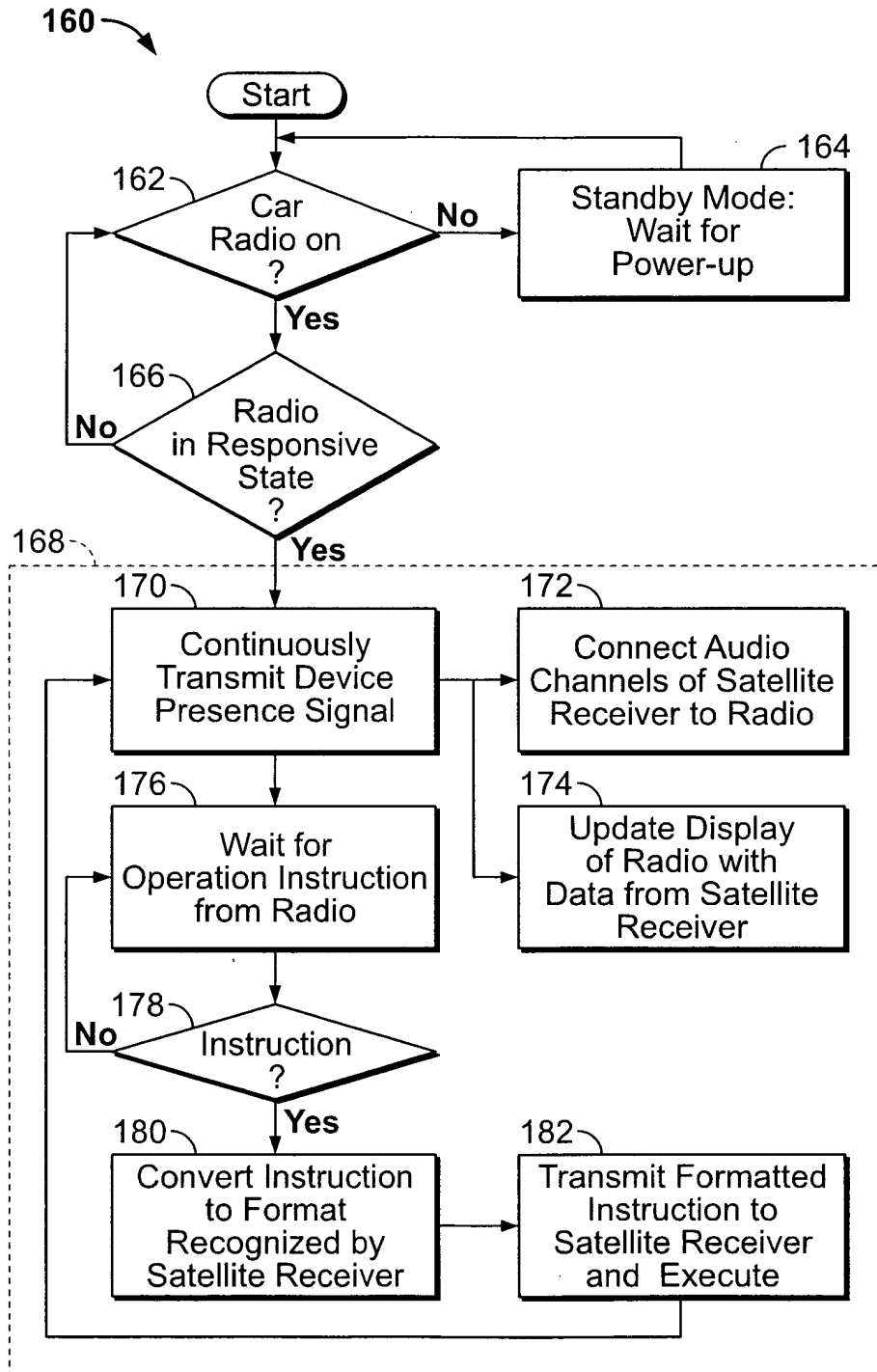


FIG. 4C

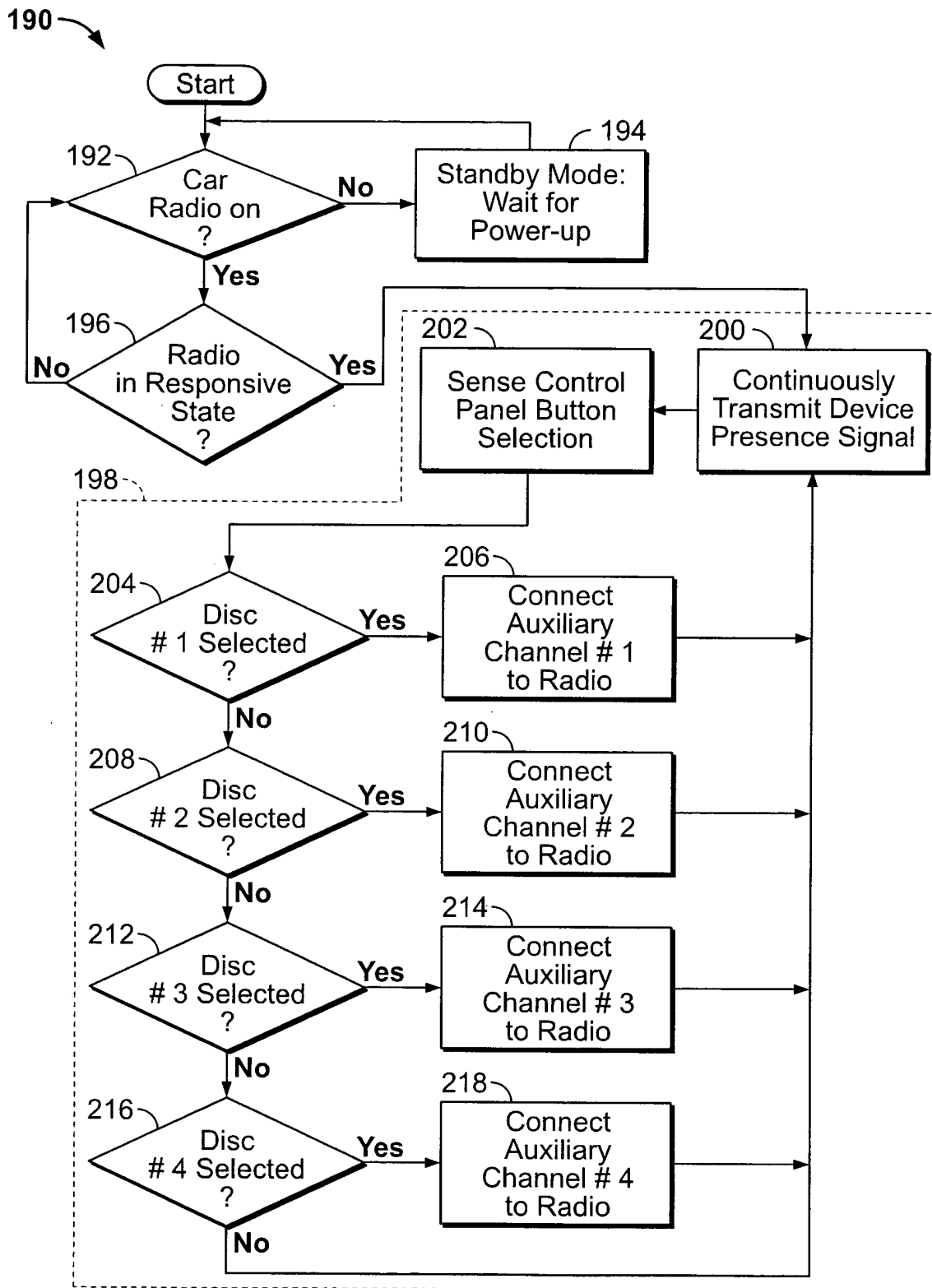


FIG. 4D

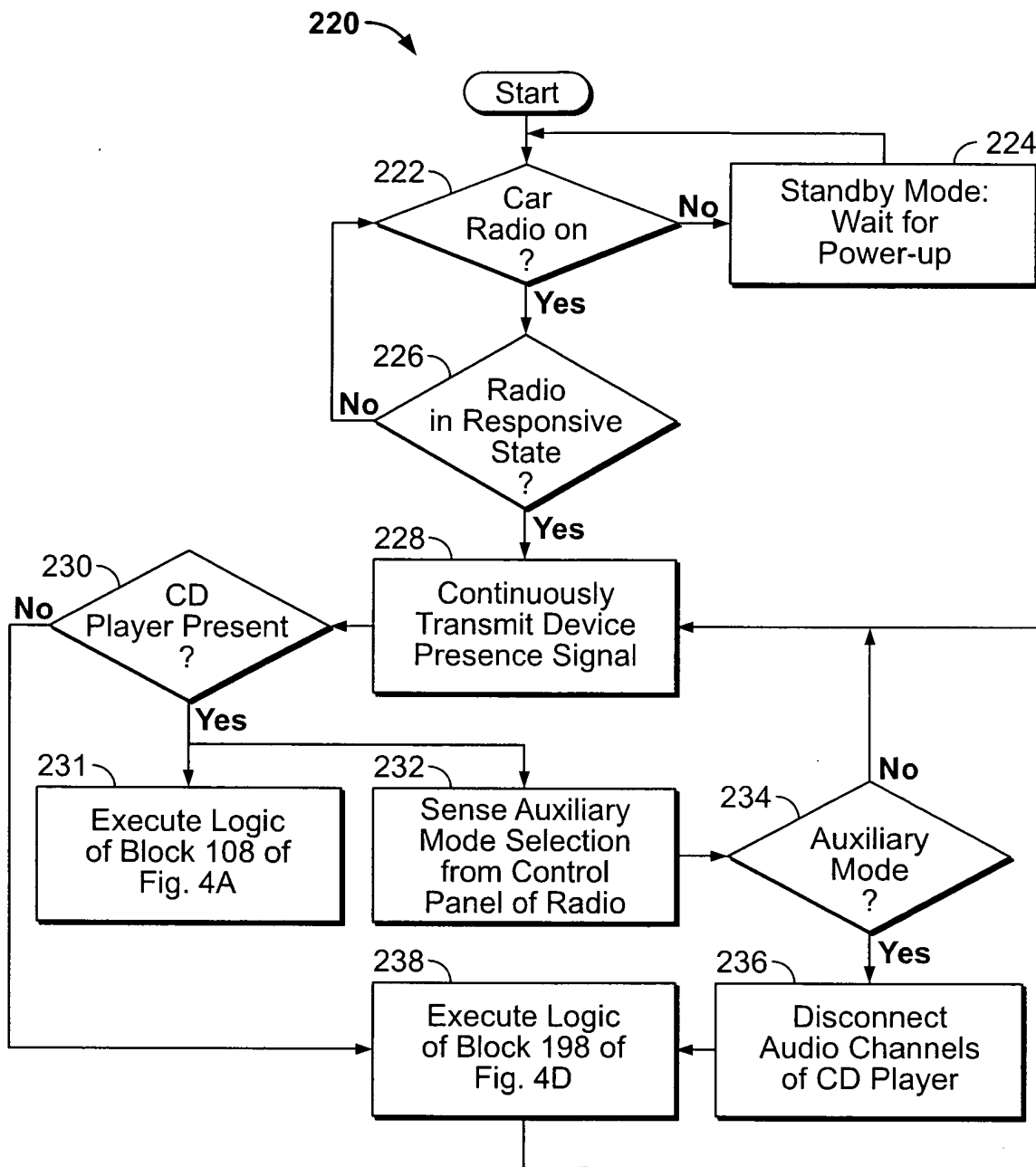


FIG. 4E

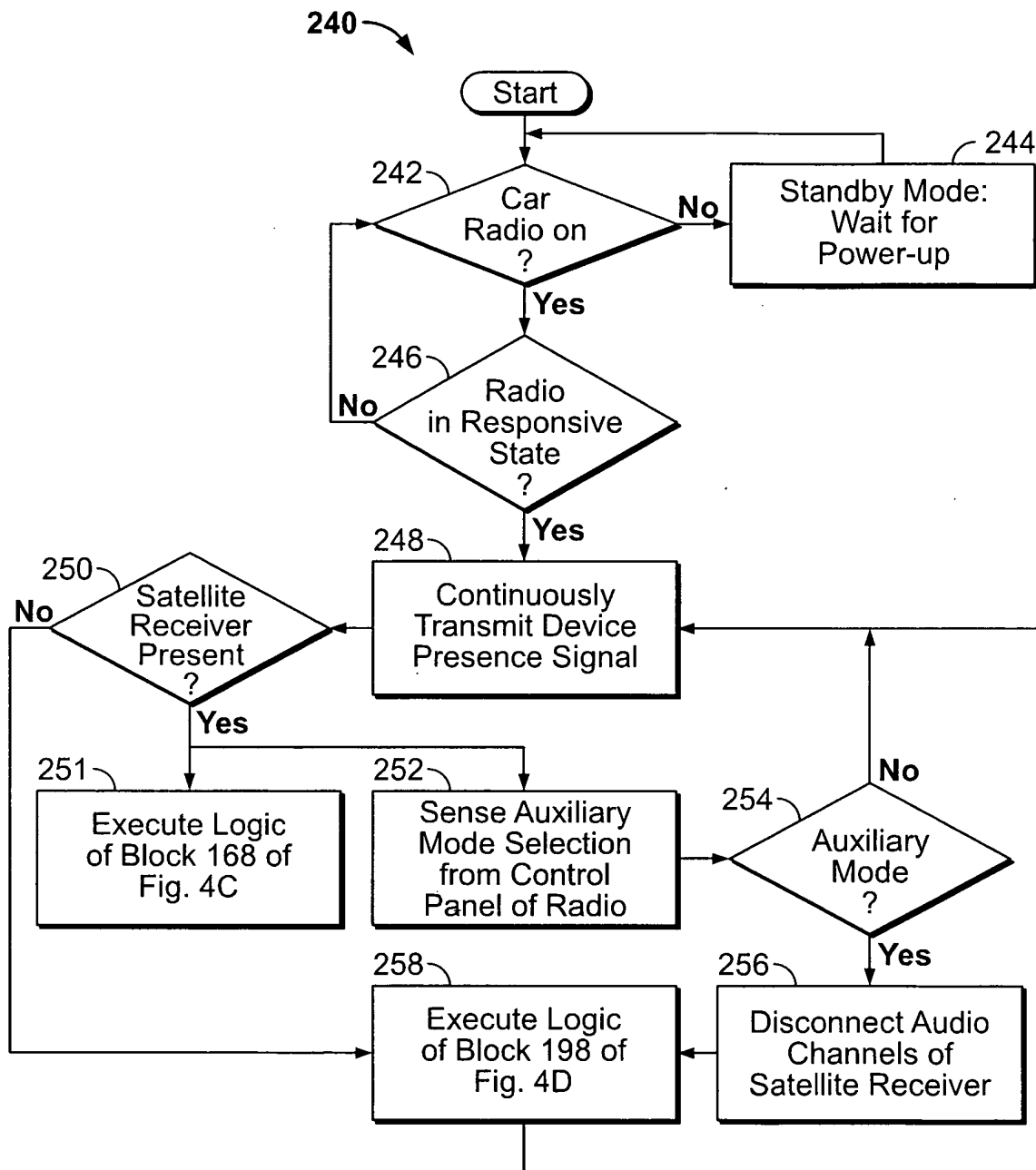


FIG. 4F

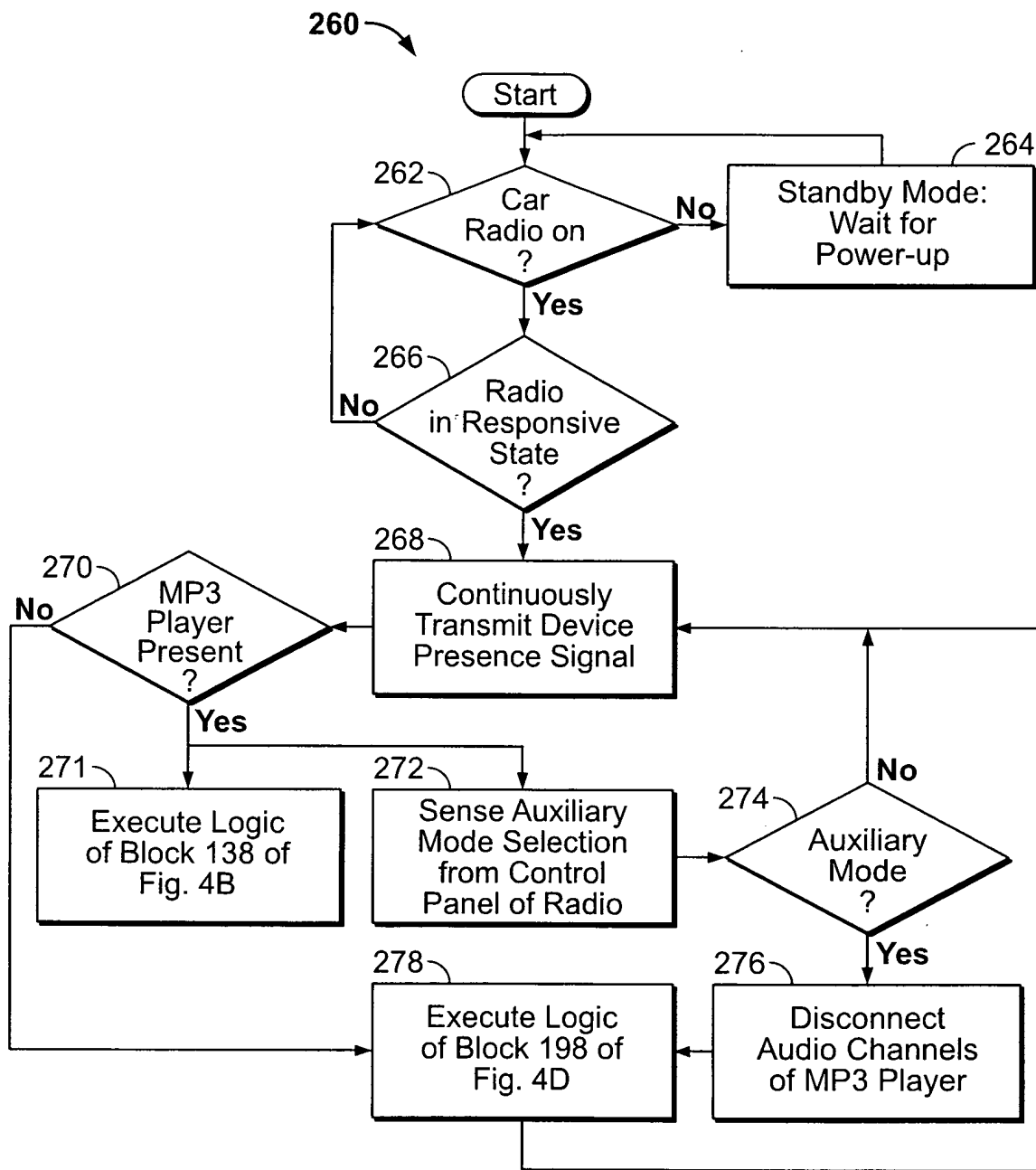


FIG. 4G

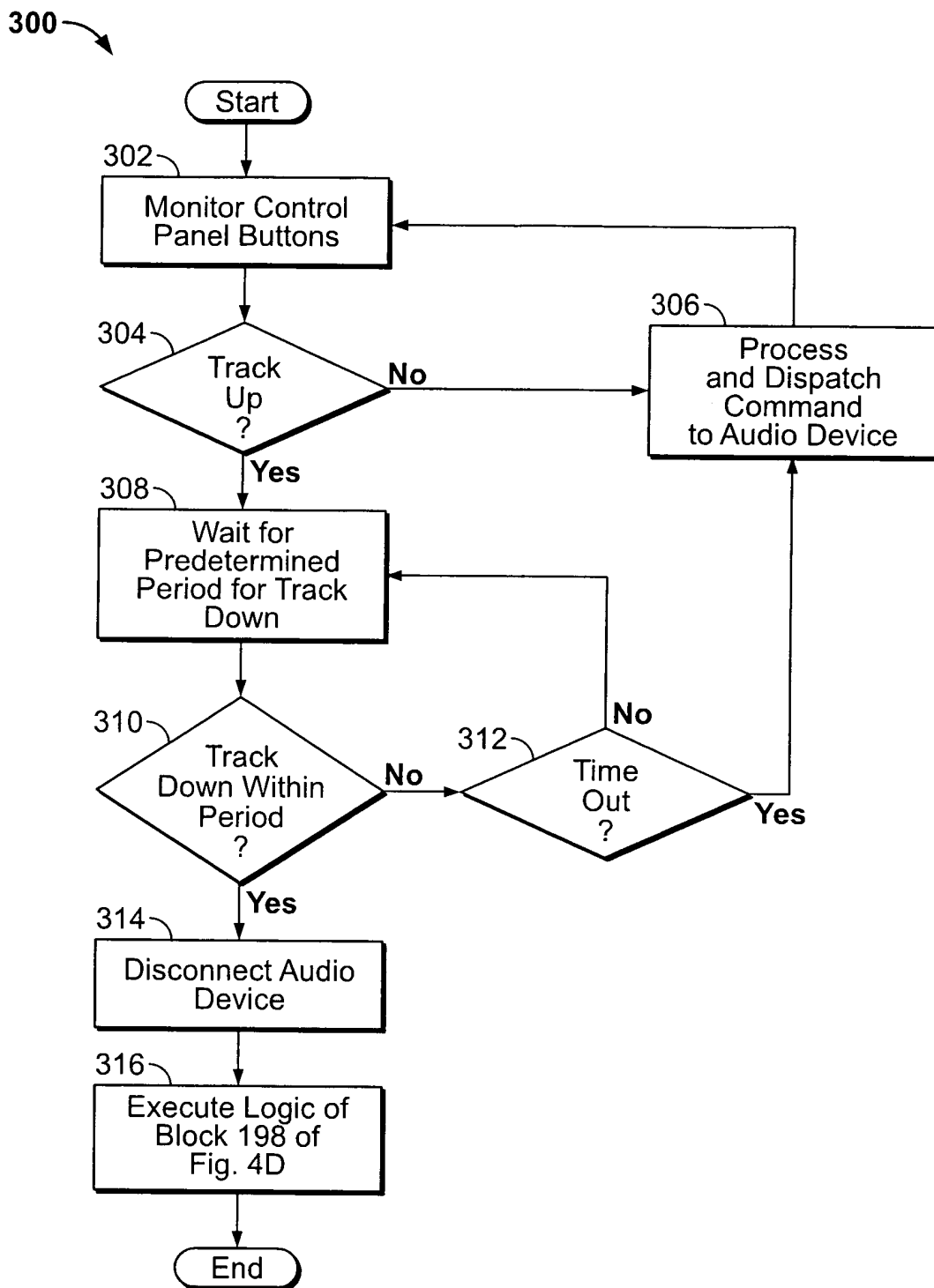


FIG. 5

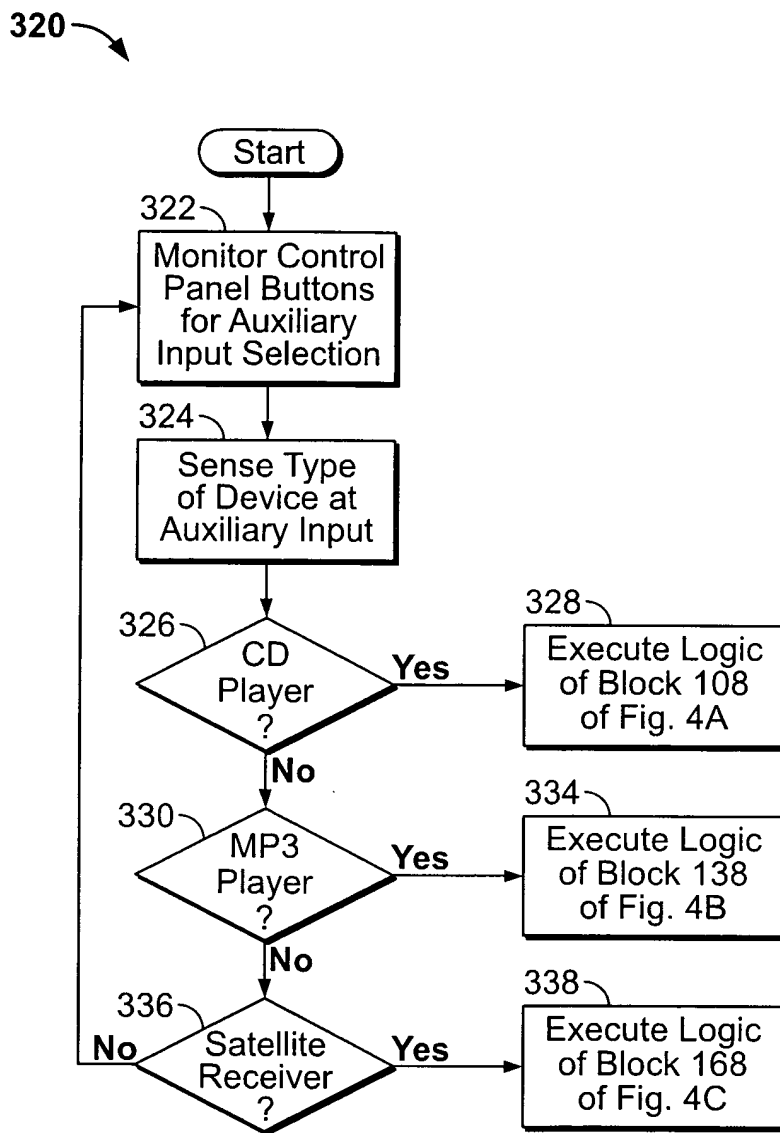


FIG. 6

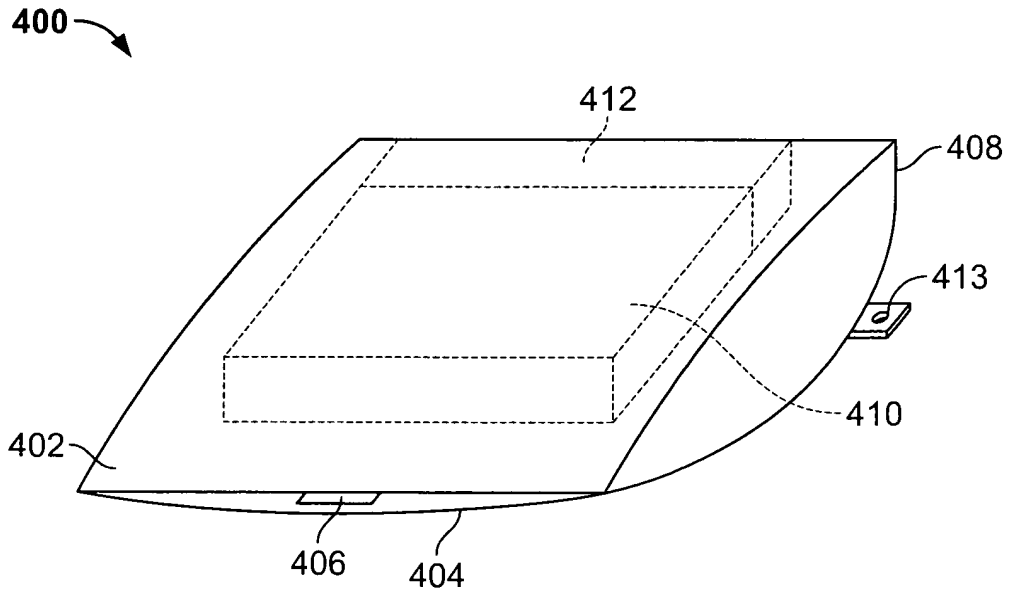


FIG. 7A

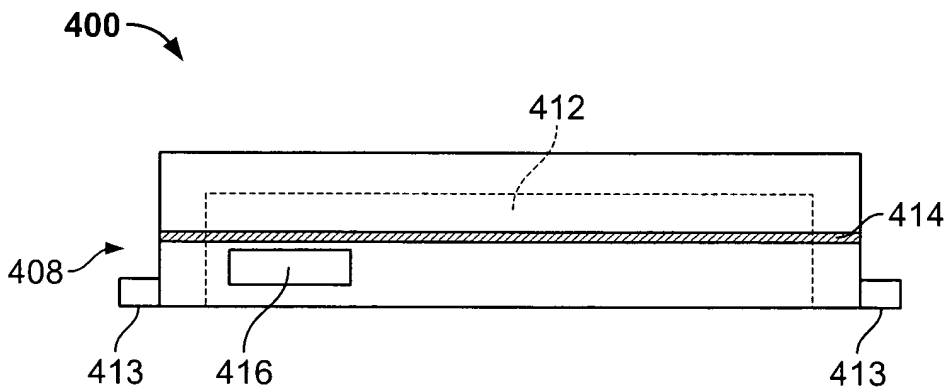


FIG. 7B

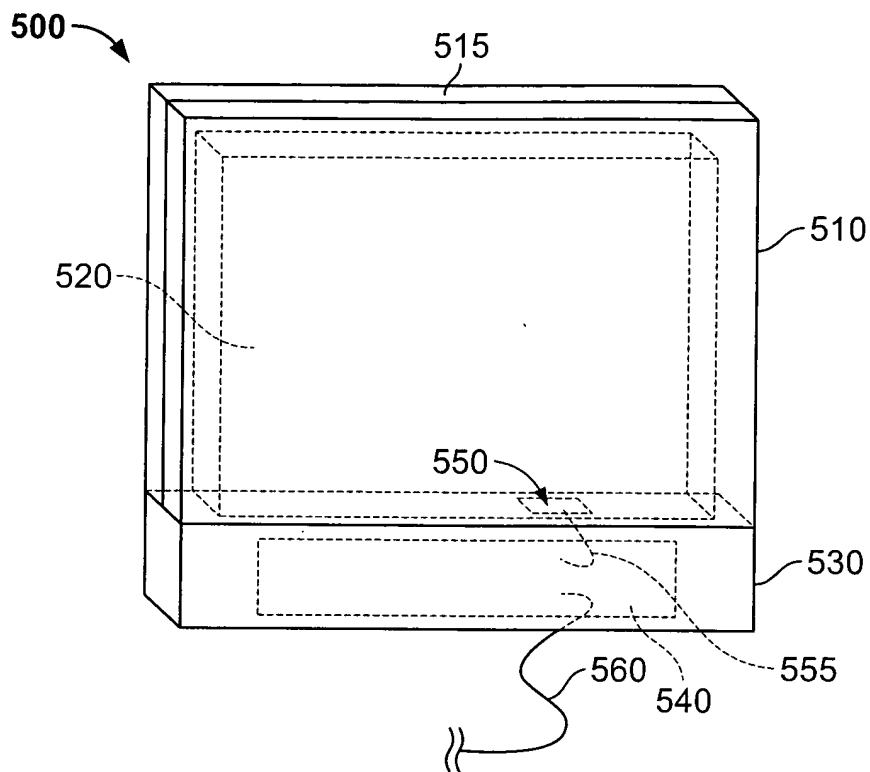


FIG. 8A

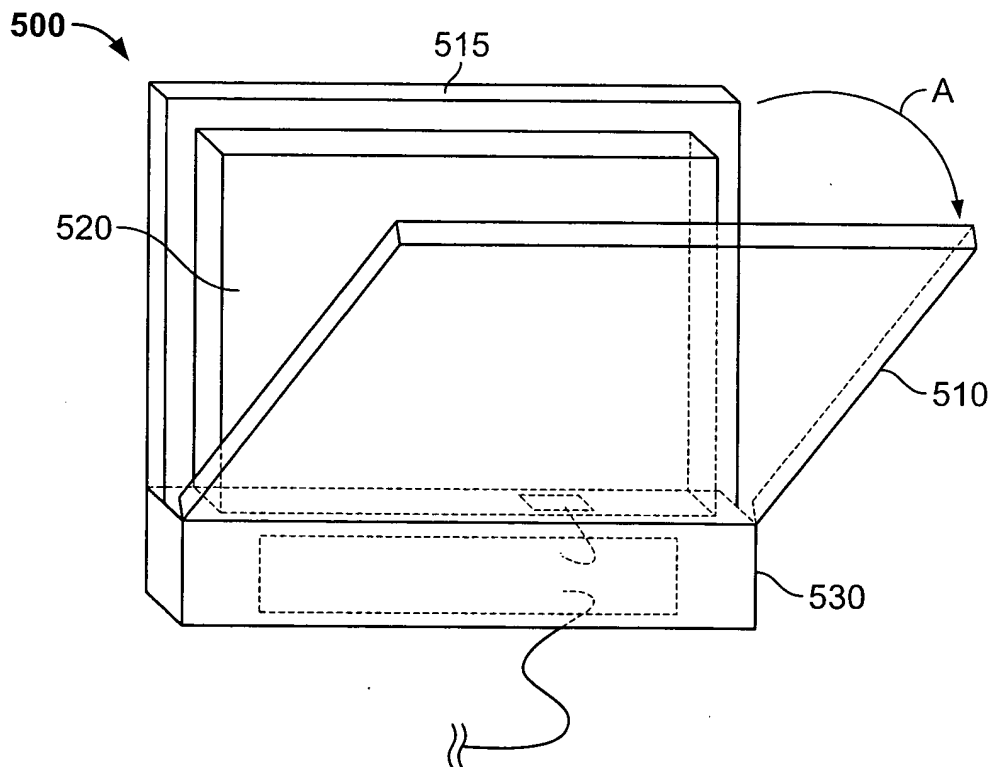


FIG. 8B

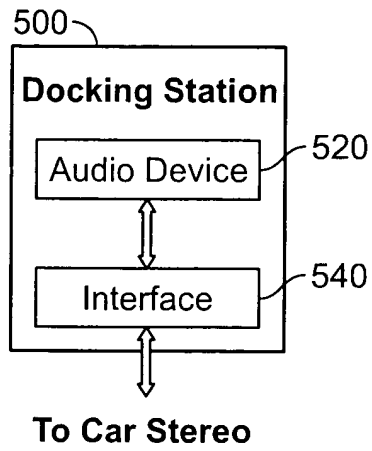


FIG. 9

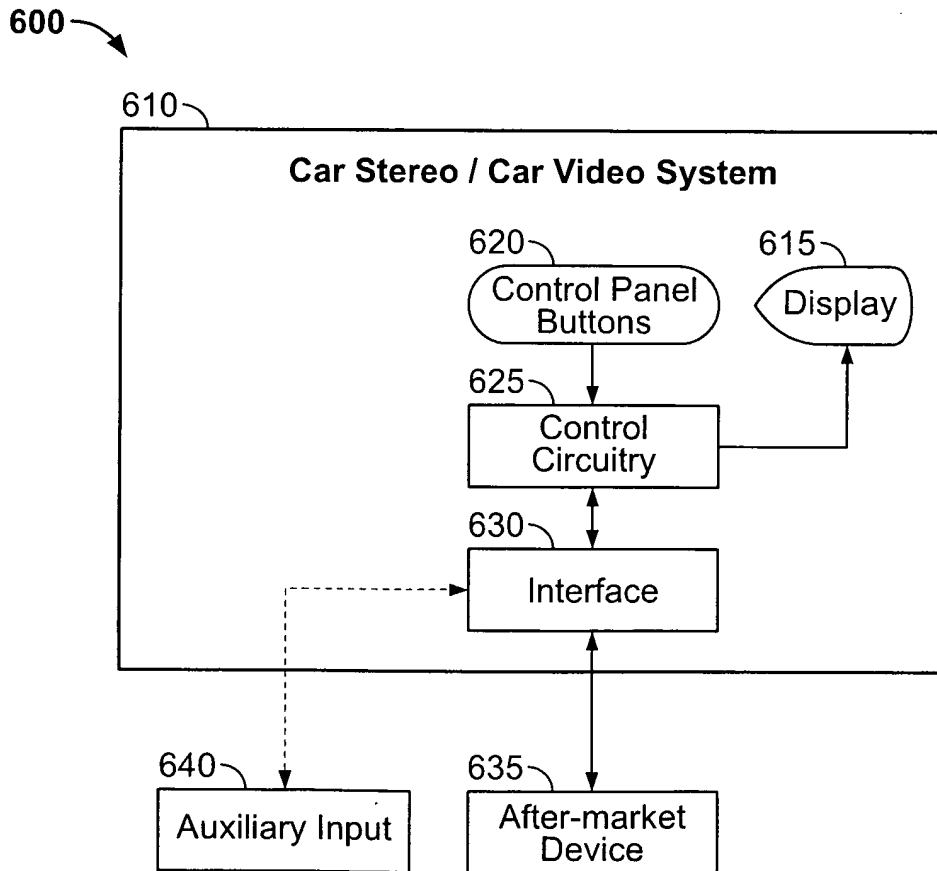


FIG. 10

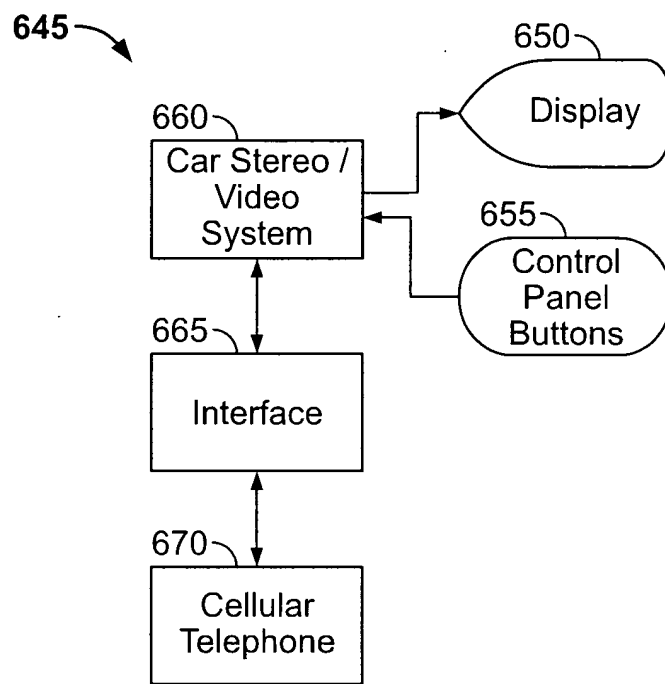


FIG. 11A

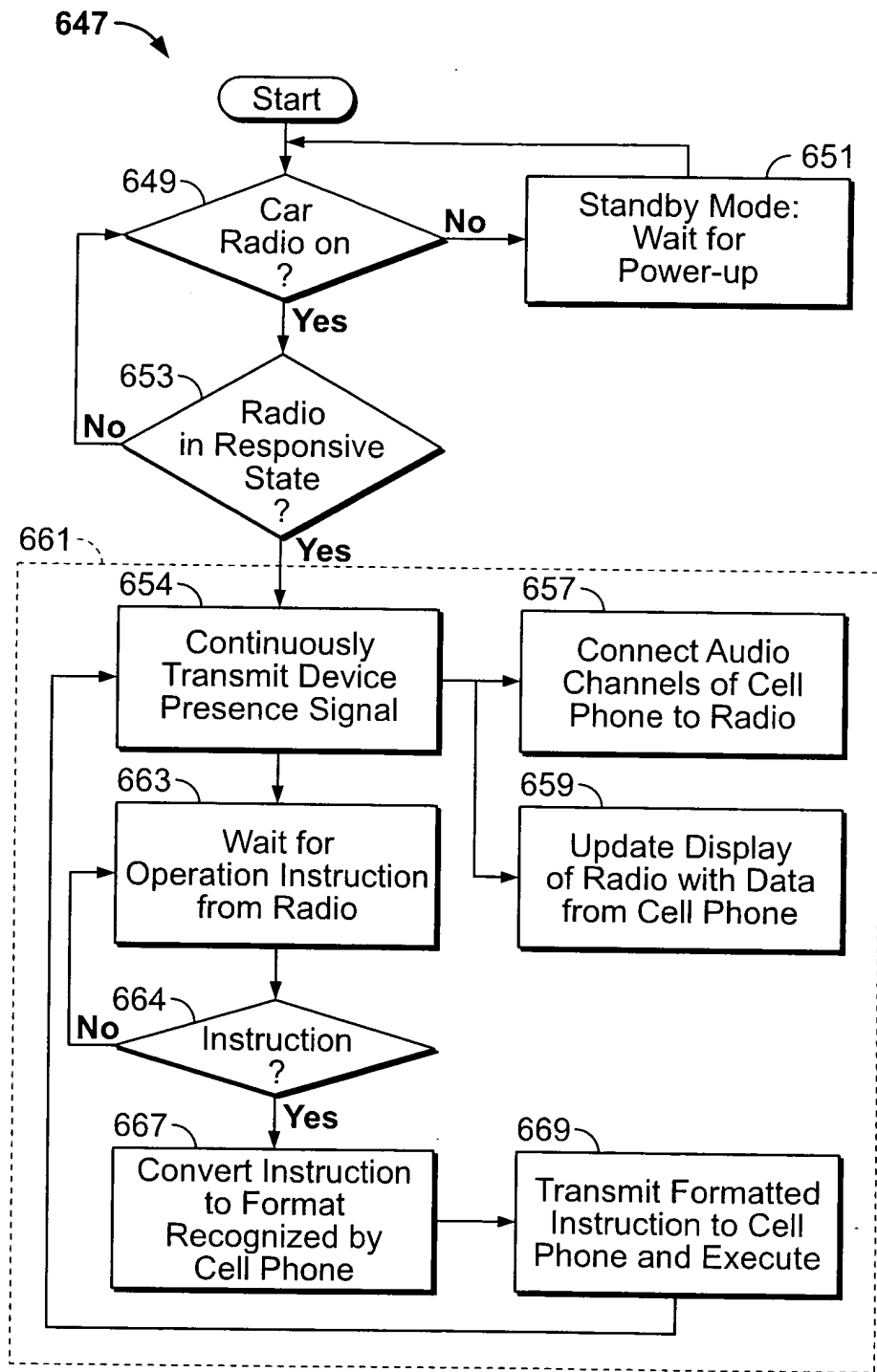


FIG. 11B

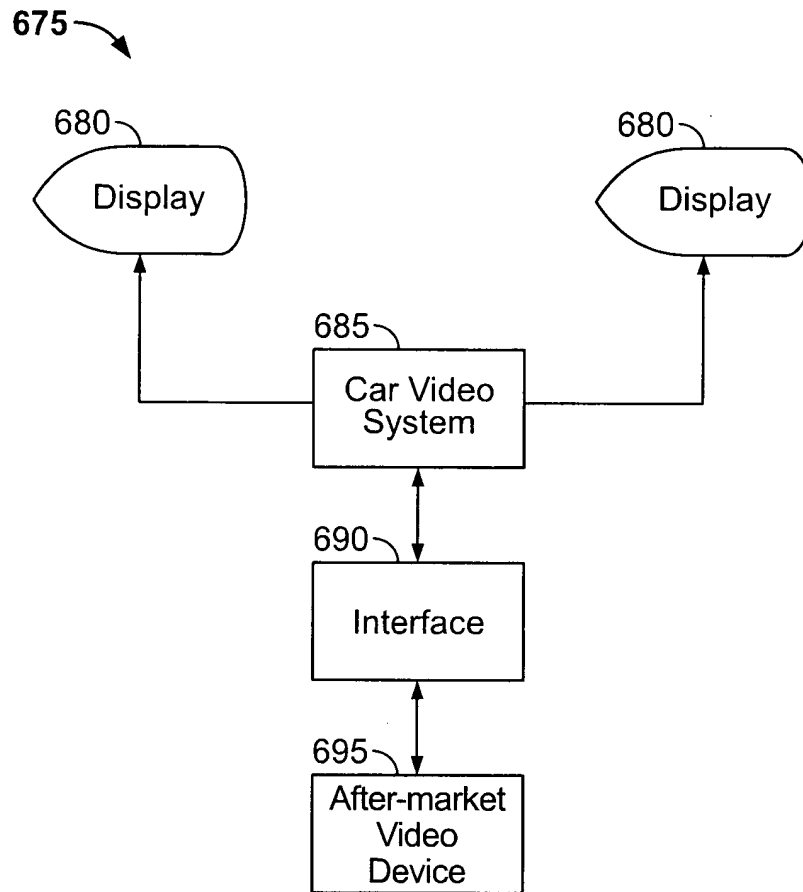


FIG. 12A

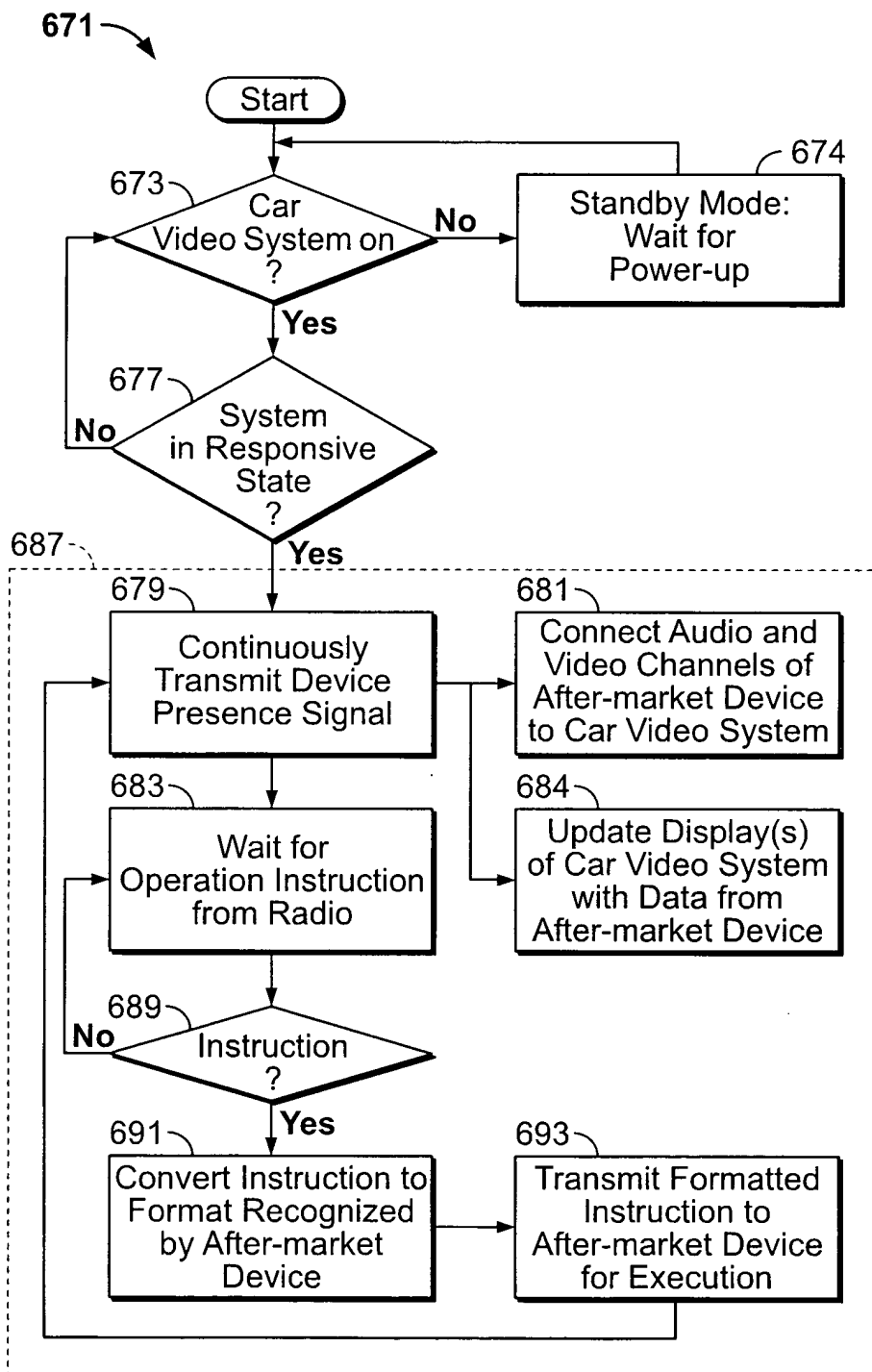


FIG. 12B

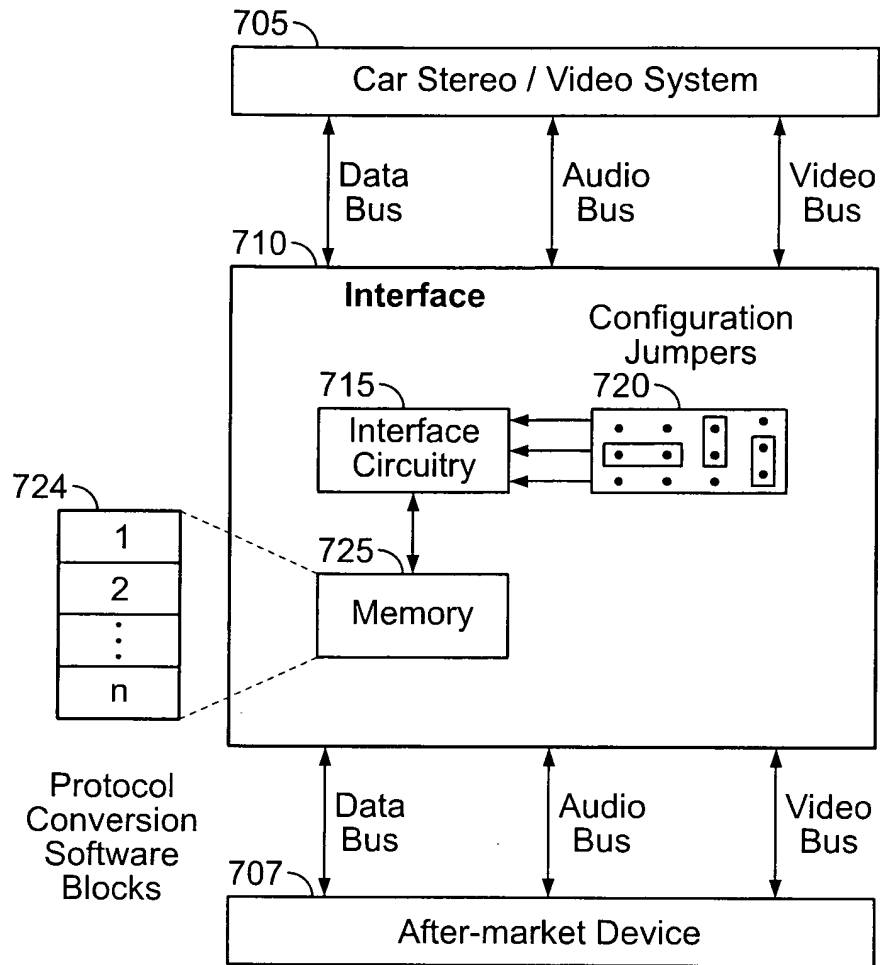


FIG. 13A

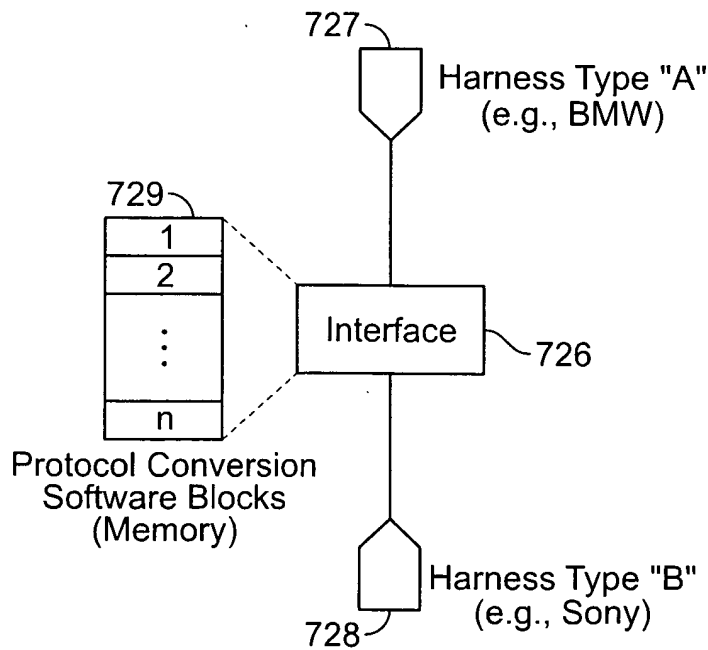


FIG. 13B

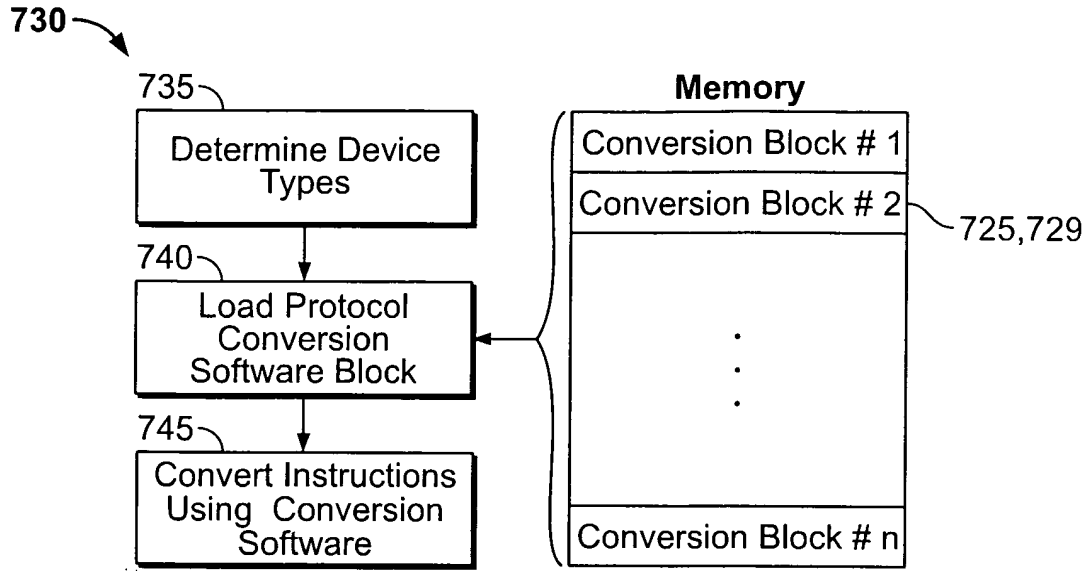


FIG. 14

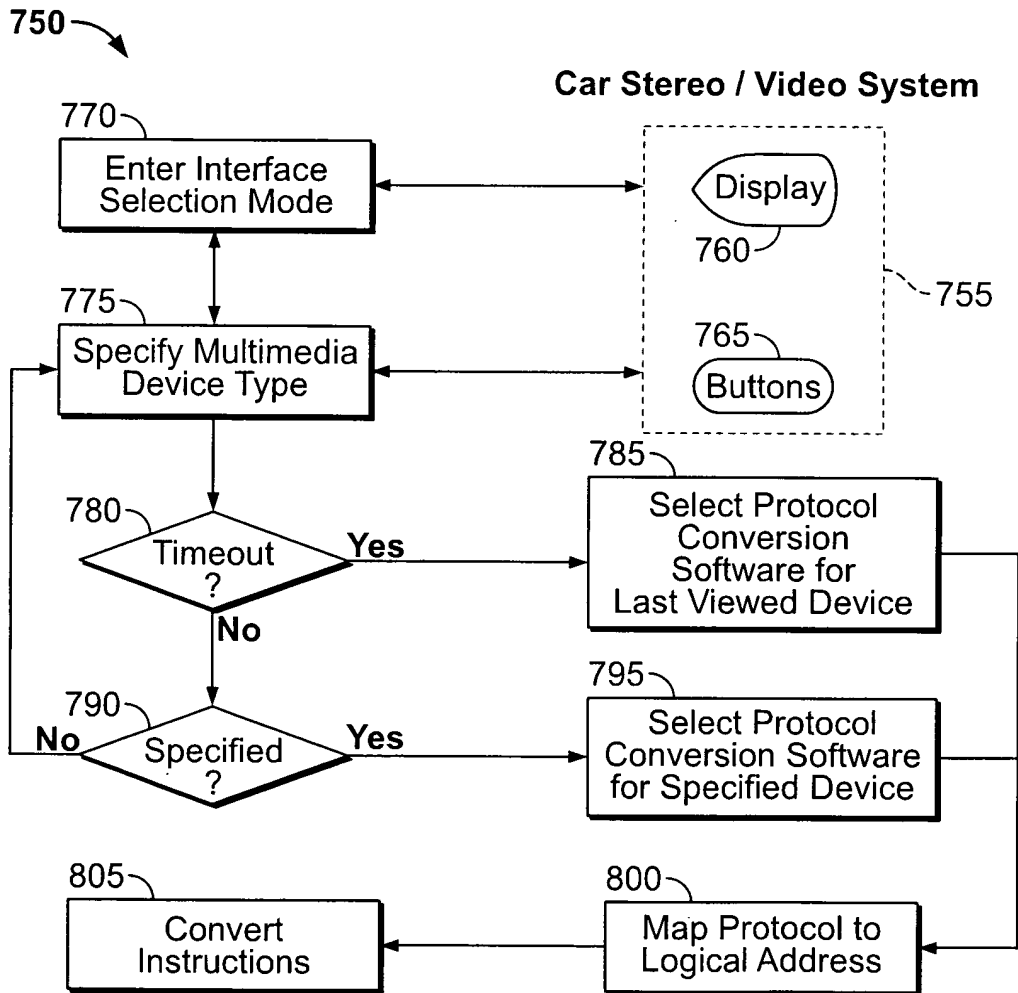


FIG. 15

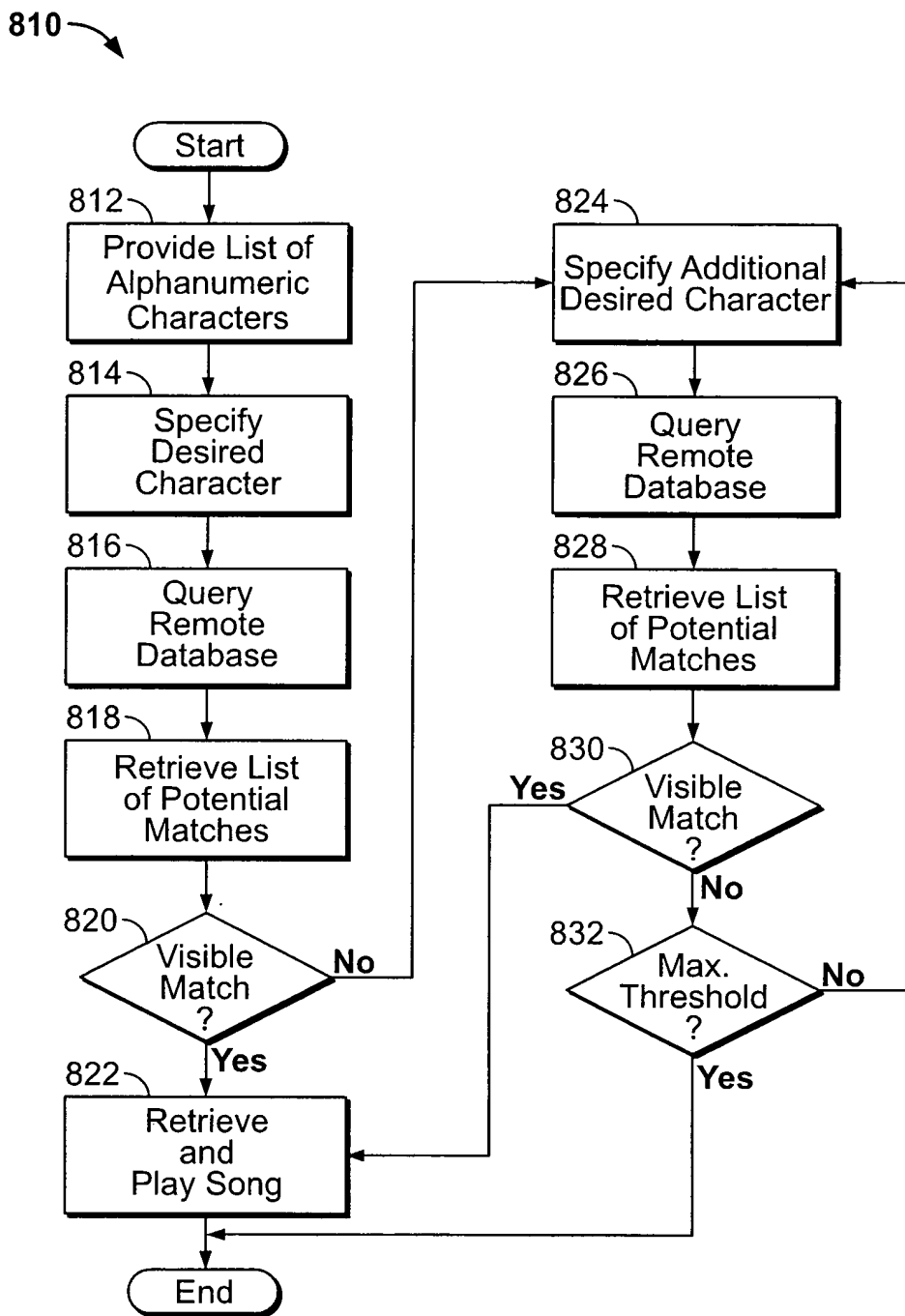


FIG. 16

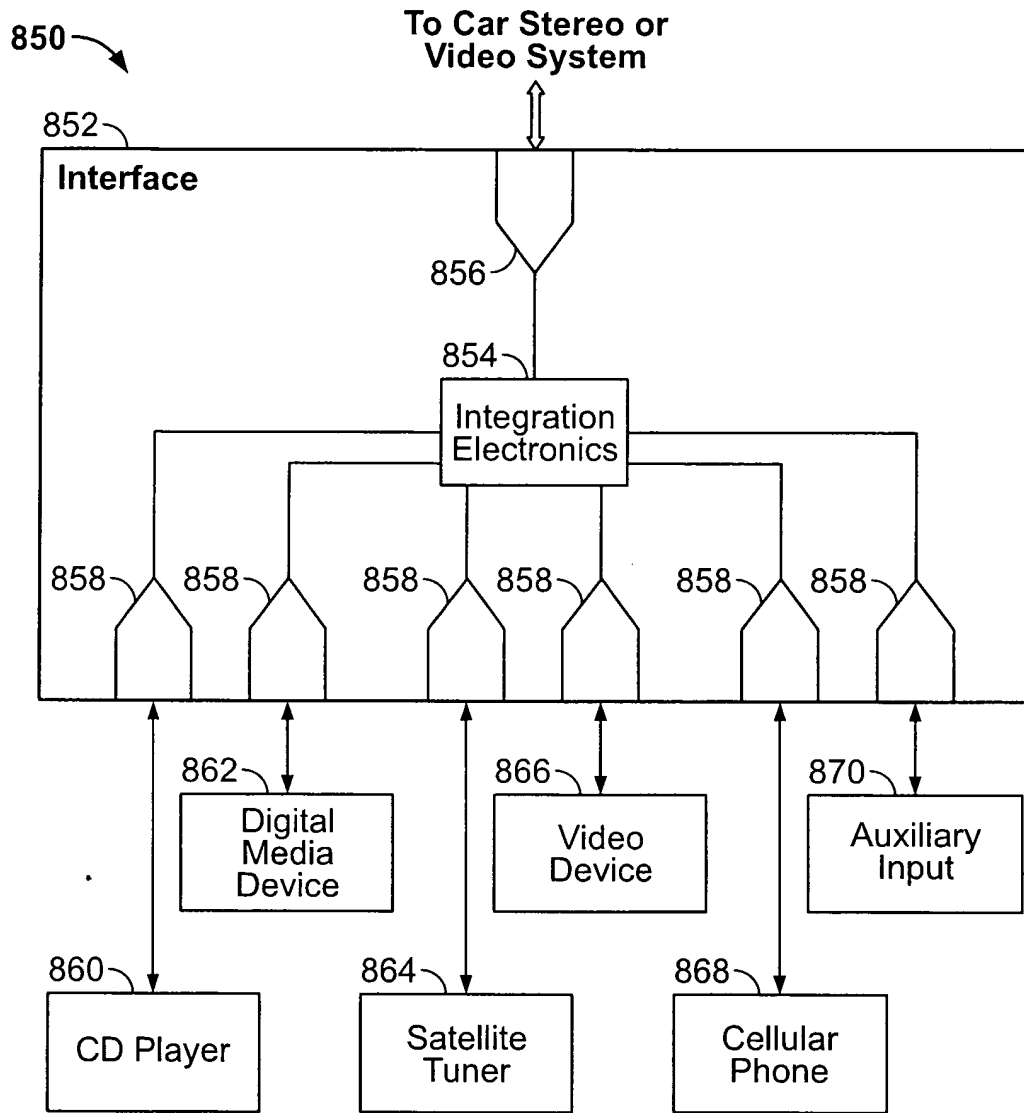


FIG. 17

FIG. 18

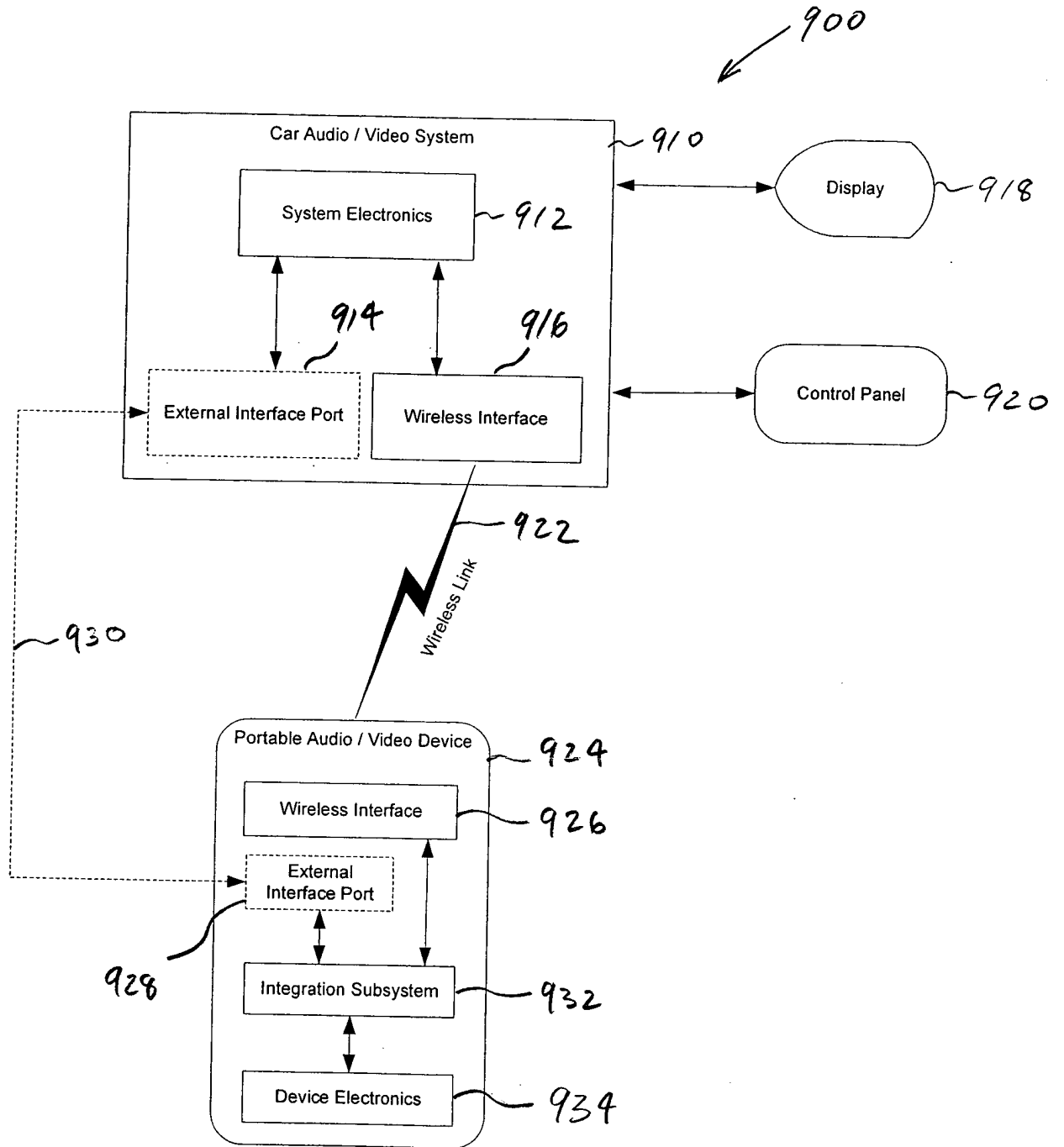


FIG. 19

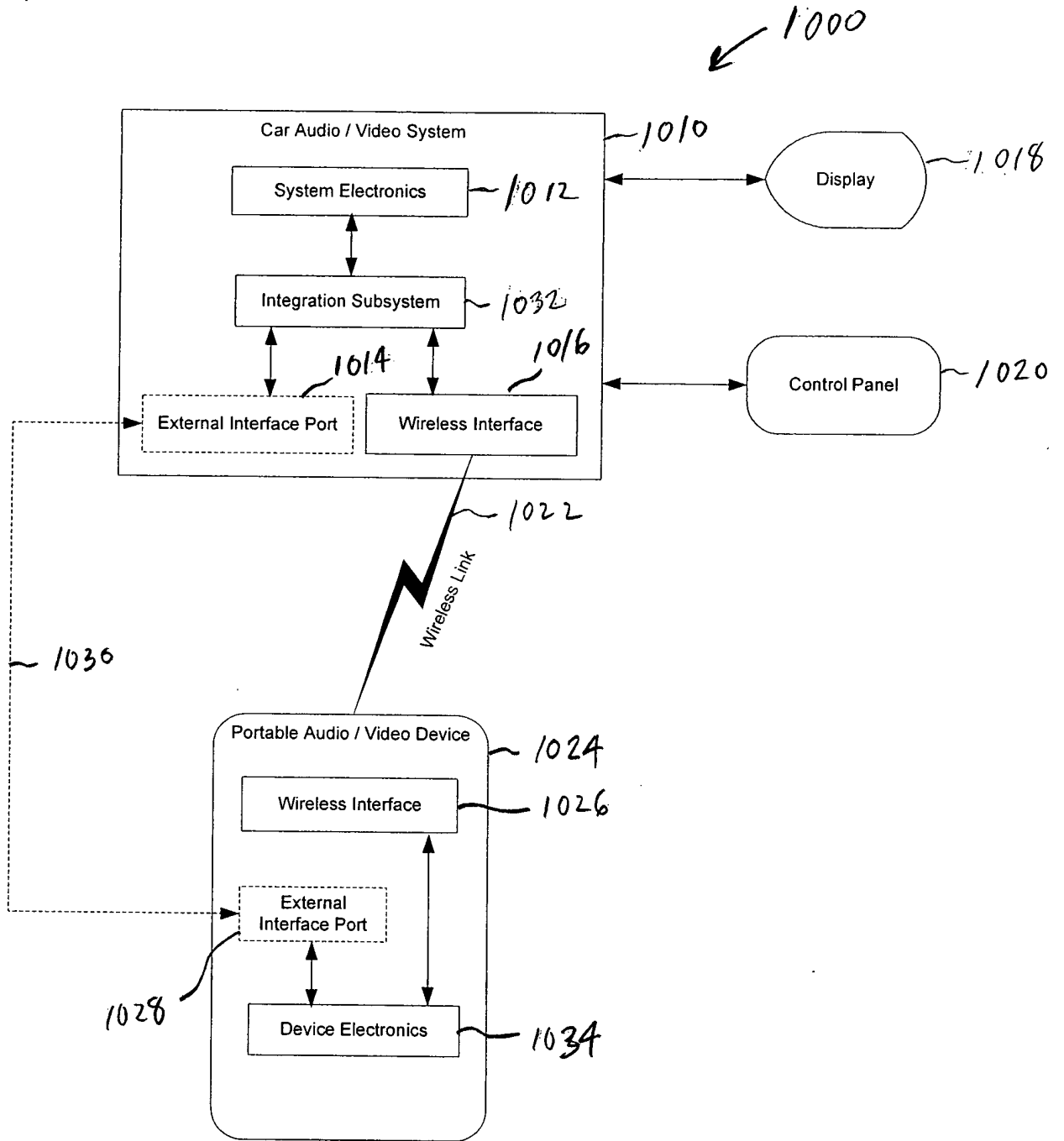


FIG. 20

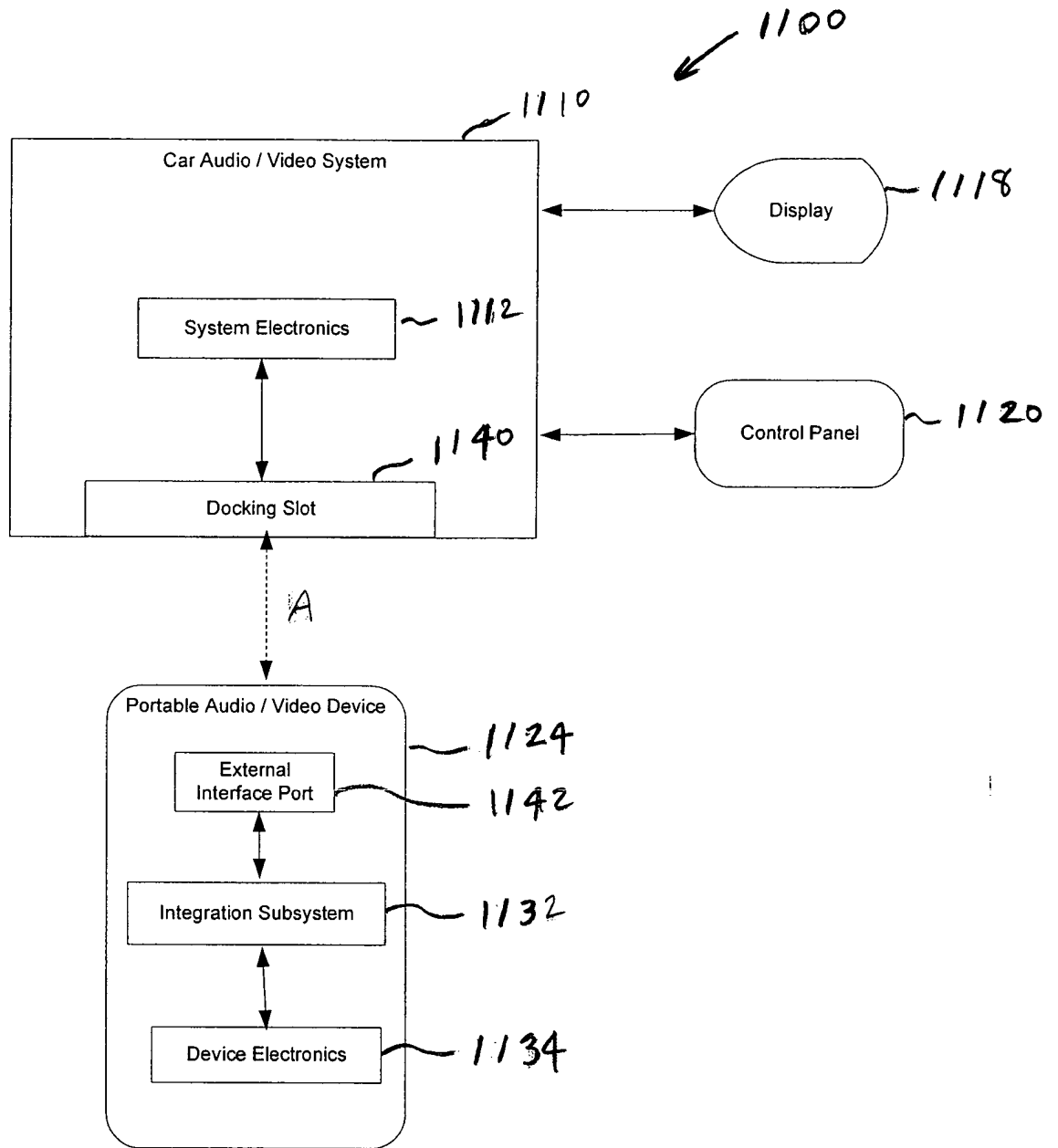


FIG. 21

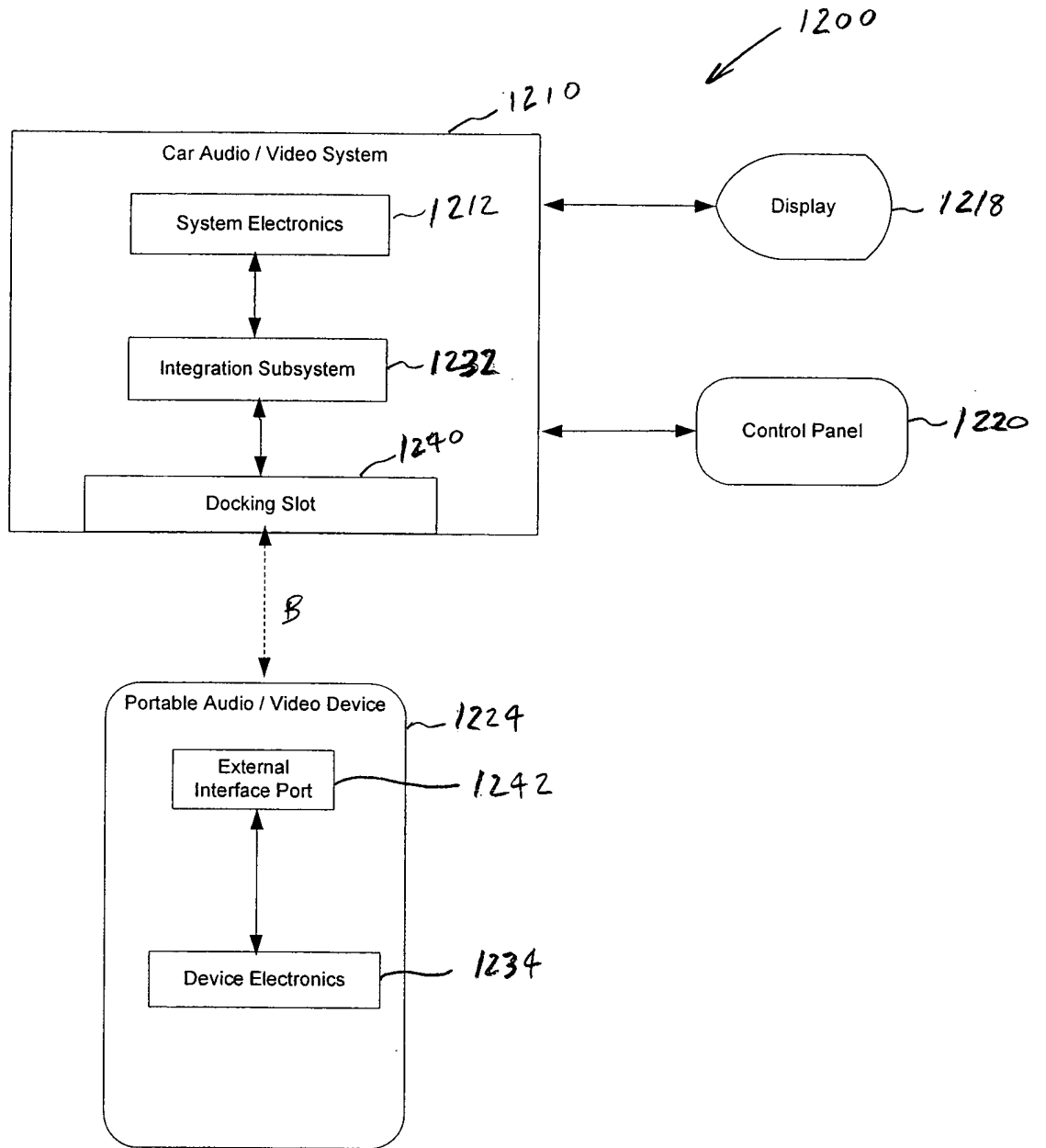


FIG. 22

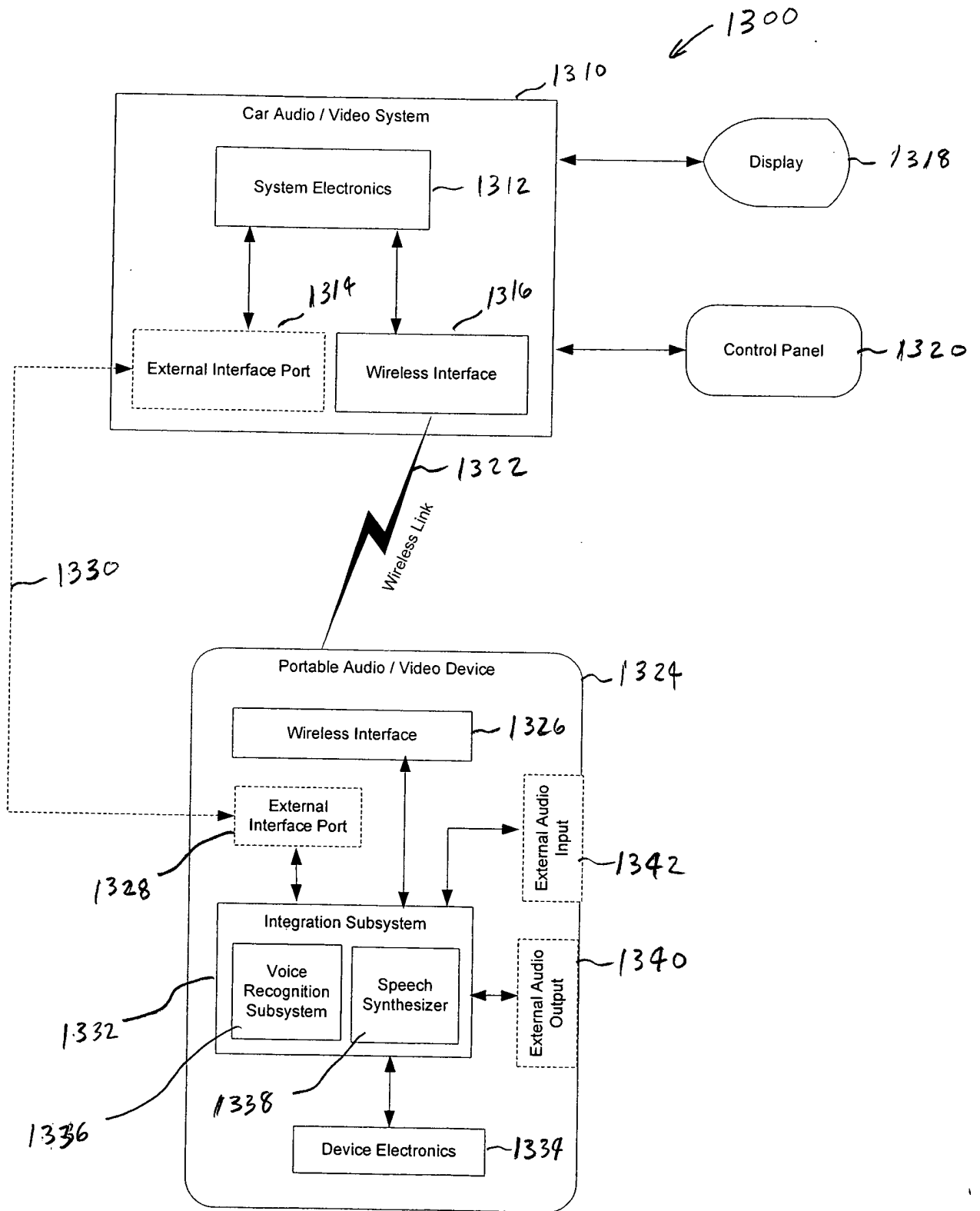


FIG. 23

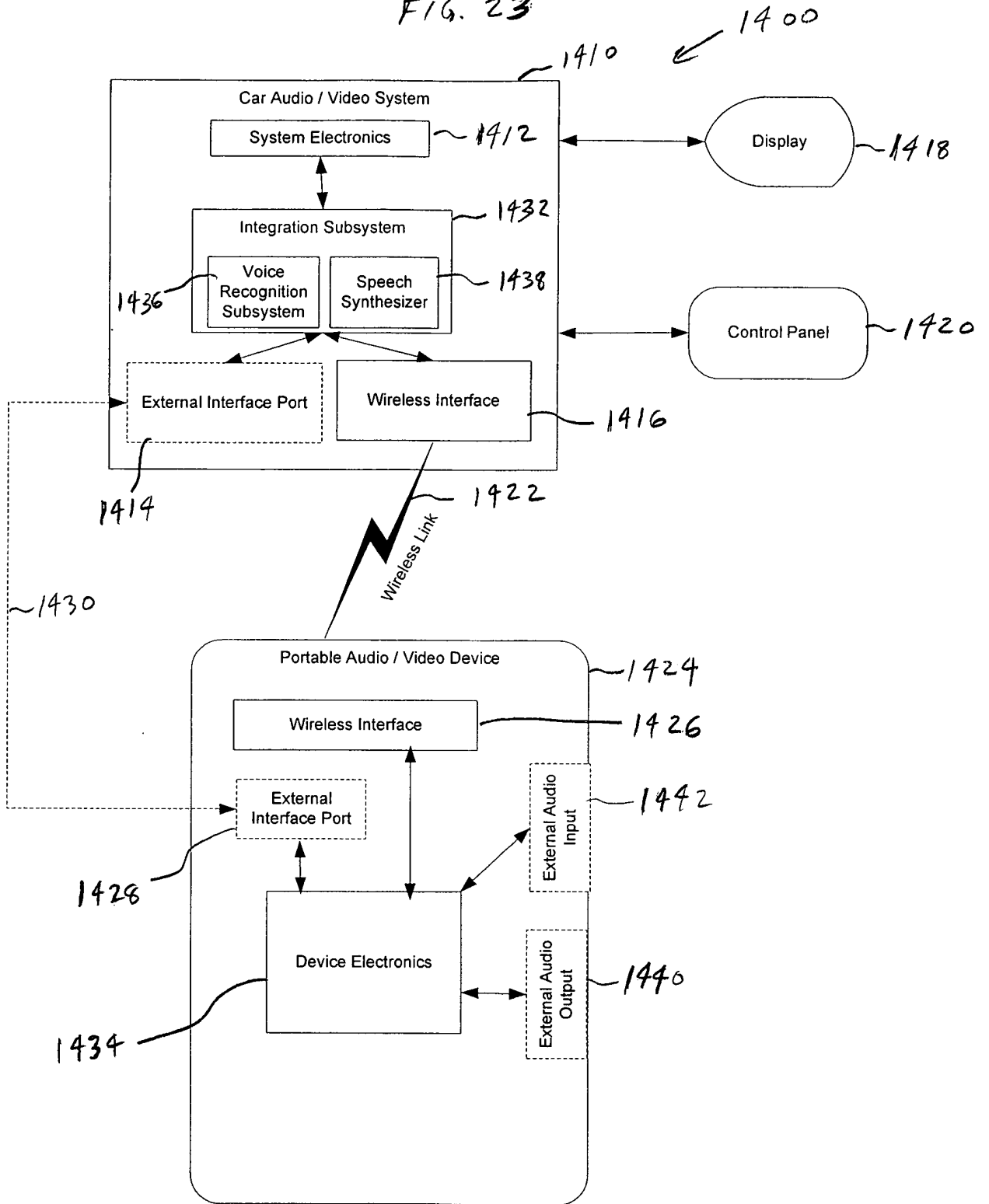
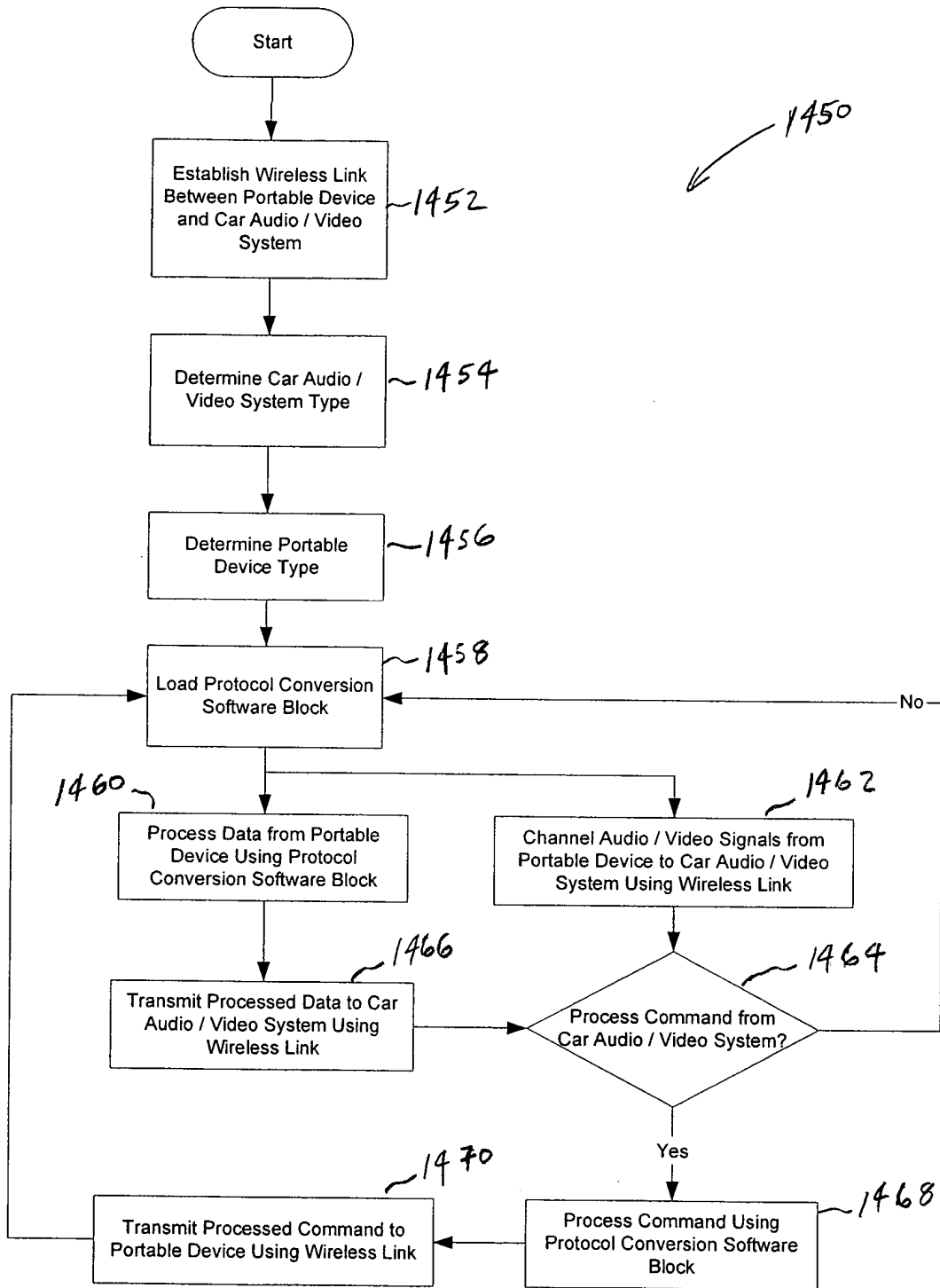


FIG. 24



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

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:

<u>11/071,667</u> (Application Serial No.)	<u>March 3, 2005</u> (Filing Date)	<u>Pending</u> (Status: patented, pending, abandoned)
<u>10/732,909</u> (Application Serial No.)	<u>December 10, 2003</u> (Filing Date)	<u>Pending</u> (Status: patented, pending, abandoned)
<u>10/316,961</u> (Application Serial No.)	<u>December 11, 2002</u> (Filing Date)	<u>Pending</u> (Status: patented, pending, abandoned)

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:
Residence & Citizenship	City: Fort Lee	State or Foreign Country: NJ	Country of Citizenship: USA
Post Office Address	Post Office Address: 6403 Hilltop Court	City: Fort Lee	State or Country and Zip Code: NJ 07102
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 of Inventor #2
Date:	Date:

LISTING OF INVENTORS CONTINUED ON PAGE 2 HEREOF: YES ___ NO X ___

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

11,475,847

APPLICATION AS FILED – PART I

(Column 1) (Column 2)

FOR	NUMBER FILED	NUMBER EXTRA
BASIC FEE (37 CFR 1.16(a), (b), or (c))		
SEARCH FEE (37 CFR 1.16(k), (l), or (m))		
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		
TOTAL CLAIMS (37 CFR 1.16(i))	91 minus 20 =	71
INDEPENDENT CLAIMS (37 CFR 1.16(h))	7 minus 3 =	* 4
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	
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))		

SMALL ENTITY

OR OTHER THAN SMALL ENTITY

RATE (\$)	FEE (\$)
	150
	250
	100
X\$ 25	1775
X\$100	400
180	
TOTAL	2675

RATE (\$)	FEE (\$)
	300
	500
	200
X\$50	
X\$200	
360	
TOTAL	1000

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED – PART II

(Column 1) (Column 2) (Column 3)

AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total (37 CFR 1.16(i))	*	Minus	**	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=
	Application Size Fee (37 CFR 1.16(s))				
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))				

SMALL ENTITY

OR OTHER THAN SMALL ENTITY

RATE (\$)	ADDITIONAL FEE (\$)
X =	
X =	
180	
TOTAL	
ADD'T FEE	

RATE (\$)	ADDITIONAL FEE (\$)
X =	
X =	
360	
TOTAL	
ADD'T FEE	

(Column 1) (Column 2) (Column 3)

AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total (37 CFR 1.16(i))	*	Minus	**	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=
	Application Size Fee (37 CFR 1.16(s))				
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))				

RATE (\$)	ADDITIONAL FEE (\$)
X =	
X =	
N/A	
TOTAL	
ADD'T FEE	

RATE (\$)	ADDITIONAL FEE (\$)
X =	
X =	
N/A	
TOTAL	
ADD'T 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.

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.


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 NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
11/475,847	06/27/2006	Ira Marlowe	99879-00026

27614
 MCCARTER & ENGLISH, LLP
 FOUR GATEWAY CENTER
 100 MULBERRY STREET
 NEWARK, NJ 07102

CONFIRMATION NO. 9001
FORMALITIES
LETTER

Date Mailed: 07/25/2006

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).

- The statutory basic filing fee is missing.
Applicant must submit \$ 150 to complete the basic filing fee for a small entity.
- The oath or declaration is unsigned.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Additional claim fees of **\$2175** as a small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of \$65 for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this letter.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is **\$2865** for a Small Entity

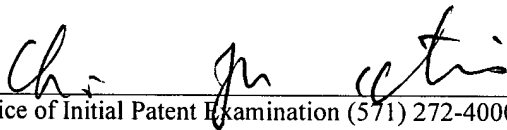
- **\$150** Statutory basic filing fee.
- **\$65** Surcharge.
- The application search fee has not been paid. Applicant must submit **\$250** to complete the search fee.

- The application examination fee has not been paid. Applicant must submit **\$100** to complete the examination fee for a small entity in compliance with 37 CFR 1.27
- The specification and drawings contain more than 100 pages. Applicant owes **\$125** for **38** pages in excess of **100** pages for a small entity in compliance with 37 CFR 1.27.

- Total additional claim fee(s) for this application is **\$2175**
 - **\$400** for **4** independent claims over 3.
 - **\$1775** for **71** total claims over 20.

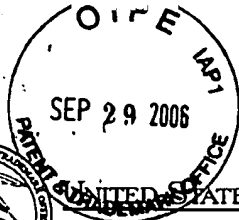
Replies should be mailed to: Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

*A copy of this notice **MUST** be returned with the reply.*



Office of Initial Patent Examination (571) 272-4000, or 1-800-PTO-9199, or 1-800-972-6382
PART 3 - OFFICE COPY

17W



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 NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
11/475,847	06/27/2006	Ira Marlowe	99879-00026

27614
 MCCARTER & ENGLISH, LLP
 FOUR GATEWAY CENTER
 100 MULBERRY STREET
 NEWARK, NJ 07102

10/02/2006 WASFAM1 00000027 11475847
 01 FC:2011 150.00 OP
 02 FC:2111 250.00 OP
 03 FC:2311 200.00 OP
 04 FC:2201 400.00 OP
 05 FC:2202 1775.00 OP
 06 FC:2051 65.00 OP
 07 FC:2081 125.00 OP

CONFIRMATION NO. 9001

FORMALITIES
LETTER

Date Mailed: 07/25/2006

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).

- The statutory basic filing fee is missing.
Applicant must submit \$ 150 to complete the basic filing fee for a small entity.
- The oath or declaration is unsigned.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Additional claim fees of **\$2175** as a small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of \$65 for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this letter.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is **\$2865** for a Small Entity

- **\$150** Statutory basic filing fee.
- **\$65** Surcharge.
- The application search fee has not been paid. Applicant must submit **\$250** to complete the search fee.

- The application examination fee has not been paid. Applicant must submit **\$100** to complete the examination fee for a small entity in compliance with 37 CFR 1.27
- The specification and drawings contain more than 100 pages. Applicant owes **\$125** for **38** pages in excess of **100** pages for a small entity in compliance with 37 CFR 1.27.

- Total additional claim fee(s) for this application is **\$2175**
 - **\$400** for **4** independent claims over 3.
 - **\$1775** for **71** total claims over 20.

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.*

Ch. p. et's

Office of Initial Patent Examination (571) 272-4000, or 1-800-PTO-9199, or 1-800-972-6382
PART 2 - COPY TO BE RETURNED WITH RESPONSE



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Customer No. 27614

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Examiner: Not Yet Assigned
Art Unit: 2618

Re: Our file: 99879-00026
Applicant: Ira Marlowe
Serial No.: 11/475,847
Filed: 06/27/2006
For: Multimedia Device Integration System

Sir:

Enclosed for filing in the United States Patent and Trademark Office is the following:

- 1. Response to Notice to File Missing Parts of Application Filing Date Granted
- 2. Copy of Notice to File Missing Parts
- 3. Executed Declaration and Power of Attorney
- 4. Check in the amount of \$2,925.00
- 5. Transmittal Sheet
- 6. 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.

9/27/06
Date

Respectfully submitted,

Michael R. Frisia
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:

CERTIFICATE OF MAILING BY EXPRESS MAIL

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. _____ US to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on _____.

By: _____

CERTIFICATE OF MAILING BY FIRST CLASS MAIL

I hereby certify that this correspondence is being deposited with the United States Postal Service, First Class Mail, postage prepaid, to Mail Stop Missing Parts, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on 9/27/06.

By:
Janelle Fava

.MEI\5864513.1

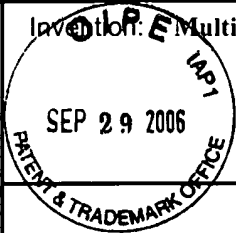
**Response To Notice To File Missing Parts Of Application -
Filing Date Granted (PTO-1533)(Small Entity)**

Docket No.
99879-00026

In Re Application Of: **Ira Marlowe**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
11/475,847	06/27/2006	Not Yet Assigned	27614	2618	9001

Inventor: **IRE Multimedia Device Integration System**



Mail Stop Missing Parts
COMMISSIONER FOR PATENTS:

This is a response to the Notice to File Missing Parts of Application - Filing Date Granted (PTO-1533) mailed on
07/25/2006
Date

Enclosed herewith for filing are the following:

- A copy of the Notice to File Missing Parts of Application - Filing Date Granted (PTO-1533). **(REQUIRED)**
- An oath or declaration in compliance with 37 CFR 1.63, including residence information and identifying the application by the above Application Number and Filing Date.
- A properly signed oath or declaration in compliance with 37 CFR 1.63.
- An oath or declaration in compliance with 37 CFR 1.63 listing the names of all inventors and signed by the omitted inventor(s), identifying this application by the above Application Number and Filing Date.
- A verified English translation of the non-English language application papers as originally filed. It is requested that this translation be used as the copy for examination purposes in the United States Patent and Trademark Office.
- _____ verified small entity declaration(s)
 - is/are attached.
 - was/were filed on _____
- A separate request for refund.
- Other (list):

Transmittal Sheet
Postcard Receipt

10/02/2006 WASFAW1 00000027 11475847

08 F0:2251 60.00 DP

**Response To Notice To File Missing Parts Of Application
Filing Date Granted (PTO-1533) (Small Entity)**

Docket No.
99879-00026

In Re Application Of: **Ira Marlowe**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
11/475,847	06/27/2006	Not Yet Assigned	27614	2618	9001

Invention: **Multimedia Device Integration System**

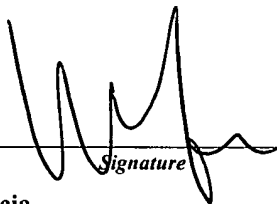
TO THE COMMISSIONER FOR PATENTS:

Mail Stop Missing Parts

The fee of **\$2,925.00** 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.



Signature

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

Dated: **9/27/06**

I hereby 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 "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)] on

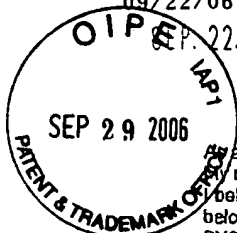
9/27/06
(Date)


Signature of Person Mailing Correspondence

Janelle Fava

Typed or Printed Name of Person Mailing Correspondence

cc:



SEP 22 2006 4:41PM MCCARTER & ENGLISH

NO. 2087 P. 4 Attorney Docket No. 99879-00026

DECLARATION AND POWER OF ATTORNEY (Patent, Design or C-I-P Application)

I, 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

is attached hereto X was filed on June 27, 2006 as Application Serial No. 11/475,847 and was amended on

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)

Table with 4 columns: COUNTRY, APPLICATION NO., DATE OF FILING (day, month, year), PRIORITY CLAIMED UNDER 35 U.S.C. 119 (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. §1.58 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

Table listing prior applications with columns for Application Serial No., Filing Date, and Status (patented, pending, abandoned)

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) 839-8493

Table with 4 columns: Full Name of Inventor #1, 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.

Table for signatures and dates of inventors: Signature of Inventor #1, Signature of Inventor #2, Date: 9/22/2006

LISTING OF INVENTORS CONTINUED ON PAGE 2 HEREOF: YES NO X

BEST AVAILABLE COPY



APPLICATION NUMBER	FILING OR 371(c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/475,847	06/27/2006	Ira Marlowe	99879-00026

CONFIRMATION NO. 9001

27614
MCCARTER & ENGLISH, LLP
FOUR GATEWAY CENTER
100 MULBERRY STREET
NEWARK, NJ07102

Title: Multimedia device integration system

Publication No. US-2007-0015486-A1

Publication Date: 01/18/2007

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publicly available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <http://pair.uspto.gov/>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 703-305-3028.

Pre-Grant Publication Division, 703-605-4283

LFW



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

Examiner: Not Yet Assigned
Art Unit: 2618

Re: Our file: 99879-00026
Applicant: Ira Marlowe
Serial No.: 11/475,847
Filed: 06/27/2006
For: 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 (12 pages)
- 3. Copies of References 10, 11, 21, 22, 32, 33, 40, 41, 47, 48 and 54-120 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.

2/16/07
Date

Respectfully submitted,

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:

CERTIFICATE OF MAILING BY EXPRESS MAIL

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. _____ US to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on _____.

By: _____

CERTIFICATE OF MAILING BY FIRST CLASS MAIL

I hereby certify that this correspondence is being deposited with the United States Postal Service, First Class Mail, postage prepaid, to Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on 2/16/07.

By:
Janelle Fava

TRANSMITTAL OF INFORMATION DISCLOSURE STATEMENT
(Under 37 CFR 1.97(b) or 1.97(c))

Docket No.
99879-00026

In Re Application Of: **Ira Marlowe**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
11/475,847	06/27/2006	Not Yet Assigned	27614	2618	9001

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).

TRANSMITTAL OF INFORMATION DISCLOSURE STATEMENT
(Under 37 CFR 1.97(b) or 1.97(c))

Docket No.
99879-00026

In Re Application of: **Ira Marlowe**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
11/475,847	06/27/2006	Not Yet Assigned	27614	2618	9001

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.
- 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.

Certificate of Transmission by Facsimile*

I certify that this document and authorization to charge deposit account is being facsimile transmitted to the United States Patent and Trademark Office (Fa: _____)

(Date)

Signature

Typed or Printed Name of Person Signing Certificate

Certificate of Mailing by First Class Mail

I hereby 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 "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)] on _____

2/16/07
(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]
Signature

Dated: 2/16/07

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:

INFORMATION DISCLOSURE CITATION
(Use several sheets if necessary)



Docket Number (Optional) 99879-00026	Application Number 11/475,847
Applicant(s) Ira Marlowe	
Filing Date 06/27/2006	Group Art Unit 2618

U.S. PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
1	6,993,615	01/31/2006	Falcon	710	303	11/15/2002
2	6,629,164	09/30/2003	Bhogal, et al.	711	111	11/03/2000
3	6,653,948	11/25/2003	Kunimatsu, et al.	340	995.19	06/05/2000
4	6,648,661	11/18/2003	Byrne, et al.	439	188	11/08/2002
5	6,591,085	07/08/2003	Grady	455	42	07/17/2002

U.S. PATENT APPLICATION PUBLICATIONS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	6	US 2005/0239434 A1	10/27/2002	Marlowe	455	345	03/03/2005
	7	US 2004/0151327 A1	08/05/2004	Marlowe	381	86	12/10/2003
	8	US 2004/0091123 A1	05/13/2004	Stark, et al.	381	86	11/08/2002
	9	US 2003/0215102 A1	11/20/2003	Marlowe	381	77	12/11/2002

FOREIGN PATENT DOCUMENTS

	REF	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation	
							YES	NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

	10	VoiceBox Technologies, printout from website http://www.voiceboxtechnologies.com/auto.php (2 pages).
	11	"Video: A Dashboard That is Really a PC," printout from website http://news.com.com/1606-2_3-6052333.html (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.

INFORMATION DISCLOSURE CITATION <i>(Use several sheets if necessary)</i>	Docket Number (Optional) 99879-00026	Application Number 11/475,847
	Applicant(s) Ira Marlowe	
	Filing Date 06/27/2006	Group Art Unit 2618

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	12	6,396,164	05/28/2002	Barnea, et al.	307	10.1	10/20/1999
	13	6,389,332	05/14/2002	Hess, et al.	701	1	05/01/2000
	14	6,374,177	04/16/2002	Lee, et al.	701	200	09/20/2000
	15	6,346,917	02/12/2002	Fuchs, et al.	343	713	11/09/2000
	16	6,330,337	12/11/2001	Nicholson, et al.	381	86	01/19/2000

U.S. PATENT APPLICATION PUBLICATIONS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	17	US 2003/0086699 A1	05/08/2003	Benyamin, et al.	386	96	02/15/2002
	18	US 2003/0053638 A1	03/20/2003	Yasuhara	381	86	09/13/2002
	19	US 2003/0007649 A1	01/09/2003	Riggs	381	86	06/14/2002
	20	US 2002/0197954 A1	12/26/2002	Schmitt, et al.	455	41	12/31/2001

FOREIGN PATENT DOCUMENTS

REF	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation	
						YES	NO

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	21	"Blitz Safe Offers XM Cables for Radios," printout from website http://www.twice.com/article/CA190041.html?text=blitz+safe (2 pages)
	22	"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.

INFORMATION DISCLOSURE CITATION <i>(Use several sheets if necessary)</i>	Docket Number (Optional) 99879-00026	Application Number 11/475,847
	Applicant(s) Ira Marlowe	
	Filing Date 06/27/2006	Group Art Unit 2618

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	23	6,295,033	09/25/2001	Chatzipetros, et al.	343	713	05/25/1999
	24	6,278,697	08/21/2001	Brody, et al.	370	310	07/29/1997
	25	6,163,079	12/19/2000	Miyazaki, et al.	307	10.1	07/23/1998
	26	6,157,725	12/05/2000	Becker	381	86	12/10/1997
	27	6,058,319	05/02/2000	Sadler	455	569	03/05/1997

U.S. PATENT APPLICATION PUBLICATIONS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	28	US 2002/0180767 A1	12/05/2002	Northway, et al.	345	698	06/04/2001
	29	US 2002/0133610 A1	09/19/2002	Hadland	709	230	05/03/2002
	30	US 2002/0091863 A1	07/11/2002	Schug	709	250	10/19/2001
	31	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	NO

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	32	"OEM Integration Poised for Strong Growth," printout from website http://www.twice.com/article/CA200523.html?text=blitz+safe (3 pages)
	33	"Blitzsafe Overview," from Blitzsafe.com website-"The Worldwide Leader in Aftermarket Interfaces and OEM Engineering" (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 <i>(Use several sheets if necessary)</i>	Docket Number (Optional) 99879-00026	Application Number 11/475,847
	Applicant(s) Ira Marlowe	
	Filing Date 06/27/2006	Group Art Unit 2618

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	34	6,052,603	04/18/2000	Kinzalow, et al.	455	557	09/18/1997
	35	6,005,488	12/21/1999	Symanov, et al.	340	825.56	12/03/1997
	36	5,794,164	08/11/1998	Beckert, et al.	701	1	11/29/1995
	37	5,410,675	04/25/1995	Shreve, et al.	395	500	09/17/1993
	38	5,339,362	08/16/1994	Harris	381	86	01/07/1992

U.S. PATENT APPLICATION PUBLICATIONS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	39	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	NO

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	40	"Delphi XM SKYFI(TM) RADIO," product description from XM Satellite Radio website (2 pages).
	41	The New Delphi XM SKYFi Radio Add it to Any Car or Home Audio System, product description from www.xmradio.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) 99879-00026	Application Number 11/475,847
Applicant(s) Ira Marlowe	
Filing Date 06/27/2006	Group Art Unit 2618

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	42	4,943,978	07/24/1990	Rice	375	1	01/17/1989
	43	4,817,130	03/28/1989	Frimmel, Jr.	379	88	12/05/1986
	44	Re. 34,536	02/08/1994	Frimmel, Jr.	379	88	06/28/1990
	45	4,772,079	09/20/1988	Douglas, et al.	312	257	09/26/1986
	46	4,562,533	12/31/1985	Hodel, et al.	364	200	08/20/1984

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	NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

	47	Mobile Electronics: News, "Soundgate to Release New GM and BMW Interfaces," December 2, 2002, ME-Mag.com (1 page).
	48	"Welcome to Ventura Technology," from Venturatechnology.com (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 <i>(Use several sheets if necessary)</i>	Docket Number (Optional) 99879-00026	Application Number 11/475,847
	Applicant(s) Ira Marlowe	
	Filing Date 06/27/2006	Group Art Unit 2618

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	49	4,234,919	11/18/1980	Bruce, et al.	364	200	10/31/1978
	50	4,091,455	05/23/1978	Woods, et al.	364	200	12/20/1976
	51	4,068,104	01/10/1978	Werth, et al.	179	175.3	05/14/1976
	52	4,047,162	09/06/1977	Dorey, et al.	364	200	04/28/1975
	53	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	NO

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	54	Ventura Technology product descriptions from www.venturatechnology.net (1 page).
	55	"Phatnoise Digital Media Players," product description from http://www.phatnoise.com (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) 99879-00026	Application Number 11/475,847
Applicant(s) Ira Marlowe	
Filing Date 06/27/2006	Group Art Unit 2618

*EXAMINER INITIAL	OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)
56	"Automedia," magazine pages from June/July 1996 issue (2 pages).
57	"Automedia," magazine pages from January 1998 issue (2 pages).
58	"Automedia," magazine pages from February 1998 issue (2 pages).
59	"Automedia," magazine pages from July 1998 issue (2 pages).
60	"Automedia," magazine pages from September 1998 issue (2 pages).
61	"Automedia," magazine pages from November 1998 issue (12 pages).
62	"Automedia," magazine pages from February 1999 issue (2 pages).
63	"Automedia," magazine pages from February 1999 issue (2 pages).
64	"Car Stereo Review," magazine pages from June 1998 issue (5 pages).
65	"Car Stereo Review," magazine pages from January 1999 issue (2 pages).
66	"Car Stereo Review," magazine pages from April 1999 issue (3 pages).
67	"Car Audio and Electronics," magazine pages from December 1998 issue (2 pages).

EXAMINER	DATE CONSIDERED
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*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 <i>(Use several sheets if necessary)</i>	Docket Number (Optional) 99879-00026	Application Number 11/475,847
	Applicant(s) Ira Marlwe	
	Filing Date 06/27/2006	Group Art Unit 2618

*EXAMINER INITIAL	OTHER DOCUMENTS <i>(Including Author, Title, Date, Pertinent Pages, Etc.)</i>
68	"Car Audio and Electronics," magazine pages from April 1999 issue (2 pages).
69	"Car Audio and Electronics," magazine pages from June 1999 issue (2 pages).
70	"Carsound," magazine pages from May/June 1999 issue (3 pages).
71	"Mobile Electronics Retailer," magazine pages from August 1997 issue (4 pages).
72	"Mobile Electronics," magazine pages from July 1999 issue (7 pages).
73	"Mobile Electronics," magazine pages from August 2000 issue (2 pages).
74	"Cesmobile," magazine pages from January 1999 issue (3 pages).
75	"The 12 Volt News," magazine pages from March 2002 issue (2 pages).
76	"P.I.E. Millennium Price Guide Make the Precision Decision," Precision Interface Electronics, Inc. (6 pages).
77	"PIE 1999 Price Guide," Precision Interface Electronics, Inc. (4 pages).
78	"Design & Engineering Showcase Award," award presented to Precision Interface Electronics, Inc. for DPX Technology Digital Protocol Converter FRDN/PC-KNW, 2000 International CES (1 page).
79	"Design & Engineering Showcase Award," award presented to Precision Interface Electronics, Inc. for DPX Technology Digital Protocol Converter GM9/PC-KNW, 2000 International CES (1 page).

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INFORMATION DISCLOSURE CITATION <i>(Use several sheets if necessary)</i>	Docket Number (Optional) 99879-00026	Application Number 11/475,847
	Applicant(s) Ira Marlowe	
	Filing Date 06/27/2006	Group Art Unit 2618

*EXAMINER INITIAL	OTHER DOCUMENTS <i>(Including Author, Title, Date, Pertinent Pages, Etc.)</i>
80	Invoice dated January 28, 1998 from Precision Interface Electronics, Inc. for "Ford FCU-Sanyo Protocol," and "Ford RCU Sanyo Protocol" (1 page).
81	Invoice dated January 29, 1999 from Precision Interface Electronics, Inc. for "Ford NCU-Sanyo Protocol" (1 page).
82	Invoice dated April 26, 1999 from Precision Interface Electronics, Inc. for "9 Pin GM-Kenwood Protocol," and "10 Pin GM-Kenwood Protocol" (1 page).
83	Invoice dated April 27, 1999 from Precision Interface Electronics, Inc. for "9 Pin GM-Kenwood Protocol" (1 page).
84	Invoice dated May 27, 1999 from Precision Interface Electronics, Inc. for "10 Pin GM-Kenwood Protocol," and "9 Pin GM-Kenwood Protocol" (1 page).
85	Invoice dated March 20, 2000 from Precision Interface Electronics, Inc. for "98-2000 Pre-Wired VW 6 DIS" (1 page).
86	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" (1 page).
87	Invoice dated December 17, 2001 from Precision Interface Electronics, Inc. for "98-02 Ford/Lincoln/Mercury" (1 page).
88	Invoice dated December 17, 2001 from Precision Interface Electronics, Inc. for "98-02 Ford/Lincoln/Mercury" (1 page).
89	Invoice dated May 29, 2002 from Precision Interface Electronics, Inc. for "95-01 GMC/Chev/Pontiac AUX," and "98-02 Ford/Lincoln/Merc AU" (1 page).
90	Toyota/Avox Interface Rev. Eng., Peripheral Model TIAS, created February 15, 1998 (1 page).
91	GM/Kenwood Translator diagram, created February 4, 1999 (2 pages).

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	Applicant(s) Ira Marlowe	
	Filing Date 06/27/2006	Group Art Unit 2618

*EXAMINER INITIAL	OTHER DOCUMENTS <i>(Including Author, Title, Date, Pertinent Pages, Etc.)</i>
92	Ford/Audiovox Translator diagram, created December 29, 1997 (2 pages).
93	Component Side Silkscreen, created December 31, 1997 (2 pages).
94	Component Xray, created February 4, 1992 (2 pages).
95	"SoundGate, Ventura Announce Sophisticated OEM-Integration Interfaces," article from The 12 Volt News, December 2002 (1 page).
96	"XMDirect Smart Digital Adapter," product description (3 pages).
97	"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).
98	"PIE Virtual Catalog," printout from http://web.archive.org/web/19981205005802/http://www.pie.net/sec12sbl.htm (2 pages).
99	"The UniLink Project," printout from website (2 pages).
100	"CD Changer Interfaces," printout from http://web.archive.org/web/19991012021952/soundgate.com/cd-inter.html (1 page).
101	"Digital Obsessions A Spotlight on Audio Gadgets, ZDNet Music: The PhatNoise Car Audio System," printout from http://web.archive.org/web/20000815203327/music.zdnet.com/features/phantnoise (3 pages).
102	"Bypassing and Switching With the CD4053 CMOS Analog MUX," printout from website (4 pages).
103	"Device Profile: PhatNoise PhatBox Car MP3 Player," November 1, 2000, printout from http://techupdate.zdnet.com/techupdate/stories/main/0,14179,2649276,00.htm (4 pages).

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	Applicant(s) Ira Marlowe	
	Filing Date 06/27/2006	Group Art Unit 2618

*EXAMINER INITIAL	OTHER DOCUMENTS <i>(Including Author, Title, Date, Pertinent Pages, Etc.)</i>
104	"The EZ Protoboard," printout from http://web.archive.org/web/20010613095105/http://www.ajusd.org/~edward/ezproto (2 pages).
105	"TDIClub Forums: Reverse Engineering CD Changer Progress,," April 3, 2001, printout from website (3 pages).
106	"TDIClub Forums: Reverse Engineering CD Changer Progress Reports,," April 5, 2001, printout from website (8 pages).
107	"Multi Technology Equipment - Home of the Neo MP3 Player," printout from http://web.archive.org/web/20010413222617/ssiamerica.com/products/neo35/ (1 page).
108	"TDIClub Forums: Reverse Engineering CD Changer Protocol Update," April 18, 2001, printout from website (3 pages).
109	"The Car CD Changer Interface Page," printout from website (10 pages).
110	"SourceForge.net: Project Info - GNUlink," printout from http://sourceforge.net/projects/gnunilink/ (3 pages).
111	"EZ Protoboard News," printout from website (3 pages).
112	"GNUlink - For All Your AUX-IN Needs..., "printout from http://gnunilink.sourceforge.net/ (4 pages).
113	"VWCDPIC News, "printout from http://web.archive.org/web/20020701101541/http://www.ajusd.org/~edward/vwcdpic/ (8 pages).
114	"VWCDPIC News, "printout from http://web.archive.org/web/20021009014959/http://www.ajusd.org/~edward/vwcdpic/ (10 pages).
115	"Neo Car Jukebox MP3 Player," printout from website (3 pages).

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/475,847	06/27/2006	Ira Marlowe	99879-00026	9001
27614	7590	09/09/2008	EXAMINER	
MCCARTER & ENGLISH, LLP FOUR GATEWAY CENTER 100 MULBERRY STREET NEWARK, NJ 07102			KURR, JASON RICHARD	
			ART UNIT	PAPER NUMBER
			2615	
			MAIL DATE	DELIVERY MODE
			09/09/2008	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.

Office Action Summary	Application No. 11/475,847	Applicant(s) MARLOWE, IRA	
	Examiner JASON R. KURR	Art Unit 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 27 June 2006.
- 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) 1-91 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) 1-91 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: _____.

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-90, drawn to a system and method of integrating a portable device with a car audio/video system, classified in class 381, subclass 86.
- II. Claim 91, drawn to a docking station comprising a base portion, a bottom member and a top member, classified in class 710, subclass 303.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination (I) as claimed does not require the particulars of the subcombination (II) as claimed because the communication between the portable device and the car audio/video system is not solely based on a docking station having the structure described in the subcombination. The combination describes other means of communication such as wireless communication or a docking slot within the car audio/video system. The subcombination has separate utility such as providing power to a portable device.

The examiner has required restriction between combination and subcombination inventions. Where applicant elects a subcombination, and claims thereto are

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subsequently found allowable, any claim(s) depending from or otherwise requiring all the limitations of the allowable subcombination will be examined for patentability in accordance with 37 CFR 1.104. See MPEP § 821.04(a). Applicant is advised that if any claim presented in a continuation or divisional application is anticipated by, or includes all the limitations of, a claim that is allowable in the present application, such claim may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application.

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.

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 the use of a first and second wireless interface as the communication means between the car audio/video system and the portable device, as in figures 18-19 and 22-23, claims 1-38 and 71-90.

Group I: Species 2 is drawn to the use of a docking slot as the communication means between the car audio/video system and the portable device, as in figures 20-21, claims 39-70.

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.

Art Unit: 2615

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.

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.

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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

Index of Claims



Application/Control No.

11/475,847

Examiner

JASON R. KURR

Applicant(s)/Patent under
Reexamination

MARLOWE, IRA

Art Unit

2615

✓	Rejected
=	Allowed

—	(Through numeral) Cancelled
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N	Non-Elected
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A	Appeal
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Application Number



Application/Control No.

11/475,847

Applicant(s)/Patent under Reexamination

MARLOWE, IRA

Examiner

JASON R. KURR

Art Unit

2615

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Ira Marlowe

Serial No.: 11/475,847

Filed: 06/27/2006

Title: Multimedia Device Integration System

Examiner: Kurr, Jason R.

Art Unit: 2614

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE

Sir:

This is a response to the outstanding Restriction Requirement mailed September 9, 2008.

The time period for response is extendible to and including March 9, 2009.

Amendments to the Claims begin on page 2 of this response.

Remarks begin on page 22 of this response.

AMENDMENTS TO THE CLAIMS

1. (Original) A multimedia device integration system comprising:

a car audio system having a display associated therewith;

a portable device external to the car audio system;

a first wireless interface in communication with the car audio system;

a second wireless interface in communication with the portable device, the first and second wireless interfaces establishing a wireless communications link between the car audio system and the portable device; and

an integration subsystem for generating a device presence signal for maintaining the car audio system in a state responsive to the portable device, wherein the integration subsystem transmits the device presence signal to the car audio system, channels audio from the portable device to the car audio system using the wireless communications link, processes video information generated by the portable device into a format compatible with the car audio system, and transmits the processed video information to the car audio system using the wireless communications link for displaying the processed video information on the display of the car audio system.

2. (Original) The system of Claim 1, wherein the integration subsystem processes data generated by the portable device into a format compatible with the car audio system and displays the processed data on the display of the car audio system.

3. (Original) The system of Claim 1, wherein the integration subsystem receives control commands issued at the car audio system and transmitted over the wireless communications link, processes the commands into a format compatible with the portable device, and dispatches the processed commands to the portable device for execution thereby.

4. (Original) The system of Claim 1, wherein the integration subsystem further comprises a voice recognition subsystem for processing spoken control commands issued by a user.

5. (Original) The system of Claim 4, wherein the integration subsystem retrieves an audio file or a video file from the portable device in response to a spoken command.

6. (Original) The system of Claim 4, wherein the integration subsystem further comprises a speech synthesizer for generating synthesized speech corresponding to data generated by the portable device.

7. (Original) The system of Claim 1, wherein the car audio system comprises an OEM car audio system.

8. (Original) The system of Claim 1, wherein the car audio system comprises an after-market car audio system.

9. (Original) The system of Claim 1, wherein the portable device comprises a portable receiver.

10. (Original) The system of Claim 10, wherein the portable receiver comprises a digital audio broadcast (DAB) receiver, a high-definition (HD) radio receiver, or a satellite receiver.

11. (Original) The system of Claim 1, wherein the portable device comprises a portable digital media player.

12. (Original) The system of Claim 11, wherein the portable digital media player comprises a video device, a portable media center, a portable media player, an MP3 player, an MP4 player, a WMV player, an Apple iPod, or an Apple video iPod.

13. (Original) The system of Claim 1, wherein the portable device comprises a cellular telephone.

14. (Original) The system of Claim 1, further comprising a non-wireless connection established between the car audio system and the portable device for exchanging data, commands, audio and video signals between the car audio system and the portable device.

15. (Original) The system of Claim 1, wherein the integration subsystem is positioned within the portable device.

16. (Original) The system of Claim 1, wherein the integration subsystem is positioned within the car audio system.

17. (Original) The system of Claim 1, wherein the video information comprises a video file stored on the portable device.

18. (Original) The system of Claim 1, wherein the video information comprises a picture stored on the portable device.

19. (Original) The system of Claim 1, wherein the video information comprises a television signal received by the portable device.

20. (Original) A multimedia device integration system comprising:

a car video system having a display associated therewith;

a portable device external to the car video system;

a first wireless interface in communication with the car video system;

a second wireless interface in communication with the portable device, the first and second wireless interfaces establishing a wireless communications link between the car video system and the portable device; and

an integration subsystem for generating a device presence signal for maintaining the car video system in a state responsive to the portable device, wherein the integration subsystem transmits the device presence signal to the car video system, channels audio from the portable device to the car video system using the wireless communications link, processes video information generated by the portable device into a format compatible with the car video system, and transmits the processed video information to the car video system using the wireless communications link for displaying the processed video information on the display of the car video system.

21. (Original) The system of Claim 20, wherein the integration subsystem processes data generated by the portable device into a format compatible with the car video system and displays the processed data on the display of the car video system.

22. (Original) The system of Claim 20, wherein the integration subsystem receives control commands issued at the car video system and transmitted over the wireless communications link, processes the commands into a format compatible with the portable device, and dispatches the processed commands to the portable device for execution thereby.

23. (Original) The system of Claim 20, wherein the integration subsystem further comprises a voice recognition subsystem for processing spoken control commands issued by a user.

24. (Original) The system of Claim 23, wherein the integration subsystem retrieves an audio file or a video file from the portable device in response to a spoken command.

25. (Original) The system of Claim 23, wherein the integration subsystem further comprises a speech synthesizer for generating synthesized speech corresponding to data generated by the portable device.

26. (Original) The system of Claim 20, wherein the car video system comprises an OEM car video system.

27. (Original) The system of Claim 20, wherein the car video system comprises an after-market car video system.

28. (Original) The system of Claim 20, wherein the portable device comprises a portable receiver.

29. (Original) The system of Claim 28, wherein the portable receiver comprises a digital audio broadcast (DAB) receiver, a high-definition (HD) radio receiver, or a satellite receiver.

30. (Original) The system of Claim 20, wherein the portable device comprises a portable digital media player.

31. (Original) The system of Claim 30, wherein the portable digital media player comprises a video device, a portable media center, a portable media player, an MP3 player, an MP4 player, a WMV player, an Apple iPod, or an Apple video iPod.

32. (Original) The system of Claim 20, wherein the portable device comprises a cellular telephone.

33. (Original) The system of Claim 20, further comprising a non-wireless connection established between the car video system and the portable device for exchanging data, commands, audio and video signals between the car video system and the portable device.

34. (Original) The system of Claim 20, wherein the integration subsystem is positioned within the portable device.

35. (Original) The system of Claim 20, wherein the integration subsystem is positioned within the car video system.

36. (Original) The system of Claim 20, wherein the video information comprises a video file stored on the portable device.

37. (Original) The system of Claim 20, wherein the video information comprises a picture stored on the portable device.

38. (Original) The system of Claim 20, wherein the video information comprises a television signal received by the portable device.

39. (Original) A multimedia device integration system comprising:

a car audio system;

a portable device external to the car audio system;

a docking slot formed in the car audio system for receiving the portable device and establishing electrical communication between the car audio system and the portable device; and

an integration subsystem for generating a device presence signal for maintaining the car audio system in a state responsive to the portable device, wherein the integration subsystem receives data generated by the portable device, processes the data into a format compatible with the car audio system, and transmits the processed data, the device presence signal, and audio signals to the car audio system.

40. (Original) The system of Claim 39, wherein the processed data is displayed on a display of the car audio system.

41. (Original) The system of Claim 39, wherein the integration subsystem processes a video file stored on the portable device into a format compatible with the car audio system and transmits the video file to the car audio system for displaying the video file on a display of the car audio system.

42. (Original) The system of Claim 39, wherein the integration subsystem receives control commands issued at the car audio system, processes the commands into a format compatible with the portable device, and dispatches the processed commands to the portable device for execution thereby.

43. (Original) The system of Claim 39, wherein the integration subsystem further comprises a voice recognition subsystem for processing spoken control commands issued by a user.

44. (Original) The system of Claim 43, wherein the integration subsystem retrieves an audio file or a video file from the portable device in response to a spoken command.

45. (Original) The system of Claim 43, wherein the integration subsystem further comprises a speech synthesizer for generating synthesized speech corresponding to data generated by the portable device.

46. (Original) The system of Claim 39, wherein the car audio system comprises an OEM car audio system.

47. (Original) The system of Claim 39, wherein the car audio system comprises an after-market car audio system.

48. (Original) The system of Claim 39, wherein the portable device comprises a portable receiver.

49. (Original) The system of Claim 48, wherein the portable receiver comprises a digital audio broadcast (DAB) receiver, a high-definition (HD) radio receiver, or a satellite receiver.

50. (Original) The system of Claim 39, wherein the portable device comprises a portable digital media player.

51. (Original) The system of Claim 50, wherein the portable digital media player comprises a video device, a portable media center, a portable media player, an MP3 player, an MP4 player, a WMV player, an Apple iPod, or an Apple video iPod.

52. (Original) The system of Claim 39, wherein the portable device comprises a cellular telephone.

53. (Original) The system of Claim 39, wherein the integration subsystem is positioned within the portable device.

54. (Original) The system of Claim 39, wherein the integration subsystem is positioned within the car audio system.

55. (Original) A multimedia device integration system comprising:

a car video system;

a portable device external to the car video system;

a docking slot formed in the car video system for receiving the portable device and establishing electrical communication between the car video system and the portable device; and

an integration subsystem for generating a device presence signal for maintaining the car video system in a state responsive to the portable device, wherein the integration subsystem receives data generated by the portable device, processes the data into a format compatible with the car video system, and transmits the processed data, the device presence signal, audio signals, and video signals to the car video system.

56. (Original) The system of Claim 55, wherein the processed data is displayed on a display of the car video system.

57. (Original) The system of Claim 55, wherein the integration subsystem processes a video file stored on the portable device into a format compatible with the car video system and transmits

the video file to the car video system for displaying the video file on a display of the car video system.

58. (Original) The system of Claim 55, wherein the integration subsystem receives control commands issued at the car video system, processes the commands into a format compatible with the portable device, and dispatches the processed commands to the portable device for execution thereby.

59. (Original) The system of Claim 55, wherein the integration subsystem further comprises a voice recognition subsystem for processing spoken control commands issued by a user.

60. (Original) The system of Claim 59, wherein the integration subsystem retrieves an audio file or a video file from the portable device in response to a spoken command.

61. (Original) The system of Claim 59, wherein the integration subsystem further comprises a speech synthesizer for generating synthesized speech corresponding to data generated by the portable device.

62. (Original) The system of Claim 55, wherein the car video system comprises an OEM car video system.

63. (Original) The system of Claim 55, wherein the car video system comprises an after-market car video system.

64. (Original) The system of Claim 55, wherein the portable device comprises a portable receiver.

65. (Original) The system of Claim 64, wherein the portable receiver comprises a digital audio broadcast (DAB) receiver, a high-definition (HD) radio receiver, or a satellite receiver.

66. (Original) The system of Claim 55, wherein the portable device comprises a portable digital media player.

67. (Original) The system of Claim 66, wherein the portable digital media player comprises a video device, a portable media center, a portable media player, an MP3 player, an MP4 player, a WMV player, an Apple iPod, or an Apple video iPod.

68. (Original) The system of Claim 55, wherein the portable device comprises a cellular telephone.

69. (Original) The system of Claim 55, wherein the integration subsystem is positioned within the portable device.

70. (Original) The system of Claim 55, wherein the integration subsystem is positioned within the car video system.

71. (Original) A method for wirelessly integrating a portable device for use with a car audio system comprising:

establishing a wireless communications link between the car audio system and the portable device;

generating a device presence signal for maintaining the car audio system in a state responsive to the portable device;

transmitting the device presence signal to the car audio system over the wireless communications link;

processing video information generated by the portable device into a format compatible with the car audio system;

transmitting the processed video information and audio signals generated by the portable device to the car audio system over the wireless communications link;

displaying the processed video information on a display of the car audio system; and

playing the audio signals over the car audio system.

72. (Original) The method of Claim 71, further comprising processing data generated by the portable device into a format compatible with the car audio system.

73. (Original) The method of Claim 72, further comprising transmitting the processed data over the wireless communications link to the car audio system.

74. (Original) The method of Claim 73, further comprising displaying the processed data on a display of the car audio system.

75. (Original) The method of Claim 71, further comprising transmitting control commands issued by a user at the car audio system over the wireless communications link.

76. (Original) The method of Claim 75, further comprising receiving the control commands at the portable device and processing the control commands into a format compatible with the portable device.

77. (Original) The method of Claim 76, further comprising dispatching the processed control commands to the portable device for execution thereby.

78. (Original) The method of Claim 71, further comprising receiving spoken control commands with a voice recognition subsystem and processing the spoken control commands into a format compatible with the portable device.

79. (Original) The method of Claim 78, further comprising dispatching the processed control commands to the portable device for execution thereby.

80. (Original) The method of Claim 71, further comprising generating synthesized speech corresponding to data generated by the portable device.

81. (Original) A method for wirelessly integrating a portable device for use with a car video system comprising:

 establishing a wireless communications link between the car video system and the portable device;

 generating a device presence signal for maintaining the car video system in a state responsive to the portable device;

transmitting the device presence signal to the car video system over the wireless communications link;

processing video information generated by the portable device into a format compatible with the car video system;

transmitting the processed video information and audio signals generated by the portable device to the car video system over the wireless communications link;

displaying the processed video information on a display of the car video system; and

playing the audio signals over the car video system.

82. (Original) The method of Claim 81, further comprising processing data generated by the portable device into a format compatible with the car video system.

83. (Original) The method of Claim 82, further comprising transmitting the processed data over the wireless communications link to the car video system.

84. (Original) The method of Claim 83, further comprising displaying the processed data on a display of the car video system.

85. (Original) The method of Claim 81, further comprising transmitting control commands issued by a user at the car video system over the wireless communications link.

86. (Original) The method of Claim 85, further comprising receiving the control commands at the portable device and processing the control commands into a format compatible with the portable device.

87. (Original) The method of Claim 86, further comprising dispatching the processed control commands to the portable device for execution thereby.

88. (Original) The method of Claim 81, further comprising receiving spoken control commands with a voice recognition subsystem and processing the spoken control commands into a format compatible with the portable device.

89. (Original) The method of Claim 88, further comprising dispatching the processed control commands to the portable device for execution thereby.

90. (Original) The method of Claim 81, further comprising generating synthesized speech corresponding to data generated by the portable device.

91. (Original) A docking station for docking and integrating a portable device for use with a car stereo, comprising:

a base portion;

a bottom member connected to the base portion;

a top member removably 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 connected to the base portion for integrating the portable device with a car stereo.

REMARKS

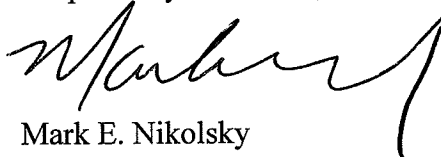
Attorney for Applicant has carefully reviewed the outstanding Restriction Requirement on the above-identified application.

In response to the Restriction Requirement, Applicant provisionally elects, without traverse, to prosecute the claims of Invention I drawn to a system and method of integrating a portable device with a car audio/video system. Applicants respectfully submits that claims 1-90 read on Invention I. Applicant further provisionally elects, without traverse, to prosecute Species 1, drawn to first and second wireless interfaces between a car audio/video system and a portable device. Applicant makes these elections to advance prosecution of this matter, and makes no representations as to the merits of the Restriction Requirement.

All issues raised in the Restriction Requirement are believed to have been addressed. Applicants respectfully submit that the pending claims are directed to the same invention and are in condition for allowance. Examination is requested and favorable action solicited.

Date: 3/9/2009

Respectfully submitted,



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**TRANSMITTAL OF INFORMATION DISCLOSURE STATEMENT
(Under 37 CFR 1.97(b) or 1.97(c))**

Docket No.
99879-00026

In Re Application Of: **Ira Marlowe**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
11/475,847	06/27/2006	Kurr, Jason R.	27614	2614	9001

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).

TRANSMITTAL OF INFORMATION DISCLOSURE STATEMENT
(Under 37 CFR 1.97(b) or 1.97(c))

Docket No.
99879-00026

In Re Application of: **Ira Marlowe**

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11/475,847	06/27/2006	Kurr, Jason R.	27614	2614	9001

Title: **Multimedia Device Integration System**

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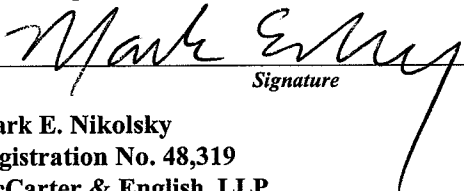
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Dated: 3/9/2009

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Art Unit	2614												
Examiner Name	Kurr, Jason R.												
Attorney Docket Number	99879-00026												
Sheet 1 of 7													

U. S. PATENT DOCUMENTS					
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		Number-Kind Code ² (if known)			
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		Country Code ³ Number ⁴ Kind Code ⁵ (if known)				
	20	WO 2008/002954	01/03/2008	Ira Marlowe		
	21	WO 2006/094281	09/08/2006	Ira Marlowe		
	22	WO 2004/053722	06/24/2004	BlitzSafe of America, Inc		
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	25	JP 2000-286874 with English translation	10/13/2000	Suzuki Motor Corp.		

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	Filing Date	06/27/2006	
	First Named Inventor	Ira M. Marlowe	
	Art Unit	2614	
	Examiner Name	Kurr, Jason R.	
	Attorney Docket Number	99879-00026	
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	27	US- 5,897,155	04/27/1999	Kerner, et al.	
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	29	JP 11-273321 with English Translation	10/08/1999	Clarion Co. Ltd.		<input type="checkbox"/>
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		First Named Inventor	Ira Marlowe
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Attorney Docket Number	99879-00026		
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	30	Gilroy, Amy, "Blitz Safe Bows New SkyLink," This Week in Consumer Electronics (TWICE), November 24, 2003 (1 page)	
	31	Gilroy, Amy, "XM Exceeds Forecasts," This Week in Consumer Electronics (TWICE), November 24, 2003 (2 pages)	
	32	"BlitzSafe News," http://www.blitzsafe.com/blitz_news/news031124/body_news031124.html , November 24, 2003 (1 page)	
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	39	"BlitzSafe Launches XM and Six Interfaces for the 'Mini Cooper'," http://www.blitzsafe.com/blitz_news/news062002a/body_news062002a.html , June 25, 2002 (1 page)	

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		Art Unit	2614
		Examiner Name	Kurr, Jason R.
Sheet	4	of	7
		Attorney Docket Number	99879-00026

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	48	"MBALP V.2A2 CD Changer Converter Mercedes Benz Model for 1997 and 1996," http://www.blitzsafe.com/blitz_news/pr02111996/body_pr02111996.html , June 11, 1996 (1 page)	
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		Application Number	11/475,847
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		First Named Inventor	Ira Marlowe
		Art Unit	2614
		Examiner Name	Kurr, Jason R.
Sheet 5 of 7	Attorney Docket Number	99879-00026	

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	50	"CD Changer Converter - Mercedes Benz 1996 MY," http://www.blitzsafe.com/blitz_news/pr08231995/body_pr08231995.html, August 23, 1995 (1 page)	
	51	Copy of Office Action dated June 5, 2006, from co-pending Application Serial No.: 10/316,961 (40 pages)	
	52	Copy of Office Action dated November 14, 2006, from co-pending Application Serial No.: 10/316,961 (51 pages)	
	53	Copy of Office Action dated April 19, 2007, from co-pending Application Serial No.: 10/316,961 (69 pages)	
	54	Copy of Office Action dated July 12, 2007, from co-pending Application Serial No.: 10/316,961 (71 pages)	
	55	Copy of Office Action dated February 20, 2008, from co-pending Application Serial No.: 10/316,961 (52 pages)	
	56	Copy of Interview Summary dated April 9, 2008, from co-pending Application Serial No.: 10/316,961 (4 pages)	
	57	Copy of Interview Summary dated April 21, 2008, from co-pending Application Serial No.: 10/316,961 (4 pages)	
	58	Copy of Office Action dated August 8, 2006, from co-pending Application Serial No.: 10/732,909 (29 pages)	
	59	Copy of Interview Summary dated December 15, 2006, from co-pending Application Serial No.: 10/732,909 (3 pages)	

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		Application Number	11/475,847
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		Examiner Name	Kurr, Jason R.
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	60	Copy of Interview Summary dated January 3, 2007, from co-pending Application Serial No.: 10/732,909 (3 pages)	
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	65	International Search Report of the International Searching Authority mailed Sept. 24, 2007, issued in connection with International Patent Appln. No. PCT/US06/008043 (4 pages)	
	66	Written Opinion of the International Searching Authority mailed Sept. 24, 2007, issued in connection with International Patent Appln. No. PCT/US06/008043 (5 pages)	
	67	International Preliminary Report on Patentability issued Oct. 16, 2007, issued in connection with International Patent Appln. No. PCT/US06/008043 (1 page)	
	68	Russian Official Action with translation, issued by the Patent Office of the Russian Federation on Dec. 24, 2007, in connection with Russian App. No. 2006101060 (21 pages)	
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	70	International Search Report of the International Searching Authority mailed September 25, 2008, issued in connection with International Patent Appln. No. PCT/US07/72182 (3 pages)	
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(54) Title: MULTIMEDIA DEVICE INTEGRATION SYSTEM

(57) Abstract: A 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, satellite receiver, DAB receiver, video device, digital camera, cellular telephone, portable navigation device, 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. Instructions 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. The integration subsystem could be provided as an integrated circuit that can be installed in a car audiovisual system or a portable audiovisual device. A wireless or inductive battery charging circuit could be provided for wirelessly or inductively charging a battery of a portable after-market device.

MULTIMEDIA DEVICE INTEGRATION SYSTEM

SPECIFICATIONBACKGROUND OF THE INVENTIONFIELD 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 is 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. Still further, it would be desirable to provide a multimedia device integration system that allows for wireless integration of portable devices for use with car audio and/or video systems, wherein full remote control of the portable device is provided at the controls of the car 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, digital cameras, portable navigation devices, 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), digital cameras, satellite receivers (*e.g.*, XM or Sirius receivers), digital audio broadcast (DAB) receivers, portable navigation devices, 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.

The present invention further provides a multimedia device integration system that allows for the wireless integration of a portable audio and/or video device with a car audio and/or video system. The portable device could comprise 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), or a cellular telephone. The portable device includes a wireless interface and an integration subsystem positioned within the portable device. The wireless interface establishes a wireless communications channel between the portable device and the car system, and allows for the wireless exchange of control commands, data, video, and audio signals between the portable device and the car system. The integration module receives control commands issued at the car system and transmitted over the wireless channel, processes same into a format compatible with the portable device, and dispatches same to the portable device for execution thereby. The integration module also receives data from the portable device (including, but not limited to, track information, song information, artist information, time information, and other related information), processes the data into a format compatible with the car system, and transmits same over the wireless channel to the car system for display thereon. Optionally, the integration module could be positioned within the car system.

The integration module could also include a voice recognition subsystem for acquiring spoken commands from a user, converting same into control commands compatible with the portable device, and dispatching the processed control commands to the portable device for execution thereby. The voice commands could be received at the

car audio and/or video system (i.e., using a microphone connected to the car audio and/or video system or some other vehicle component), or at the portable device (i.e., using a microphone connected to or forming a part of the portable device). Additionally, the integration module could include a speech synthesizer for generating synthesized speech for conveying data generated by the portable device to a user. The synthesized speech could be channeled to the car audio and/or video system by the integration module to be played through the car audio and/or video system.

The present invention further provides a multimedia device integration system that allows for the integration of a portable audio and/or video device with a car audio and/or video system using a docking slot provided in the car system. The portable device includes an integration module positioned within the portable device and an external interface for allowing electrical communication with the car system via the docking slot. Optionally, the integration module could be positioned within the car audio or video system. The integration module could also include a voice recognition subsystem for acquiring spoken commands from a user, converting same into control commands compatible with the portable device, and dispatching the processed control commands to the portable device for execution thereby. Additionally, the integration module could include a speech synthesizer for generating synthesized speech for conveying data generated by the portable device to a user.

The present invention also provides a multimedia device integration system which allows a digital camera, such as a still digital camera or a digital video camera, to be integrated for use with an existing car audiovisual system. Data, video, and/or audio from the digital camera is received by the interface, processed into a format compatible with the car audiovisual system, and transmitted thereto for display on and/or playing through the car audiovisual system. Control commands for controlling the digital camera, which can be issued at the car audiovisual system, are received by the interface, processed into a format compatible with the digital camera, and transmitted thereto for execution by the digital camera.

The present invention also provides a multimedia device integration system which allows a portable navigation device, such as a portable GPS receiver, to be integrated for use with an existing car audiovisual system. Data, video, and/or audio from the portable navigation device is received by the interface, processed into a format compatible with the

car audiovisual system, and transmitted thereto for display on and/or playing through the car audiovisual system. Control commands for controlling the portable navigation device, which can be issued at the car audiovisual system, are received by the interface, processed into a format compatible with the portable navigation device, and transmitted thereto for execution by the portable navigation device.

The present invention also provides an interface integrated circuit that allows for the integration of an external portable audio and/or video device with a car audiovisual system, and which can be installed within the car audiovisual system. The interface integrated circuit could communicate with the portable audio and/or video device using one or more communications ports or a wireless transceiver. A manufacturer of a car audiovisual system could be provided with the interface integrated circuit and an electrical schematic for installing same. The interface integrated circuit could be provided with pre-installed firmware for converting data, audio, and/or video signals generated by the portable audio and/or video device into a format compatible with the car audiovisual system, and for converting control commands issued by the car audiovisual system into a format compatible with the portable audio and/or video device for execution thereby. The integrated circuit could also be installed in the portable audio and/or video device, or it could be embodied as a software product which is functionally equivalent to the integrated circuit and which is executed by an existing microprocessor of either the car audiovisual system or the portable audio and/or video device.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other important features of the present 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 another embodiment of the present invention, wherein a plurality of external devices are integrated using a single interface.

FIG. 18 is a diagram showing another embodiment of the present invention, wherein wireless integration is provided between a car audio and/or video system and a portable audio and/or video device using a wireless transceiver and an integration module positioned within the portable device.

FIG. 19 is a diagram showing another embodiment of the present invention, wherein wireless integration is provided between a car audio and/or video system and a portable audio and/or video device using a wireless transceiver and an integration module positioned within the car audio and/or video system.

FIG. 20 is a diagram showing another embodiment of the present invention, wherein a docking slot is provided in a car audio and/or video system for receiving a portable audio and/or video device, and an integration module is positioned within the portable device.

FIG. 21 is a diagram showing another embodiment of the present invention, wherein a docking slot is provided in a car audio and/or video system for receiving a portable audio and/or video device, and an integration module is positioned within the car audio and/or video system.

FIG. 22 is a diagram showing another embodiment of the present invention, wherein wireless integration is provided between a car audio and/or video system and a portable audio and/or video device, and the portable device includes an integration module having speech synthesis and recognition capabilities.

FIG. 23 is a diagram showing another embodiment of the present invention, wherein wireless integration is provided between a car audio and/or video system and a portable audio and/or video device, and the car audio and/or video system includes an integration module having speech synthesis and recognition capabilities.

FIG. 24 is a flowchart showing processing logic according to the present invention for wirelessly integrating a portable audio and/or video device for use with a car audio or video system.

FIG. 25A is a diagram showing another embodiment of the multimedia device integration system of the present invention for integrating a digital camera for use with a car audiovisual system; **FIG. 25B** is a flowchart showing processing logic for integrating the digital camera for use with the car audiovisual system.

FIG. 26A is a diagram showing another embodiment of the multimedia device integration system of the present invention for integrating a portable navigation device for use with a car audiovisual system; **FIG. 26B** is a flowchart showing processing logic for integrating the portable navigation device for use with the car audiovisual system.

FIG. 27 is a diagram showing another embodiment of the multimedia device integration system of the present invention, wherein the integration system is provided as an integrated circuit installed within a car audiovisual system.

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, is retrieved from 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, 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 “interoperable” 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 present 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 **J1** 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 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 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

```

```
    skipz
    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, if 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** of **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. It should be noted that the docking station **400** could be formed without the top portion **402**.

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 integrated 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 integrated 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 and video from the telephone **670** can be channeled to the car stereo or video system **660** via the interface **665** and played through the speakers and/or display **650** 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**. Further, the telephone **670** could be provided with the ability to receive live and/or streamed audio and/or video signals (*e.g.*, via QuickTime or RealSystem streaming files, or a live radio signal received by the telephone), satellite audio (*e.g.*, XM or SIRIUS satellite radio signals, received by a satellite-capable cellular telephone), mobile television (*e.g.*, “amp’d” mobile), or navigational information (*e.g.*, via the Global Positioning System (GPS)), which can be selected using the car stereo or video system **660** and played

thereon (both audio and video) using the interface **665**. For example, if the telephone **670** is equipped to receive SIRIUS satellite digital audio signals, a user could be presented with a menu of available channels that can be displayed and selected using the car stereo or video system **660**, which causes corresponding audio signals to be played through speakers of the car stereo or video system **660**. It is also noted that navigational and map data received by the telephone **670**, including, but not limited to, Global Positioning System (GPS) maps and road / driving maps (e.g., Google driving / road maps, Telnav maps, etc.), can be displayed on the car stereo or video system **660**. Additionally, other types of data, such as restaurant menus accessed by the telephone **670**, could be displayed on the car stereo or video system **660**.

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 system **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. Video signals from the cellular telephone could also

be processed in accordance with the present invention (e.g., RGB to composite signal conversion, or vice-versa), and the processed video could be sent by the interface to the car stereo system for display thereby. 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, satellite radio channel, artist name, genre, etc. 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**. In particular, the interface **675** allows a non-native video device **695** (i.e., a device which is alien to a car video system) to be used interchangeably with a car video system **685**. The after-market video device **695** could comprise a portable DVD player, digital video (DV) camera, digital camera, rear-view 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 output signals could be transmitted via a wired or a wireless connection to the interface **690**. 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 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.

FIG. 18 is a diagram showing another embodiment of the present invention, indicated generally at **900**, wherein wireless integration is provided between a car audio and/or video system **910** and a portable audio and/or video device **924**. The car system **910** could be any OEM or after-market car audio and/or video system. The portable device **924** could comprise a CD player, CD changer, digital media player (*e.g.*, MP3 player, MP4 player, WMV player, Apple iPod, Apple video iPod), portable media center, portable media player, satellite receiver, digital audio broadcast (DAB) receiver (also commonly referred to as a high-definition (HD) radio receiver), video device (*e.g.*, DVD player or digital media player, such as the SONY PSP digital media player), cellular telephone, or any other portable device.

The car system **910** includes system electronics **912** (*e.g.*, circuitry and components provided by an OEM or after-market car audio and/or video system manufacturer), a display **918**, a control panel **920** (*e.g.*, buttons, touch screen display, etc.) for allowing user interaction and control, and a wireless interface or transceiver **916**. The wireless interface **916** could comprise an AT76C551 Bluetooth transceiver manufactured by Atmel, Inc., which includes a Bluetooth baseband controller with an integrated digital signal processor (DSP), and an AT7024 2.4 - 2.5 GHz band RF front end transceiver manufactured by Atmel, Inc., which includes a low-noise amplifier and transmit / receive

switch driver. Any other suitable wireless transceiver (e.g., IEEE 802.11a, 802.11b, or 802.11g) could also be substituted. The display **918** could comprise any display associated with the car system **910**, including, but not limited to, a display panel, a seat-back display, a dashboard display, an LCD or plasma display, or any other display in a car or associated with a car audio and/or video system, positioned anywhere within a vehicle.

The portable device **924** includes device electronics **934** (e.g., circuitry and components provided by the portable device manufacturer), a wireless interface or transceiver **926**, and an integration subsystem or module **932** positioned within the portable device **924**. Optionally, the wireless interface **926** could be positioned external to the portable device **924**. The wireless interface **926** is identical to the wireless interface **916**, and both interfaces **916** and **926** establish a wireless communications channel or link **922** between the car system **910** and the portable device **924**.

The integration subsystem **932** receives control commands that are issued at the car system **910** and wirelessly transmitted to the portable device **924** via the wireless communications link **922**, processes the commands into a format compatible with the device electronics **934** of the portable device **924**, and dispatches same to the device electronics **934** for execution thereby, so as to provide remote, wireless control of the portable device **924** using the car system **910**. For example, a "Play" command could be entered at the car system **910** (which could be a BMW car stereo), wirelessly transmitted to the portable device **924** (which could be an Apple iPod), converted by the integration subsystem **932** into a format recognizable by the device electronics **934**, and executed thereby. The integration subsystem **932** also receives data generated by the device electronics **934** (including, but not limited to, track information, artist information, song title, time information, etc.), processes same into a format compatible with the car system **910**, and transmits the processed data to the car system **910** using the wireless link **922** for display thereon using the display **918**. For example, playlists or other data generated by the portable device **924** could be processed by the integration subsystem **932** into a format compatible with the car system **910**, and wirelessly transmitted thereto for display on the display **918**.

Audio and video information generated by the portable device **924** can be transmitted digitally to the car system **910** using the wireless link **922**. This information could also be transmitted via one or more analog RF carrier signals, using suitable digital-

to-analog and analog-to-digital conversion circuitry known in the art. The integration subsystem **932** could also include conversion circuitry (*e.g.*, using the video format conversion chips discussed above with respect to **FIG. 12A**) for converting video information generated by the portable device **924** for display on the display **918** of the car system **910** (*e.g.*, by converting composite video signals to red, green, and blue (RGB) video signals, or vice versa). It should be noted that the integration subsystem **932** could also be utilized to process data, video, and audio information provided by the portable device **924** where the portable device **924** is connected to the Internet (*e.g.*, via a wireless Internet connection established by a cellular telephone). In such circumstances, the display **918** of the car system **910** would function as an Internet browser, and the controls **920** of the car system **910** could be utilized to navigate the Internet.

The integration subsystem **932** contains circuitry similar to the circuitry disclosed in the various embodiments of the present invention discussed herein, and could include a PIC16F872 or PIC16F873 microcontroller manufactured by Microchip, Inc. and programmed in accordance with the flowchart discussed below with respect to **FIG. 24**. Additionally, the integration subsystem **932** generates a device presence signal for maintaining the car system **910** in a state responsive to the portable device **924**. It should be noted that a non-wireless connection **930** could be provided between optional external interfaces ports **914** and **928** of the car system **910** and the portable device **924**, respectively, using any suitable wired connection type such as serial, FIREWIRE, CAN/CAN2, USB/USB2, IE Bus, T Bus, I Bus, or any other connection, to allow for wired integration between the car system **910** and the portable device **924**. Additionally, the non-wireless connection **930** could include a fiber-optic connection, such as a D2B or MOST fiber-optic connection. The device presence can be transmitted to the car system **910** using the wireless link **922** or, optionally, the non-wireless connection **930**.

FIG. 19 is a diagram showing another embodiment of the present invention, indicated generally at **1000**, wherein wireless integration is provided between a car audio and/or video system **1010** and a portable audio and/or video device **1024**. The components shown in **FIG. 19** are identical to the components shown in **FIG. 18**, and reference numerals of corresponding components have been increased by 100. In this embodiment, the integration subsystem **1032** is positioned internally within the car system **1010**, which also includes system electronics **1012**, wireless interface **1016**, display **1018**,

control panel **1020**, and, optionally, external interface port **1014**. The portable device **1024** includes a wireless interface **1026** in communication with device electronics **1034**, and optionally, an external interface port **1028** for communicating with the external interface port **1014** of the car system **1010** via non-wireless connection **1030**.

FIG. 20 is a diagram showing another embodiment of the present invention, indicated generally at **1100**, wherein a docking slot **1140** is provided in a car audio and/or video system **1110** for receiving a portable audio and/or video device **1124**. The car system **1110** includes system electronics **1112** (e.g., circuitry and components provided by an OEM or after-market car audio or video system manufacturer), a display **1118**, and a control panel **1120**. The portable device **1124** includes an integration subsystem or module **1132**, device electronics **1134** (e.g., circuitry and components provided by the manufacturer of the portable device **1124**) and an external interface port **1142** that interfaces with the docking slot **1140** to allow electrical communication between the integration subsystem **1132** of the car system **1110** and the device electronics **1134** of the portable device **1124**. The electrical connection formed by the external interface port **1142** and the docking slot **1140** could include a FIREWIRE, CAN/CAN2, USB/USB2, IE Bus, T Bus, or I Bus connection, or any other suitable connection type. Additionally, a fiber-optic connection could be formed between the external interface port **1142** and the docking slot **1140**, using a D2B, MOST, or other suitable fiber-optic connection.

The portable device **1124** is inserted into the docking slot **1140** in the general direction indicated by arrow **A**. Once docked, the integration subsystem **1132** processes control commands issued at the car system **1110** into a format compatible with the portable device **1124**, and processes data generated by the portable device **1124** into a format compatible with the car system **1110** in the manner described herein. Audio and video signals generated by the portable device **1124** are channeled by the integration subsystem **1132** to the system electronics **1112**, for playing through the car system **1110**. The portable device **1124** could comprise a digital media player (e.g., MP3 player, MP4 player, WMV player, Apple iPod, Apple video iPod, or other device), a portable media center, a portable media player, a satellite receiver, a digital audio broadcast (DAB) receiver or high-definition (HD) radio receiver, a portable video device, a cellular telephone, or any other portable device.

FIG. 21 is a diagram showing another embodiment of the present invention, indicated generally at **1200**, wherein a docking slot **1240** is provided in a car audio and/or video system **1210** for receiving a portable audio and/or video device **1224**. The components shown in **FIG. 21** are identical to those disclosed in **FIG. 20**, and reference numerals of corresponding components have been increased by 100. In this embodiment, the integration subsystem **1232** is positioned within the car system **1210**, which also includes system electronics **1212**, display **1218**, and control panel **1220**. The portable device **1224** includes device electronics **1234** and an external interface port **1242** for interfacing with the docking slot **1240** and providing electrical (and/or optical) communication with the integration subsystem **1232**.

FIG. 22 is a diagram showing another embodiment of the present invention, indicated generally at **1300**, wherein wireless integration is provided between a car audio and/or video system **1310** and a portable audio and/or video device **1324**, and voice synthesis and speech recognition capabilities are provided. More particularly, the portable device **1324** includes an integration subsystem or module **1332** having a voice recognition subsystem **1336** and a speech synthesizer **1338**. As with the embodiments discussed earlier with respect to **FIGS. 18-19**, the car system **1310** includes system electronics **1312** (*e.g.*, circuitry and components provided by an OEM or after-market car audio or video system manufacturer), an optional external interface port **1314**, a wireless interface or transceiver **1316** (which could be a Bluetooth or other suitable wireless transceiver), a display **1318**, and a control panel **1320**.

The portable device **1324** could comprise a CD player, CD changer, digital media player (*e.g.*, MP3 player, MP4 player, WMV player, Apple iPod, Apple video iPod, or other device), portable media center, portable media player, satellite receiver, digital audio broadcast (DAB) receiver, high-definition (HD) radio receiver, video device (*e.g.*, DVD player or digital media player, such as the SONY PSP digital media player), cellular telephone, or any other portable device. The portable device **1324** includes a wireless interface **1326** which communicates with the wireless interface **1316** to provide a wireless communications channel or link **1322**, an optional external interface port **1328** for providing a non-wireless connection **1330** with the external interface port **1314** (which could include any suitable wired connection, such as FIREWIRE, CAN/CAN2, USB/USB2, IE Bus, T Bus, I Bus, etc., or any suitable optical connection, such as D2B or

MOST), device electronics **1334**, and optional external audio output **1340** and optional external audio input **1342**.

The voice recognition subsystem **1336** of the integration subsystem **1332** could comprise the HM2007 speech recognition processor manufactured by Hualon Microelectric Corporation, the VRP6679 speech recognition processor manufactured by Oki, Inc., or any other suitable speech recognition processor. The voice recognition subsystem **1336** receives control commands that are spoken by a user and are transmitted to the portable device **1324** via the wireless link **1322** or the non-wireless connection **1330** (where the car system **1310** another vehicle component connected to the car system **1310** includes a microphone for receiving voice commands). Optionally, a microphone could be connected to the external audio input **1342** of the portable device **1324** for receiving voice commands. Any desired, spoken commands could be received by the integration subsystem **1332** and processed by the voice recognition subsystem **1336** into a format compatible with the device electronics **1334** of the portable device **1324** for execution thereby. For example, a user could speak a desired artist name, whereupon the voice recognition subsystem **1336** processes the spoken artist name into a digital format, passes the processed artist name to the integration subsystem **1332**, and the integration subsystem **1332** constructs a query command and passes the query command to the device electronics **1334** along with the processed artist name to the device electronics **1334**. The device electronics **1334** then queries the portable device **1324** for all songs (e.g., by searching ID3 tags associated with each song and stored in the portable device **1324**) having a matching artist name. The resulting list is then passed to the integration subsystem **1332**, whereupon the information is processed into a format compatible with the car system **1310**. Then, the information is transmitted to the car system **1310** via the wireless link **1322** or the non-wireless connection **1330** for display on the display **1318** of the car system **1310**.

Voice recognition could also be used to retrieve other media files, such as video clips that are stored on the portable device **1324**. Such files, one retrieved, could then be processed by the integration subsystem **1332** in the manner described herein, transmitted to the car system **1310** (via the wireless link **1322** or the non-wireless connection **1330**), and displayed on the display **1318** of the car system **1310**. An index of such files could

also be generated by the integration subsystem **1332** for quick browsing and retrieval using car system **1310** or voice commands.

The speech synthesizer **1338** provides synthesized speech corresponding to data produced by the portable device **1324**. For example, track lists, artist names, song titles, and other information (e.g., video clip titles, movie titles, etc.) could be retrieved from the portable device **1324** by the integration subsystem **1332** (e.g., in response to a command issued by the user at the car system **1310** or a spoken command processed by the voice recognition subsystem **1336**), and synthesized speech corresponding to the retrieved information could be generated by the speech synthesizer **1338** using known text-to-speech software. The speech synthesizer **1338** could include the RC 8650 or RC 8660 speech synthesis chipsets manufactured by RC Systems, Inc., or any other suitable speech synthesizers. Synthesized speech could be transmitted to the car system **1310** via the wireless link **1322** or the non-wireless connection **1330** and played through the car system **1310**, or optionally, the speech could be channeled to an external device via the optional external audio output **1340**. It should be noted that the voice recognition subsystem **1336** and the speech synthesizer **1338** could be formed on a single integrated circuit forming part of the integration subsystem **1332**. Additionally, the integration subsystem **1332** provides full control of the portable device **1324** using the car system **1310** and exchange of data, audio, and video signals between the portable device **1324** and the car system **1310**, in the manner described herein.

FIG. 23 is a diagram showing another embodiment of the present invention, indicated generally at **1400**, wherein wireless integration is provide between a car audio and/or video system **1410** and a portable audio and/or video device **1424** and voice recognition and speech synthesis capabilities are provided. The components shown in **FIG. 23** are functionally identical to the components shown in **FIG. 22**, and reference numerals of corresponding components have been increased by 100. In this embodiment, the integration subsystem **1432** is positioned in the car system **1410**, which includes system electronics **1412**, an optional external interface port **1414**, a wireless interface **1416**, a display **1418**, and a control panel **1420**. The integration subsystem **1432** includes a voice recognition subsystem **1436** and a speech synthesizer **1438**, which provide the voice recognition and speech synthesis capabilities described above with reference to **FIG. 22**. The portable device **1424** includes a wireless interface **1426**, and optional external

interface port **1428**, device electronics **1434**, an optional external audio output port **1440**, and an optional external audio input port **1442**.

FIG. 24 is a flowchart showing processing logic according to the present invention, indicated generally at **1450**, for wirelessly integrating a portable audio and/or video device for use with a car audio and/or video system. In step **1452**, a wireless link is established between the portable device and the car audio and/or video system. As discussed above, the wireless link could be any suitable wireless communications link, such as a Bluetooth wireless link, an IEEE 802.11 link, or any other suitable link. In step **1454**, the car audio and/or video system type is determined, such as the manufacturer name and/or model identifier. In step **1456**, the portable audio and/or video device type is identified, such as the manufacturer name and/or model identifier. In step **1458**, a protocol conversion software block is loaded from memory, based upon the corresponding device types of the car audio and/or video system and the portable audio and/or video device. The protocol conversion software block includes code for converting commands issued at the car audio and/or video system into a format compatible with the portable audio and/or video device, as well as code for converting data generated by the portable audio and/or video device into a format compatible with the car audio and/or video system.

In step **1460**, data generated by the portable audio and/or video device is processed by the protocol conversion software block. Then, in step **1466**, the processed data is transmitted to the car audio and/or video system for display thereon, using the wireless link. In step **1462**, audio and/or video signal generated by the portable audio and/or video device are channeled to the car audio and/or video system using the wireless link. In step **1464**, a determination is made as to whether commands from the car audio and/or video system are to be processed. If a negative determination is made, step **1458** is re-invoked. Otherwise, step **1468** is invoked, wherein the commands are processed using the protocol conversion software block. Then, in step **1470**, the processed commands are transmitted to the car audio and/or video system using the wireless link. Step **1458** is then re-invoked, so that additional processing can occur.

Importantly, the present invention allows video files in any format (including video clips, movies, pictures, etc.) that are stored on a portable device to be displayed on one or more displays of a car audio and/or video system, and playback of such files to be controlled using the car audio and/or video system. Examples of such files include, but

are not limited to, MPEG, WMV, AVI, JPEG, GIF, TIFF, MP4, or any other suitable video format. Such files could be stored on a cell phone, a portable media center, a portable media player, or any other portable device which is integrated by the present invention (through a wired or wireless connection) for use with a car audio and/or video system. Thus, for example, a video clip downloaded to a cellular telephone or a video clip stored on a portable device (e.g., an Apple video iPod) can be displayed on one or more displays of a car audio and/or video system. Further, the present invention allows for live video streams, such as live television video received by a cellular telephone or other portable device, to be displayed on one or more displays of the car audio and/or video system.

FIG. 25A is a diagram showing another embodiment of the present invention, indicated generally at **1500**, wherein a digital camera **1515** is integrated for use with a car audiovisual system **1505**. The digital camera **1515** could comprise any commercially-available digital still or video camera, such as a point-and-shoot or single-lens-reflex (SLR) digital camera. The digital camera **1515** is in electrical communication with the interface **1510** via any suitable electrical connection, such as USB, USB2, Firewire (IEEE 1394), etc., or any suitable wireless connection, such as BLUETOOTH, IEEE 802.11 (WiFi), etc. The interface **1510** receives data from the digital camera **1515** (such photographs or video clips) and formats same for displaying on a display **1520** of the car audiovisual system **1505**. Instructions for controlling the digital camera **1515** can be entered using the control panel buttons **1525** of the car audiovisual system **1505**. The instructions are processed by the interface **1510**, converted into a format (protocol) compatible with the digital camera **1515**, and transmitted to the digital camera **1515** for processing thereby. Output signals from the digital camera **1515** containing still images, full motion video, or multimedia data can be channeled to the car audiovisual system **1505** via the interface **1510** and played through the display **1520** and/or speakers of the car audiovisual system **1505**. For example, a video file stored in the digital camera **1515** can be selected using the control panel buttons **1525**, which causes the digital camera **1515** to produce corresponding output signals that are processed by the interface **1510**, transmitted to the car audiovisual system **1505**, and displayed on the display **1520**. It should be noted that control of the digital camera **1515** can be performed using buttons on the car audiovisual system **1505**, or a software or graphically-driven menu or interface, such as a

touch screen, as well as controls on the digital camera **1515** itself. The interface **1510** could include one or more of the circuits disclosed herein and modified for use with the digital camera **1515**, including, but not limited to a microcontroller programmed in accordance with the present invention as well as a video processing integrated circuit for converting video signals from the camera **1515** into video signals compatible with the car audiovisual system **1505**.

FIG. 25B is a flowchart showing processing logic, indicated generally at **1530**, for integrating a digital camera with a car audiovisual system. Beginning at step **1535**, a determination is made as to whether the existing car audiovisual system is powered on. If a negative determination is made, step **1540** is invoked, wherein the present invention enters a standby mode and waits for the car audiovisual system to be powered on. If a positive determination is made, step **1545** is invoked, wherein a second determination is made as to whether the car audiovisual system is in a state responsive to signals external to the car audiovisual system. If a negative determination is made, step **1535** is re-invoked.

If a positive determination is made in step **1545**, a digital camera handling process, indicated as block **1565**, is invoked. Beginning in step **1550**, a signal is generated by the present invention indicating that a digital camera is present, and the signal is continuously transmitted to the car audiovisual system. Importantly, this signal prevents the car audiovisual system from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source. In step **1555**, video and/or audio channels of the digital camera are connected (channeled) to the car audiovisual system. In step **1560**, data is retrieved by the present invention from the digital camera, such as title information corresponding to one or more files stored in the digital camera. For example, a list of files stored on the digital camera is presented on the display of the car audiovisual system for selection by a user. The user can then select a file, which could include a picture (.jpg, .gif, .tiff, etc.) or a video file (.wmv, .mpg, etc.), using the controls of the car audiovisual system, and display same on the display of the car audiovisual system. If conversion of the video signal is required, the present invention could convert the signal using any suitable video conversion circuitry (e.g., composite-to-RGB signal conversion, and/or vice versa) prior to displaying the signal on a display of the car audiovisual system. After steps **1550**, **1555**, and **1560** have been executed, control passes to step **1570**.

In step **1570**, the present invention monitors the control panel buttons of the car audiovisual system for digital camera operational instructions. In step **1575**, if an instruction is not detected, step **1570** is re-invoked. Otherwise, if an instruction is received, step **1580** is invoked, wherein the received instruction is converted into a format recognizable by the digital camera connected to the present invention. For example, after a user selects a particular file name presented on the display, an instruction to output video signals that correspond to the selected file is generated. Once the instruction has been formatted, step **1585** is invoked, wherein the formatted instruction is transmitted to the digital camera and executed thereby. Step **1550** is then re-invoked, so that additional processing can occur.

FIG. 26A is a diagram showing another embodiment of the present invention, indicated generally at **1600**, wherein a portable navigation device **1615** (e.g., a Garmin or Tom Tom GPS receiver, etc.) is integrated for use with a car audiovisual system **1605**. The portable navigation device **1615** is in electrical communication (e.g., wired or wireless communication, as discussed hereinabove using any suitable wired or wireless connection methodology) with the interface **1610**, which receives data from the portable navigation device **1615** and formats same for displaying on a display **1620** of the car audiovisual system **1605**. Instructions for controlling the portable navigation device **1615** can be entered using control panel buttons **1625** of the car audiovisual system **1605**. The instructions are processed by the interface **1610**, converted into a format (protocol) compatible with the portable navigation device **1615**, and transmitted to the portable navigation device **1615** for processing thereby. Maps and audio cues from the portable navigation device **1615** can be channeled to the car audiovisual system **1605** via the interface **1610** and played through the display **1620** and/or speakers of the car audiovisual system **1605**. For example, a driving destination may be specified using the control panel buttons **1625**, which causes a digital map file (or a portion thereof) stored in the portable navigation device **1615** to be presented on the display **1620**, and speech-synthesized driving instructions (generated by the portable navigation device **1615**) to be played through speakers of the car audiovisual system **1605**. It should be noted that control of the portable navigation device **1615** can be performed using buttons on the car audiovisual system **1605**, or a software or graphically-driven menu or interface, such as a touch screen, as well as controls on the portable navigation device **1615** itself. One or more interfaces

could be connected to the interface **1610** (“daisy-chained”) to allow multiple products to be integrated. The device **1600** could include one or more of the circuits disclosed herein and modified for use with the portable navigation device **1615**.

FIG. 26B is a flowchart showing processing logic, indicated generally at **1630**, for integrating a portable navigation device with a car audiovisual system. Beginning in step **1635**, a determination is made as to whether the existing car audiovisual system is powered on. If a negative determination is made, step **1640** is invoked, wherein the present invention enters a standby mode and waits for the car audiovisual system to be powered on. If a positive determination is made, step **1645** is invoked, wherein a second determination is made as to whether the car audiovisual system is in a state responsive to signals external to the car audiovisual system. If a negative determination is made, step **1635** is re-invoked.

If a positive determination is made in step **1645**, a portable navigation device handling process, indicated as block **1665**, is invoked. Beginning in step **1650**, a signal is generated by the present invention indicating that a portable navigation device is present, and the signal is continuously transmitted to the car audiovisual system. Importantly, this signal prevents the car audiovisual system from shutting off, entering a sleep mode, or otherwise being unresponsive to signals and/or data from an external source.

In step **1655**, video and/or audio channels of the portable navigation device are connected (channeled) to the car audiovisual system. In step **1660**, data is retrieved by the present invention from the portable navigation device, such as a menu for specifying a driving destination, and presented on the display of the car audiovisual system. After steps **1650**, **1655**, and **1660** have been executed, control passes to step **1670**.

In step **1670**, the present invention monitors the control panel buttons of the car audiovisual system for portable navigation device operational instructions. In step **1675**, if an instruction is not detected, step **1670** is re-invoked. Otherwise, if an instruction is received, step **1680** is invoked, wherein the received instruction is converted into a format recognizable by the portable navigation device connected to the present invention. For example, an instruction for displaying driving directions to a driving destination could be issued from the car audiovisual system and converted into a format compatible with the portable navigation device. Once the instruction has been formatted, step **1685** is invoked,

wherein the formatted instruction is transmitted to the portable navigation device and executed thereby. Step **1650** is then re-invoked, so that additional processing can occur.

FIG. 27 is a diagram showing another embodiment of the present invention, indicated generally at **1700**, wherein the integration system of the present is embodied as an interface integrated circuit **1725** (e.g., a microcontroller) that could be supplied to a manufacturer of a car audiovisual system **1705** and installed within the car audiovisual system **1705**, at the time of manufacture of the car audiovisual system **1705** or thereafter. The integrated circuit **1725** could be fabricated as a single microchip, or a collection of associated microchips (e.g., a chipset). The integrated circuit **1725** is in electrical communication with the car audiovisual system electronics **1710** and an associated display **1715** and control panel buttons **1720**. The interface integrated circuit **1725** is also in electrical communication with a communications port **1730** (e.g., FIREWIRE, CAN/CAN2, USB/USB2, IE Bus, T Bus, I Bus, MOST, or D2B) which could be formed integrally with the car audiovisual system **1705**, e.g., accessible as a port on the front panel of the car audiovisual system **1705** (such as a USB port), or at some other location in a vehicle external to the car audiovisual system **1705** but in electrical communication therewith. Optionally, the interface integrated circuit **1725** could be in electrical communication with a wireless transceiver **1735** (e.g., Bluetooth, IEEE 802.11, WiFi, WiMAX, EVDO, Wireless USB, or HyperLAN) and or one or more auxiliary communications ports **1740**, which could support the same or a different type of communications protocol as communications port **1730**. The wireless transceiver **1735** allows wireless communication of data, audio, and/or video between the interface integrated circuit **1725** and the portable music player **1745**.

A portable music player **1745** could be plugged directly into the communications port **1730** (e.g., using a USB or firewire connection) thereby placing the portable music player **1745** in electrical communication with the interface integrated circuit **1725**. The interface integrated circuit **1725** receives data, audio, and/or video from the portable music player **1745** through the communications port **1730** and formats the data for display on and/or playing through the car audiovisual system **1705**. Instructions for controlling the portable music player **1745** can be entered using the control panel buttons **1720** of the car audiovisual system **1705**. The instructions are processed by the interface integrated circuit **1725**, converted into a format (protocol) compatible with the portable music player **1745**,

and transmitted through the communications port **1730** to the portable music player **1745** for processing thereby. Audio from the portable music player **1745** can be channeled to the car audiovisual system **1705** via the interface integrated circuit **1725** and played through the display **1715** and/or speakers of the car audiovisual system **1705**.

A music file stored in the portable music player **1745** may be selected using the control panel buttons **1720**, which causes corresponding audio signals from the portable music player **1745** to be played through speakers of the car audiovisual system **1705**. It should be noted that control of the portable music player **1745** is not limited to the use of buttons on the car stereo or video system **1720**, and indeed, a software or graphically-driven menu or interface can be used to control the portable music player **1745**. The car audiovisual system **1705** could include one or more of the circuits disclosed herein and modified for use with the portable music player **1740**.

It should also be noted that a manufacturer of audiovisual system **1705** could be provided with protocol conversion software built into the interface integrated circuit **1725** and a schematic diagram with instructions for installing the interface integrated circuit **1725** into existing car audiovisual **1705** systems. Alternatively, a functional equivalent of the interface integrated circuit **1725** could be provided in the form of a protocol conversion software product or a firmware upgrade, which is loaded into an existing car audiovisual system and used by a microprocessor therein to allow integration with third-party devices. In this case, the existing car audiovisual system would include a data port or a wireless transceiver for communicating with third-party devices. Optionally, the interface integrated circuit **1725** could be sold to portable device manufacturers and implemented within portable audio and/or video devices. Alternatively, a functional equivalent of the interface integrated circuit **1725** could be provided in the form of a protocol conversion software product or a firmware upgrade, which is loaded into an existing portable and/or video device and used by a microprocessor therein to allow integration with third-party devices, such as an existing car audiovisual system.

In all embodiments of the present invention, the interface could allow audio and/or video signals generated by a car audiovisual system (whether from a live signal received by the car audiovisual system or from a stored medium) to be ported from the car audiovisual system to a portable audio and/or video device for recording same in the portable device. For example, a live radio signal received by the car audiovisual system

(e.g., a live FM station or a live satellite station) could be ported by the interface of the present invention to the portable device (via a wired or wireless connection) and recorded (“ripped”) on the portable audio and/or video device in a suitable format, such as one or more MP3 files. Further, the interface allows audio and/or video signals generated by a portable audio and/or video device (whether from a live signal received by the portable device or from a stored medium) to be ported from the portable device to the car audiovisual system for recording same using the car audiovisual system.

The interface of the present invention could include circuitry for wirelessly charging a battery of a portable audio or video device. For example, the interface could include an inductive battery charging circuit which transmits electrical power to the portable device using induction, when the device is located near the interface. In such circumstances, the portable device would also include a corresponding inductive circuit which receives the transmitted electrical power and applies same to the battery of the portable device. Such a circuit could operate in a “trickle charge” mode, wherein a low voltage and amperage electrical current is delivered to the battery of the portable device over time to charge a battery. Also, transmission of power from the interface to the portable device could be accomplished through the use of radio frequency (RF) transmissions between the interface and the portable device. In situations where the interface is installed in a car audio or video system (as discussed herein), a wireless battery charging circuit could also be installed in the car audio 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.

CLAIMSWhat is claimed is:

1. A multimedia device integration system comprising:
 - a car audio system having a display associated therewith;
 - a portable device external to the car audio system;
 - a first wireless interface in communication with the car audio system;
 - a second wireless interface in communication with the portable device, the first and second wireless interfaces establishing a wireless communications link between the car audio system and the portable device; and
 - an integration subsystem for generating a device presence signal for maintaining the car audio system in a state responsive to the portable device, wherein the integration subsystem transmits the device presence signal to the car audio system, channels audio from the portable device to the car audio system using the wireless communications link, processes video information generated by the portable device into a format compatible with the car audio system, and transmits the processed video information to the car audio system using the wireless communications link for displaying the processed video information on the display of the car audio system.
2. The system of Claim 1, wherein the integration subsystem processes data generated by the portable device into a format compatible with the car audio system and displays the processed data on the display of the car audio system.
3. The system of Claim 1, wherein the integration subsystem receives control commands issued at the car audio system and transmitted over the wireless communications link, processes the commands into a format compatible with the portable device, and dispatches the processed commands to the portable device for execution thereby.
4. The system of Claim 1, wherein the integration subsystem further comprises a voice recognition subsystem for processing spoken control commands issued by a user.

5. The system of Claim 4, wherein the integration subsystem retrieves an audio file or a video file from the portable device in response to a spoken command.
6. The system of Claim 4, wherein the integration subsystem further comprises a speech synthesizer for generating synthesized speech corresponding to data generated by the portable device.
7. The system of Claim 1, wherein the car audio system comprises an OEM car audio system.
8. The system of Claim 1, wherein the car audio system comprises an after-market car audio system.
9. The system of Claim 1, wherein the portable device comprises a portable receiver.
10. The system of Claim 10, wherein the portable receiver comprises a digital audio broadcast (DAB) receiver, a high-definition (HD) radio receiver, or a satellite receiver.
11. The system of Claim 1, wherein the portable device comprises a portable digital media player.
12. The system of Claim 11, wherein the portable digital media player comprises a video device, a portable media center, a portable media player, an MP3 player, an MP4 player, a WMV player, an Apple iPod, or an Apple video iPod.
13. The system of Claim 1, wherein the portable device comprises a cellular telephone.
14. The system of Claim 1, further comprising a non-wireless connection established between the car audio system and the portable device for exchanging data, commands, audio and video signals between the car audio system and the portable device.
15. The system of Claim 1, wherein the integration subsystem is positioned within the portable device.
16. The system of Claim 1, wherein the integration subsystem is positioned within the car audio system.

17. The system of Claim 1, wherein the video information comprises a video file stored on the portable device.
18. The system of Claim 1, wherein the video information comprises a picture stored on the portable device.
19. The system of Claim 1, wherein the video information comprises a television signal received by the portable device.
20. A multimedia device integration system comprising:
- a car video system having a display associated therewith;
 - a portable device external to the car video system;
 - a first wireless interface in communication with the car video system;
 - a second wireless interface in communication with the portable device, the first and second wireless interfaces establishing a wireless communications link between the car video system and the portable device; and
 - an integration subsystem for generating a device presence signal for maintaining the car video system in a state responsive to the portable device, wherein the integration subsystem transmits the device presence signal to the car video system, channels audio from the portable device to the car video system using the wireless communications link, processes video information generated by the portable device into a format compatible with the car video system, and transmits the processed video information to the car video system using the wireless communications link for displaying the processed video information on the display of the car video system.
21. The system of Claim 20, wherein the integration subsystem processes data generated by the portable device into a format compatible with the car video system and displays the processed data on the display of the car video system.
22. The system of Claim 20, wherein the integration subsystem receives control commands issued at the car video system and transmitted over the wireless communications link, processes the commands into a format compatible with the portable

device, and dispatches the processed commands to the portable device for execution thereby.

23. The system of Claim 20, wherein the integration subsystem further comprises a voice recognition subsystem for processing spoken control commands issued by a user.

24. The system of Claim 23, wherein the integration subsystem retrieves an audio file or a video file from the portable device in response to a spoken command.

25. The system of Claim 23, wherein the integration subsystem further comprises a speech synthesizer for generating synthesized speech corresponding to data generated by the portable device.

26. The system of Claim 20, wherein the car video system comprises an OEM car video system.

27. The system of Claim 20, wherein the car video system comprises an after-market car video system.

28. The system of Claim 20, wherein the portable device comprises a portable receiver.

29. The system of Claim 28, wherein the portable receiver comprises a digital audio broadcast (DAB) receiver, a high-definition (HD) radio receiver, or a satellite receiver.

30. The system of Claim 20, wherein the portable device comprises a portable digital media player.

31. The system of Claim 30, wherein the portable digital media player comprises a video device, a portable media center, a portable media player, an MP3 player, an MP4 player, a WMV player, an Apple iPod, or an Apple video iPod.

32. The system of Claim 20, wherein the portable device comprises a cellular telephone.

33. The system of Claim 20, further comprising a non-wireless connection established between the car video system and the portable device for exchanging data, commands, audio and video signals between the car video system and the portable device.

34. The system of Claim 20, wherein the integration subsystem is positioned within the portable device.

35. The system of Claim 20, wherein the integration subsystem is positioned within the car video system.

36. The system of Claim 20, wherein the video information comprises a video file stored on the portable device.

37. The system of Claim 20, wherein the video information comprises a picture stored on the portable device.

38. The system of Claim 20, wherein the video information comprises a television signal received by the portable device.

39. A multimedia device integration system comprising:

a car audio system;

a portable device external to the car audio system;

a docking slot formed in the car audio system for receiving the portable device and establishing electrical communication between the car audio system and the portable device; and

an integration subsystem for generating a device presence signal for maintaining the car audio system in a state responsive to the portable device, wherein the integration subsystem receives data generated by the portable device, processes the data into a format compatible with the car audio system, and transmits the processed data, the device presence signal, and audio signals to the car audio system.

40. The system of Claim 39, wherein the processed data is displayed on a display of the car audio system.

41. The system of Claim 39, wherein the integration subsystem processes a video file stored on the portable device into a format compatible with the car audio system and transmits the video file to the car audio system for displaying the video file on a display of the car audio system.

42. The system of Claim 39, wherein the integration subsystem receives control commands issued at the car audio system, processes the commands into a format compatible with the portable device, and dispatches the processed commands to the portable device for execution thereby.

43. The system of Claim 39, wherein the integration subsystem further comprises a voice recognition subsystem for processing spoken control commands issued by a user.

44. The system of Claim 43, wherein the integration subsystem retrieves an audio file or a video file from the portable device in response to a spoken command.

45. The system of Claim 43, wherein the integration subsystem further comprises a speech synthesizer for generating synthesized speech corresponding to data generated by the portable device.

46. The system of Claim 39, wherein the car audio system comprises an OEM car audio system.

47. The system of Claim 39, wherein the car audio system comprises an after-market car audio system.

48. The system of Claim 39, wherein the portable device comprises a portable receiver.

49. The system of Claim 48, wherein the portable receiver comprises a digital audio broadcast (DAB) receiver, a high-definition (HD) radio receiver, or a satellite receiver.

50. The system of Claim 39, wherein the portable device comprises a portable digital media player.

51. The system of Claim 50, wherein the portable digital media player comprises a video device, a portable media center, a portable media player, an MP3 player, an MP4 player, a WMV player, an Apple iPod, or an Apple video iPod.

52. The system of Claim 39, wherein the portable device comprises a cellular telephone.

53. The system of Claim 39, wherein the integration subsystem is positioned within the portable device.

54. The system of Claim 39, wherein the integration subsystem is positioned within the car audio system.

55. A multimedia device integration system comprising:

a car video system;

a portable device external to the car video system;

a docking slot formed in the car video system for receiving the portable device and establishing electrical communication between the car video system and the portable device; and

an integration subsystem for generating a device presence signal for maintaining the car video system in a state responsive to the portable device, wherein the integration subsystem receives data generated by the portable device, processes the data into a format compatible with the car video system, and transmits the processed data, the device presence signal, audio signals, and video signals to the car video system.

56. The system of Claim 55, wherein the processed data is displayed on a display of the car video system.

57. The system of Claim 55, wherein the integration subsystem processes a video file stored on the portable device into a format compatible with the car video system and transmits the video file to the car video system for displaying the video file on a display of the car video system.

58. The system of Claim 55, wherein the integration subsystem receives control commands issued at the car video system, processes the commands into a format compatible with the portable device, and dispatches the processed commands to the portable device for execution thereby.

59. The system of Claim 55, wherein the integration subsystem further comprises a voice recognition subsystem for processing spoken control commands issued by a user.

60. The system of Claim 59, wherein the integration subsystem retrieves an audio file or a video file from the portable device in response to a spoken command.
61. The system of Claim 59, wherein the integration subsystem further comprises a speech synthesizer for generating synthesized speech corresponding to data generated by the portable device.
62. The system of Claim 55, wherein the car video system comprises an OEM car video system.
63. The system of Claim 55, wherein the car video system comprises an after-market car video system.
64. The system of Claim 55, wherein the portable device comprises a portable receiver.
65. The system of Claim 64, wherein the portable receiver comprises a digital audio broadcast (DAB) receiver, a high-definition (HD) radio receiver, or a satellite receiver.
66. The system of Claim 55, wherein the portable device comprises a portable digital media player.
67. The system of Claim 66, wherein the portable digital media player comprises a video device, a portable media center, a portable media player, an MP3 player, an MP4 player, a WMV player, an Apple iPod, or an Apple video iPod.
68. The system of Claim 55, wherein the portable device comprises a cellular telephone.
69. The system of Claim 55, wherein the integration subsystem is positioned within the portable device.
70. The system of Claim 55, wherein the integration subsystem is positioned within the car video system.

71. A method for wirelessly integrating a portable device for use with a car audio system comprising:

establishing a wireless communications link between the car audio system and the portable device;

generating a device presence signal for maintaining the car audio system in a state responsive to the portable device;

transmitting the device presence signal to the car audio system over the wireless communications link;

processing video information generated by the portable device into a format compatible with the car audio system;

transmitting the processed video information and audio signals generated by the portable device to the car audio system over the wireless communications link;

displaying the processed video information on a display of the car audio system;
and

playing the audio signals over the car audio system.

72. The method of Claim 71, further comprising processing data generated by the portable device into a format compatible with the car audio system.

73. The method of Claim 72, further comprising transmitting the processed data over the wireless communications link to the car audio system.

74. The method of Claim 73, further comprising displaying the processed data on a display of the car audio system.

75. The method of Claim 71, further comprising transmitting control commands issued by a user at the car audio system over the wireless communications link.

76. The method of Claim 75, further comprising receiving the control commands at the portable device and processing the control commands into a format compatible with the portable device.

77. The method of Claim 76, further comprising dispatching the processed control commands to the portable device for execution thereby.

78. The method of Claim 71, further comprising receiving spoken control commands with a voice recognition subsystem and processing the spoken control commands into a format compatible with the portable device.

79. The method of Claim 78, further comprising dispatching the processed control commands to the portable device for execution thereby.

80. The method of Claim 71, further comprising generating synthesized speech corresponding to data generated by the portable device.

81. A method for wirelessly integrating a portable device for use with a car video system comprising:

establishing a wireless communications link between the car video system and the portable device;

generating a device presence signal for maintaining the car video system in a state responsive to the portable device;

transmitting the device presence signal to the car video system over the wireless communications link;

processing video information generated by the portable device into a format compatible with the car video system;

transmitting the processed video information and audio signals generated by the portable device to the car video system over the wireless communications link;

displaying the processed video information on a display of the car video system;
and

playing the audio signals over the car video system.

82. The method of Claim 81, further comprising processing data generated by the portable device into a format compatible with the car video system.

83. The method of Claim 82, further comprising transmitting the processed data over the wireless communications link to the car video system.

84. The method of Claim 83, further comprising displaying the processed data on a display of the car video system.

85. The method of Claim 81, further comprising transmitting control commands issued by a user at the car video system over the wireless communications link.

86. The method of Claim 85, further comprising receiving the control commands at the portable device and processing the control commands into a format compatible with the portable device.

87. The method of Claim 86, further comprising dispatching the processed control commands to the portable device for execution thereby.

88. The method of Claim 81, further comprising receiving spoken control commands with a voice recognition subsystem and processing the spoken control commands into a format compatible with the portable device.

89. The method of Claim 88, further comprising dispatching the processed control commands to the portable device for execution thereby.

90. The method of Claim 81, further comprising generating synthesized speech corresponding to data generated by the portable device.

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

a base portion;

a bottom member connected to the base portion;

a top member removably 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 connected to the base portion for integrating the portable device with a car stereo.

92. A multimedia device integration system comprising:

a car audiovisual system having a display associated therewith;

a cellular telephone external to the car audiovisual system, the cellular telephone including a receiver for receiving a broadcast radio transmission transmitted to the cellular telephone; and

an interface in communication with the car audiovisual system and the cellular telephone, wherein the interface generates and transmits a device presence signal to the car audiovisual system to maintain same in a state responsive to the cellular telephone, processes the broadcast radio transmission received by the cellular telephone into a format compatible with the car audiovisual system, and transmits the processed broadcast radio transmission to the car audiovisual system for playing thereby.

93. The multimedia device integration system of Claim 92, wherein the broadcast radio transmission comprises a satellite radio transmission received by the cellular telephone.

94. The multimedia device integration system of Claim 92, wherein the broadcast radio transmission comprises a live radio transmission from a radio station.

95. The multimedia device integration system of Claim 92, wherein the broadcast radio transmission comprises a streamed audio transmission received by the cellular telephone.

96. The multimedia device integration system of Claim 92, wherein the broadcast radio transmission comprises a video transmission received by the cellular telephone.

97. The multimedia device integration system of Claim 96, wherein the video transmission comprises a live video transmission.

98. The multimedia device integration system of Claim 96, wherein the video transmission comprises a streamed video transmission.

99. The multimedia device integration system of Claim 96, wherein the interface processes the video transmission into a format compatible with the car audiovisual system and transmits the processed video transmission to the car audiovisual system for display thereon.

100. The multimedia device integration system of Claim 92, wherein the interface receives control commands issued at the car audiovisual system, processes the control commands into a format compatible with the cellular telephone, and transmit processed control commands to the cellular telephone for execution thereby.

101. The multimedia device integration system of Claim 92, wherein the interface processes navigational information received by the cellular telephone into a format compatible with the car audiovisual system, and transmits processed navigational information to the car audiovisual system for display thereon.

102. The multimedia device integration system of Claim 101, wherein the navigational information comprises a road map.

103. The multimedia device integration system of Claim 101, wherein the navigational information comprises a Global Positioning System (GPS) map.

104. A multimedia device integration system comprising:

a car audiovisual system;

a digital camera external to the car audiovisual system; and

an interface in electrical communication with the car audiovisual system and the digital camera, wherein the interface generates and transmits a device presence signal to the car audiovisual system to maintain same in a state responsive to the digital camera, processes output signals generated by the digital camera into a format compatible with the car audiovisual system, and transmits the processed output signals to the car audiovisual system for display thereby.

105. The multimedia device integration system of Claim 104, wherein the interface transmits audio signals generated by the digital camera device to the car audiovisual system for playing thereby.

106. The multimedia device integration system of Claim 104, wherein the interface receives control commands issued at the car audiovisual system, processes the control commands into a format compatible with the digital camera, and transmits processed control commands to the digital camera for execution thereby.

107. The multimedia device integration system of Claim 104, wherein the output signal comprises a still video image.

108. The multimedia device integration system of Claim 104, wherein the output signal comprises a full motion video clip.

109. The multimedia device integration system of Claim 104, wherein the output signal comprises a live video signal.

110. The multimedia device integration system of Claim 104, wherein the output signal comprises a streaming video signal.

111. A multimedia device integration system comprising:

a car audiovisual system;

a portable navigation device external to the car audiovisual system;

an interface in electrical communication with the car audiovisual system and the portable navigation device, wherein the interface processes video and data signals generated by the portable navigation device into a format compatible with the car audiovisual system, and transmits the processed video and data signals to the car audiovisual system for display thereby.

112. The multimedia device integration system of Claim 111, wherein the interface receives control commands issued at the car audiovisual system, processes the control commands into a format compatible with the portable navigation device, and transmits processed control commands to the portable navigation device for execution thereby.

113. The multimedia device integration system of Claim 111, wherein the portable navigation system comprises a portable Global Positioning System (GPS) device.

114. The multimedia device integration system of Claim 111, wherein the video signals comprise a map generated by the portable navigation device and displayed on the car audiovisual system.

115. The multimedia device integration system of Claim 111, wherein the interface transmits audio signals generated by the portable navigation device to the car audiovisual system for playing thereby.

116. The multimedia device integration system of Claim 115, wherein the audio signals comprise synthesized speech generated by the portable navigation device.

117. A multimedia device integration system, comprising:

a car audiovisual system;

an after-market, portable audiovisual device external to the car audiovisual system;

and

an interface integrated circuit installed in the portable audiovisual device and in communication with the car audiovisual system and the portable audiovisual device, the interface integrated circuit generating and transmitting a device presence signal for maintaining the car audiovisual signal in a state responsive to the portable audiovisual device and transmitting audio signals from the portable audiovisual device to the car audiovisual system for playing thereon.

118. The system of Claim 117, wherein the interface integrated circuit receives control commands issued at the car audiovisual system, processes the control commands into a format compatible with the portable audiovisual device, and transmits processed control commands to the portable audiovisual device for execution thereby.

119. The system of Claim 117, wherein the interface integrated circuit receives data generated by the portable audiovisual device, processes the data into a format compatible with the car audiovisual system, and transmits processed data to the portable audiovisual device for display thereby.

120. The system of Claim 117, wherein the interface integrated circuit receives video signals generated by the portable audiovisual device, processes the video signals into a

format compatible with the car audiovisual device, and transmits processed video signals to the car audiovisual device for display thereby.

121. The system of Claim 117, further comprising a communications port operatively associated with the interface integrated circuit and allowing communications between the interface integrated circuit and the portable audiovisual device.

122. The system of Claim 121, wherein the communications port comprises a Universal Serial Bus (USB) port.

123. The system of Claim 117, further comprising a wireless transceiver operatively associated with the interface integrated circuit and allowing wireless communications between the interface integrated circuit and the portable audiovisual device.

124. The system of Claim 123, wherein the wireless transceiver comprises a WiFi, Bluetooth, or IEEE 802.11 transceiver.

125. The system of Claim 117, wherein the integrated circuit transmits audio signals generated by the portable audiovisual device to the car audiovisual system for recording by the car audiovisual system.

126. The system of Claim 117, wherein the integrated circuit transmits audio signals generated by the car audiovisual system to the portable audiovisual device for recording by the portable audiovisual device.

127. The system of Claim 117, wherein the integrated circuit transmits video signals generated by the portable audiovisual device to the car audiovisual system for recording by the car audiovisual system.

128. The system of Claim 117, wherein the integrated circuit transmits video signals generated by the car audiovisual system to the portable audiovisual device for recording by the portable audiovisual device.

129. The system of Claim 117, wherein the integrated circuit comprises a single microchip.

130. The system of Claim 117, wherein the integrated circuit comprises a chipset.

131. The system of Claim 117, wherein the integrated circuit comprises a microprocessor of the car audiovisual system.

132. A multimedia device integration system, comprising:

a car audiovisual system;

an after-market, portable audiovisual device external to the car audiovisual system;

and

an interface integrated circuit installed in the car audiovisual system and in communication with the car audiovisual system and the portable audiovisual device, the interface integrated circuit generating and transmitting a device presence signal for maintaining the car audiovisual system in a state responsive to the portable audiovisual device and transmitting audio signals from the portable audiovisual device to the car audiovisual system for playing thereby.

133. The system of Claim 132, wherein the interface integrated circuit receives control commands issued at the car audiovisual system, processes the control commands into a format compatible with the portable audiovisual device, and transmits processed control commands to the portable audiovisual device for execution thereby.

134. The system of Claim 132, wherein the interface integrated circuit receives data generated by the portable audiovisual device, processes the data into a format compatible with the car audiovisual system, and transmits processed data to the portable audiovisual device for display thereby.

135. The system of Claim 132, wherein the interface integrated circuit receives video signals generated by the portable audiovisual device, processes the video signals into a format compatible with the car audiovisual device, and transmits processed video signals to the car audiovisual device for display thereby.

136. The system of Claim 132, further comprising a communications port operatively associated with the interface integrated circuit and allowing communications between the interface integrated circuit and the portable audiovisual device.

137. The system of Claim 136, wherein the communications port comprises a Universal Serial Bus (USB) port.

138. The system of Claim 132, further comprising a wireless transceiver operatively associated with the interface integrated circuit and allowing wireless communications between the interface integrated circuit and the portable audiovisual device.

139. The system of Claim 138, wherein the wireless transceiver comprises a WiFi, Bluetooth, or IEEE 802.11 transceiver.

140. The system of Claim 132, wherein the integrated circuit transmits audio signals generated by the portable audiovisual device to the car audiovisual system for recording by the car audiovisual system.

141. The system of Claim 132, wherein the integrated circuit transmits audio signals generated by the car audiovisual system to the portable audiovisual device for recording by the portable audiovisual device.

142. The system of Claim 132, wherein the integrated circuit transmits video signals generated by the portable audiovisual device to the car audiovisual system for recording by the car audiovisual system.

143. The system of Claim 132, wherein the integrated circuit transmits video signals generated by the car audiovisual system to the portable audiovisual device for recording by the portable audiovisual device.

144. The system of Claim 142, wherein the integrated circuit comprises a single microchip.

145. The system of Claim 142, wherein the integrated circuit comprises a chipset.

146. The system of Claim 132, wherein the integrated circuit comprises a microprocessor of the car audiovisual system.

147. A multimedia device integration system comprising:
a car audiovisual system;

a portable audio device external to the car audiovisual system;

an interface in communication with the car audiovisual system and the portable audio device, the interface generating and transmitting a device presence signal to the car audiovisual system to maintain the car audiovisual system in a state responsive to the portable audio device, the interface transmitting audio signals from the portable audio device to the car audiovisual system; and

a charging circuit for inductively charging a battery of the portable audio device

148. The multimedia device integration system of Claim 147, wherein the charging circuit comprises a first inductive charging circuit operatively associated with the interface and a second inductive charging circuit operatively associated with the portable audio device, the first and second inductive charging circuits inductively coupled to each other to transmit electrical power therebetween.

149. The multimedia device integration system of Claim 147, wherein the interface receives video signals from the portable audio device, processes same into a format compatible with the car audiovisual system, and transmits processed video signals to the car audiovisual system for display thereby.

150. The multimedia device integration system of Claim 147, wherein the interface receives control commands issued at the car audiovisual system, processes same into a format compatible with the portable audio device, and transmits processed control commands to the portable audio device for execution thereby.

151. A multimedia device integration system comprising:

a car audiovisual system;

a portable audio device external to the car audiovisual system;

an interface in communication with the car audiovisual system and the portable audio device, the interface generating and transmitting a device presence signal to the car audiovisual system to maintain the car audiovisual system in a state responsive to the portable audio device, the interface transmitting audio signals from the portable audio device to the car audiovisual system; and

a charging circuit for wirelessly charging a battery of the portable audio device

152. The multimedia device integration system of Claim 151, wherein the charging circuit comprises a first wireless charging circuit operatively associated with the interface and a second wireless charging circuit operatively associated with the portable audio device, the first and second wireless charging circuits wirelessly coupled to each other to transmit electrical power therebetween.

153. The multimedia device integration system of Claim 151, wherein the interface receives video signals from the portable audio device, processes same into a format compatible with the car audiovisual system, and transmits processed video signals to the car audiovisual system for display thereby.

154. The multimedia device integration system of Claim 151, wherein the interface receives control commands issued at the car audiovisual system, processes same into a format compatible with the portable audio device, and transmits processed control commands to the portable audio device for execution thereby.

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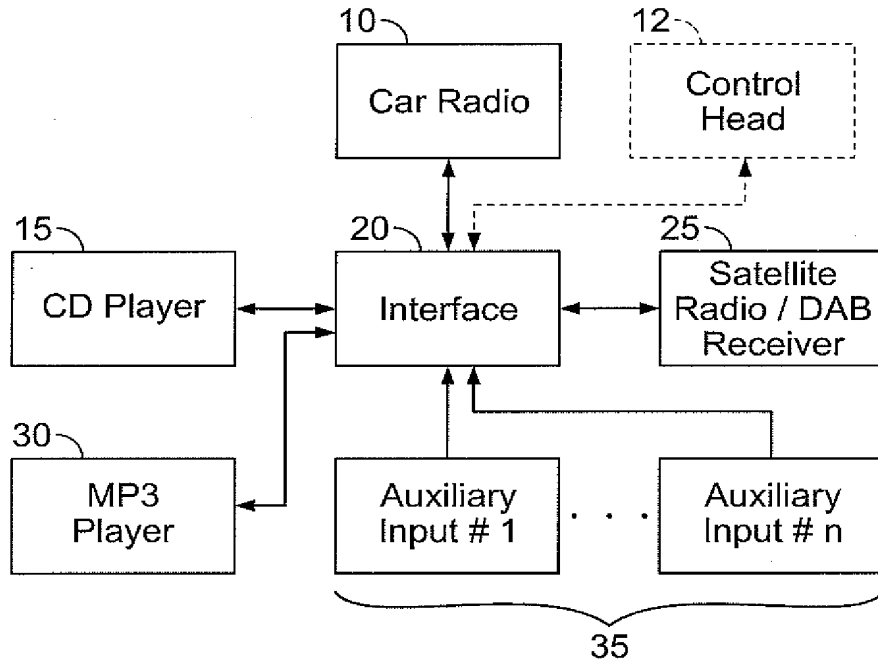


FIG. 1

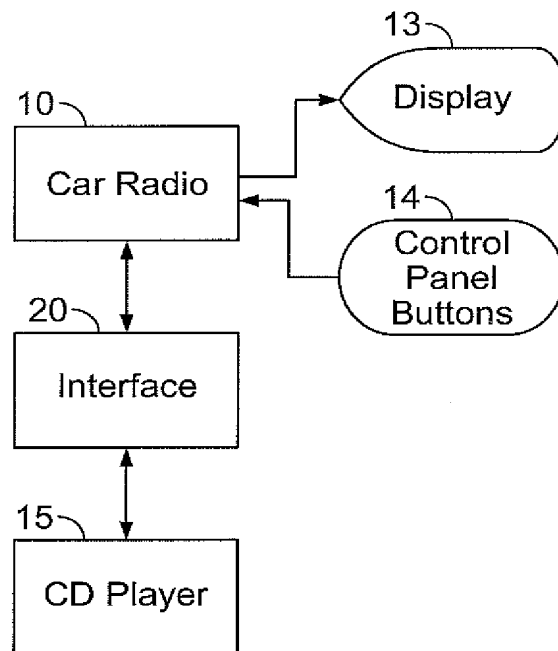


FIG. 2A

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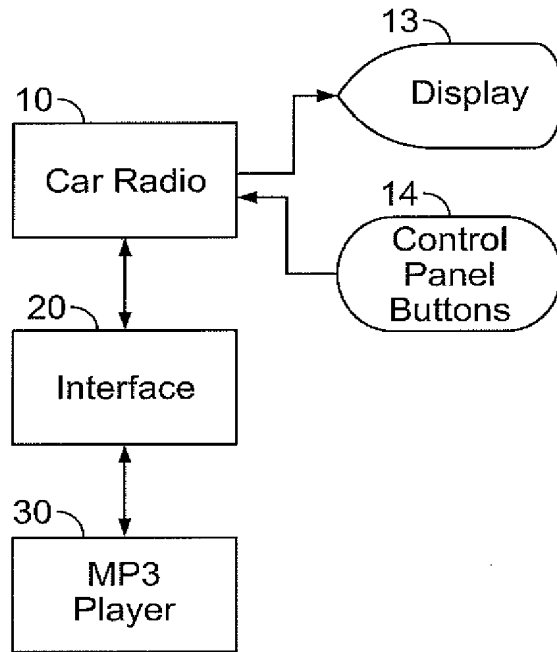


FIG. 2B

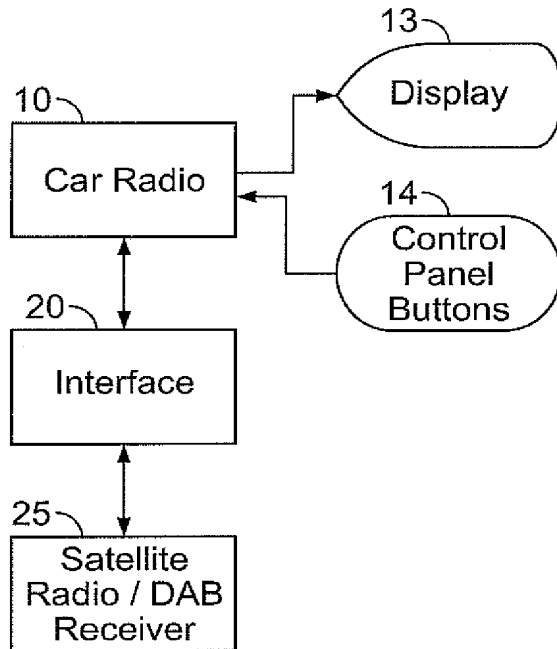


FIG. 2C

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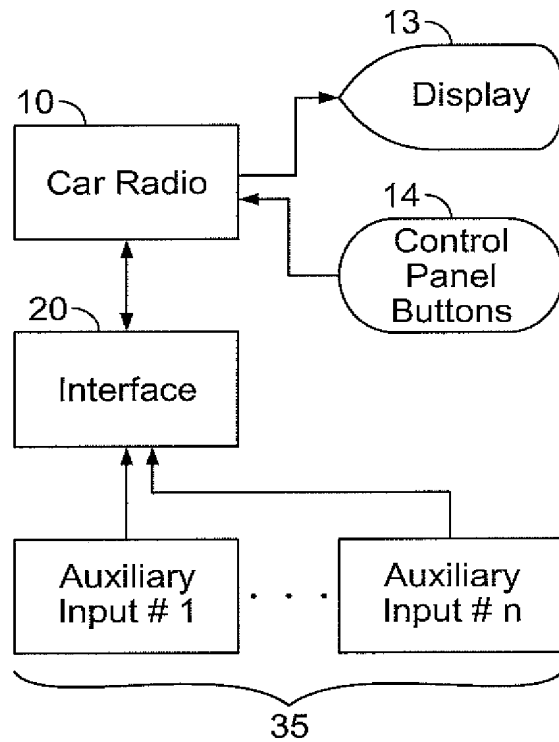


FIG. 2D

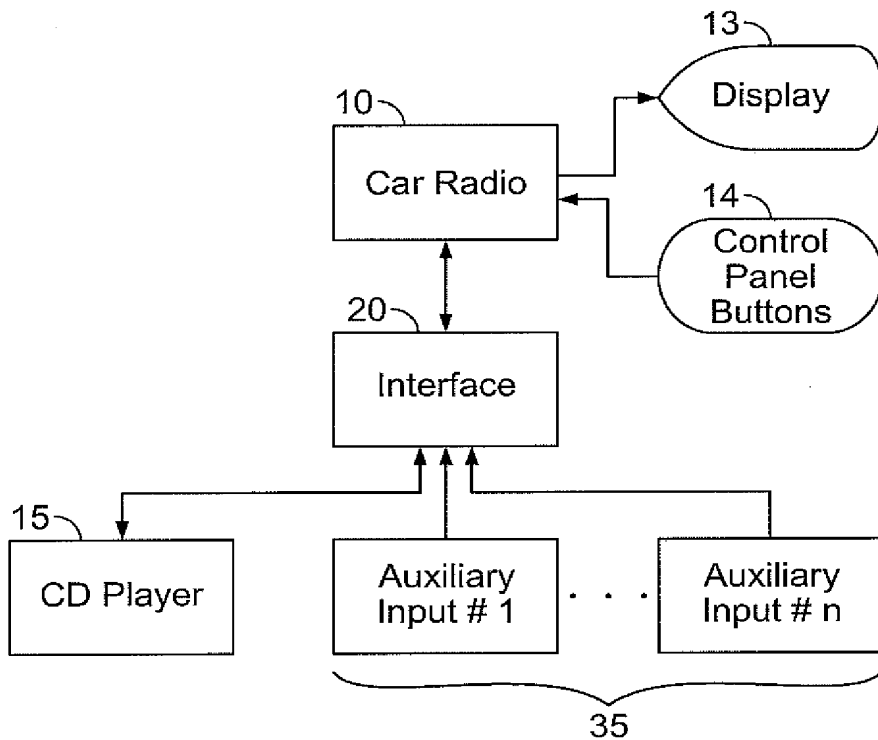


FIG. 2E

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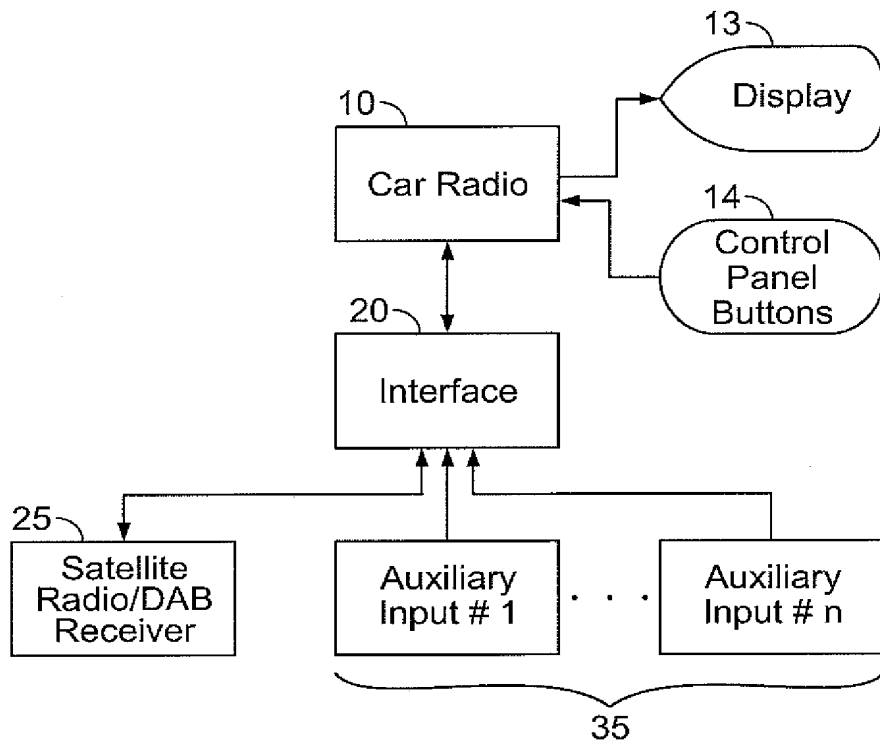


FIG. 2F

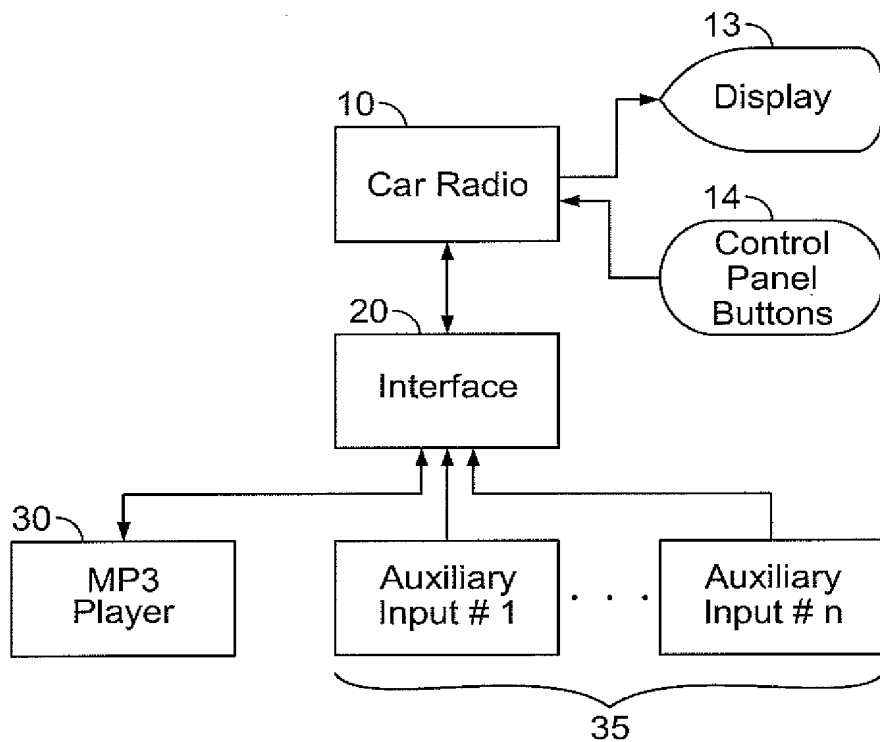


FIG. 2G

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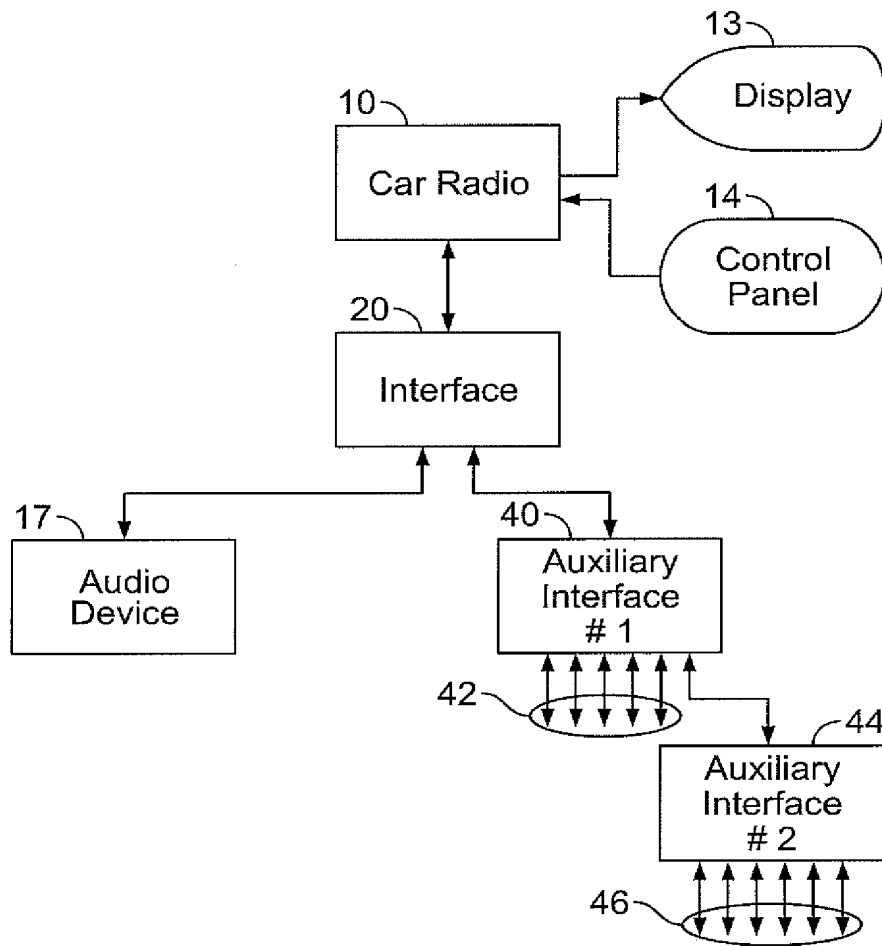
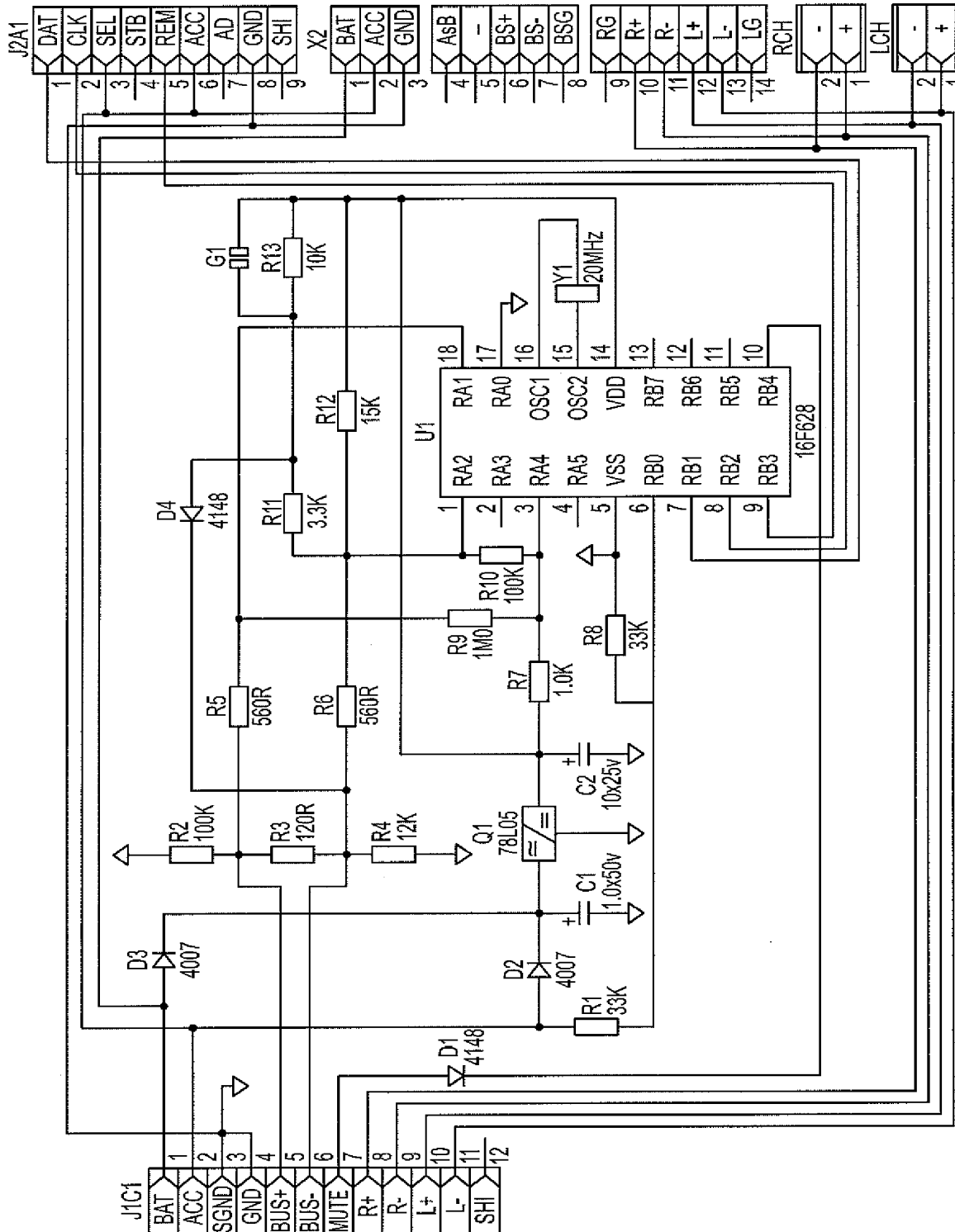


FIG. 2H

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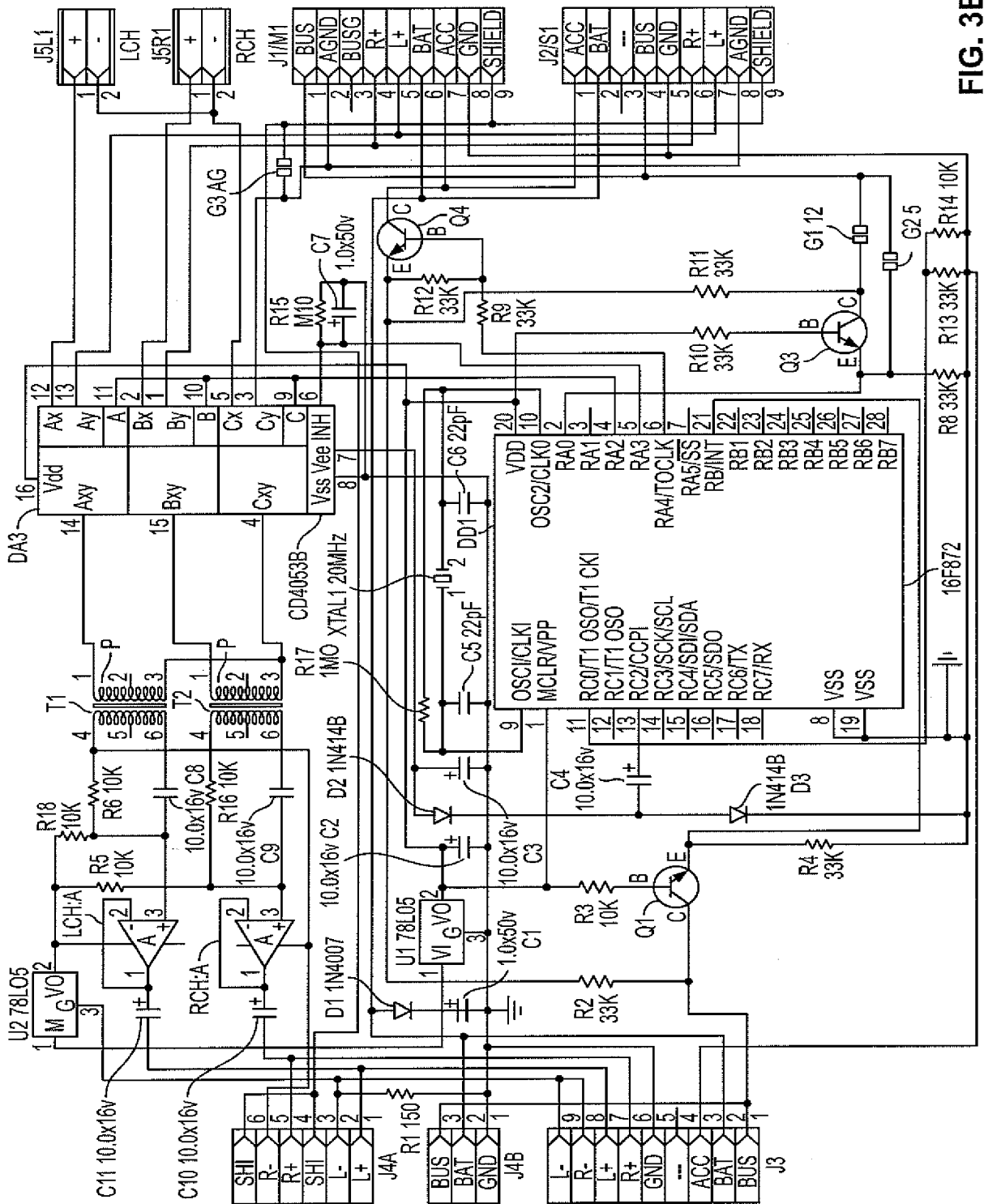
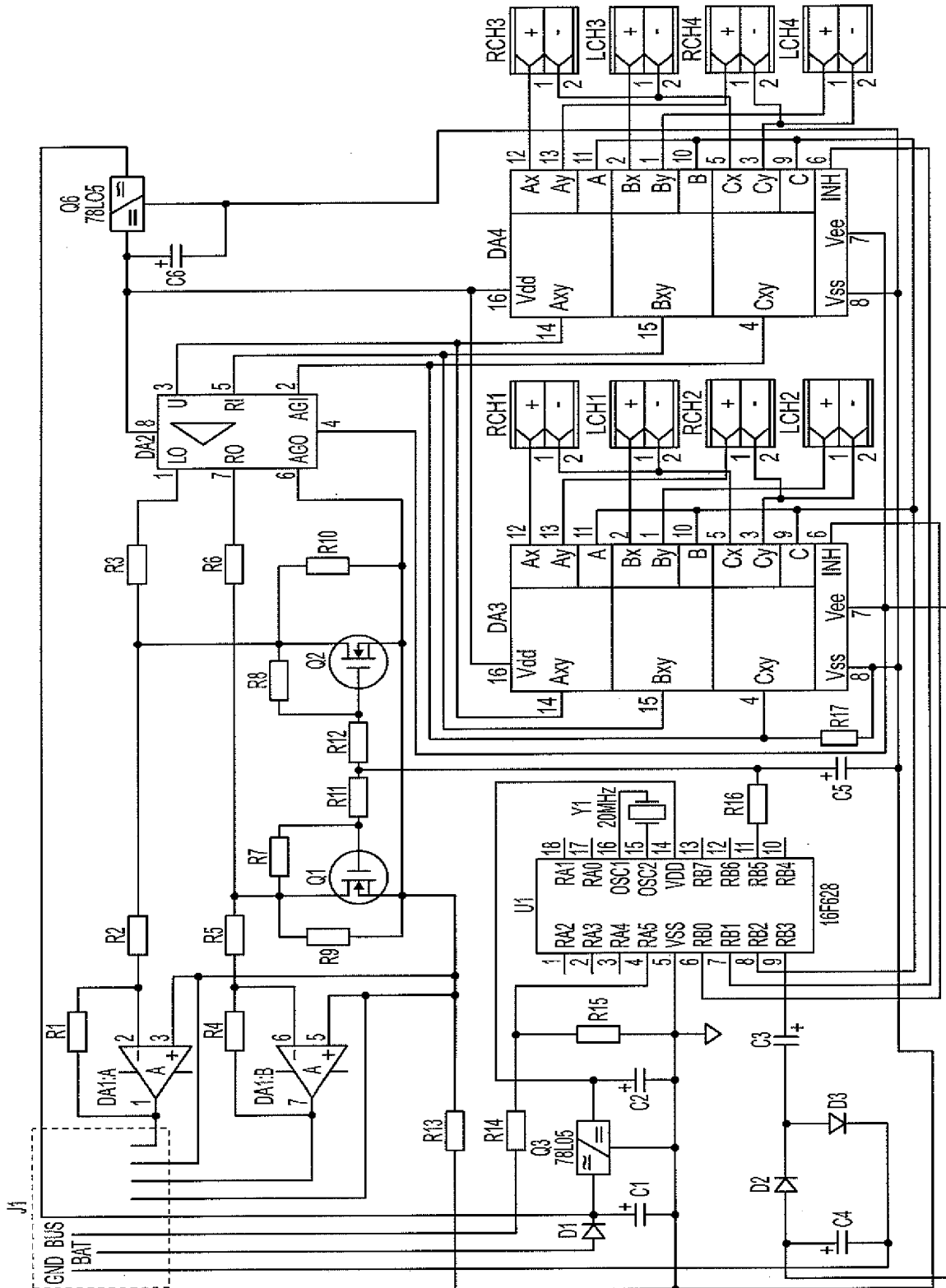
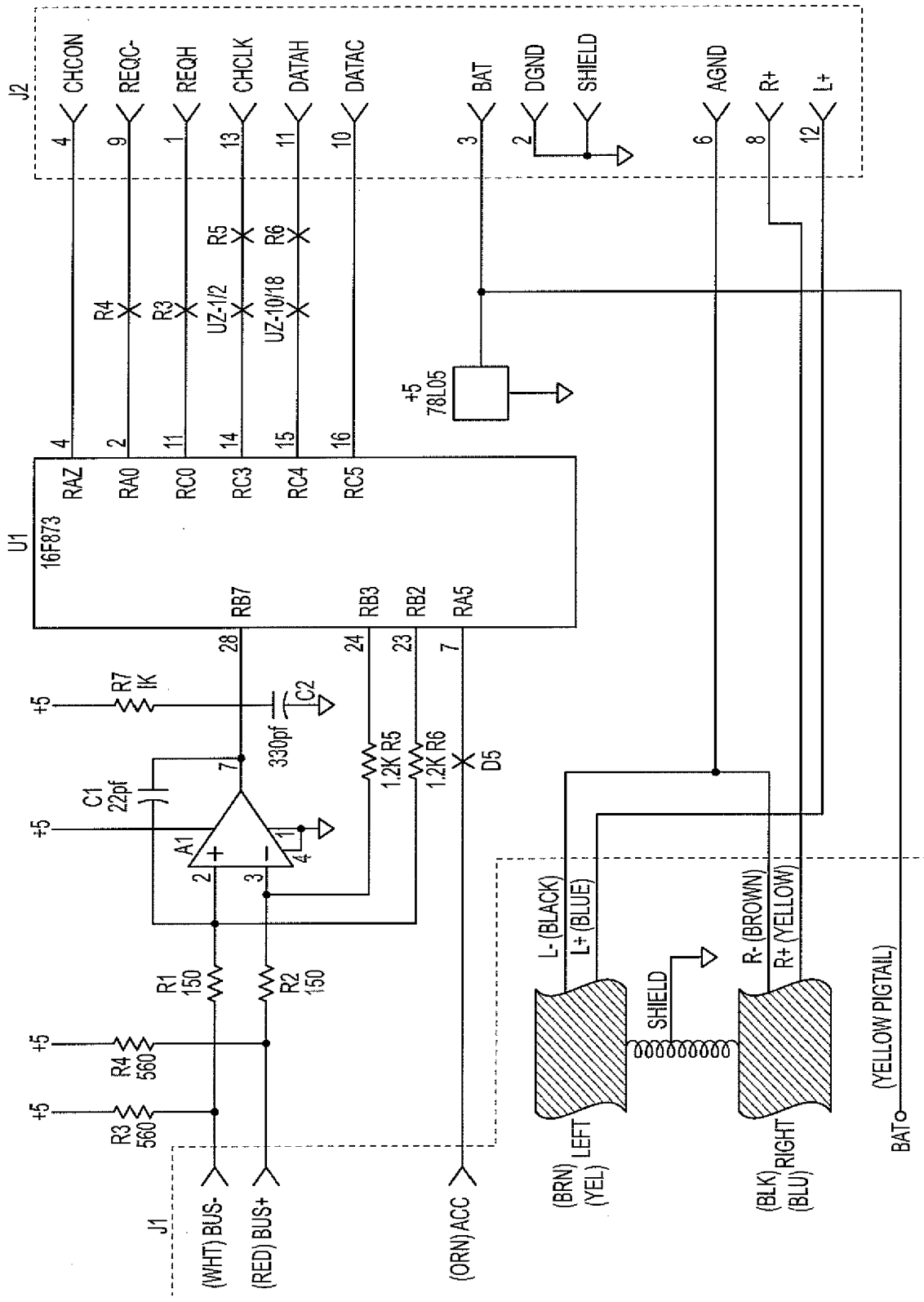


FIG. 3B

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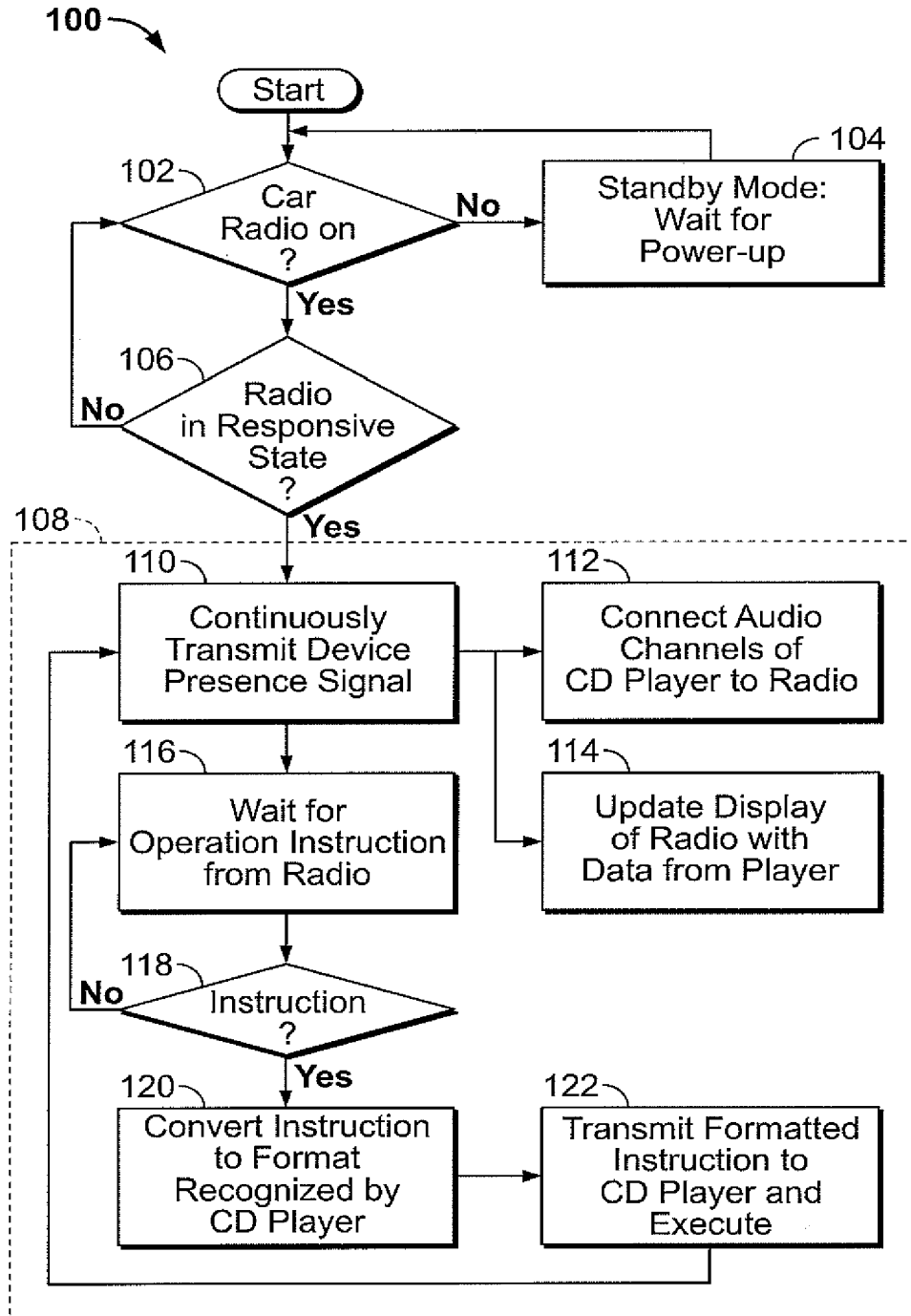


FIG. 4A

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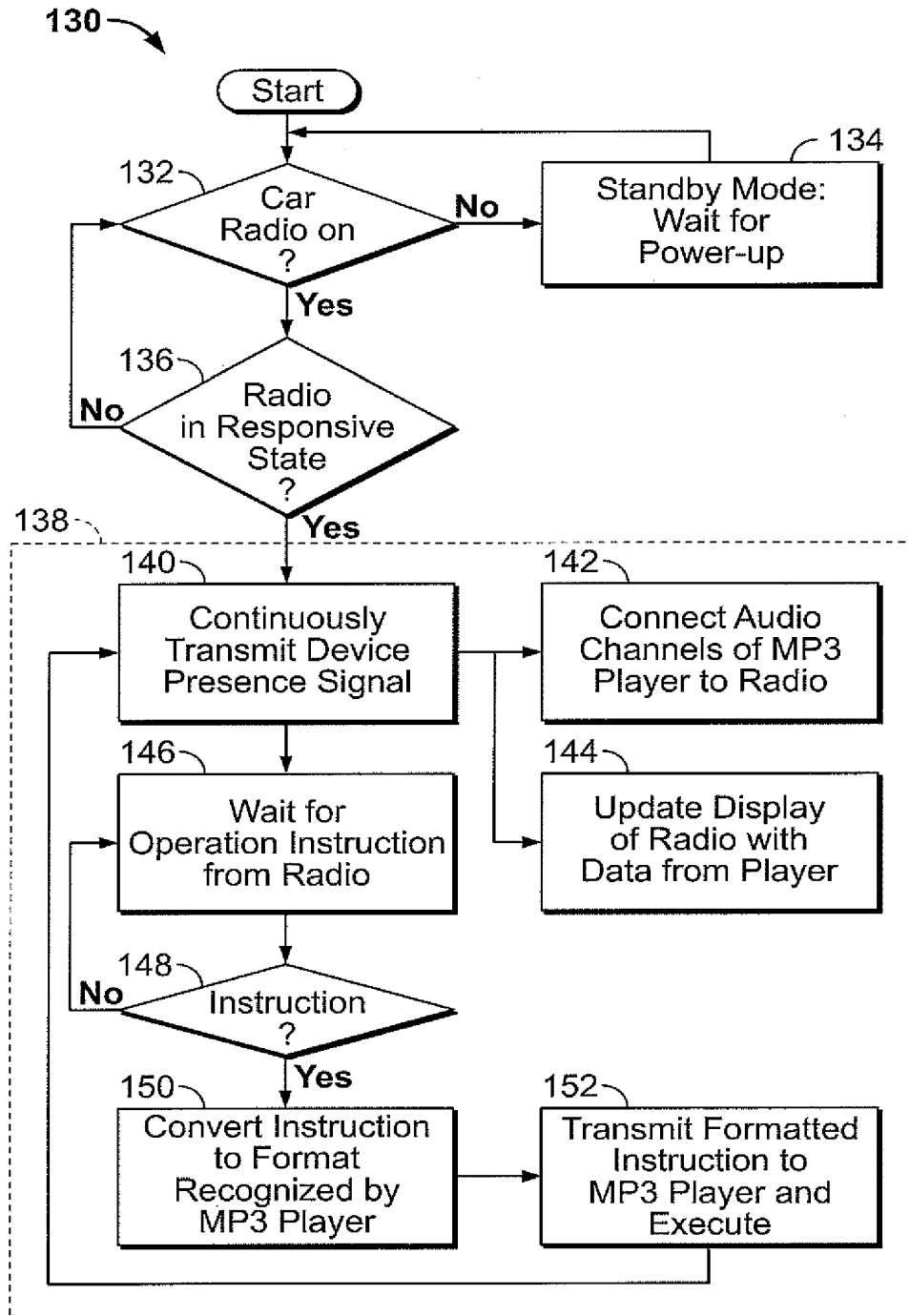


FIG. 4B

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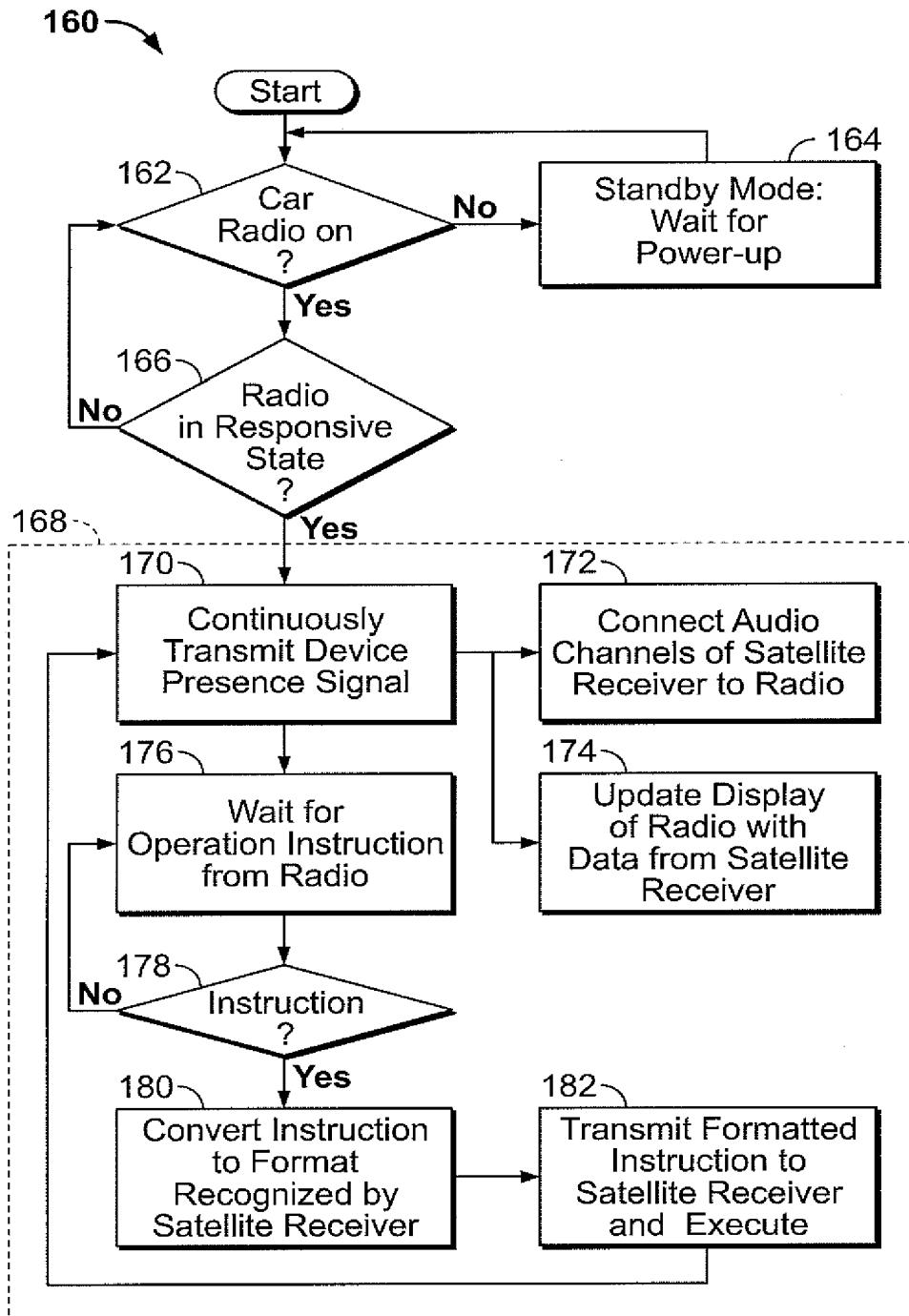


FIG. 4C

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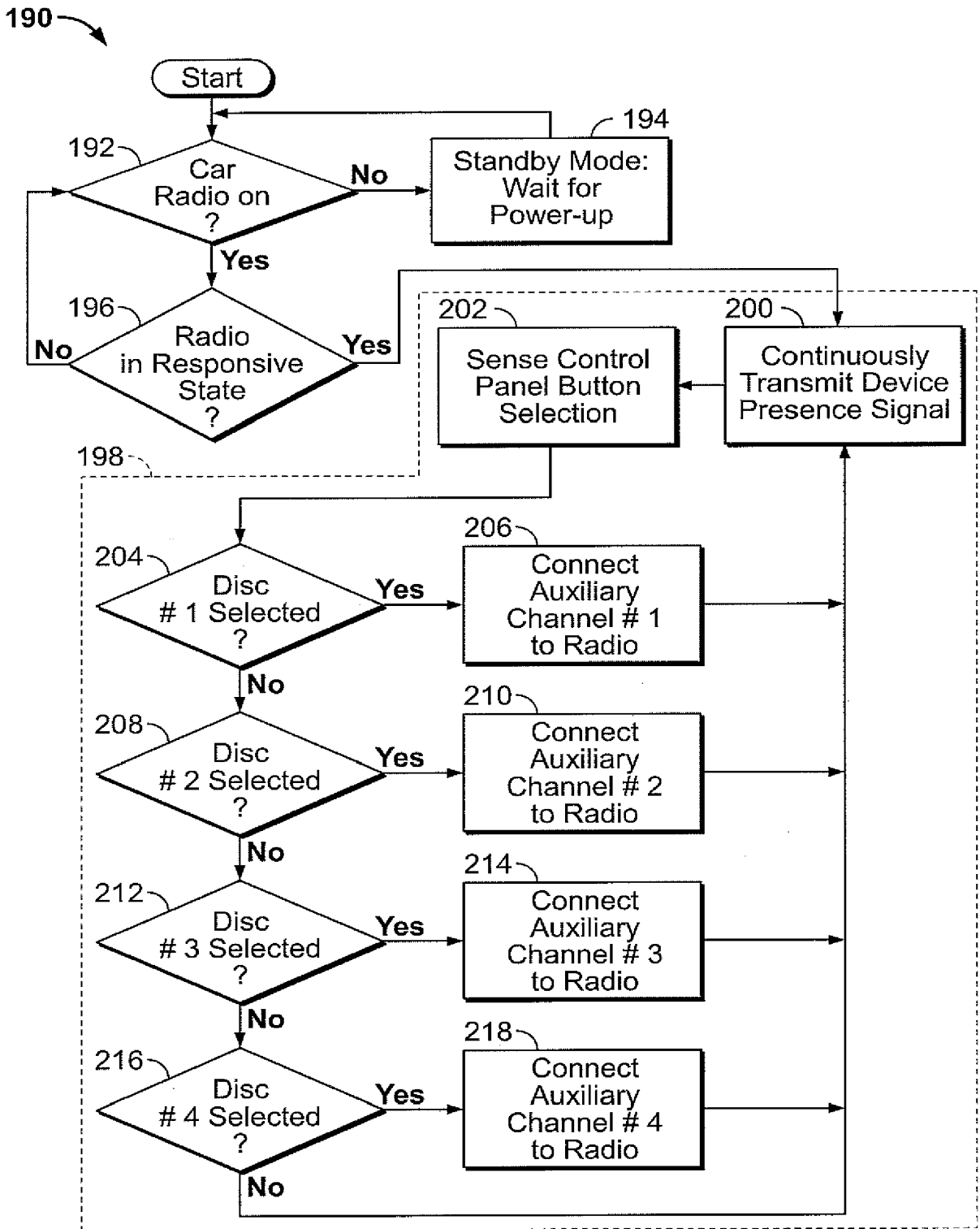


FIG. 4D

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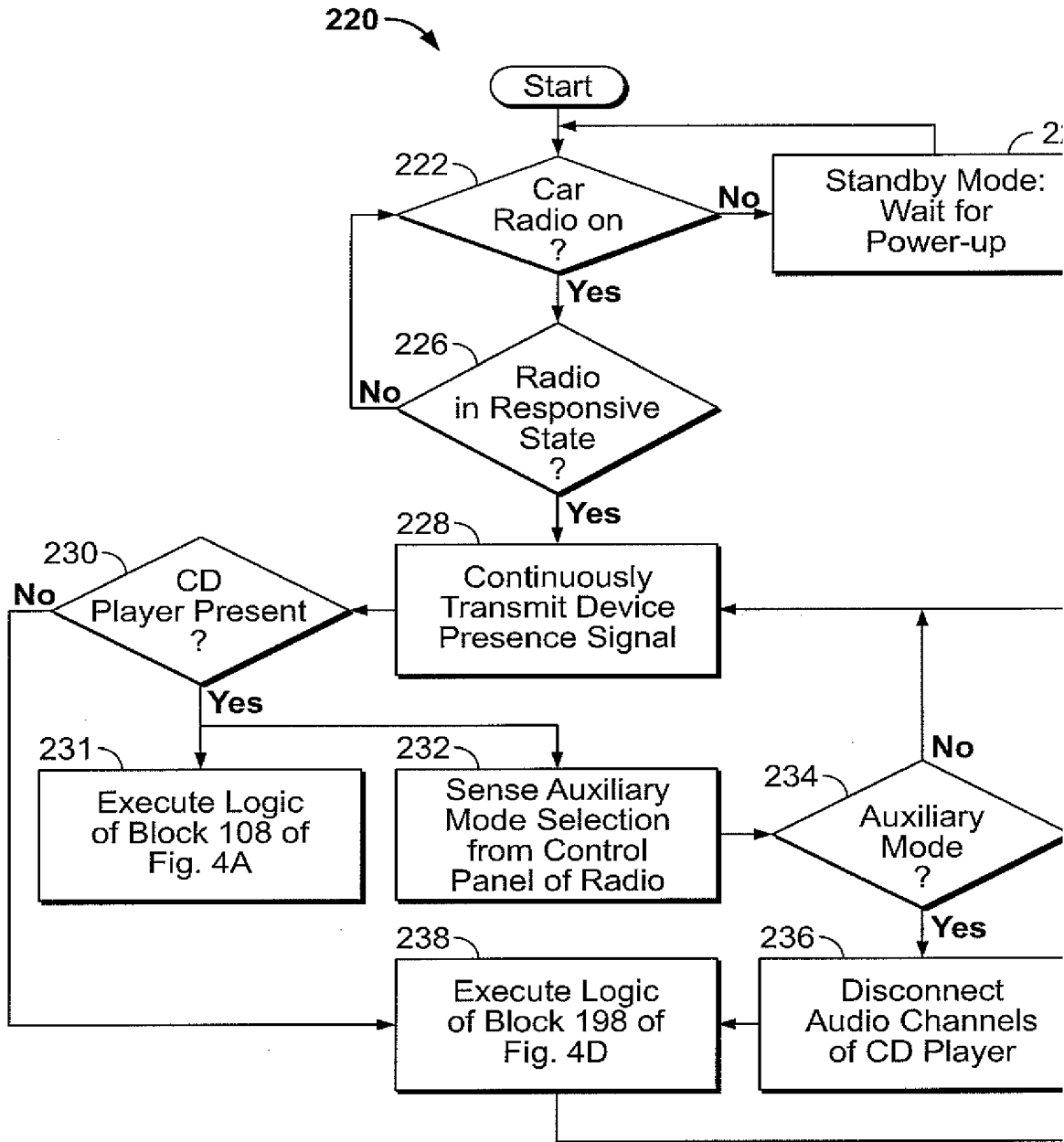


FIG. 4E

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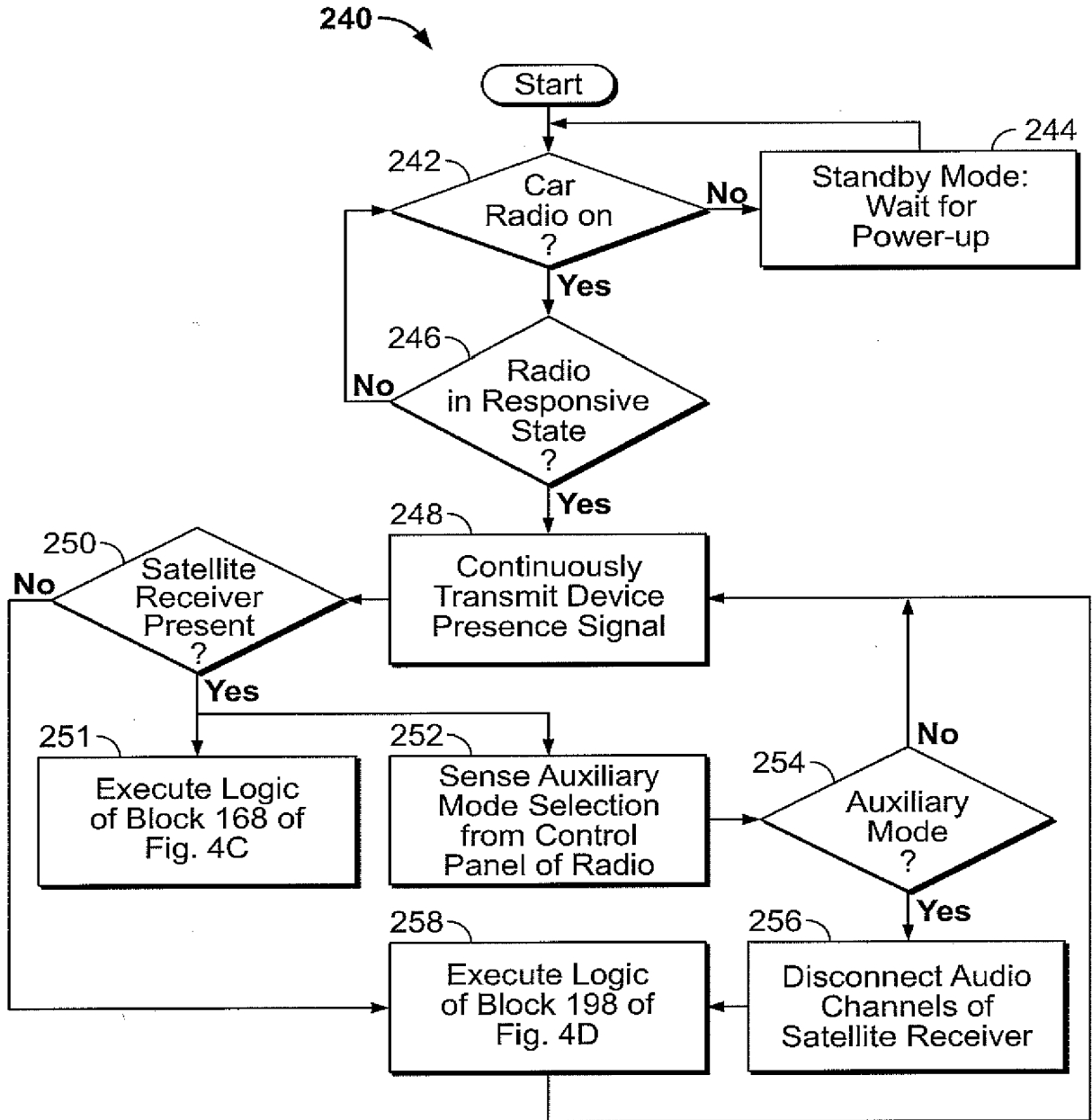


FIG. 4F

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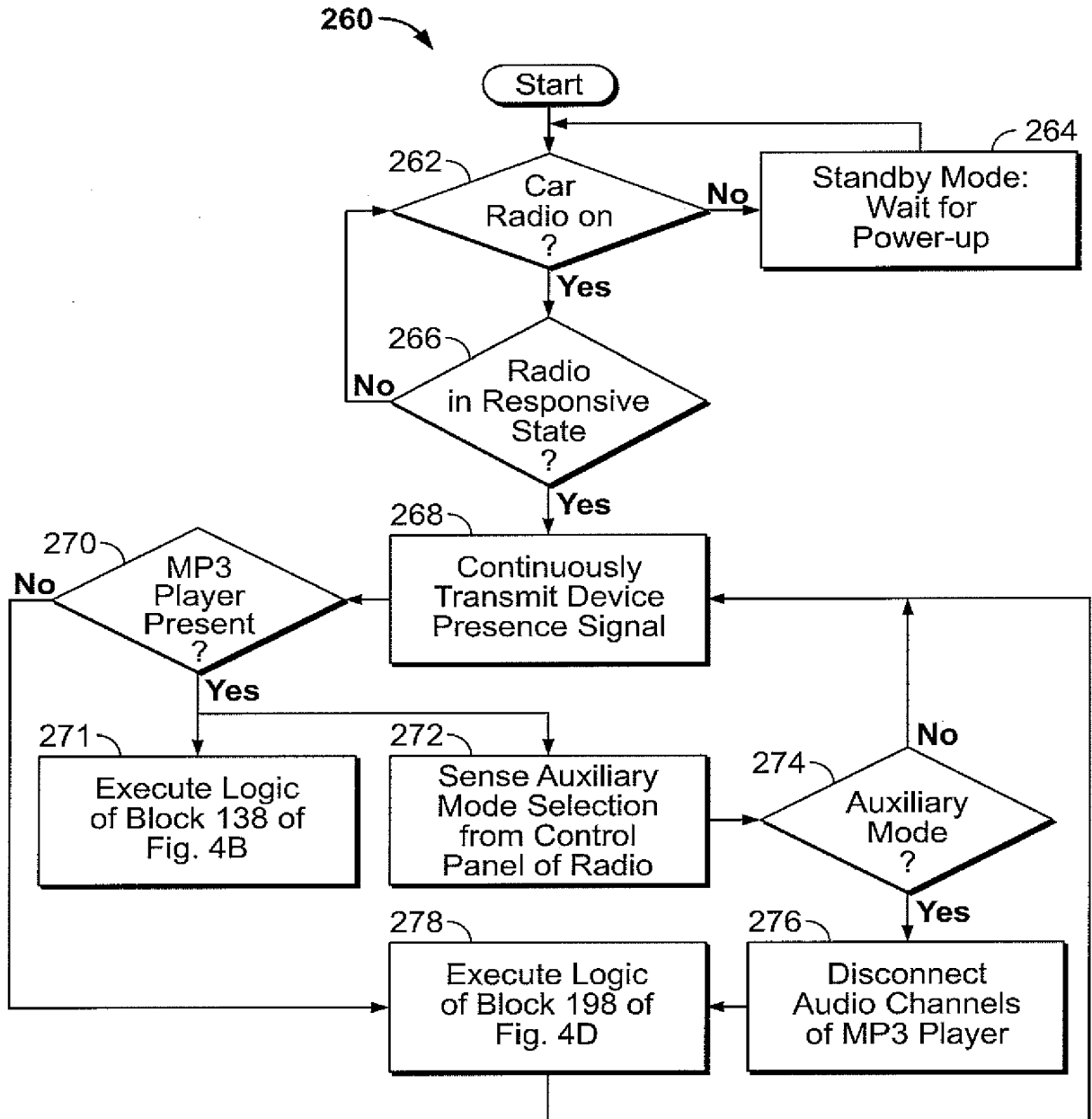


FIG. 4G

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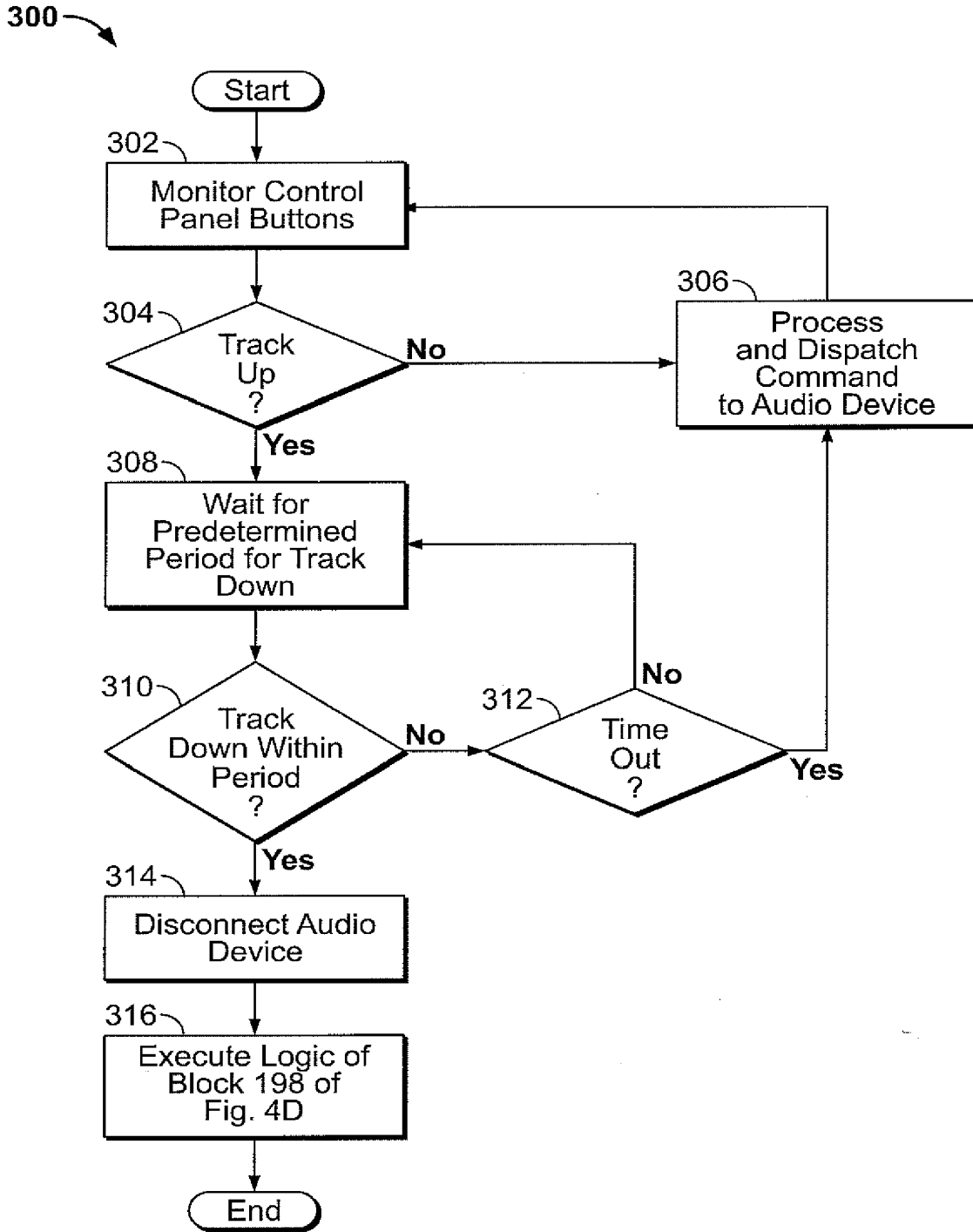


FIG. 5

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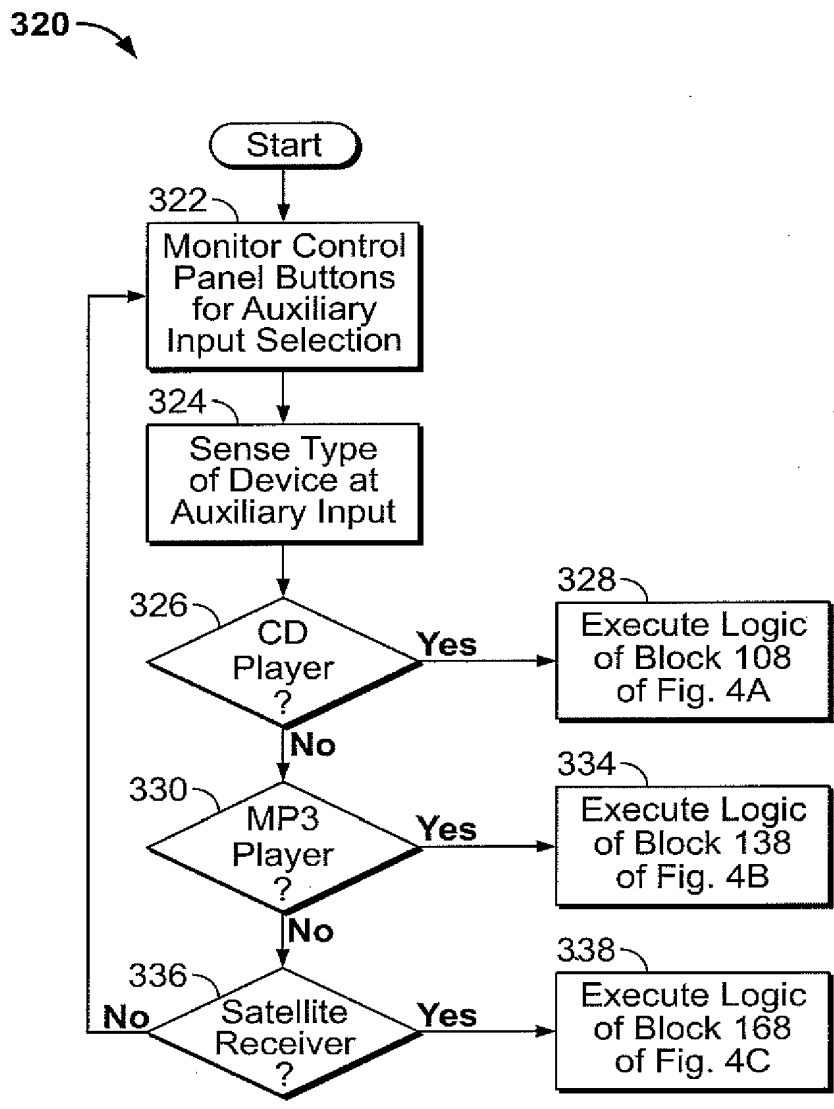


FIG. 6

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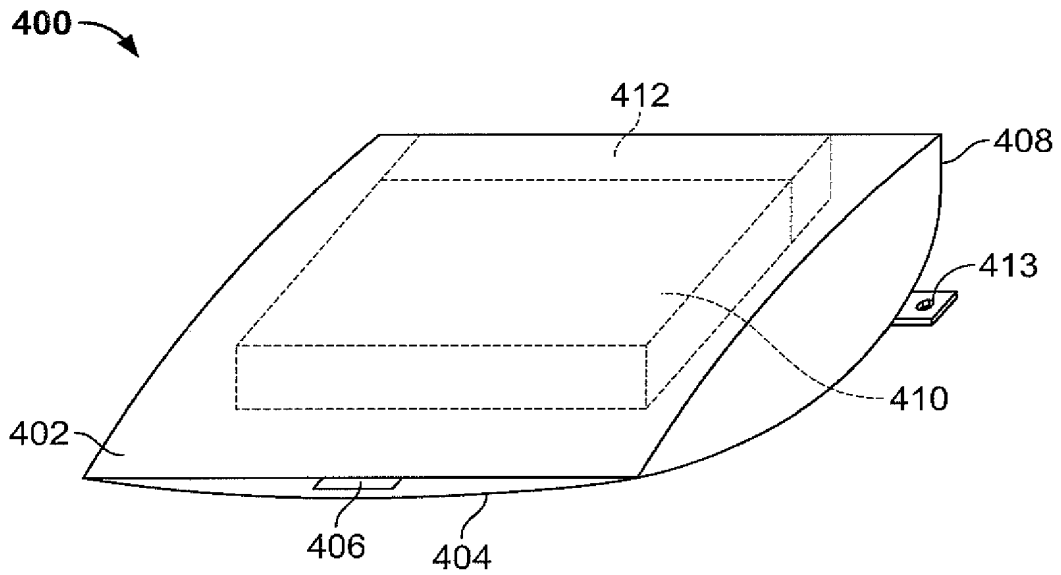


FIG. 7A

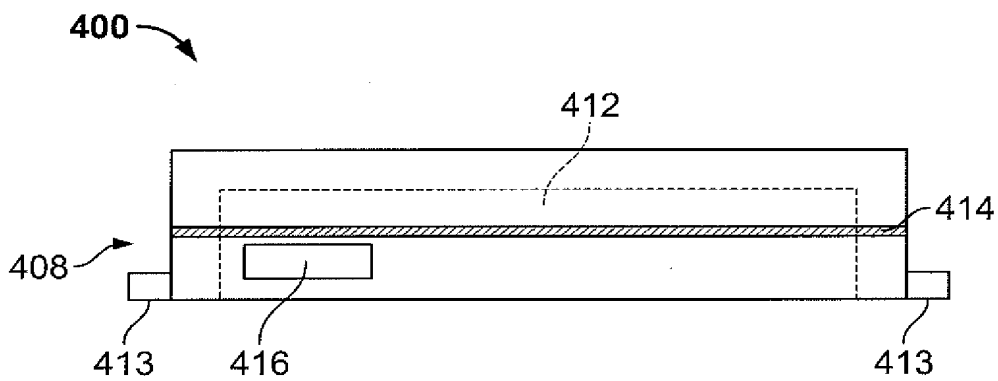


FIG. 7B

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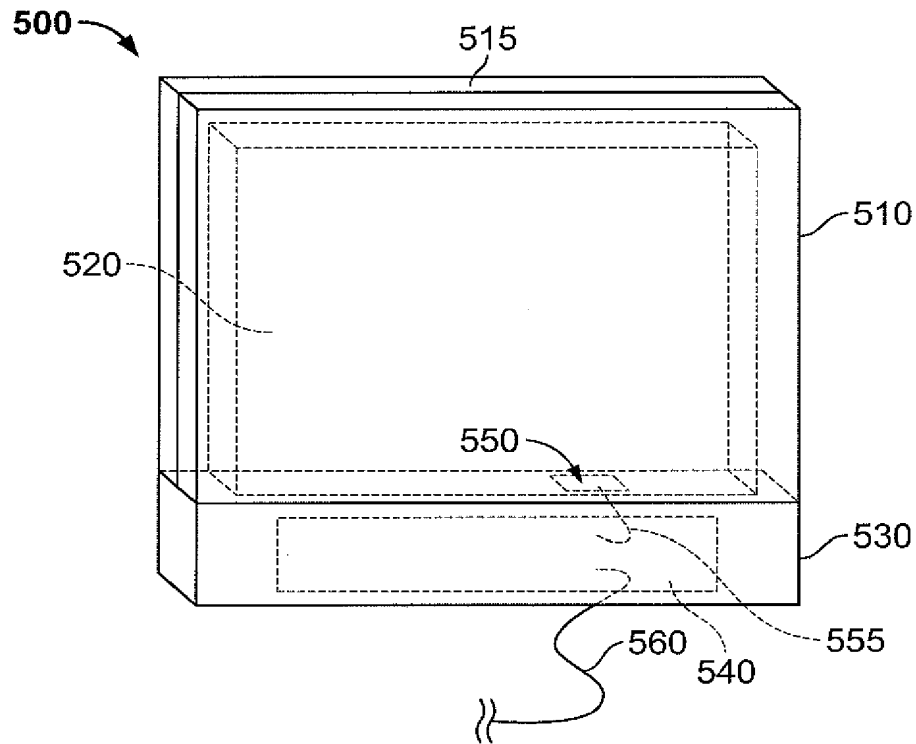


FIG. 8A

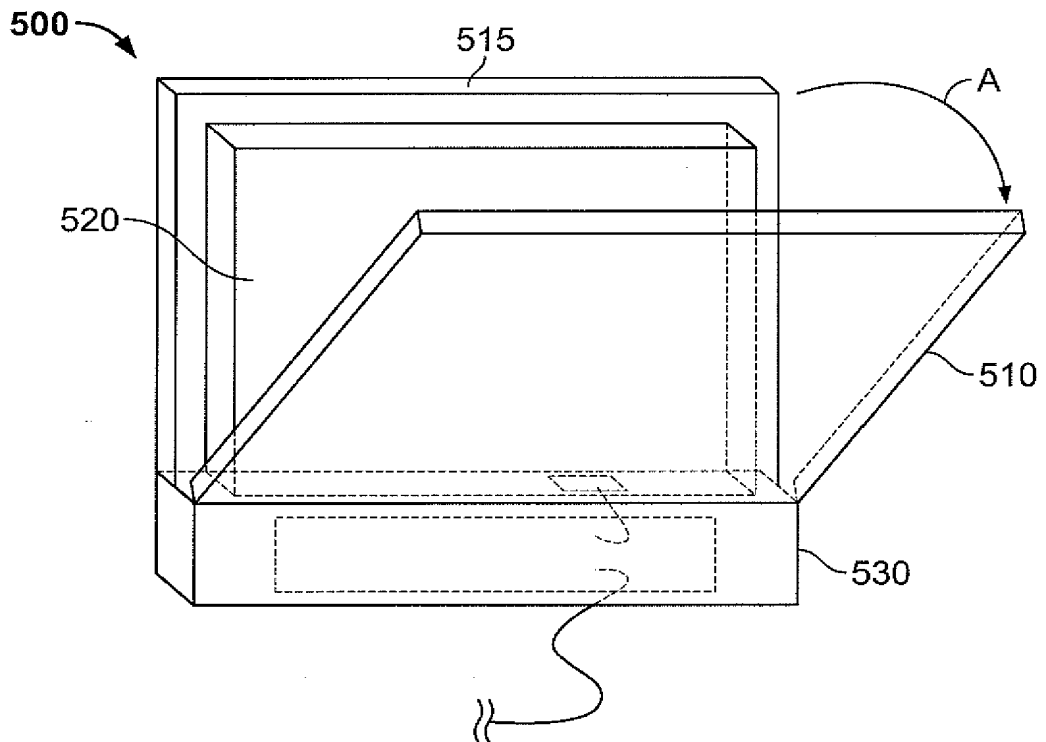


FIG. 8B

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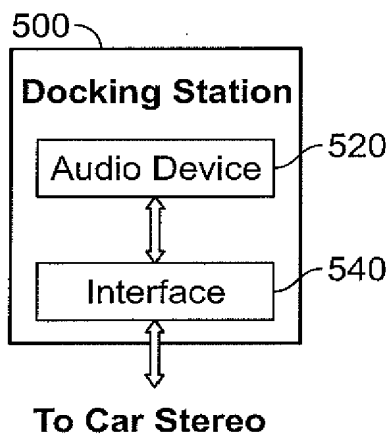


FIG. 9

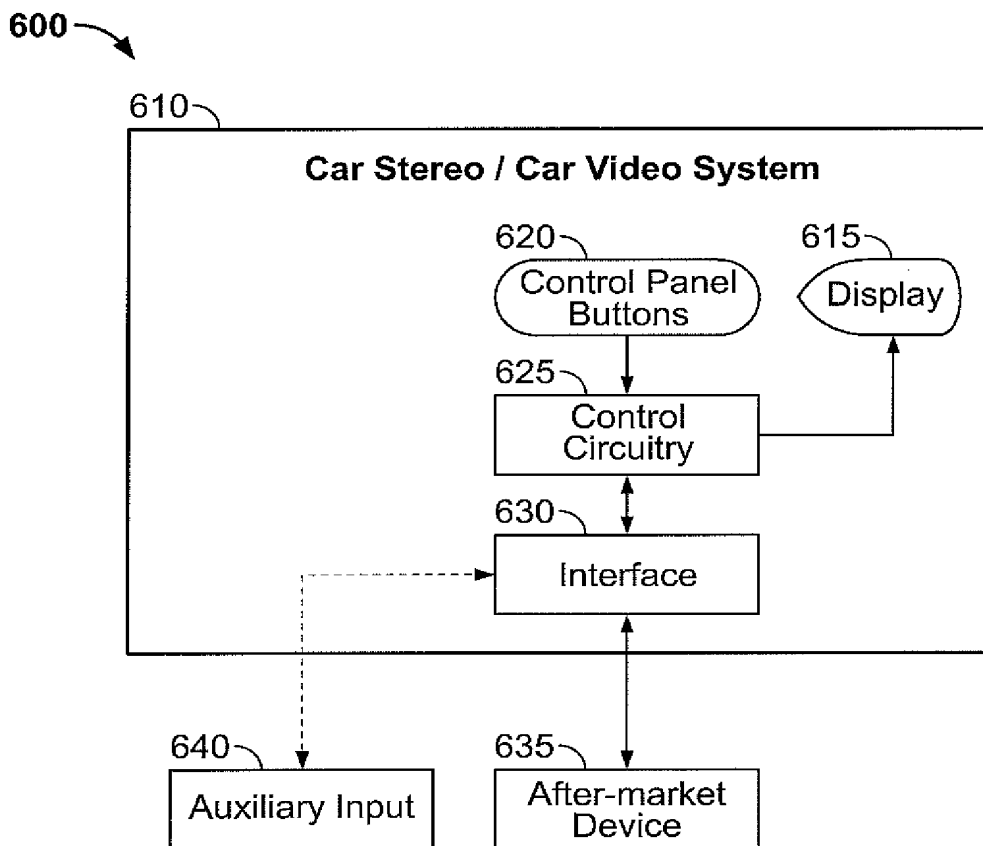


FIG. 10

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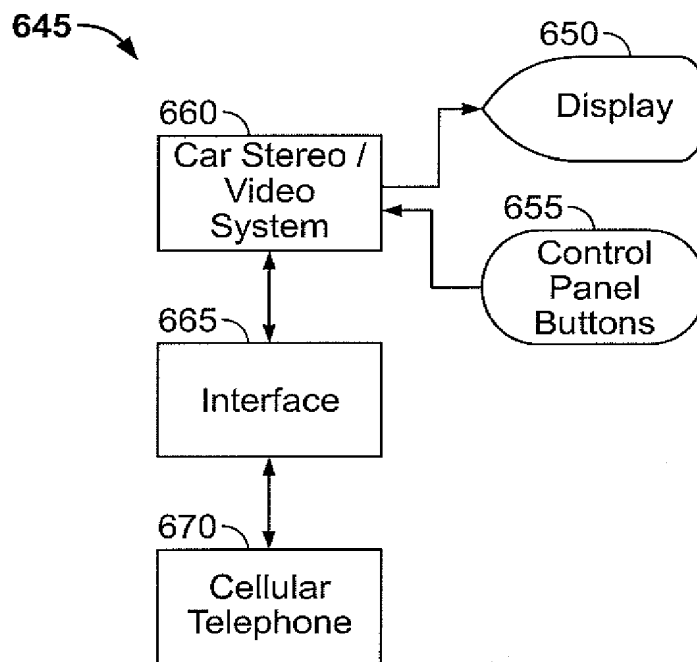


FIG. 11A

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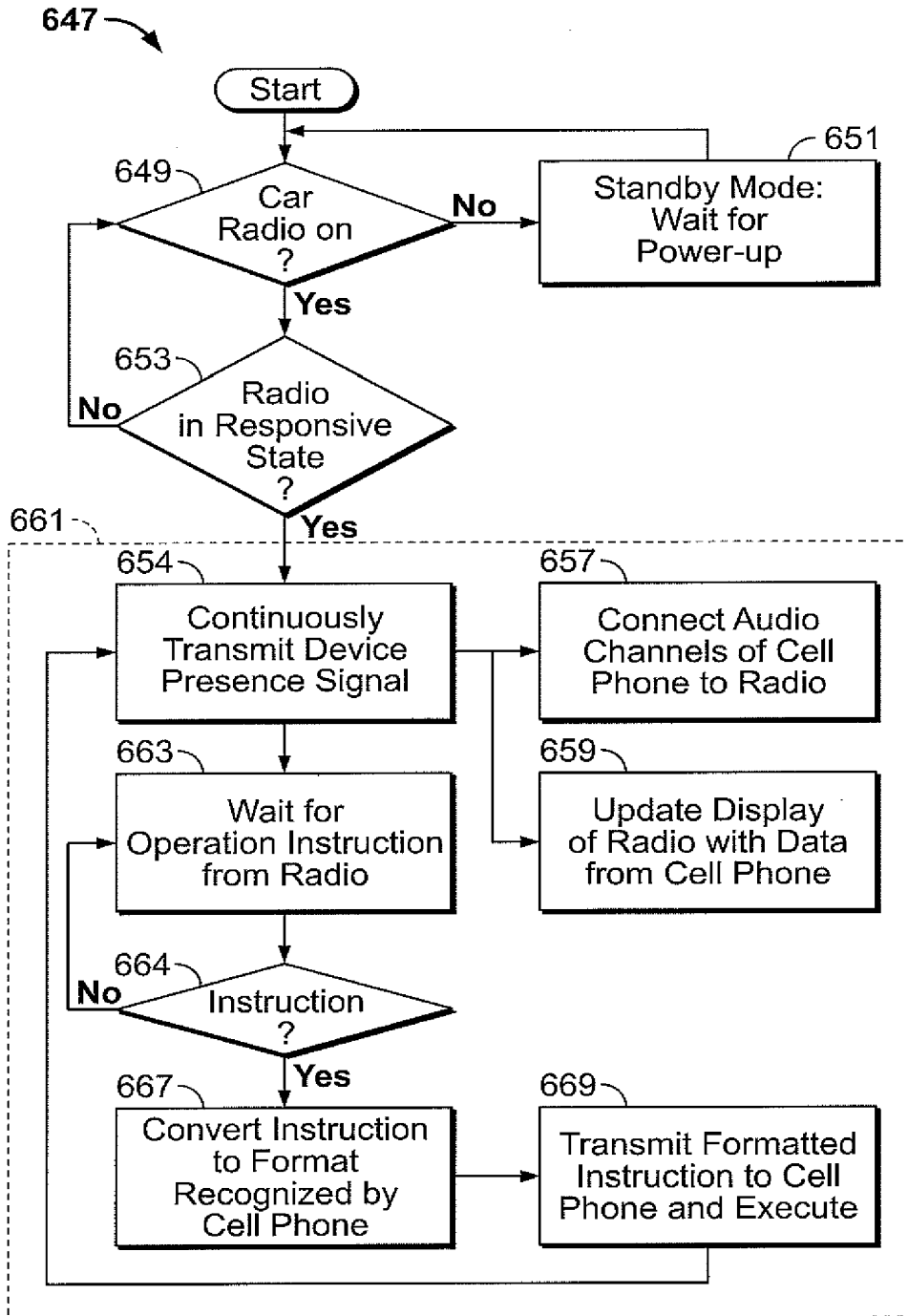


FIG. 11B

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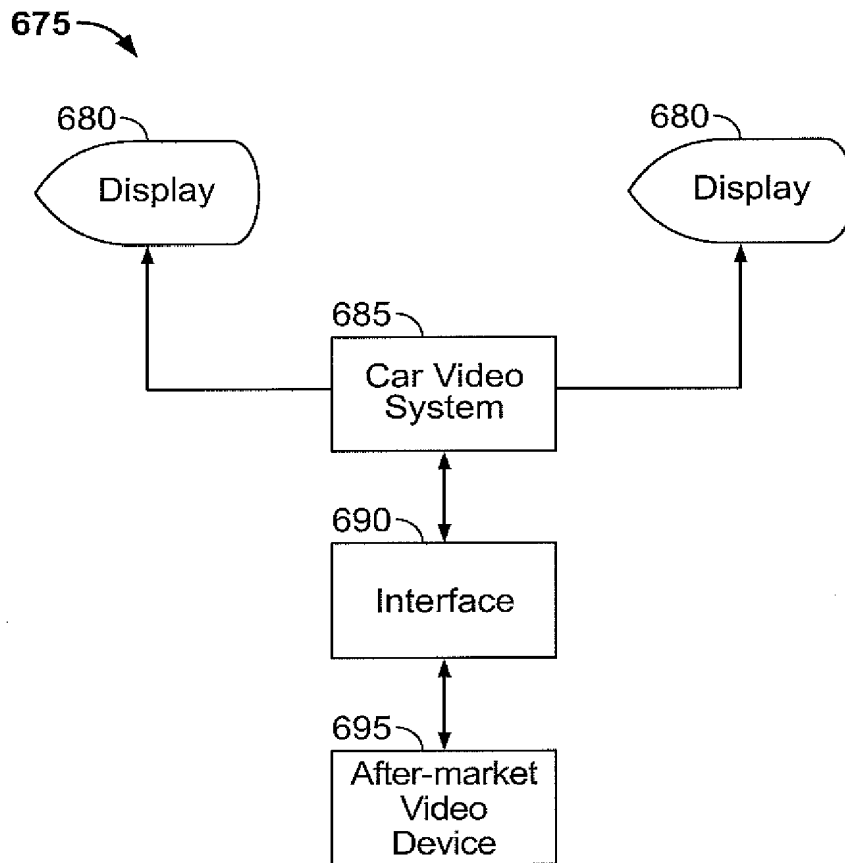


FIG. 12A

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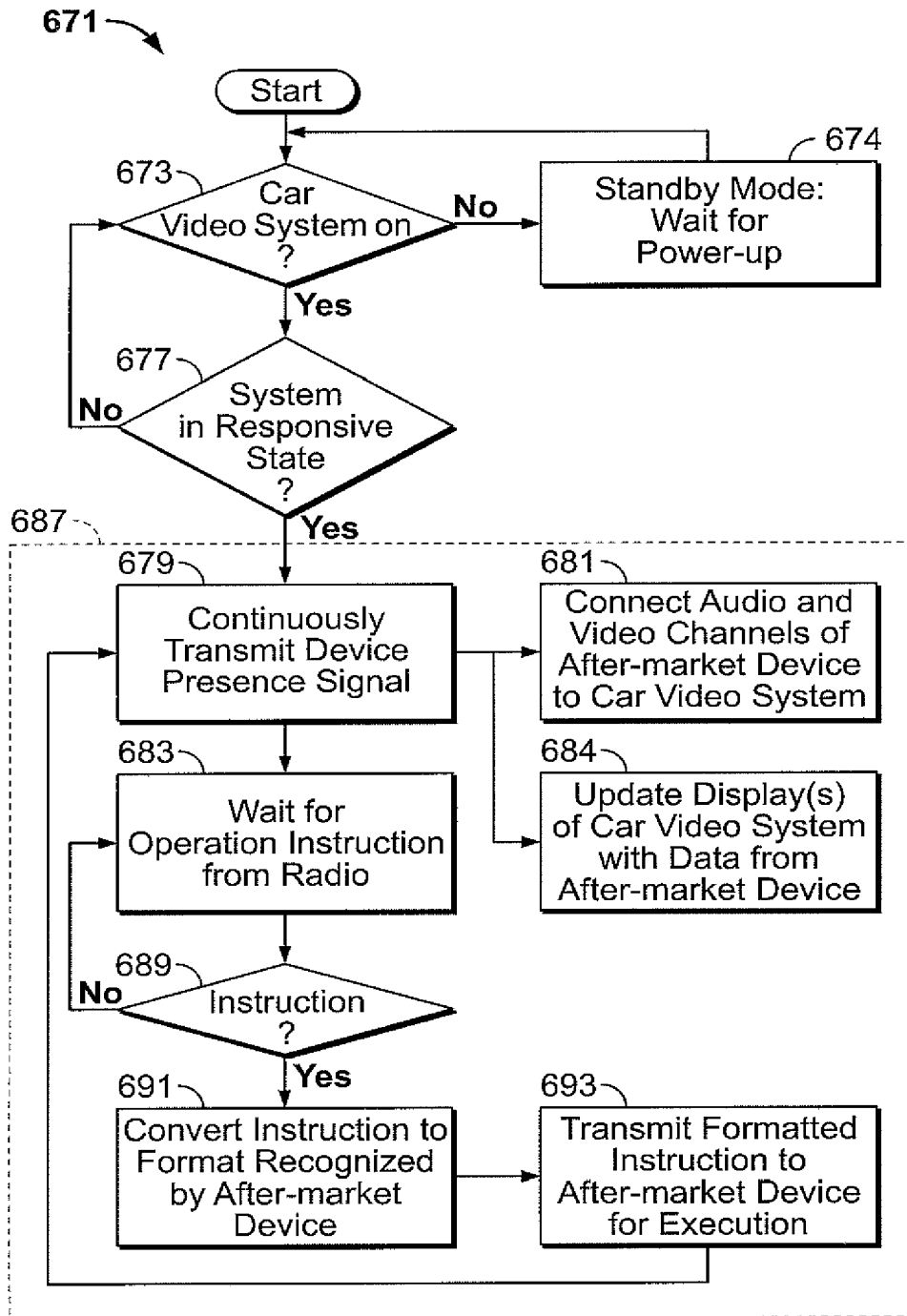
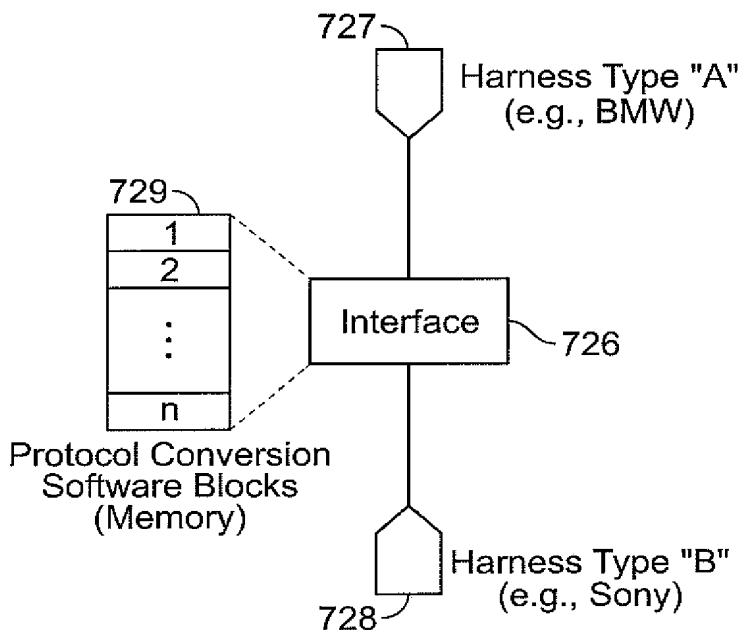
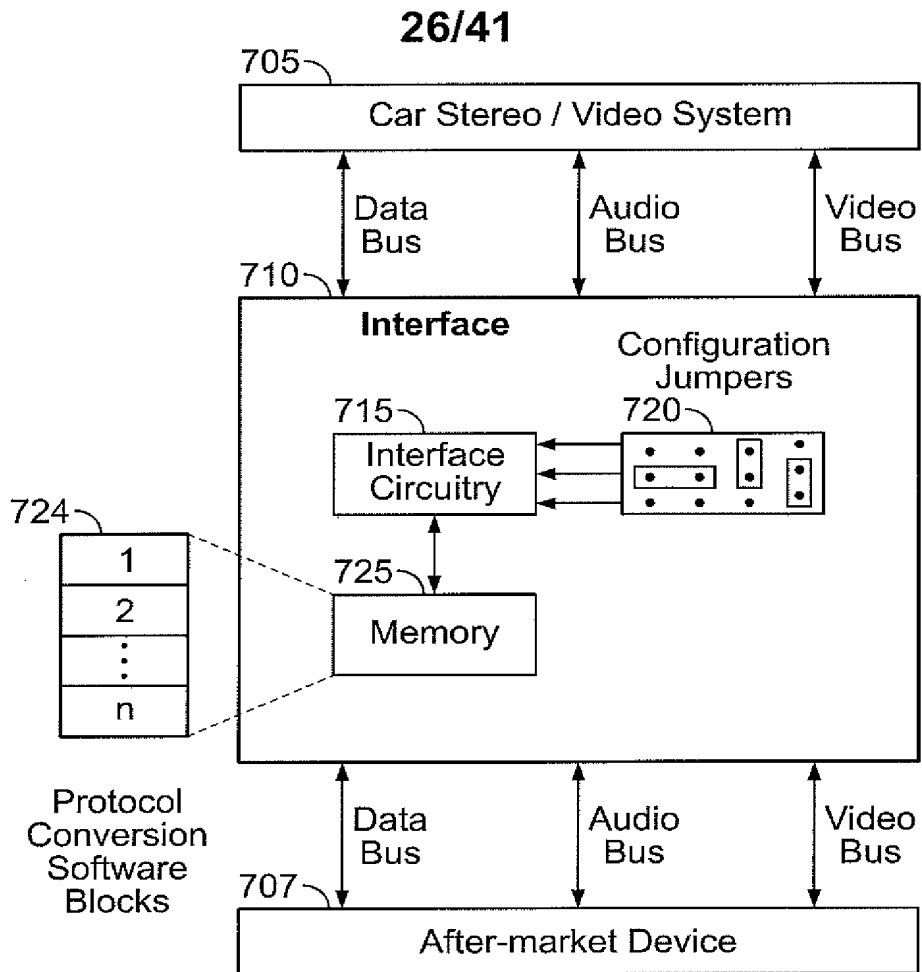


FIG. 12B



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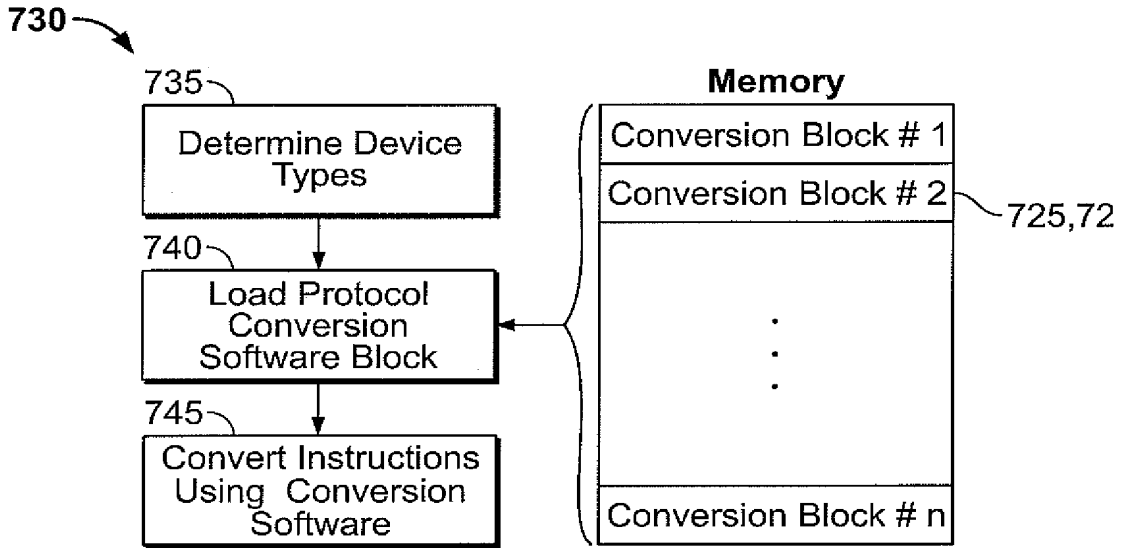


FIG. 14

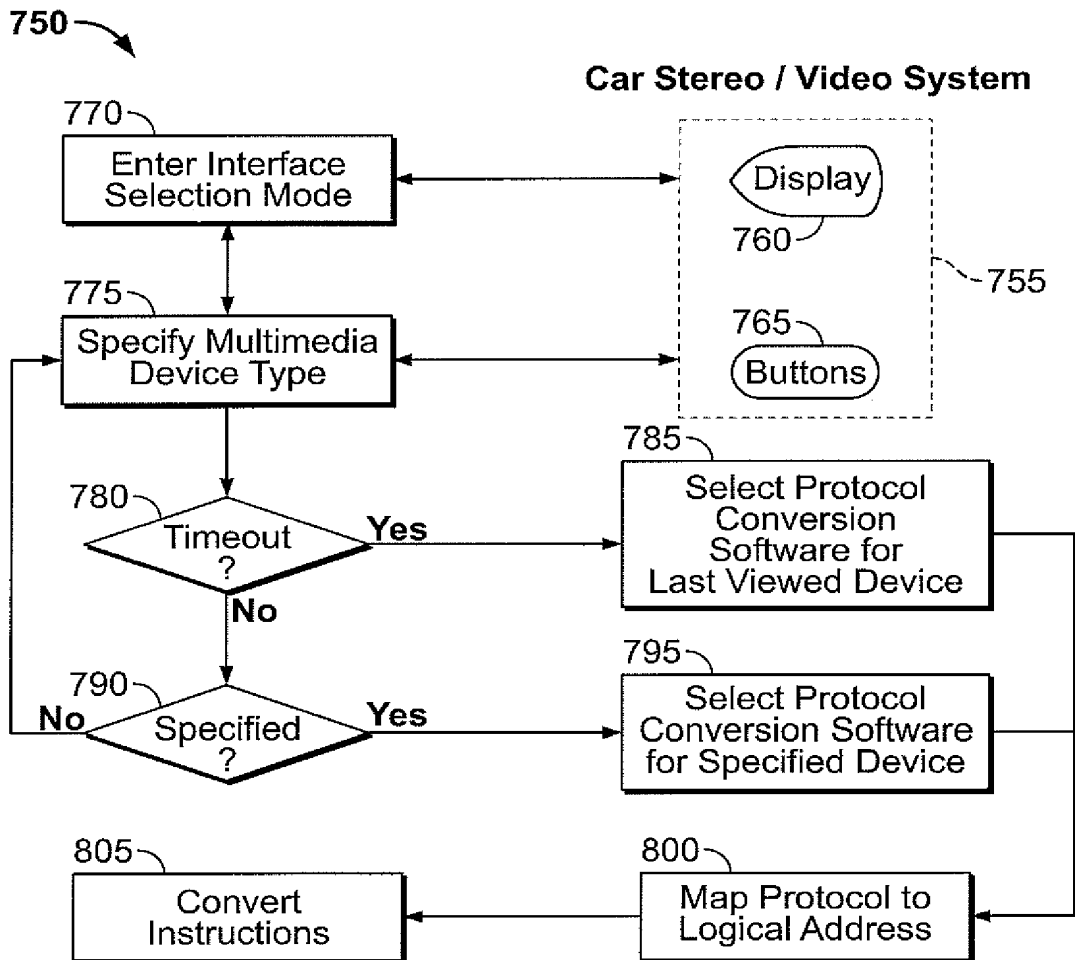


FIG. 15

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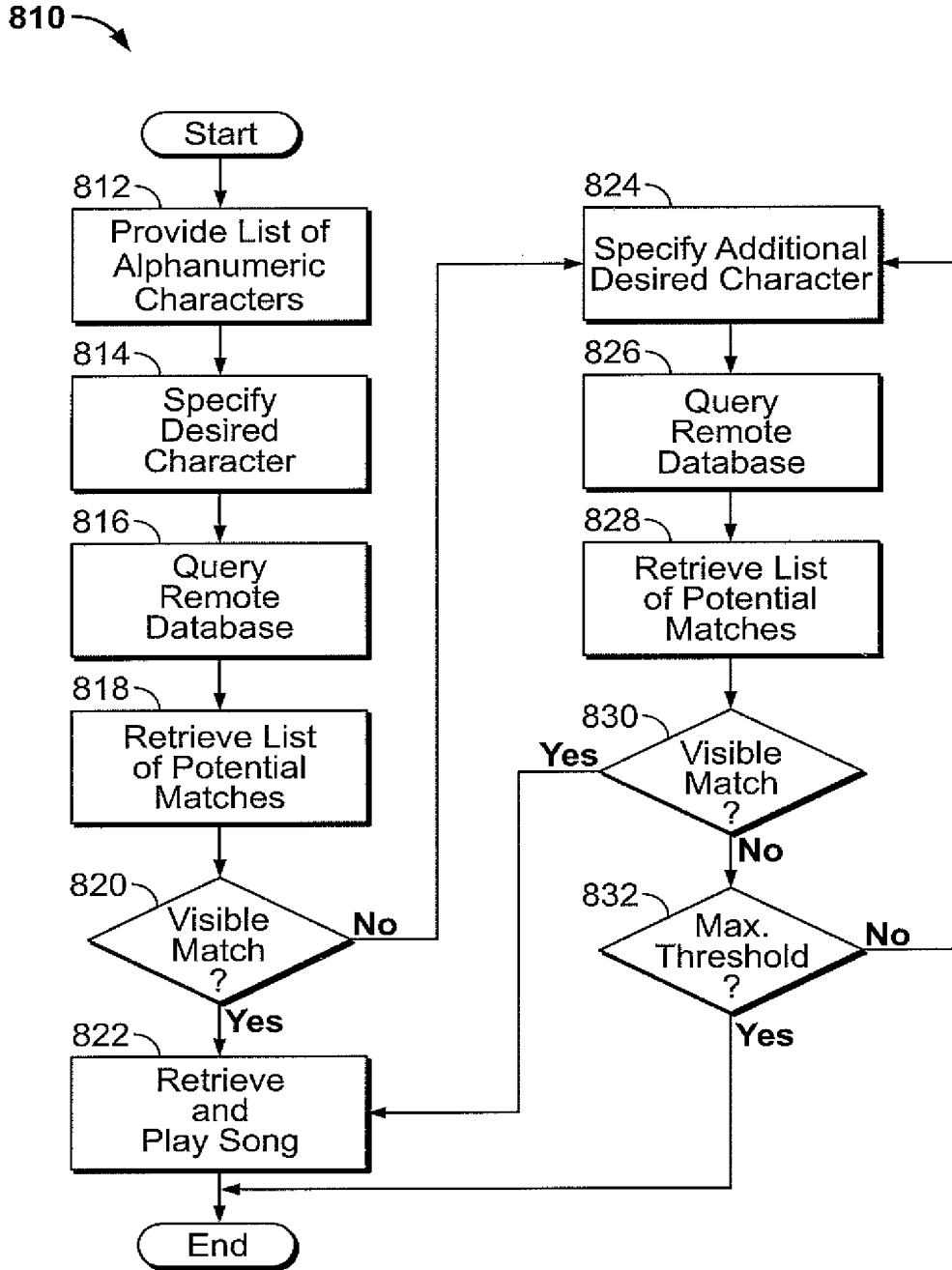


FIG. 16

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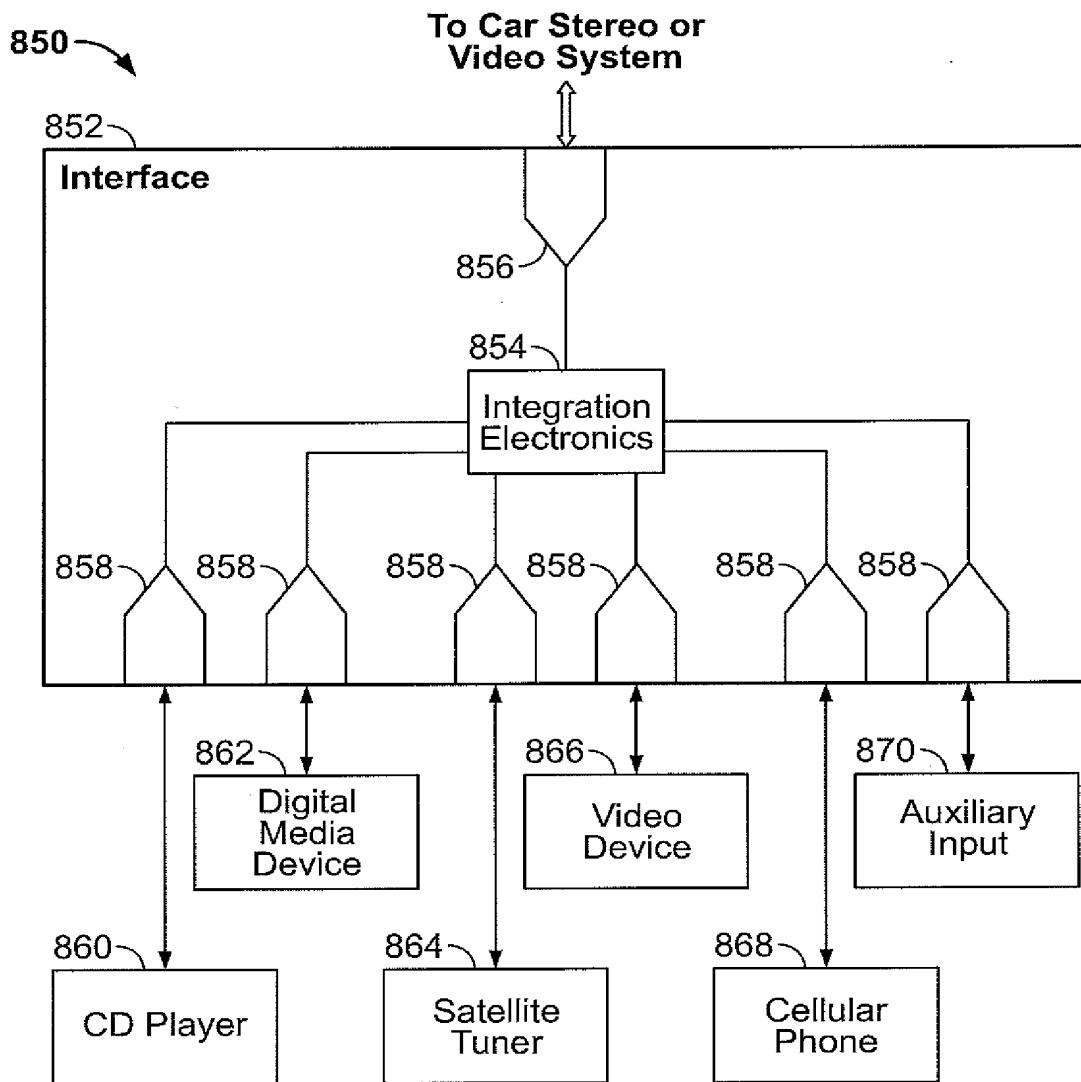


FIG. 17

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900

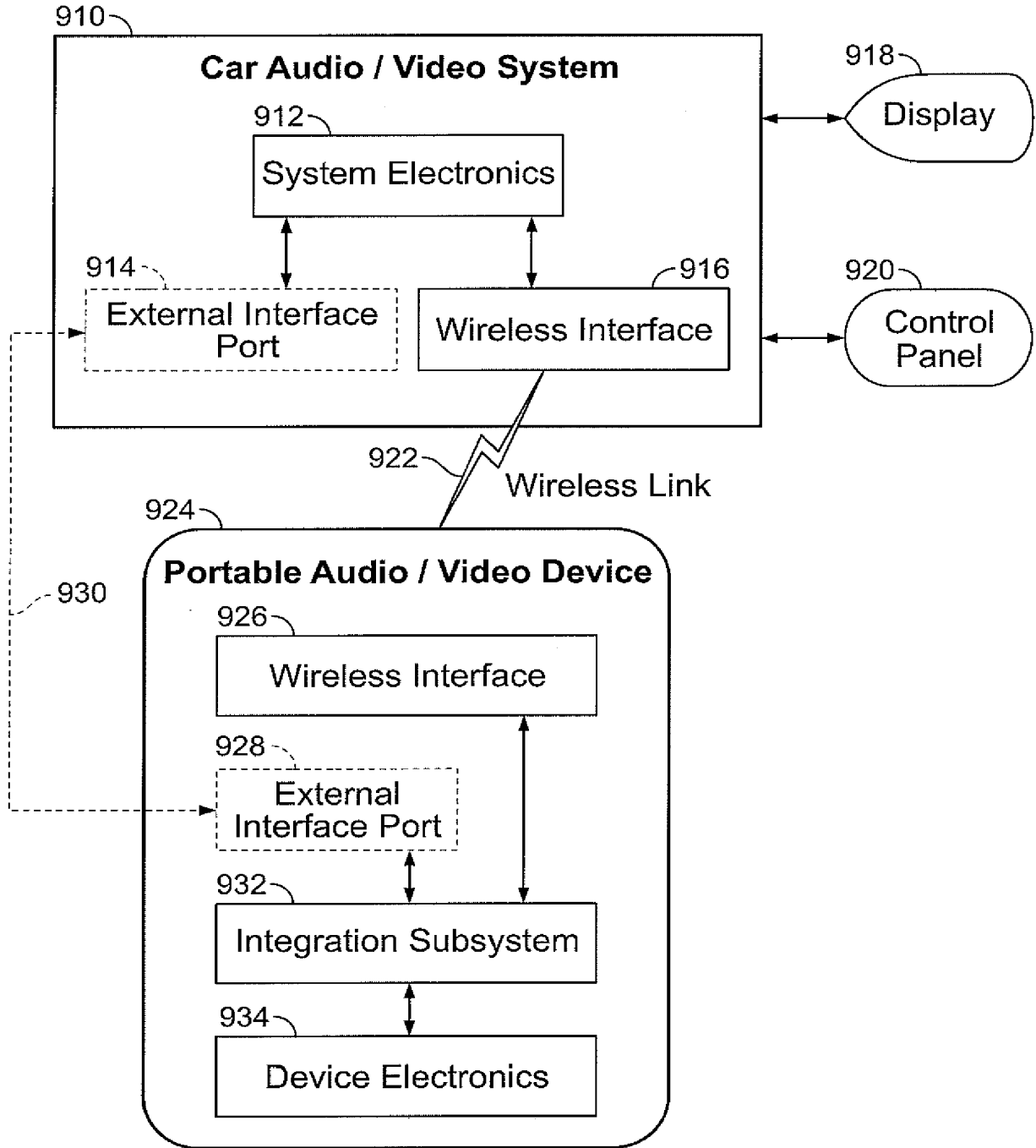


FIG. 18

1000

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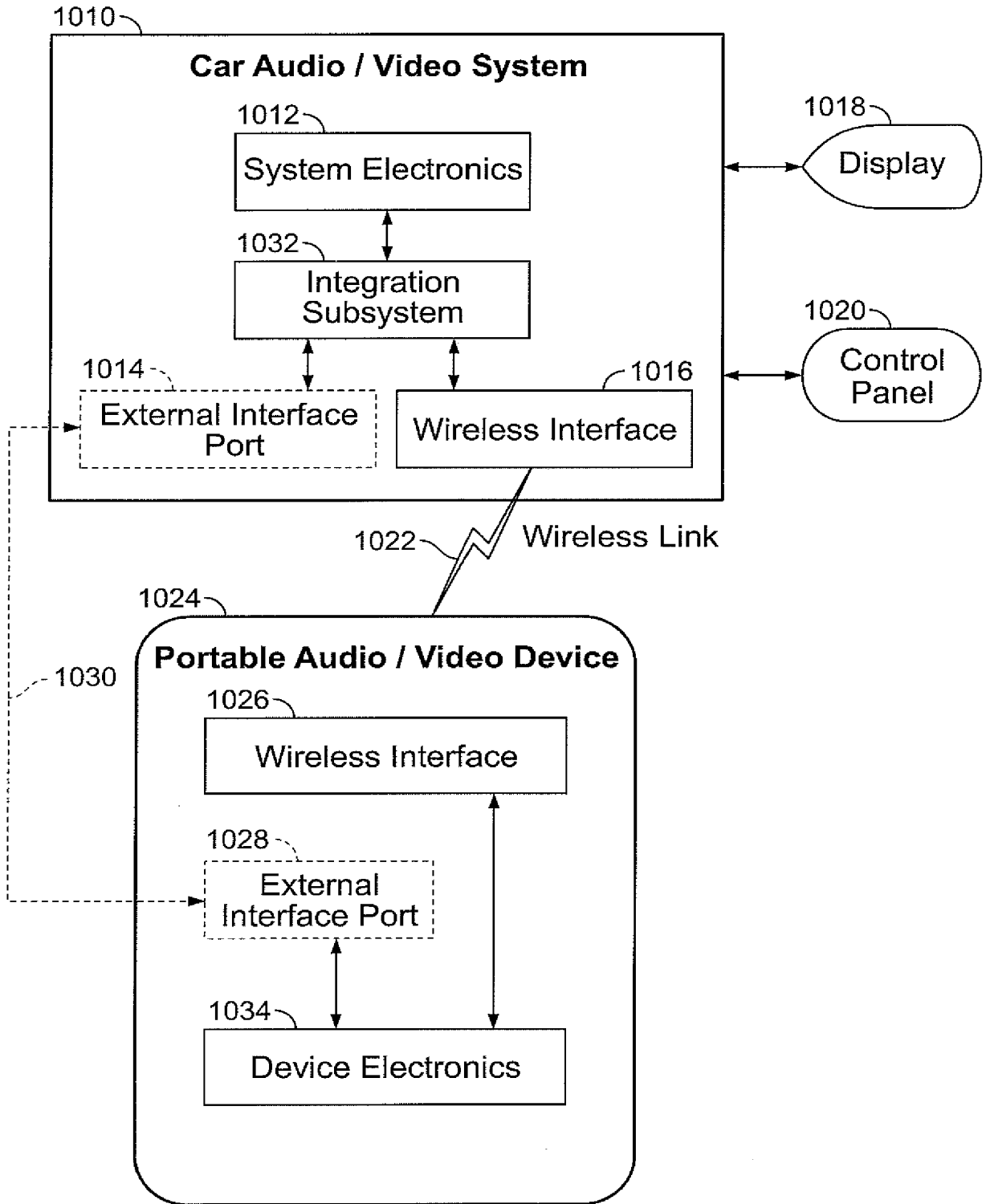


FIG. 19

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1100

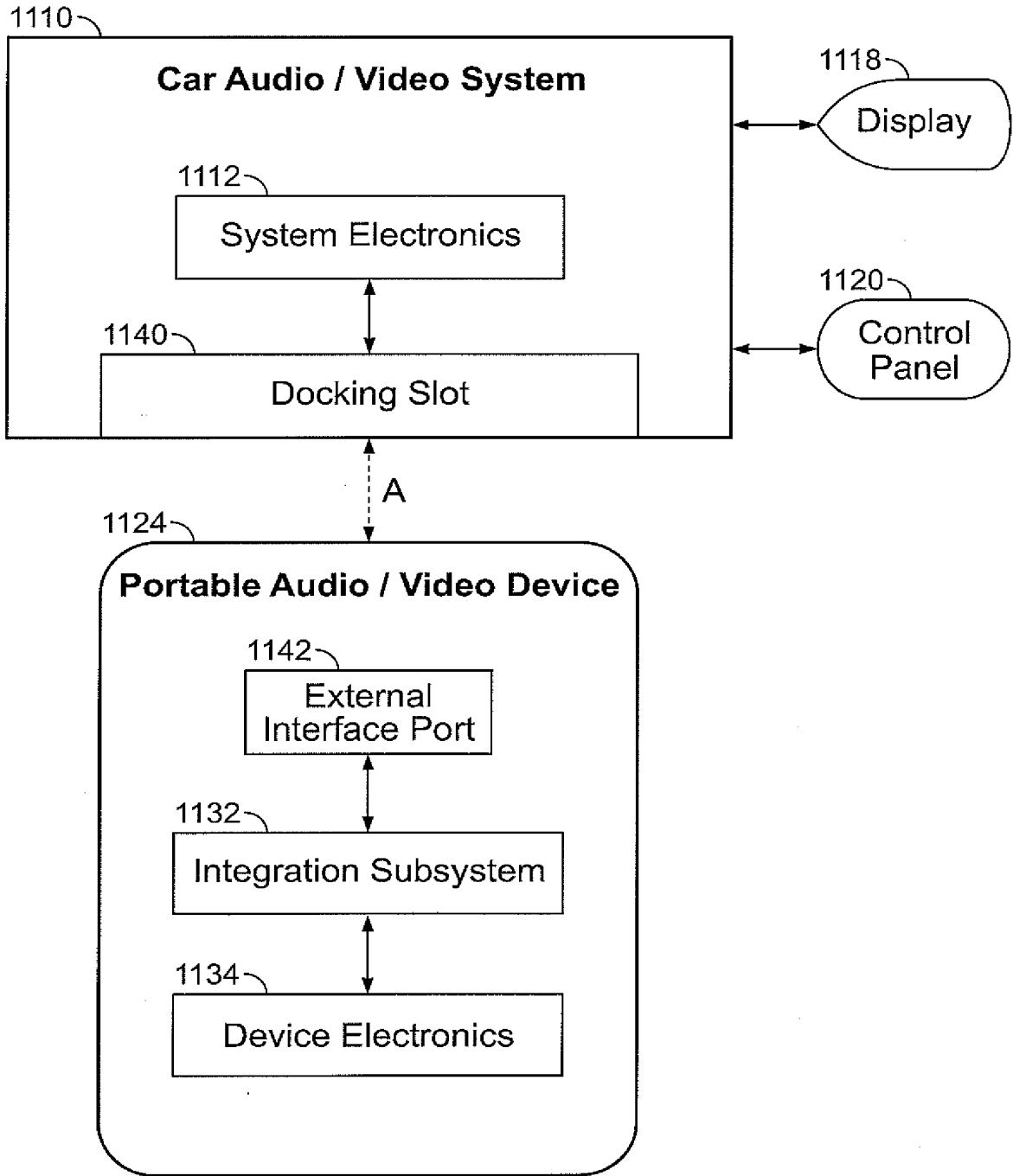


FIG. 20

1200 ↗

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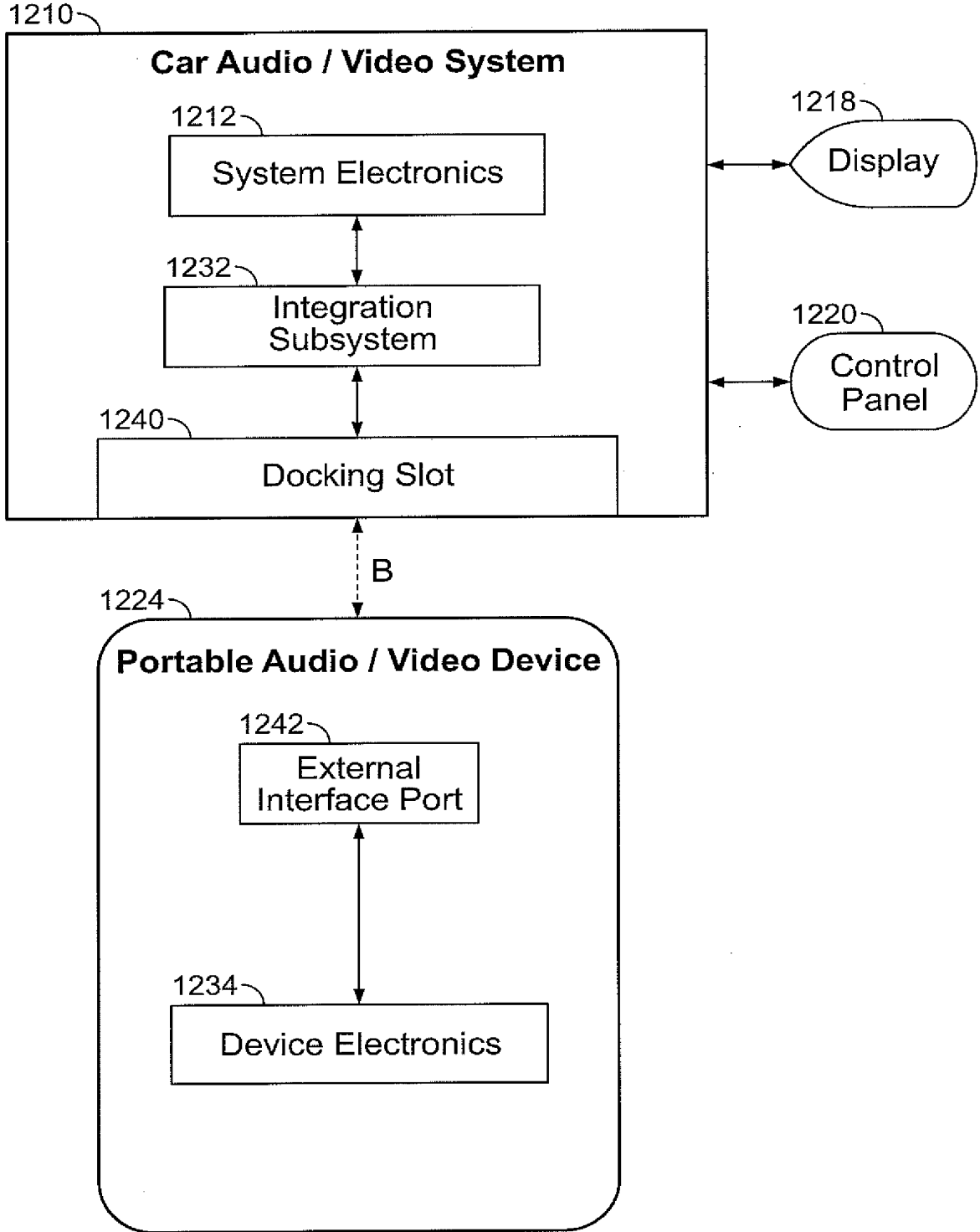


FIG. 21

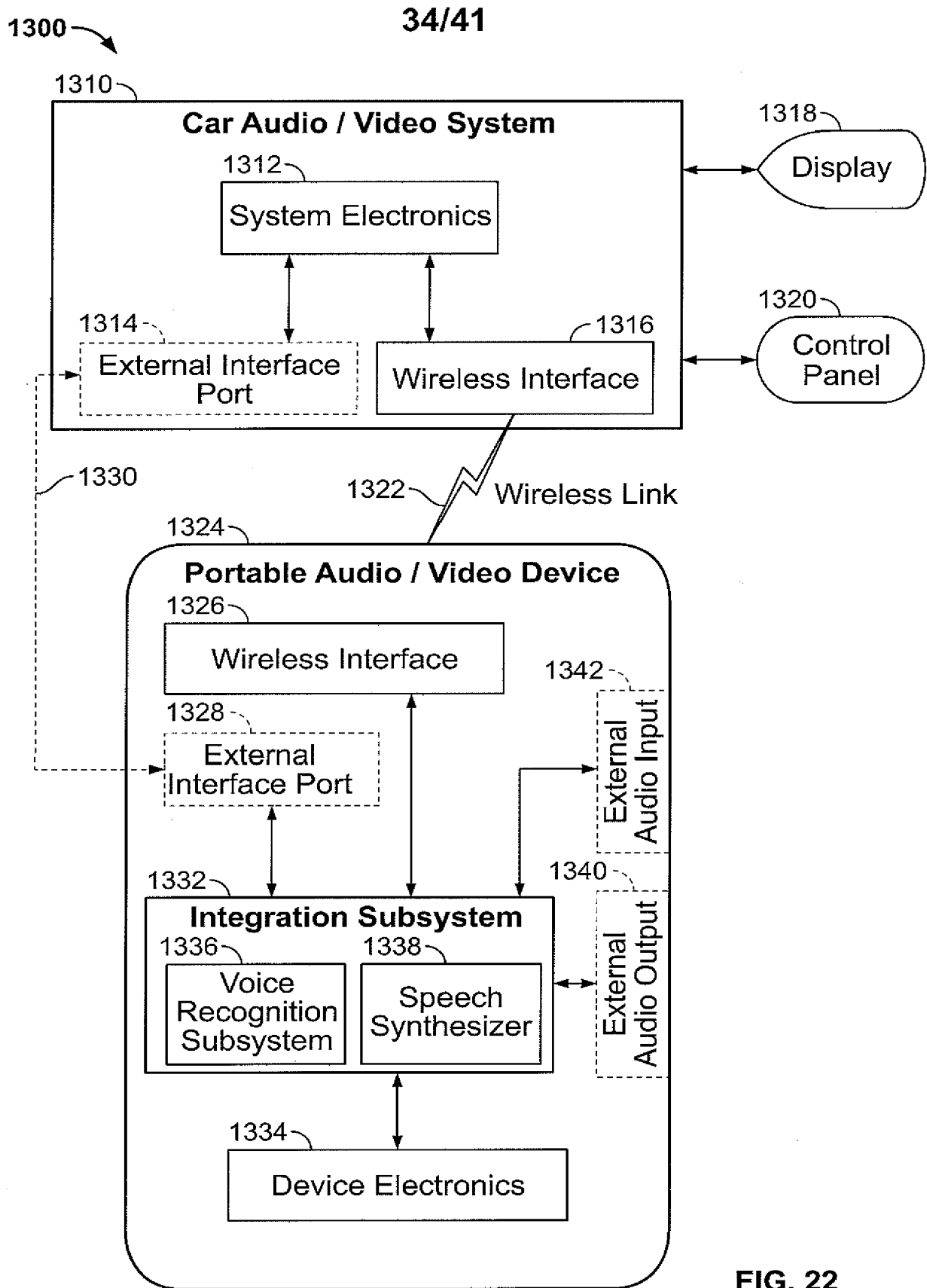


FIG. 22

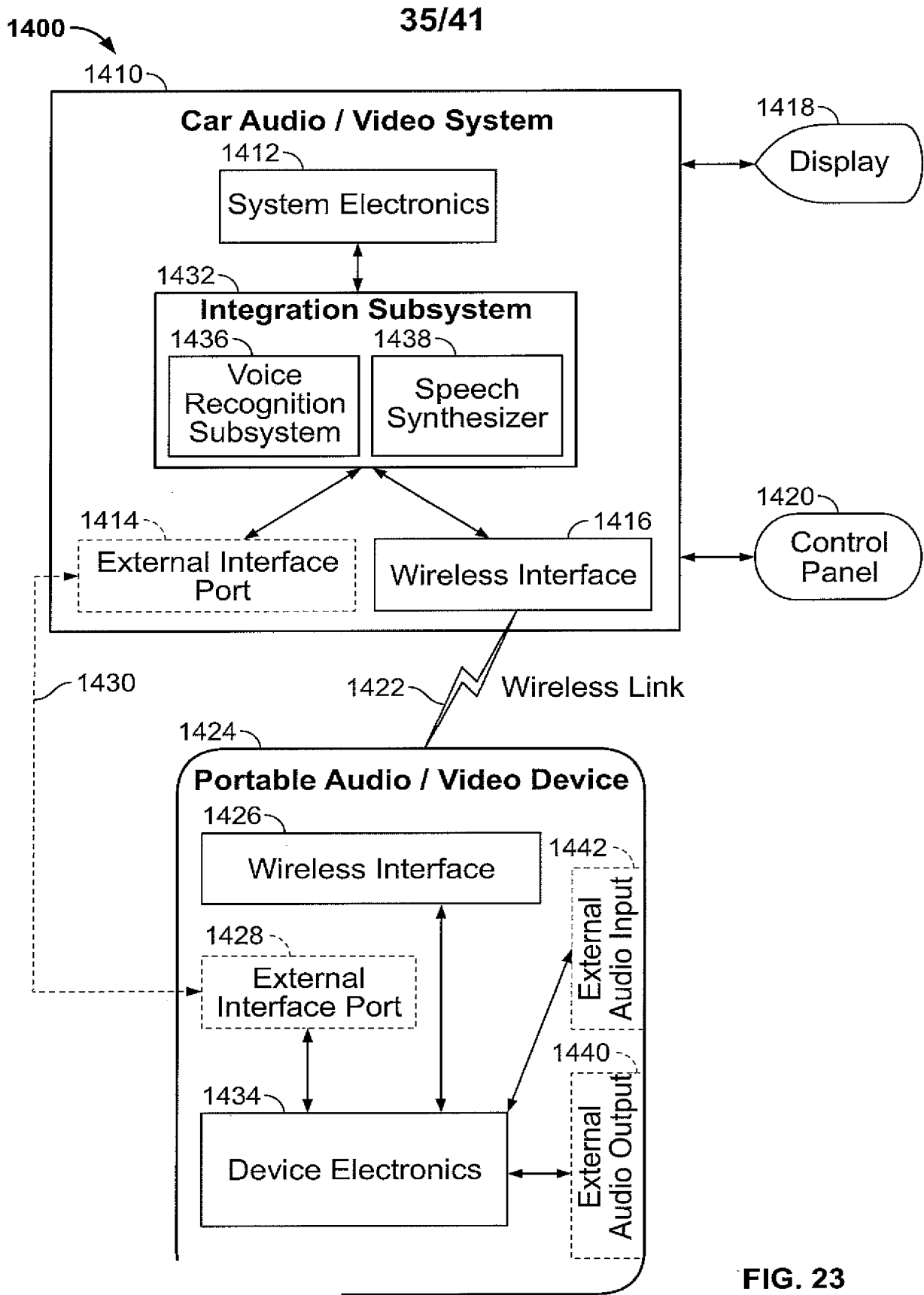


FIG. 23

1450

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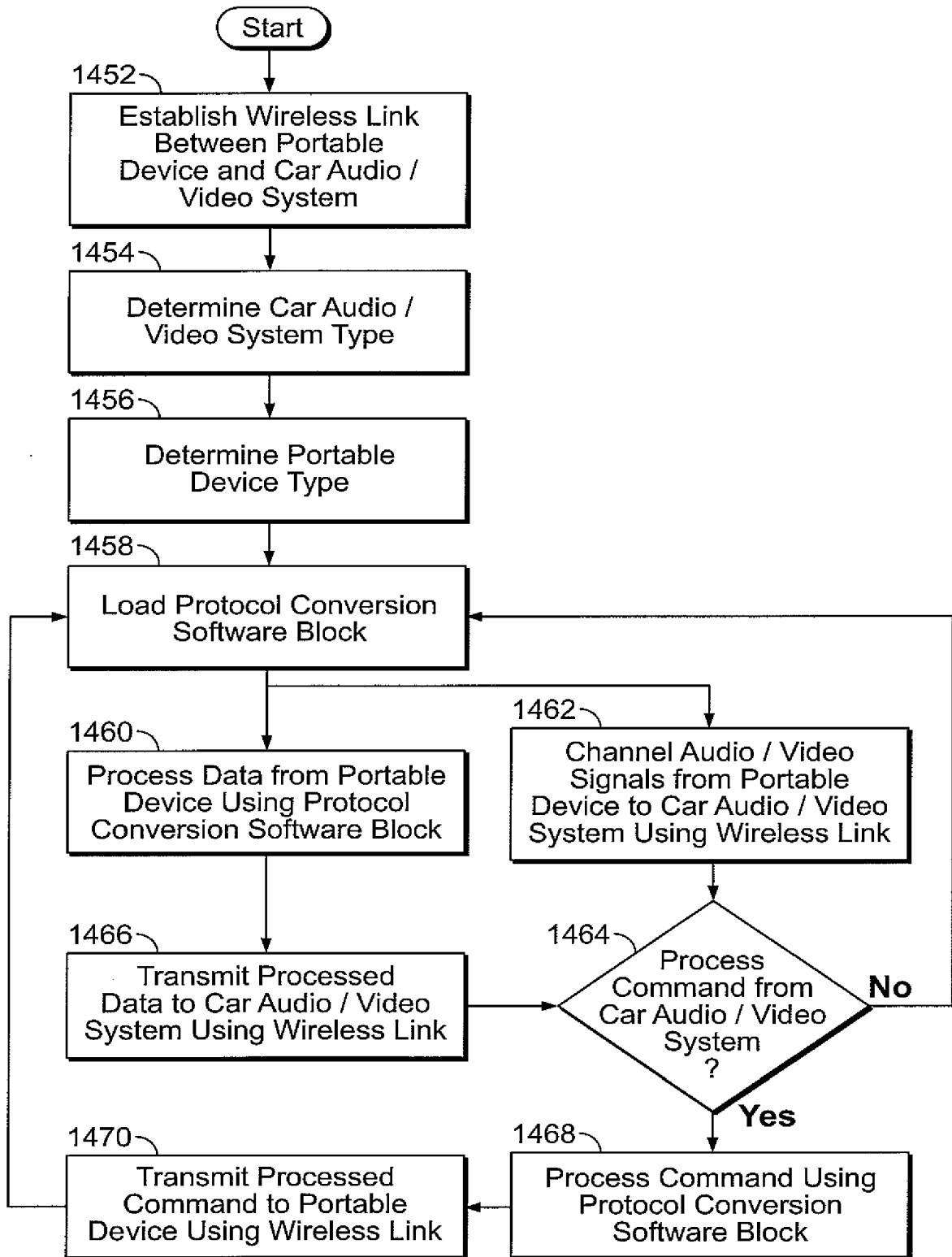


FIG. 24

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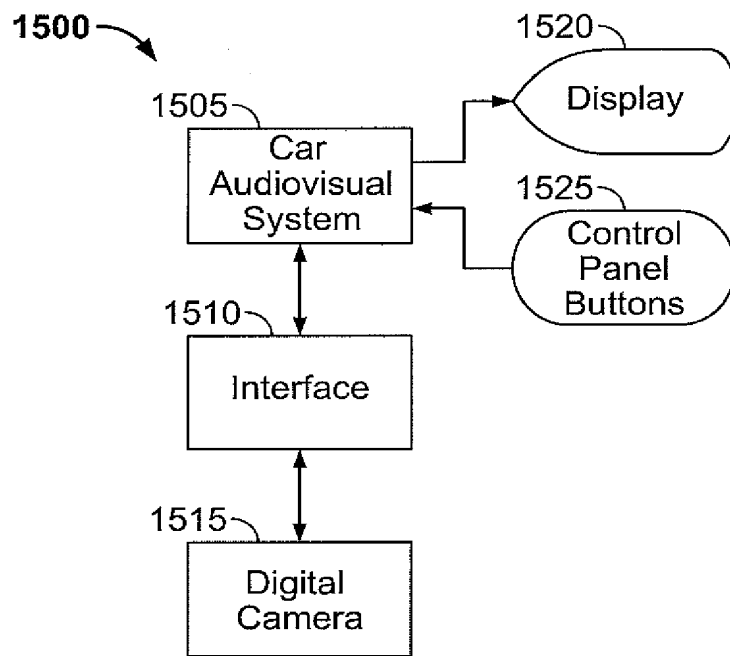


FIG. 25A

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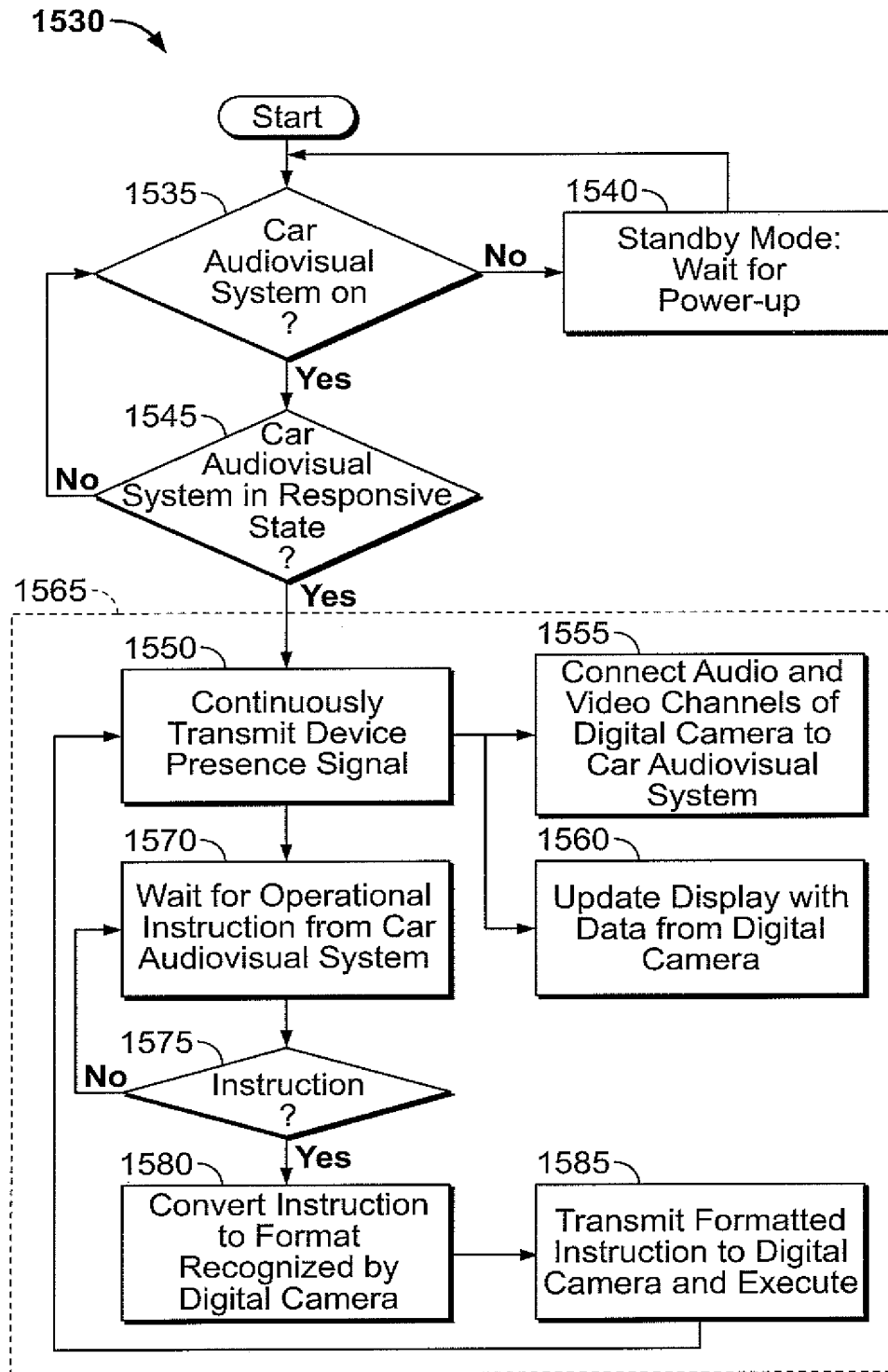


FIG. 25B

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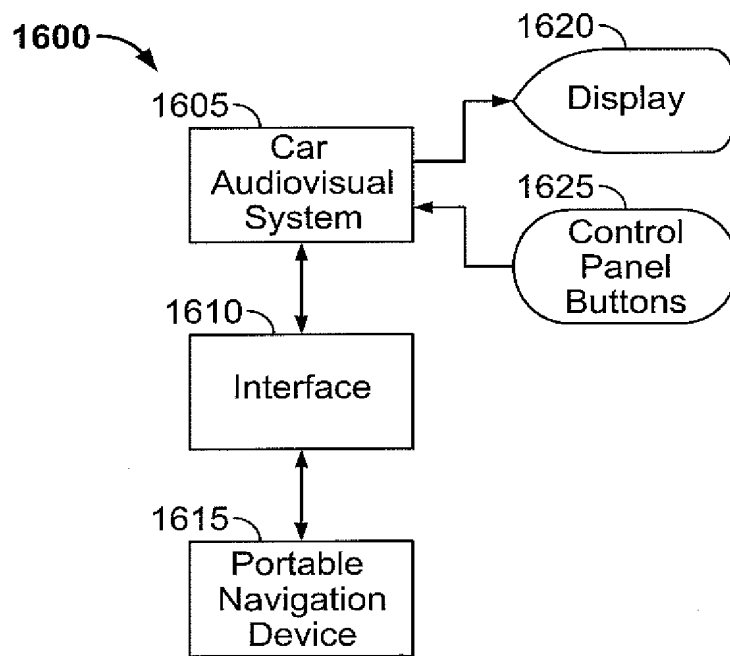


FIG. 26A

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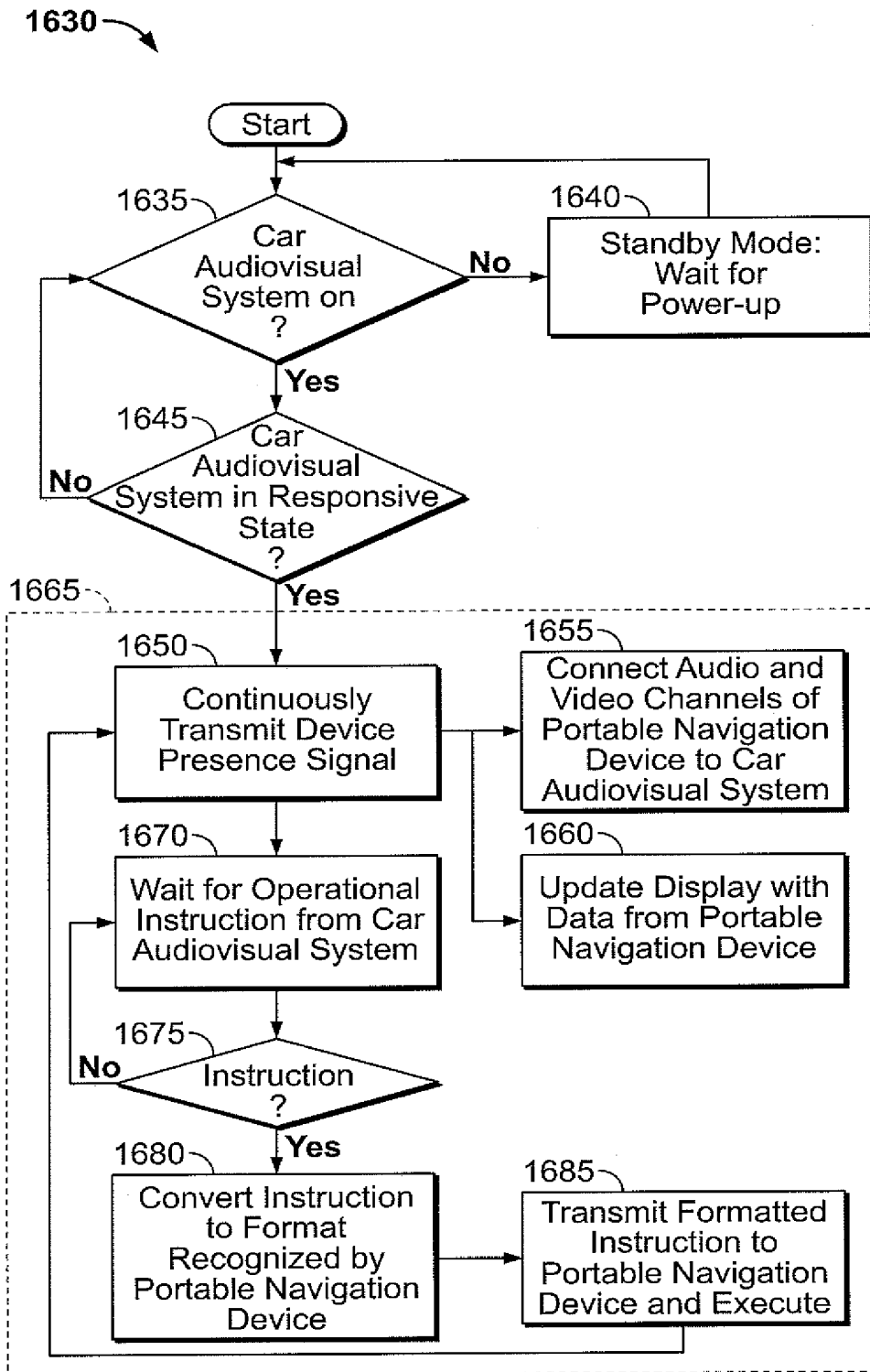


FIG. 26B

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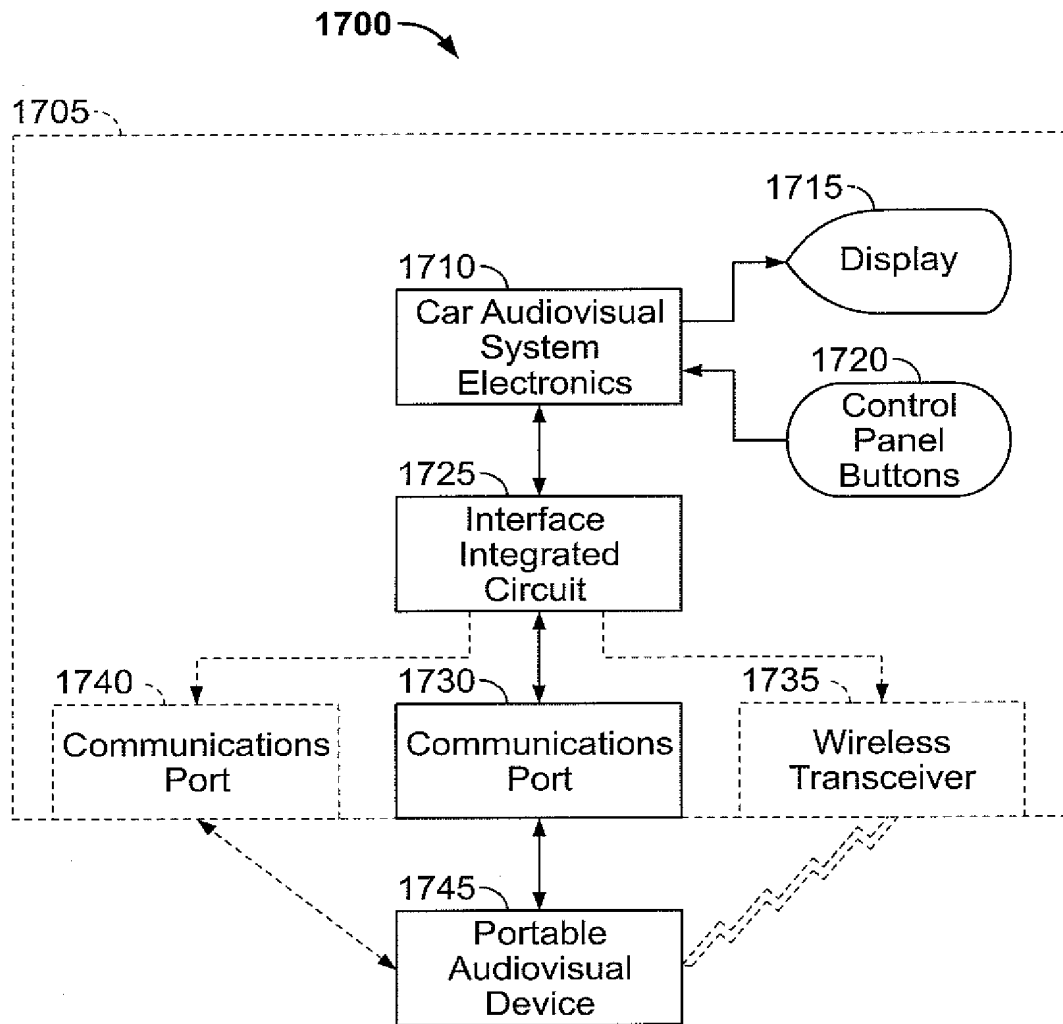


FIG.27

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(74) Agent: FRISCIA, Michael; McCarter & English, LLP, Four Gateway Center, 100 Mulberry Street, Newark, NJ 07102 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,

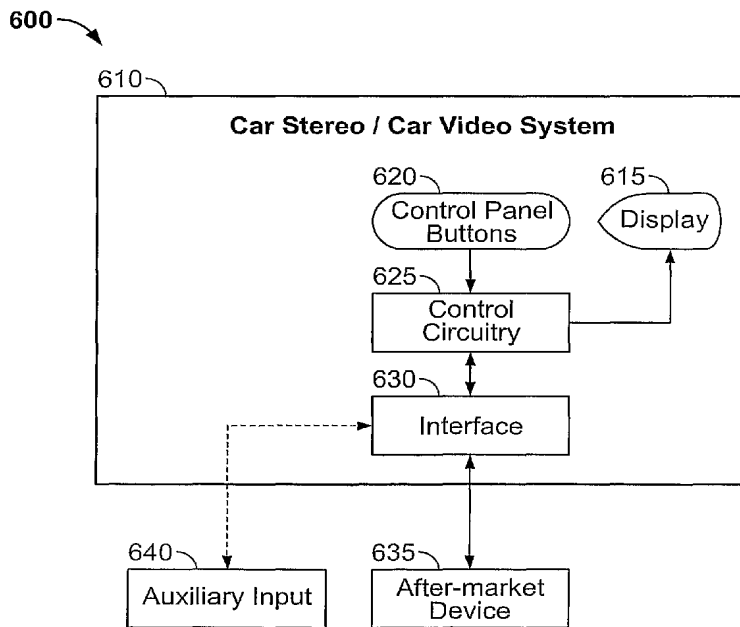
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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

Published:
— without international search report and to be republished upon receipt of that report

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.

(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.

WO 2006/094281 A2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INVENTOR: IRA MARLOWE

5 TITLE: MULTIMEDIA DEVICE INTEGRATION
SYSTEM

SPECIFICATION

10

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

15 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),
20 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

25 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
30 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
5 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,
10 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
15 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
20 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.

5 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
10 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
5 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.

10 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
15 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
20 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. 5 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.

10 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 15 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 20 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
5 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
10 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
15 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
20 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
5 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.

10 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
15 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
20 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:

5 **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.

10 **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
15 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
20 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.

5 **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.

10 **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.

15 **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.

20 **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.

5 **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.

10 **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.

15 **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**.

20 **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.

5 **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.

10 **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.

15 **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.

20 **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, 5 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 10 channel, artist, track, time, song, and other information information, is retrieved from 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 15 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 20 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.

5 **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**,
10 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
15 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**,
20 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 5 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 10 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 15 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 20 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
5 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
10 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
15 **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
20 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
5 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
10 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
15 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 present invention is illustrated in **FIGS. 2e-2h** and described below.

FIG. 2e is a block diagram showing an alternate embodiment of the present
20 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
5 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
10 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
15 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
20 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

5 **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
10 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
15 **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
20 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
5 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
10 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.

15 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
20 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
5 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
10 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
15 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**
20 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**,
5 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
10 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.

15 **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
20 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
5 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
10 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
15 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,
20 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**.

5 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,
10 a synchronous serial port that can be configured as 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.

15 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
20 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
5 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
10 **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
15 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
20 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
5 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
10 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
15 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
20 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
5 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
10 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
15 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
20 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
5 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
10 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,
15 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
20 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-
5 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
10 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
15 190, 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
20 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
5 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
10 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
15 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
20 214 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
5 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,
10 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
15 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
20 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
5 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
10 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
15 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,
20 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

```

10      ;      =====
      ;      Radio requests changer to STOP (exit PLAY mode)
      ;      Decoding 6805183801004C message
      ;      =====

15      Encode_RD_stop_msg:

      movlw 0x68
      xorwf BMW_Recv_buff,W
      skpz
      return

20      movlw 0x05
      xorwf BMW_Recv_buff+1,W
      skpz
      return

25      movlw 0x18
      xorwf BMW_Recv_buff+2,W
      skpz
      return

30      movlw 0x38
      xorwf BMW_Recv_buff+3,W
      skpz
      return

35      movlw 0x01
      xorwf BMW_Recv_buff+4,W
      skpz
      return

40      tstf BMW_Recv_buff+5
      skpz
      return

45      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
5  off      movlw 0x00          ;current status_XX=00, power
      movwf BMW_Send_buff+4
      off      movlw 0x02          ;current status_YY=02, power
10      movwf BMW_Send_buff+5
      clrfs BMW_Send_buff+6      ;separate field, always =0
      movfw BMW_MM_stat         ;current status_MM , magazine
15  config  movwf BMW_Send_buff+7
      clrfs BMW_Send_buff+8      ;separate field, always =0
      movfw BMW_DD_stat         ;current status_DD , current
20  disc    movwf BMW_Send_buff+9
      movfw BMW_TT_stat         ;current status_TT , current
25  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
30      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
35      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
40      movwf BMW_Send_cnt
      bsf   BMW_Send_on        ;ready to send
      return

```

The code portion shown in **Table 2** receives a STOP confirmation message
45 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,
5 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+
10     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];
15     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:
20                 if ( ACP_rx_data1 == 0xCA)
                    {
                        if ( ACP_rx_data2
25 == 0x01 ) {
                            flags.ACP_play_req = 1;
                                }
                                break;
                                    }
                                    break;
50
30     }
        }
    }

```

In the code portion shown in **Table 3**, a "Play" command selected by a user
35 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
5      if ( iPod_play_req == ON ) {
          iPod_play_req = OFF;
          iPod_tx_data[0] = 0x55;
          iPod_tx_data[1] = 0x03;
10     iPod_tx_data[2] = 0x02;
          iPod_tx_data[3] = 0x00;
          iPod_tx_data[4] = 0x01;
          iPod_tx_counter = 5;
          iPod_tx_ready = ON;
15     }

```

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.

5 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

10 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

15 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, if a positive determination is made, step 312 invokes step 306, so that

20 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** of **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
5 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
10 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
15 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
20 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**.

5 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
10 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
15 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.

20 **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
5 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
10 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
15 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
20 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
5 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
10 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
15 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-
20 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
5 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,
10 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.
15 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
20 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
5 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
10 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
15 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
20 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
5 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
10 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,
15 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
20 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
5 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
10 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.

15 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,
20 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 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 video system. The CD player 860 could comprise any desired CD player or
5 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
10 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
15 852 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.

CLAIMSWhat is claimed is:

1. A multimedia device integration system comprising:

a car stereo system;

5 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-
10 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
15 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
20 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;
- 5 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
- 10 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.
- 15 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;

15 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
5 comprises a DVD player.

13. The apparatus 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
10 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
15 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
5 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
10 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
15 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
20 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
5 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

10 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
15 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:

20 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

5 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
10 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
15 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;

20 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
5 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
10 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
15 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;

5 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;

10 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

15 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.

5 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:

10 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;

15 displaying a list of potentially matching songs in the after-market device on a display 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.

20 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
5 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;

10 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;

15 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.

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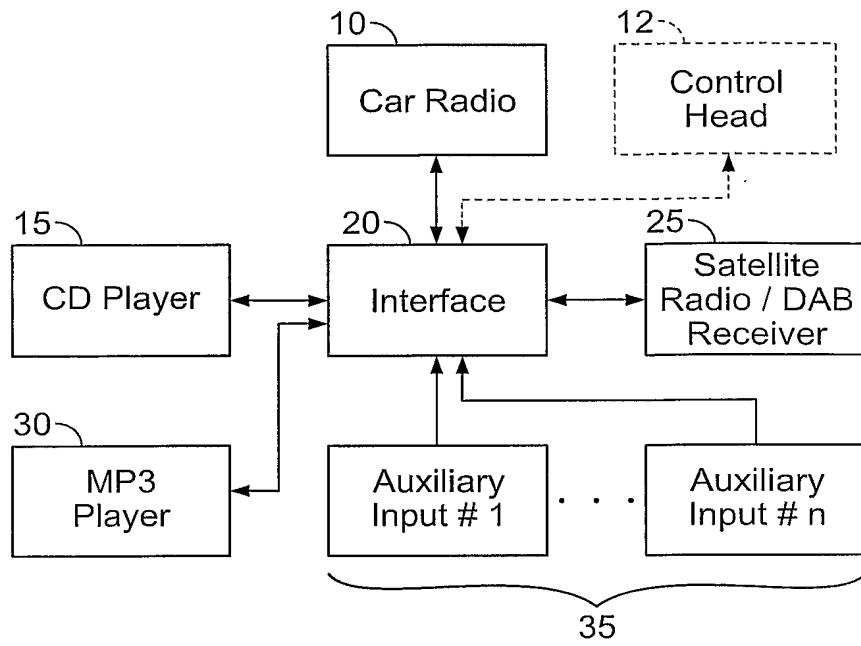


FIG. 1

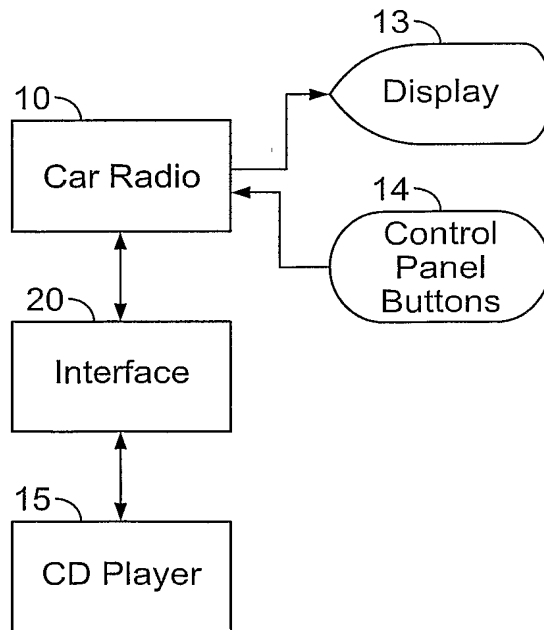


FIG. 2A

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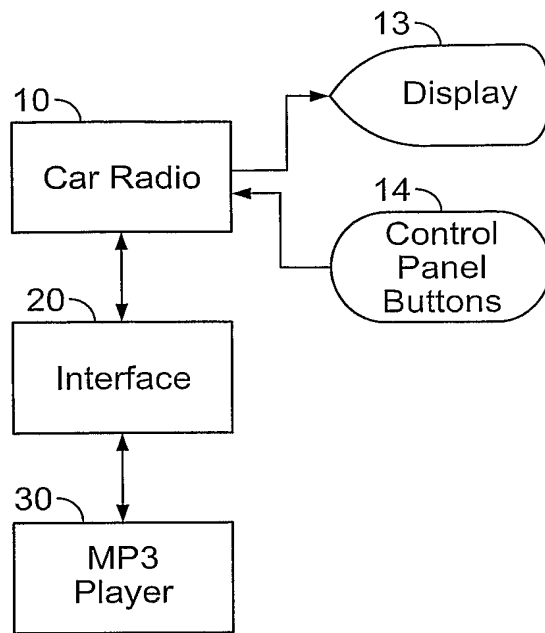


FIG. 2B

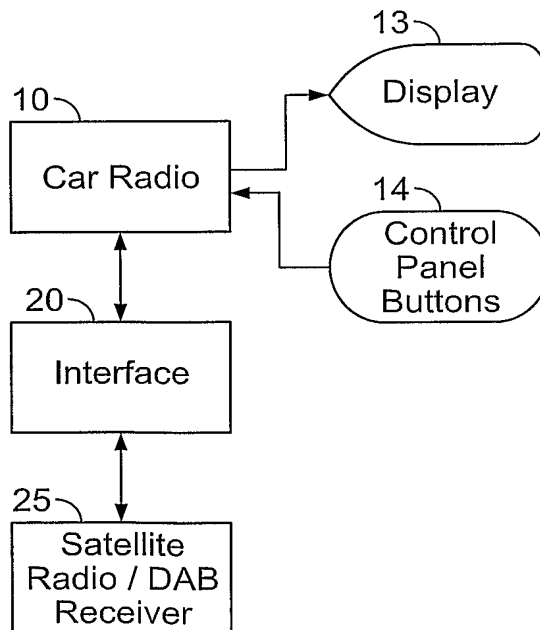


FIG. 2C

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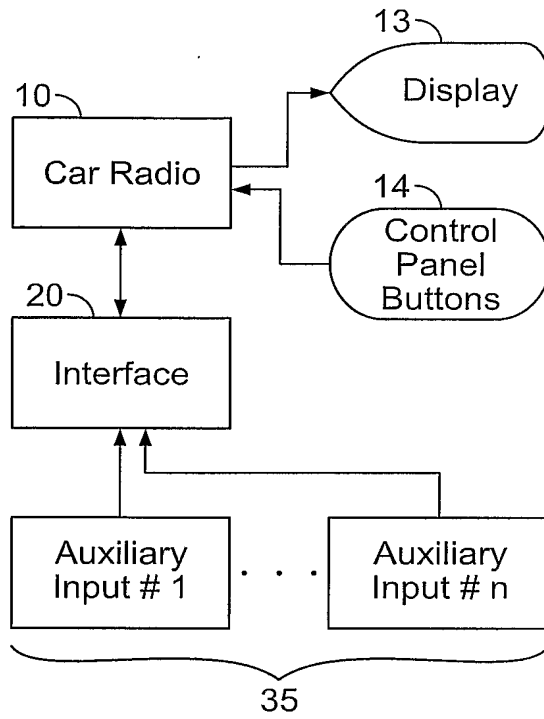


FIG. 2D

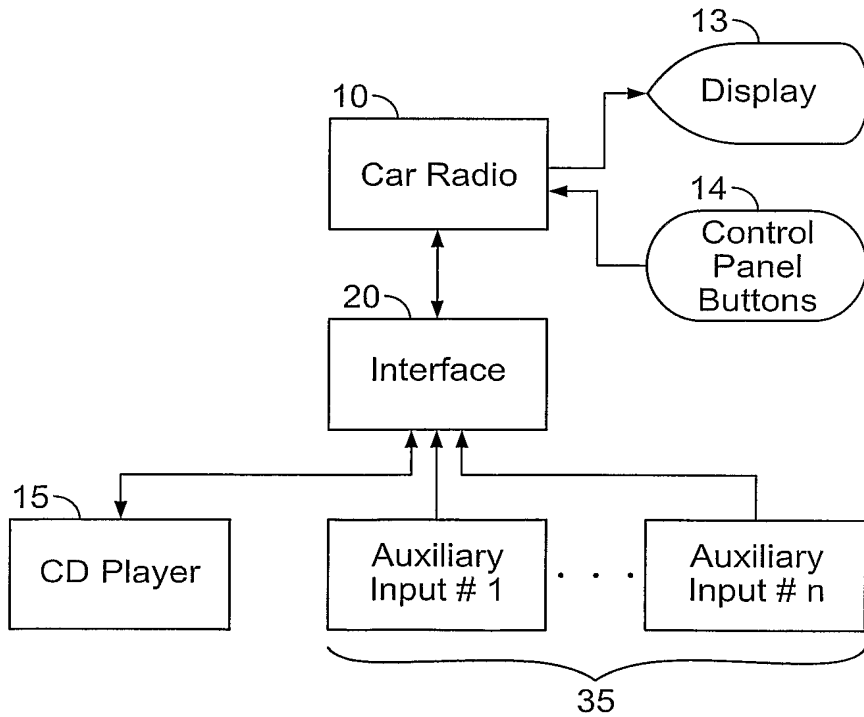


FIG. 2E

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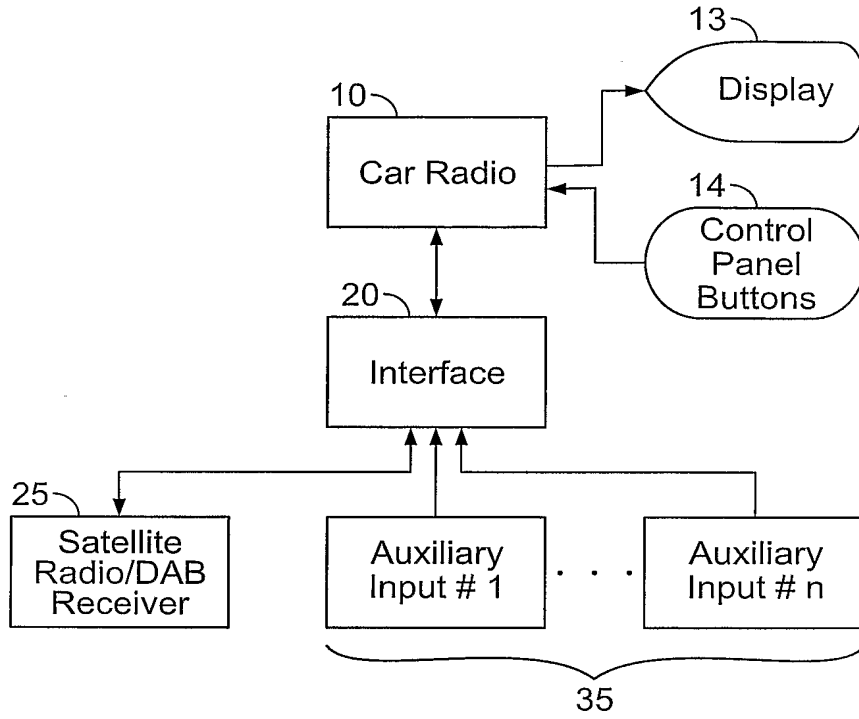


FIG. 2F

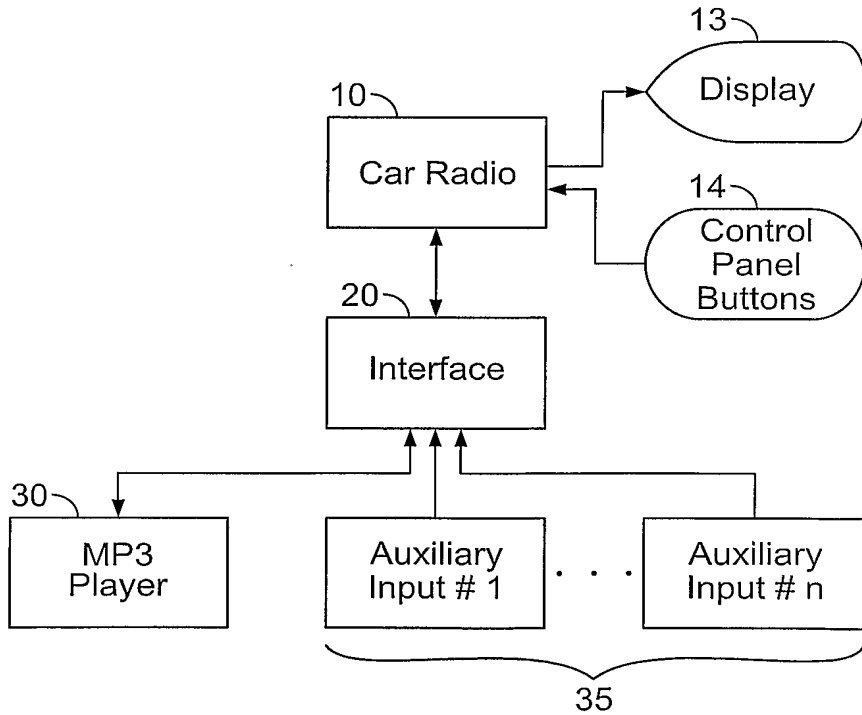


FIG. 2G

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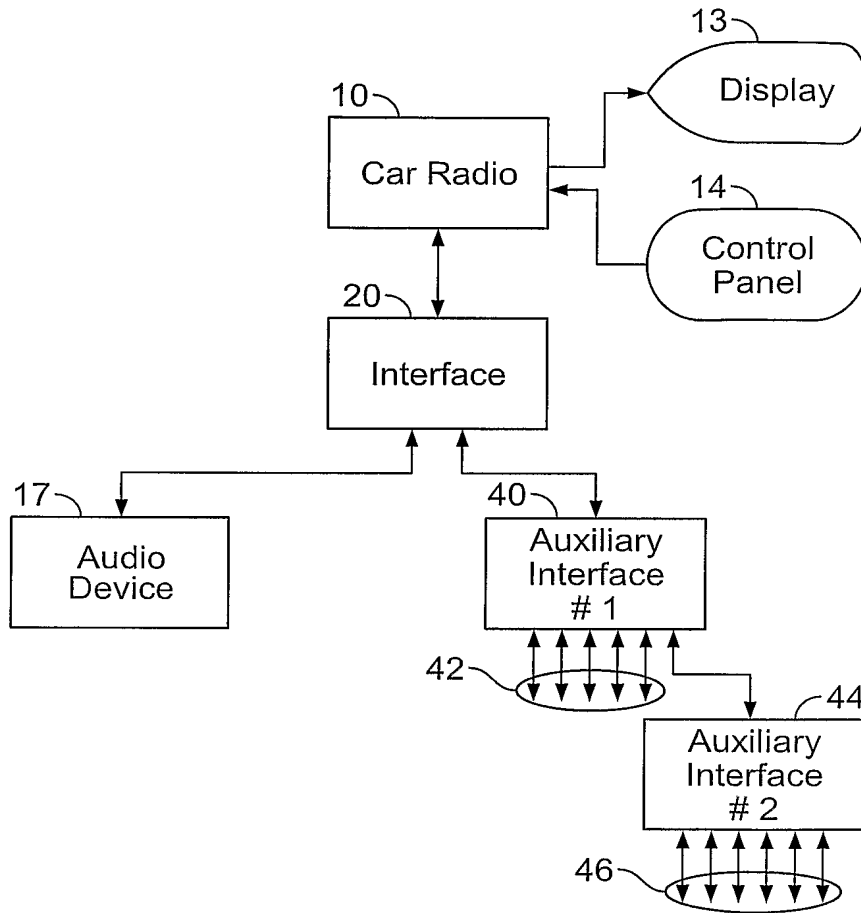


FIG. 2H

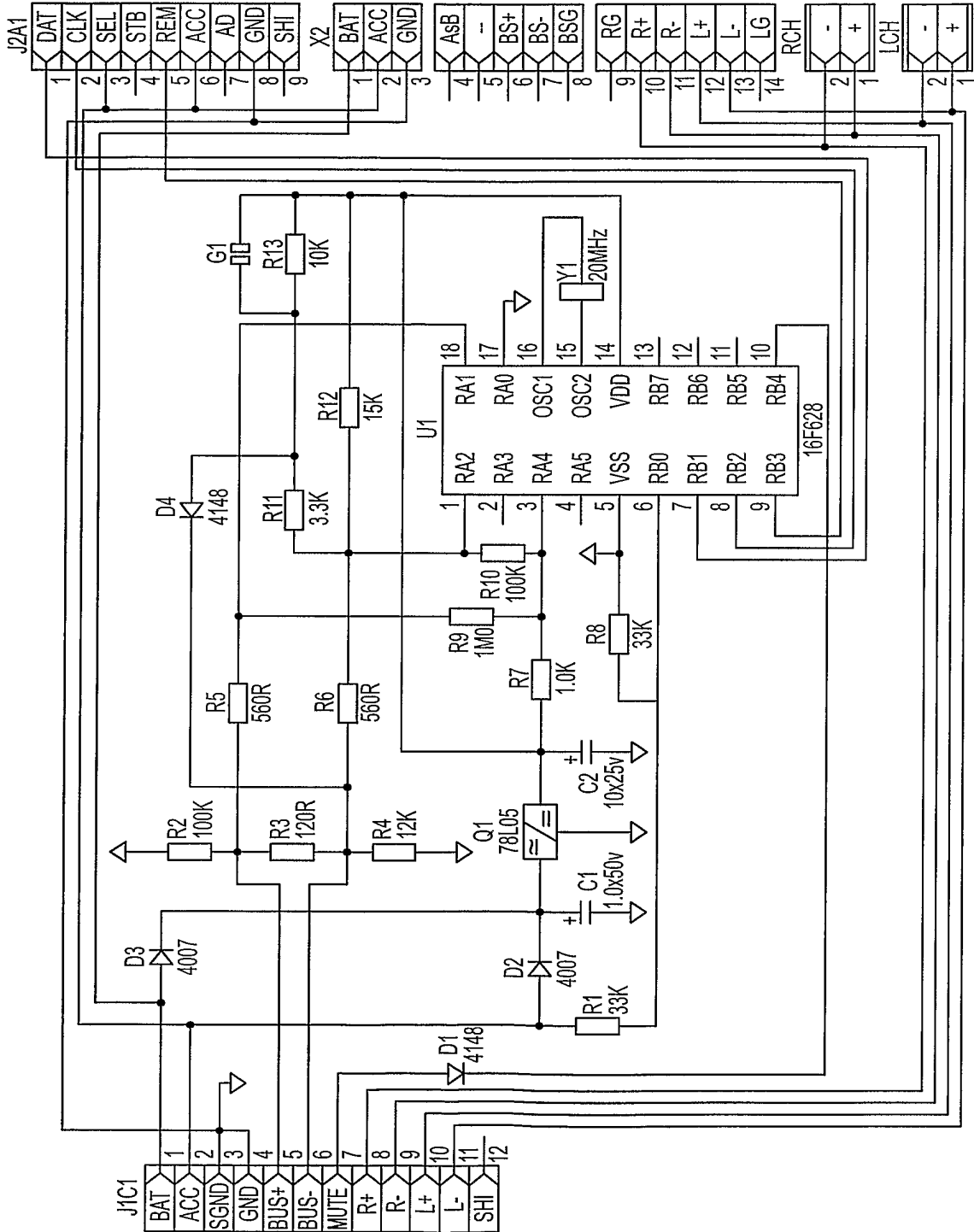


FIG. 3A

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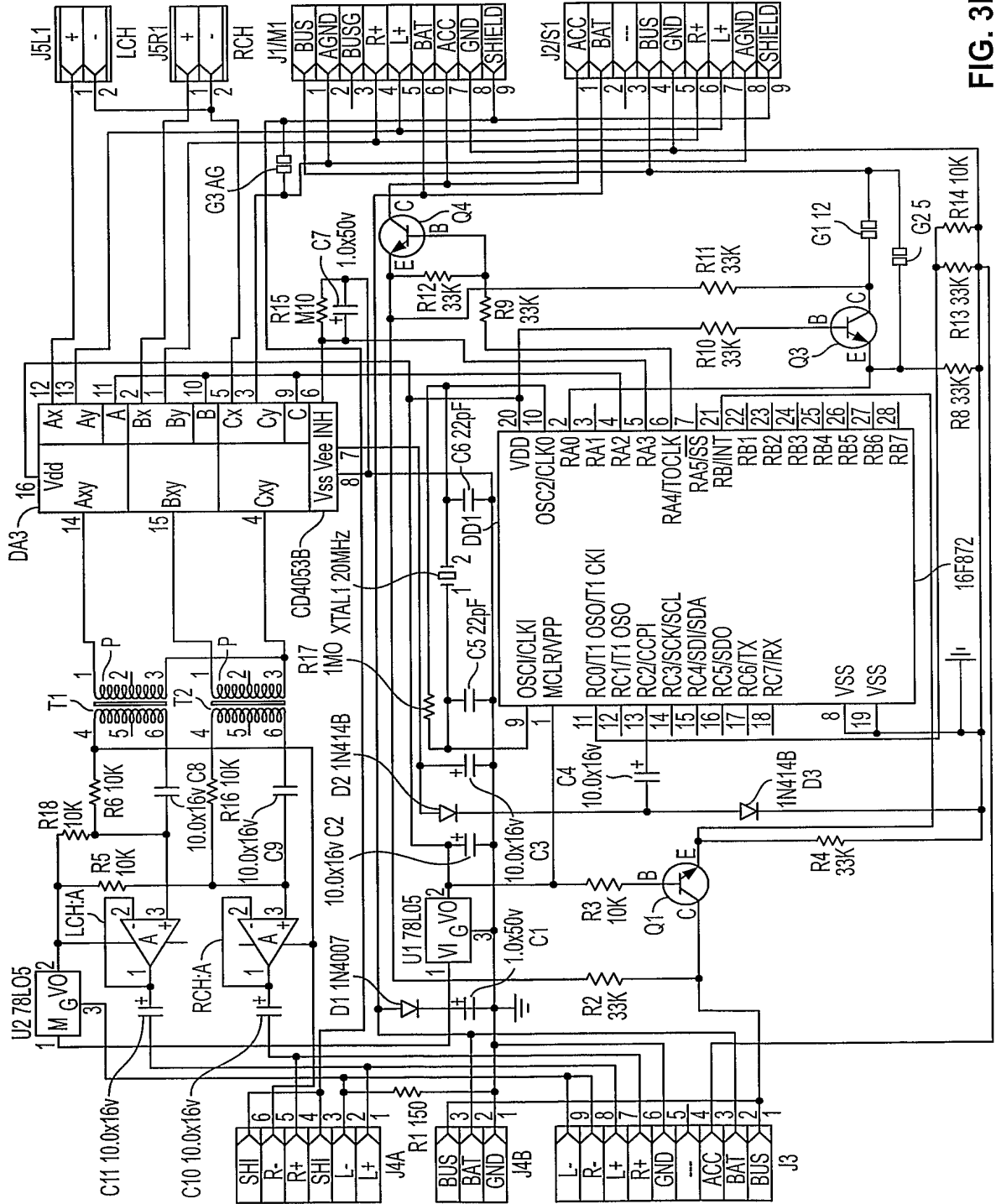


FIG. 3B

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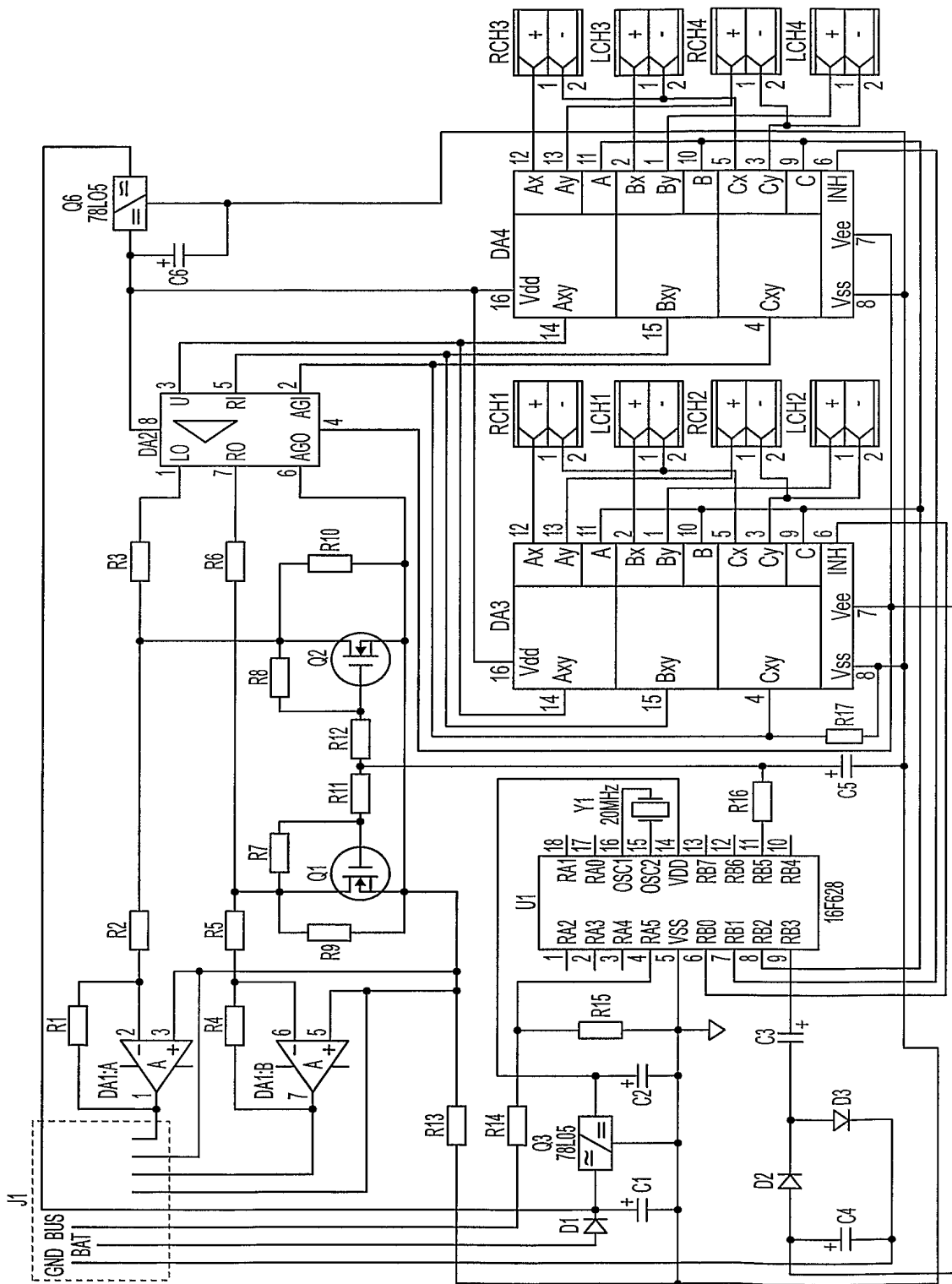


FIG. 3C

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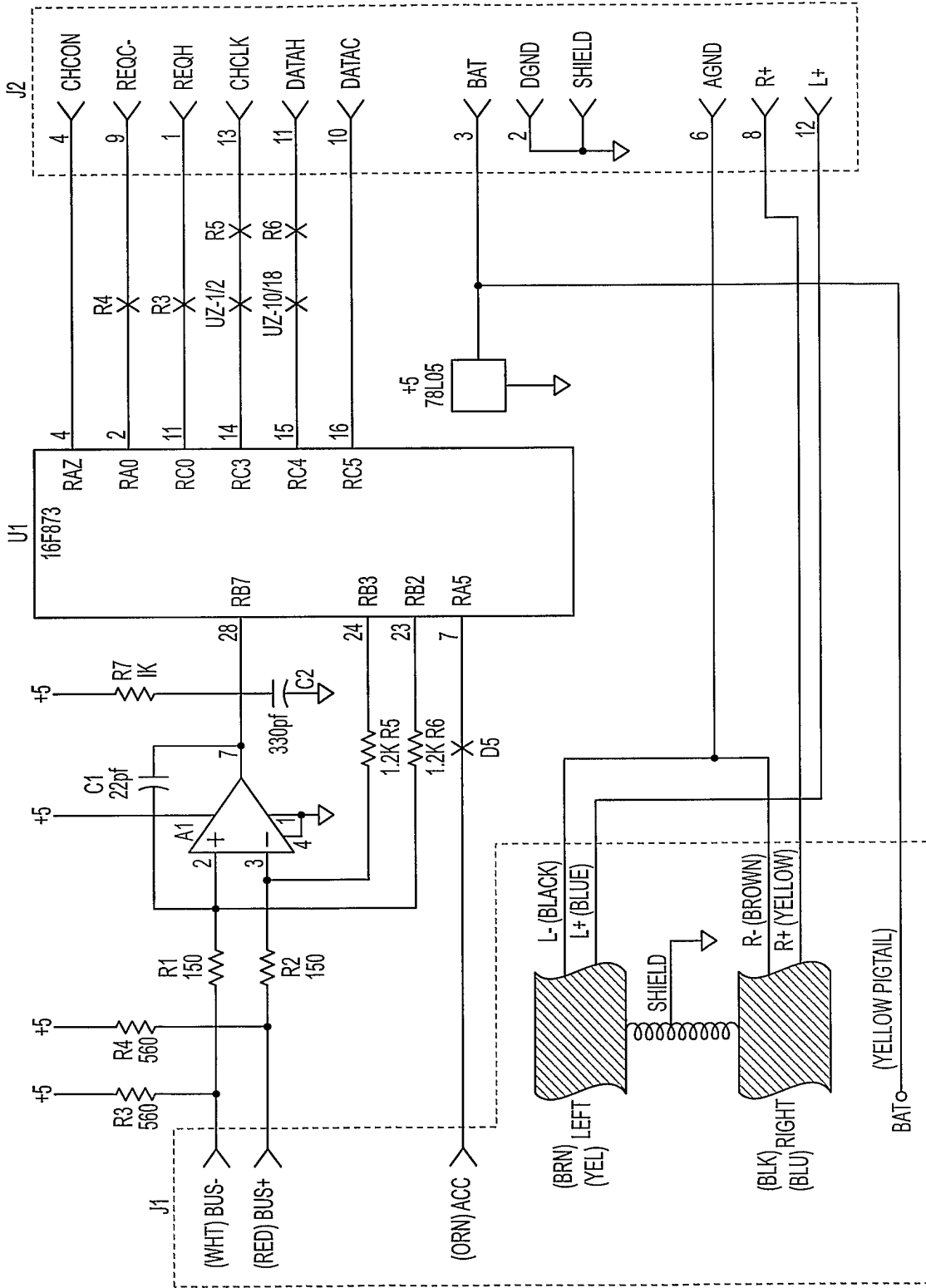


FIG. 3D

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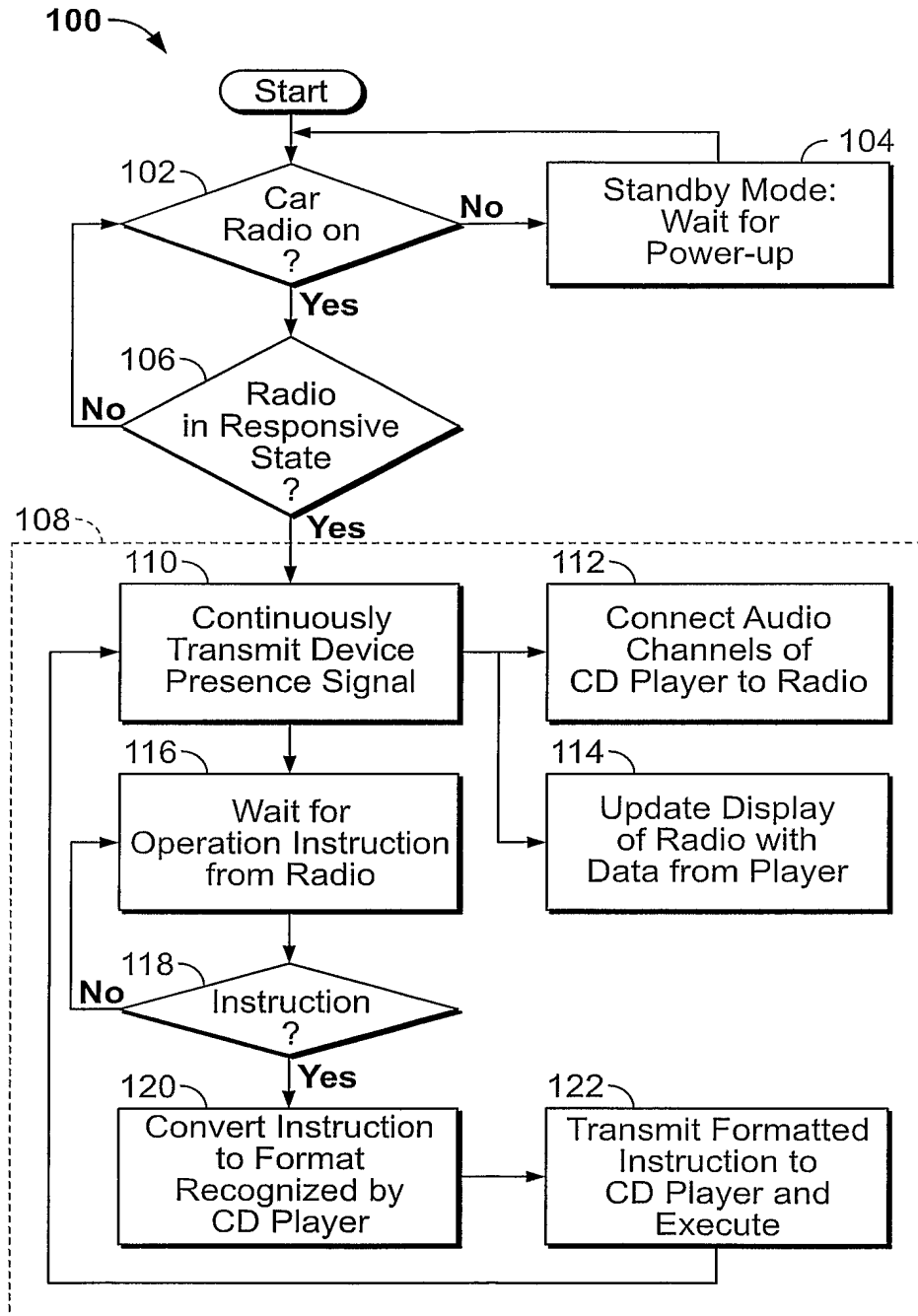


FIG. 4A

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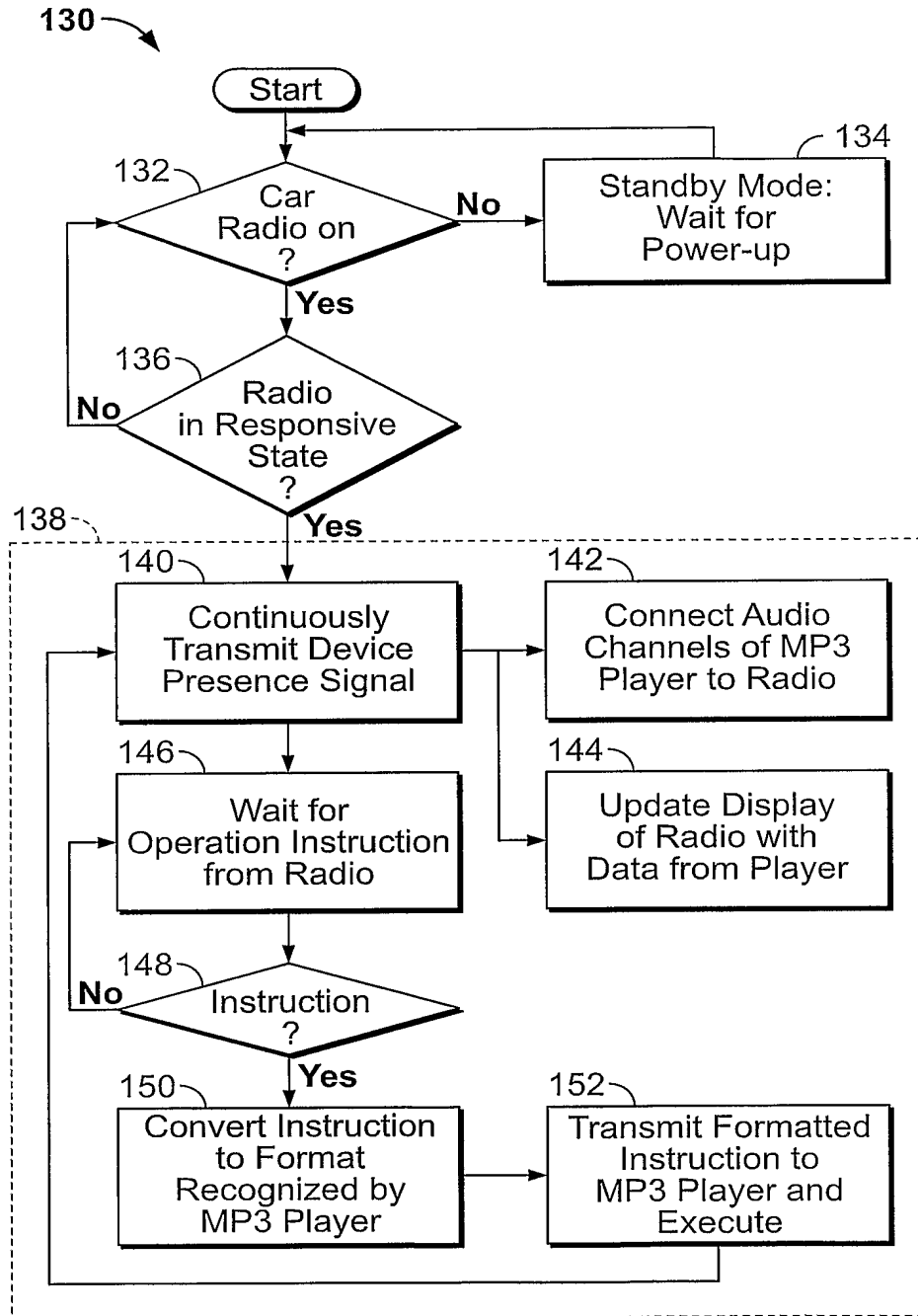


FIG. 4B

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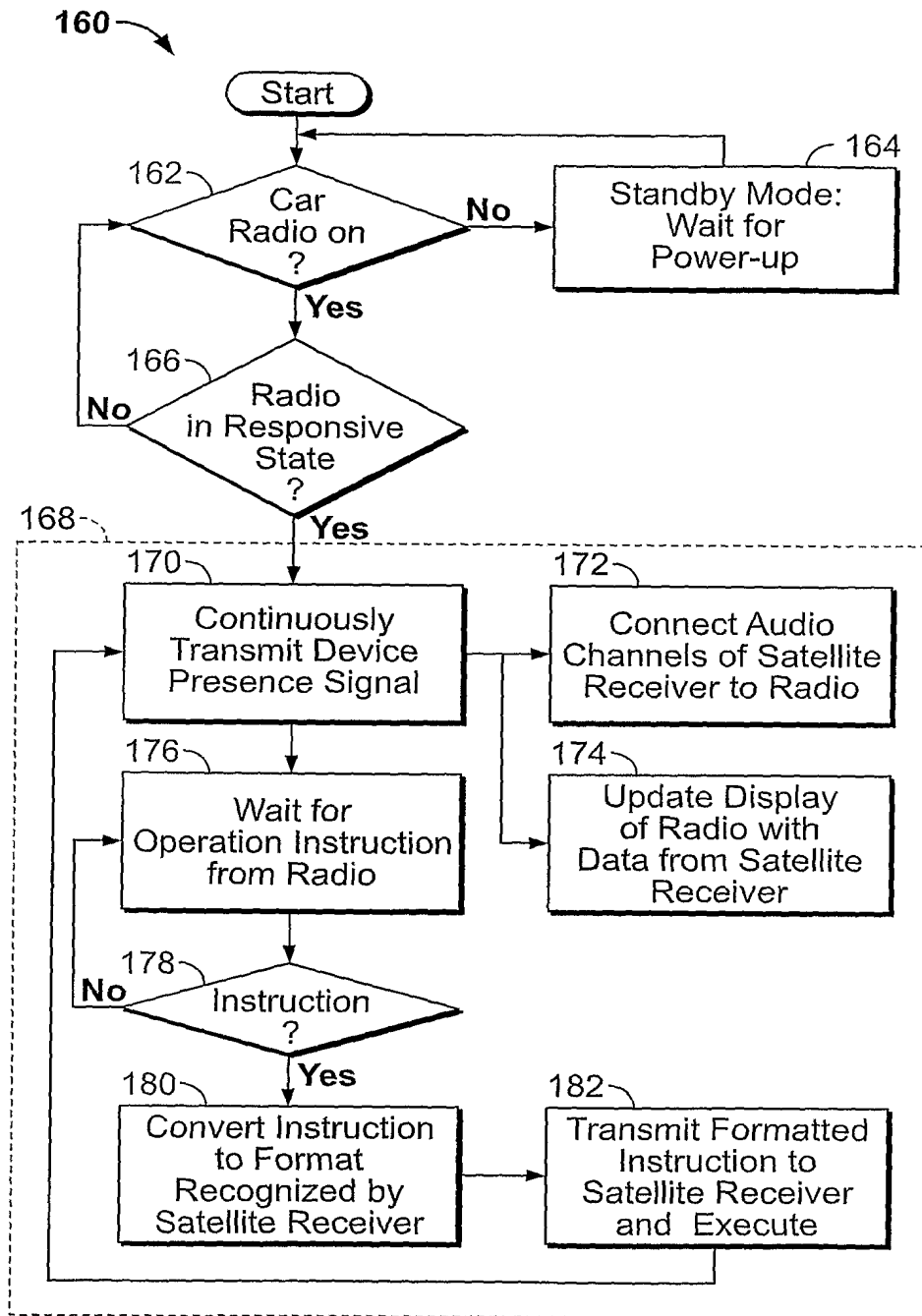


FIG. 4C

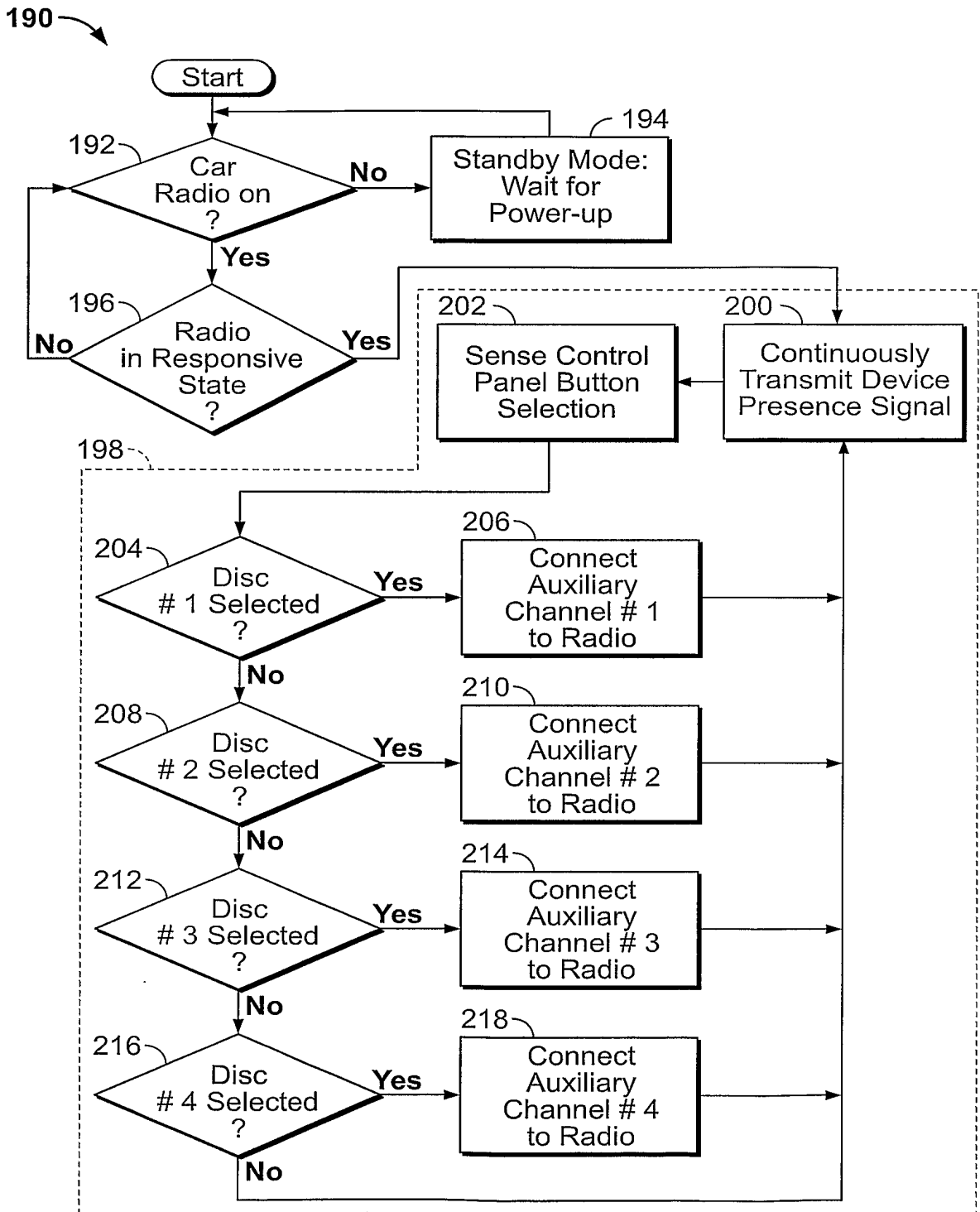


FIG. 4D

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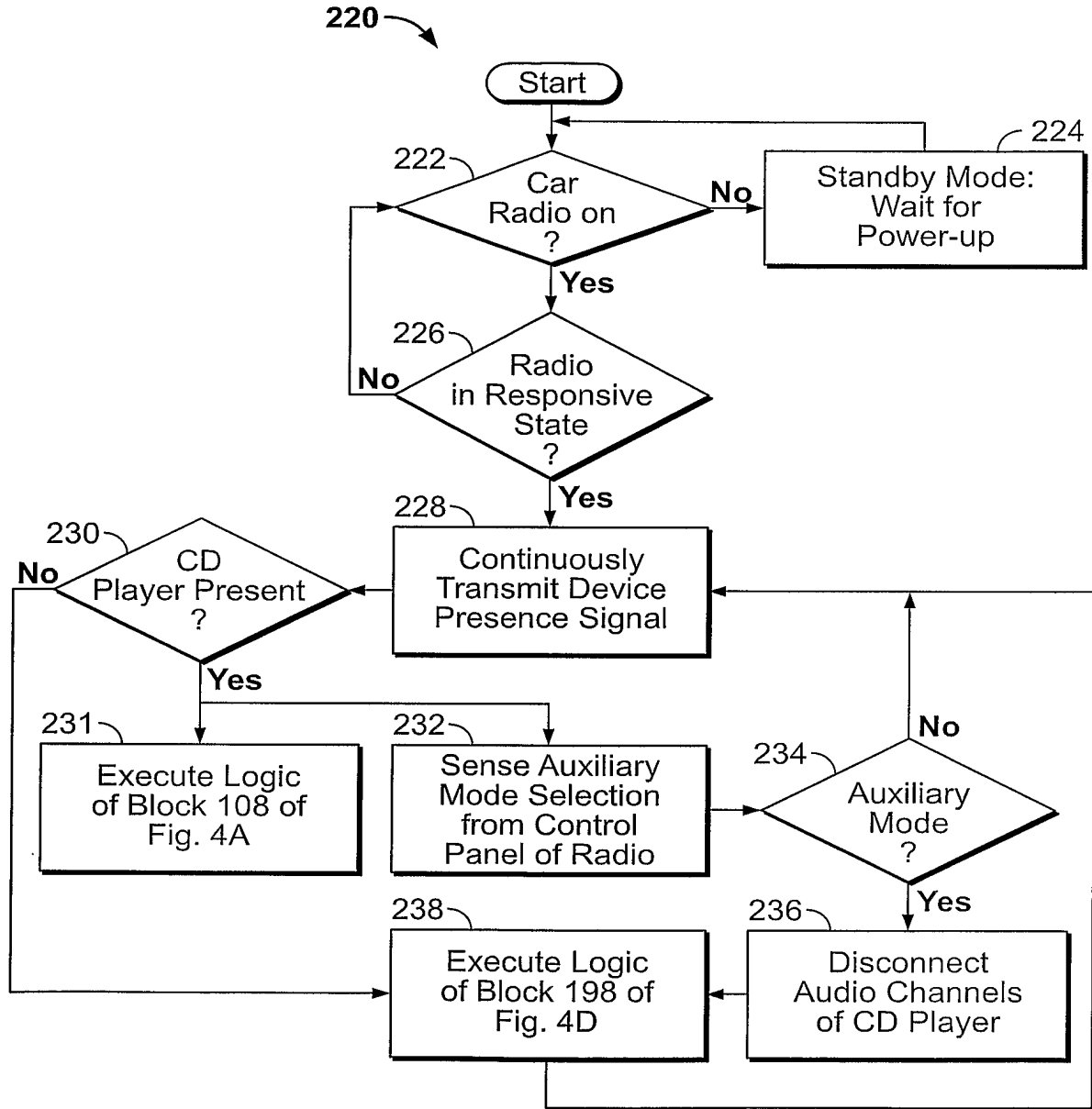


FIG. 4E

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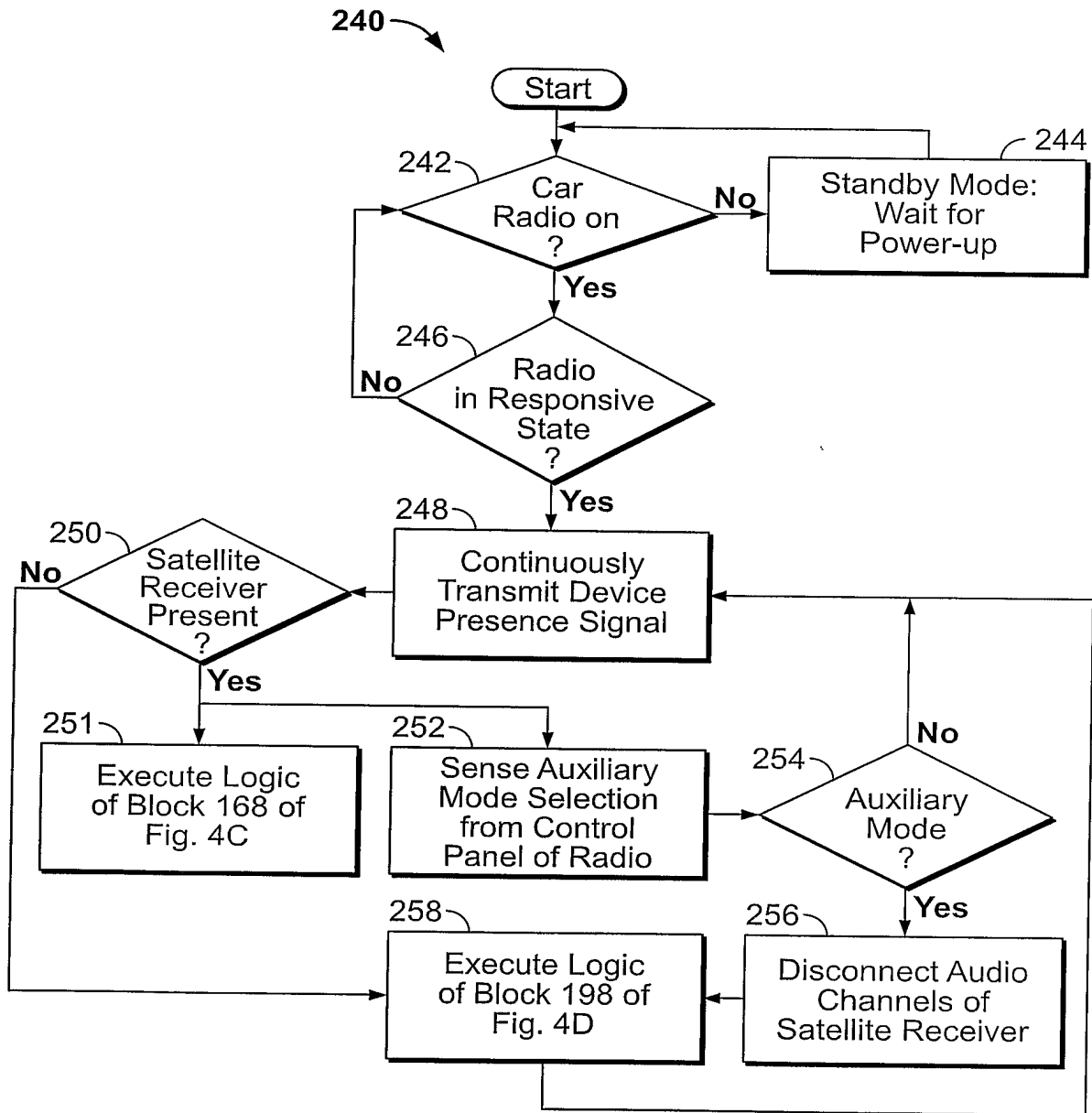


FIG. 4F

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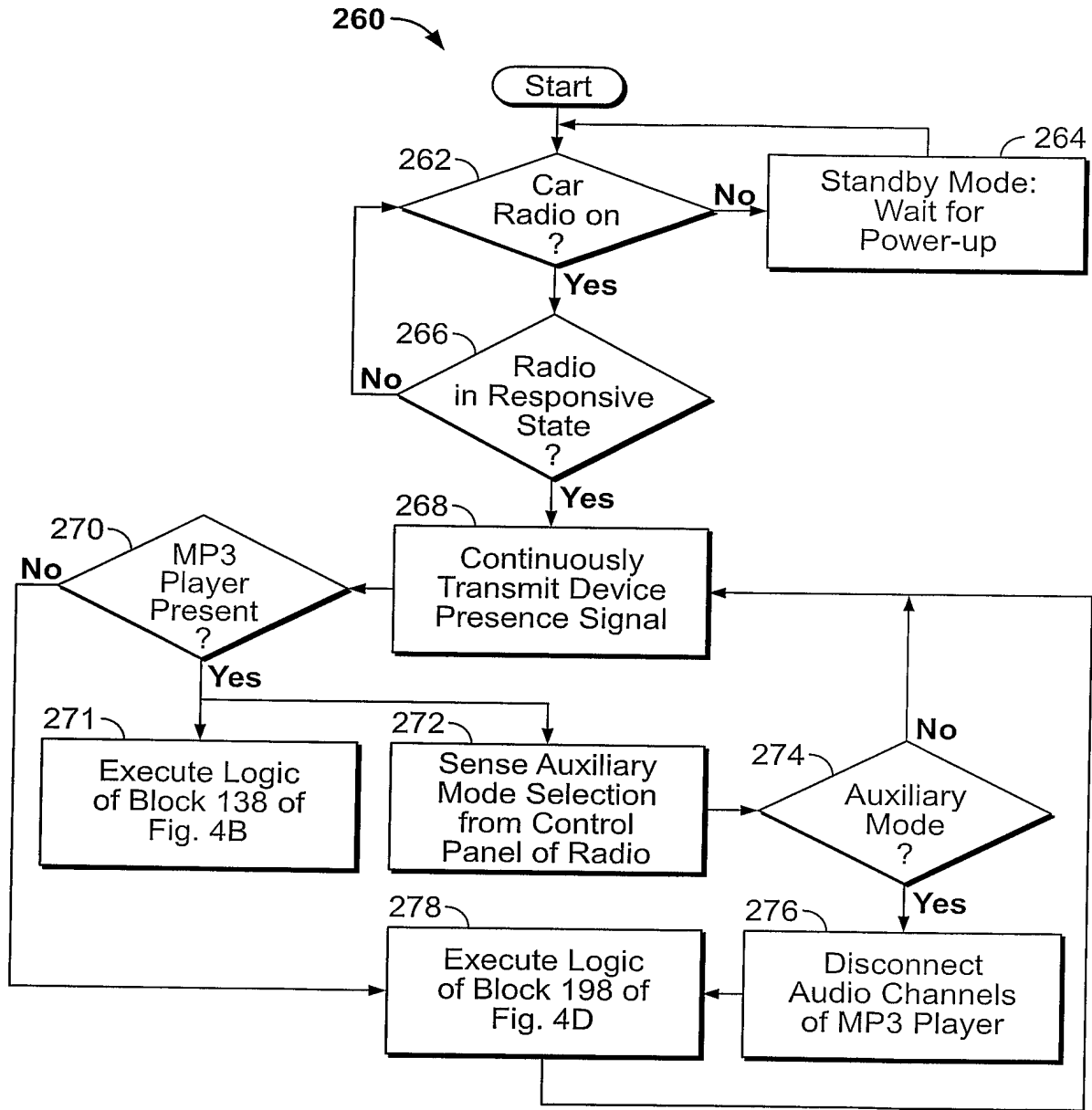


FIG. 4G

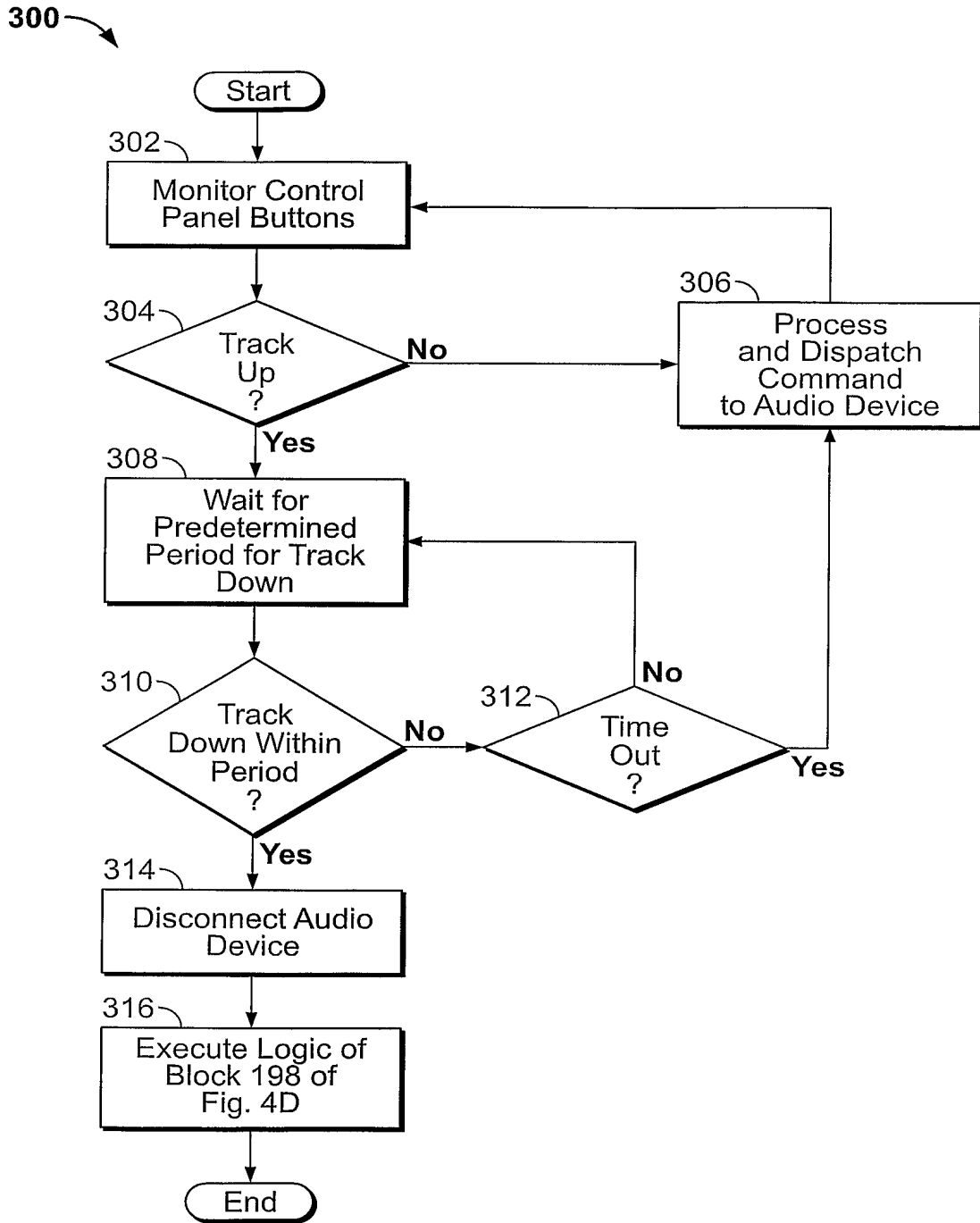


FIG. 5

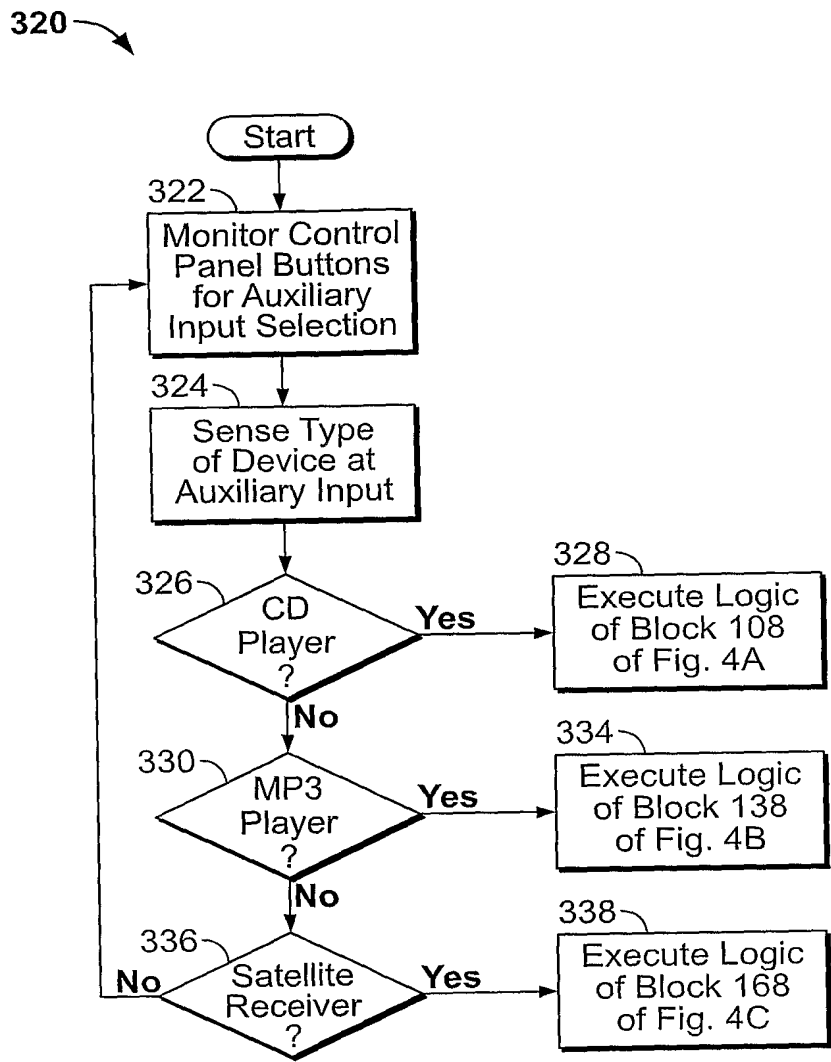


FIG. 6

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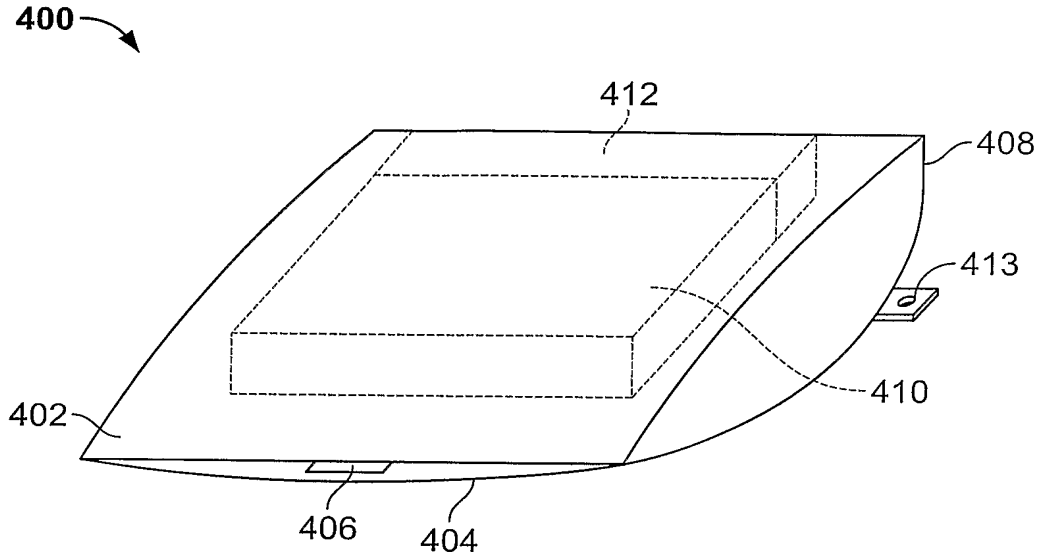


FIG. 7A

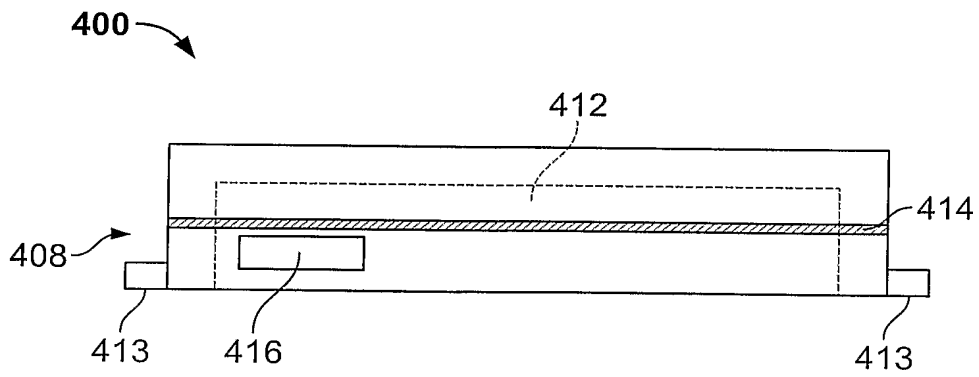


FIG. 7B

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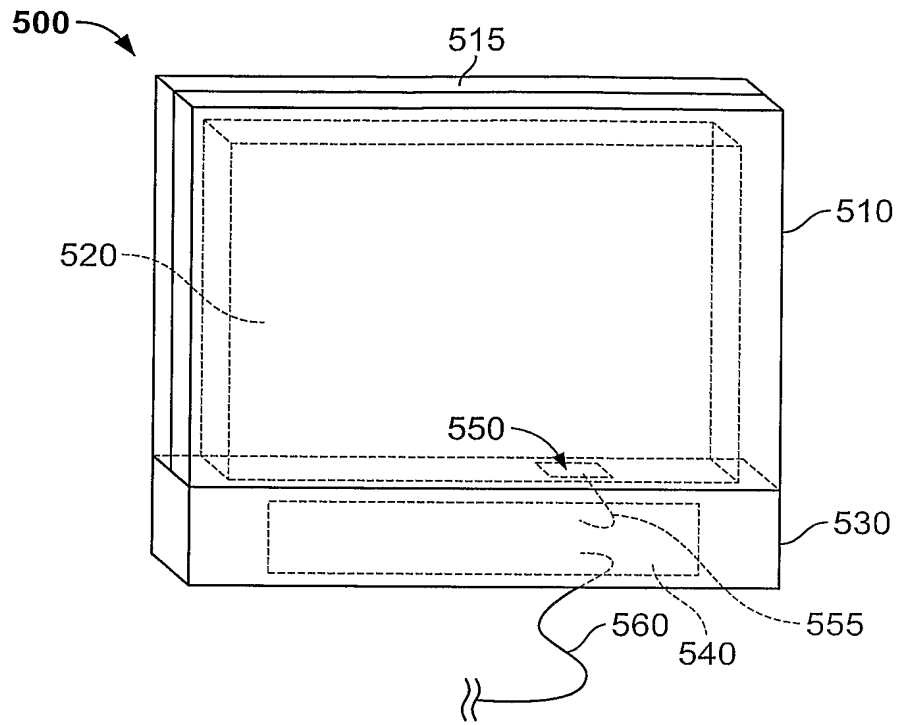


FIG. 8A

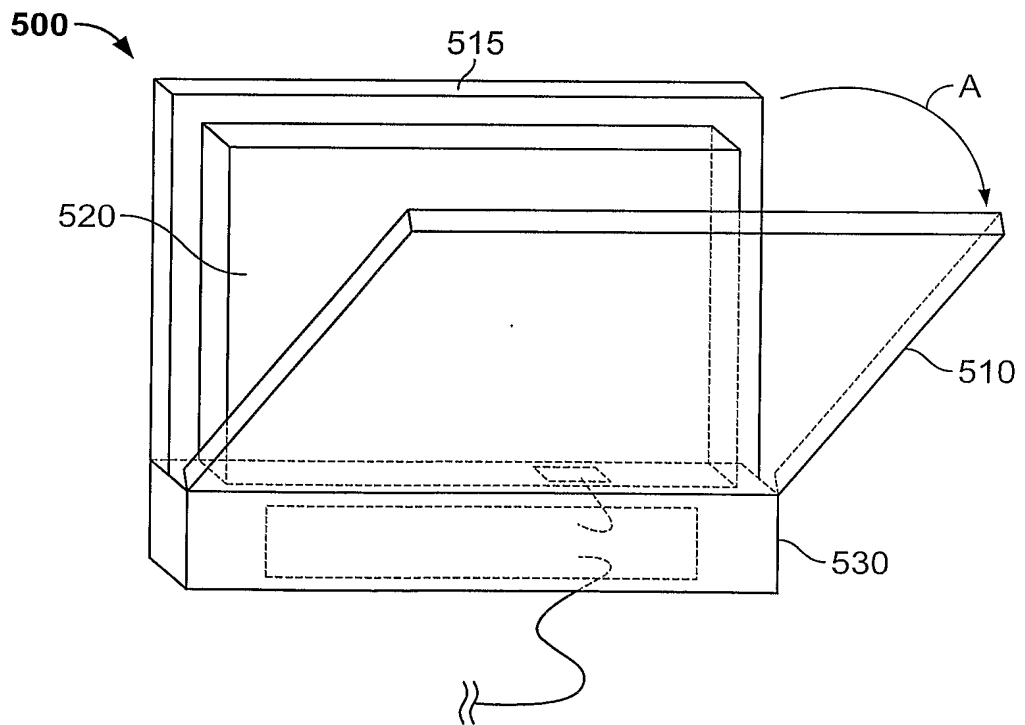


FIG. 8B

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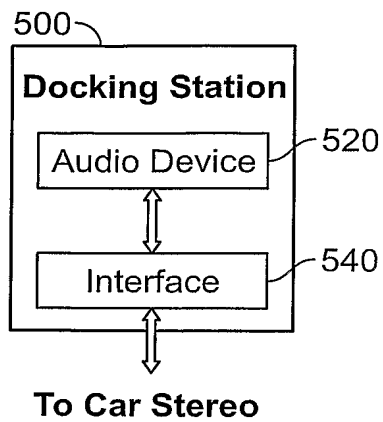


FIG. 9

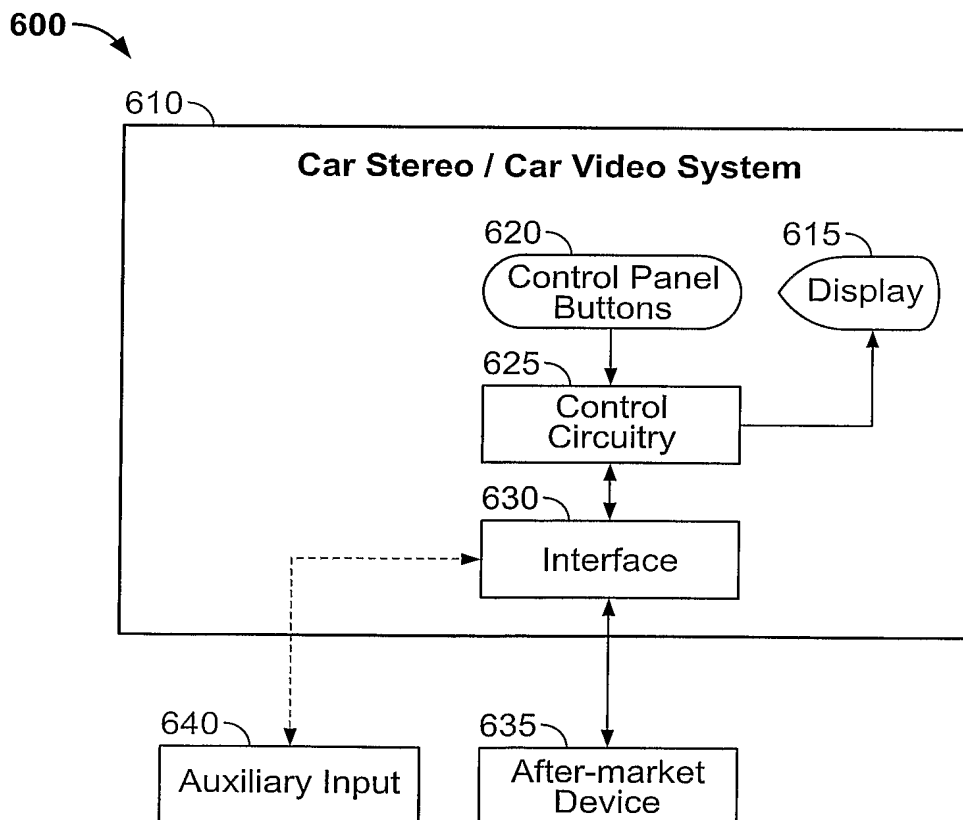


FIG. 10

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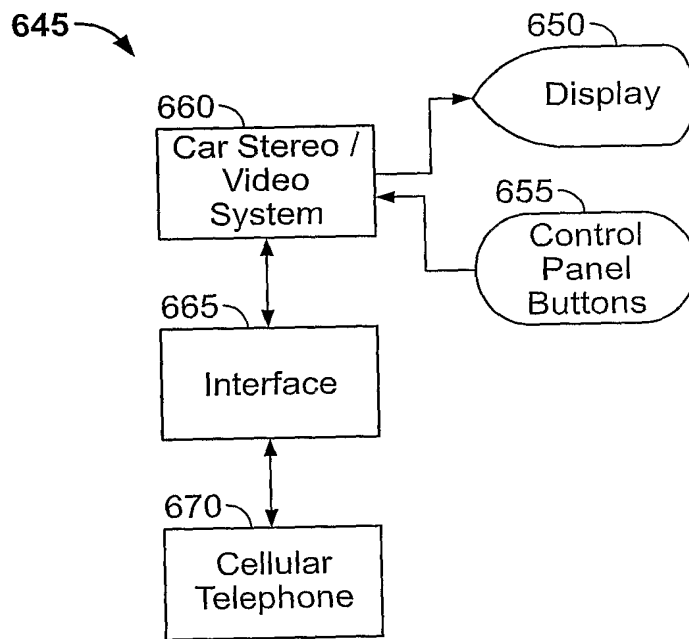


FIG. 11A

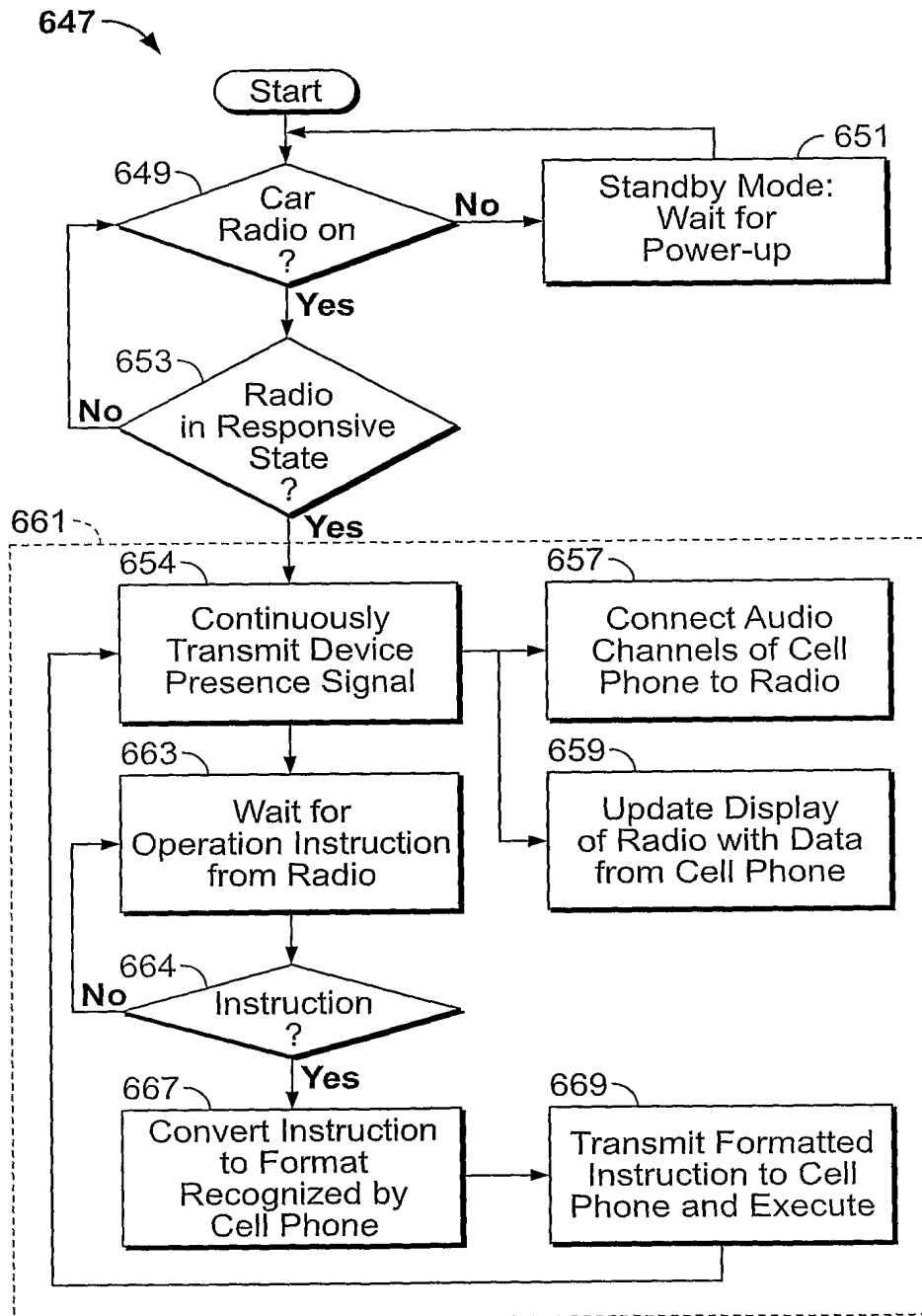


FIG. 11B

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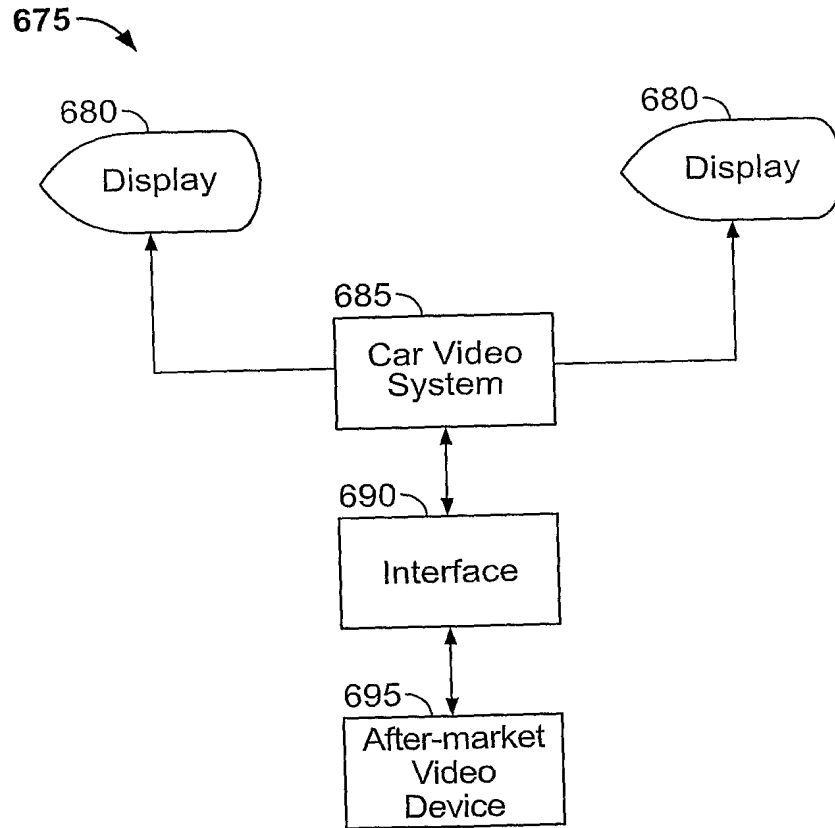


FIG. 12A

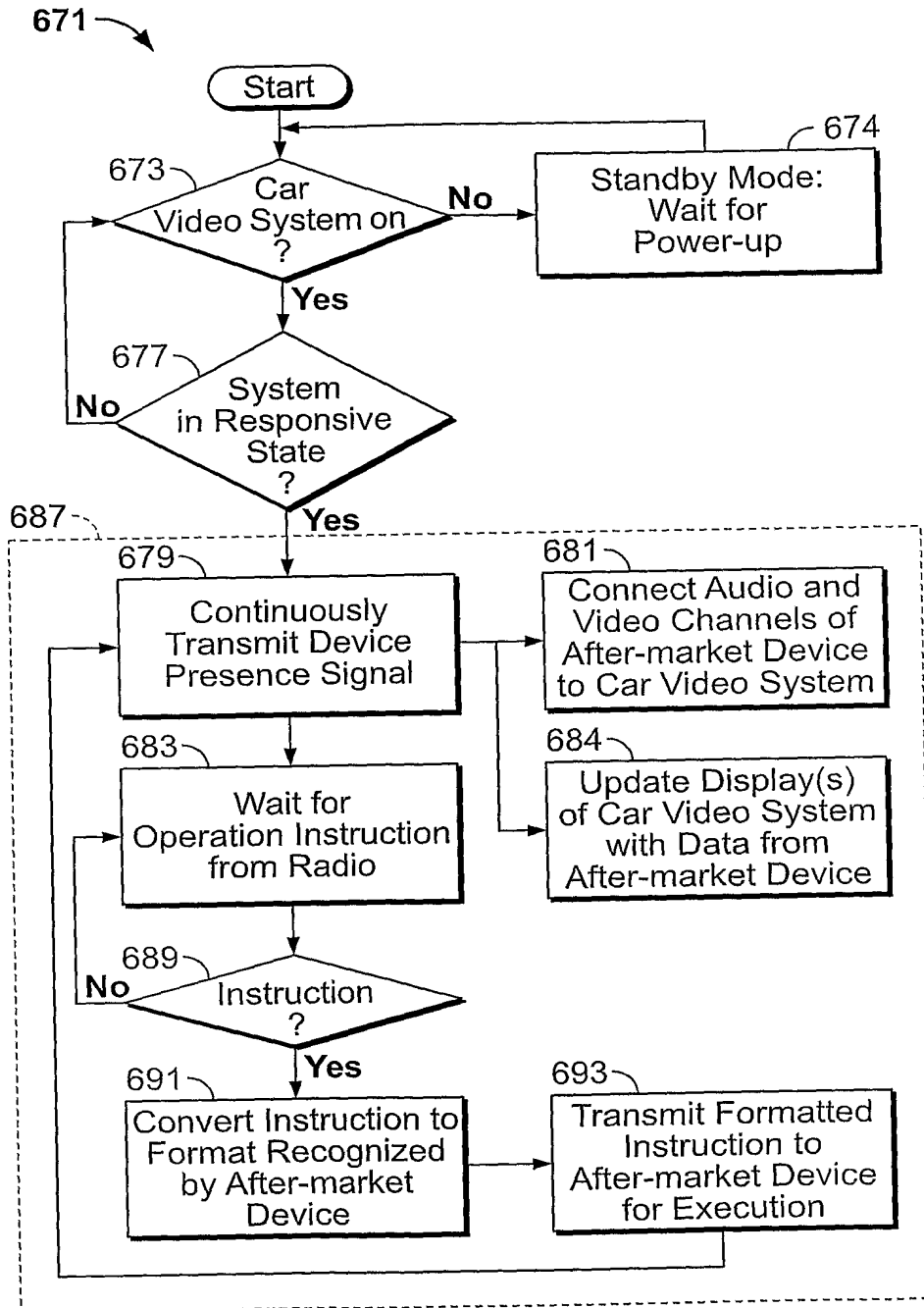


FIG. 12B

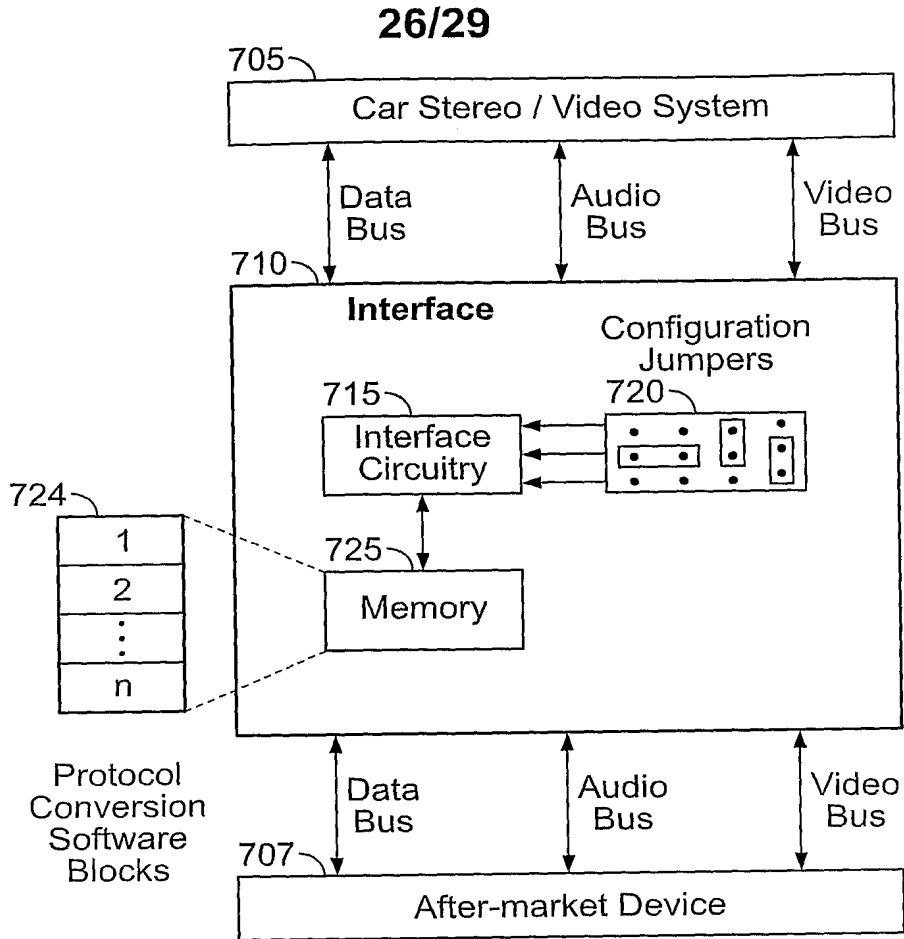


FIG. 13A

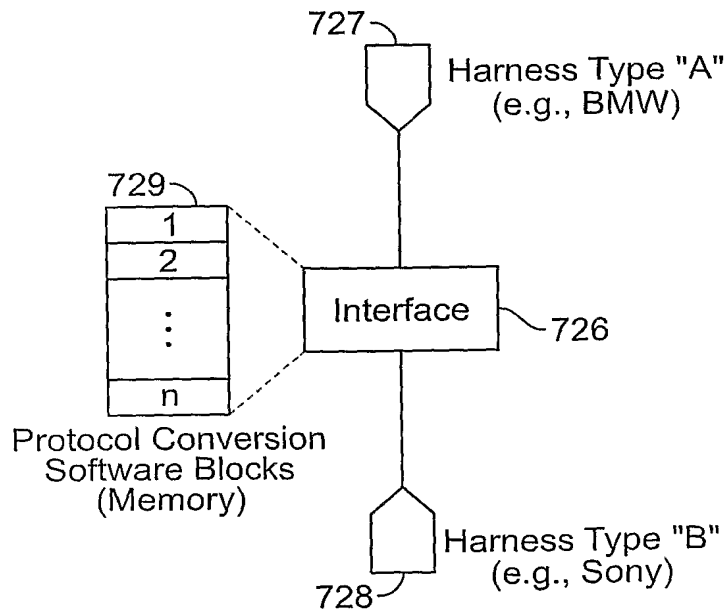


FIG. 13B

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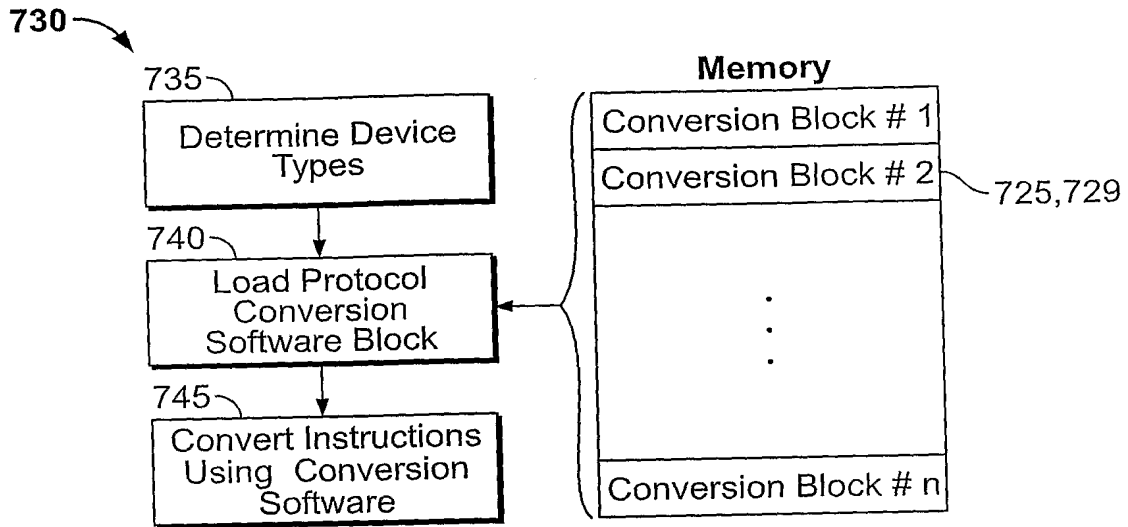


FIG. 14

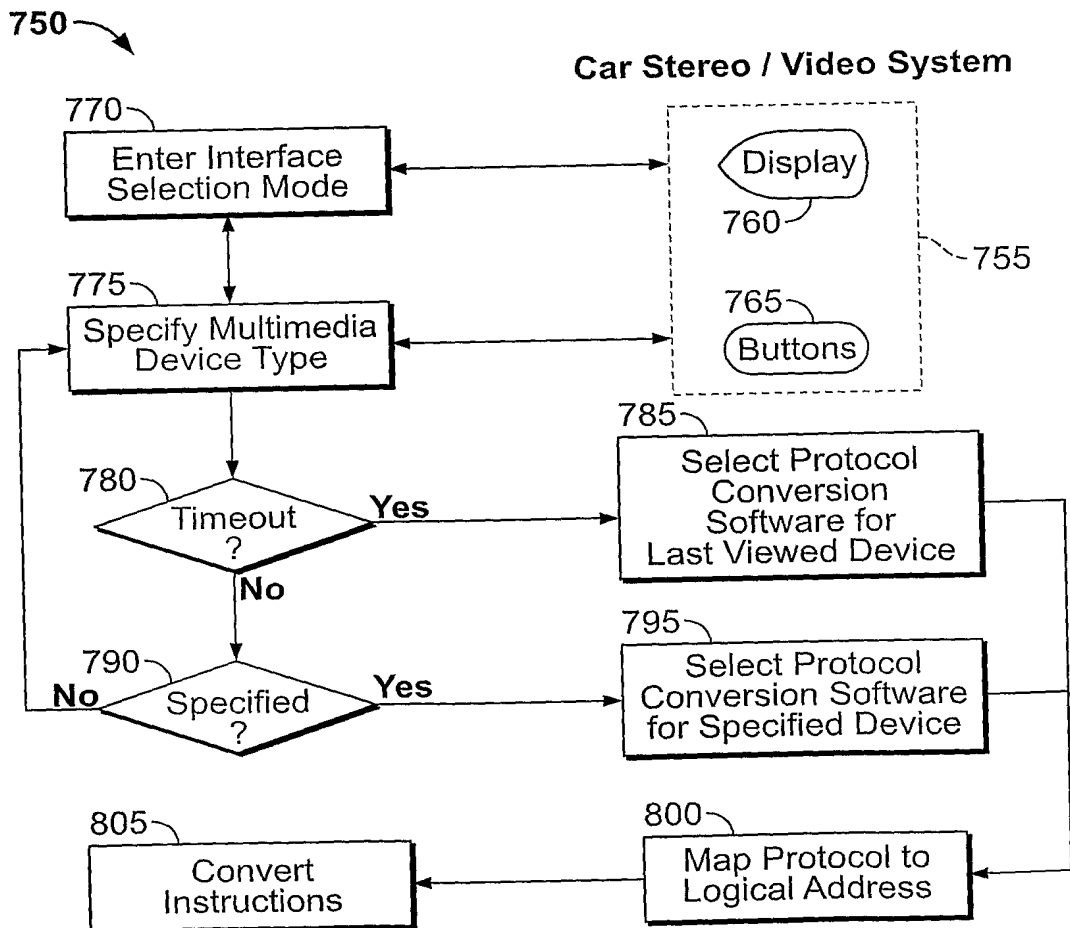


FIG. 15

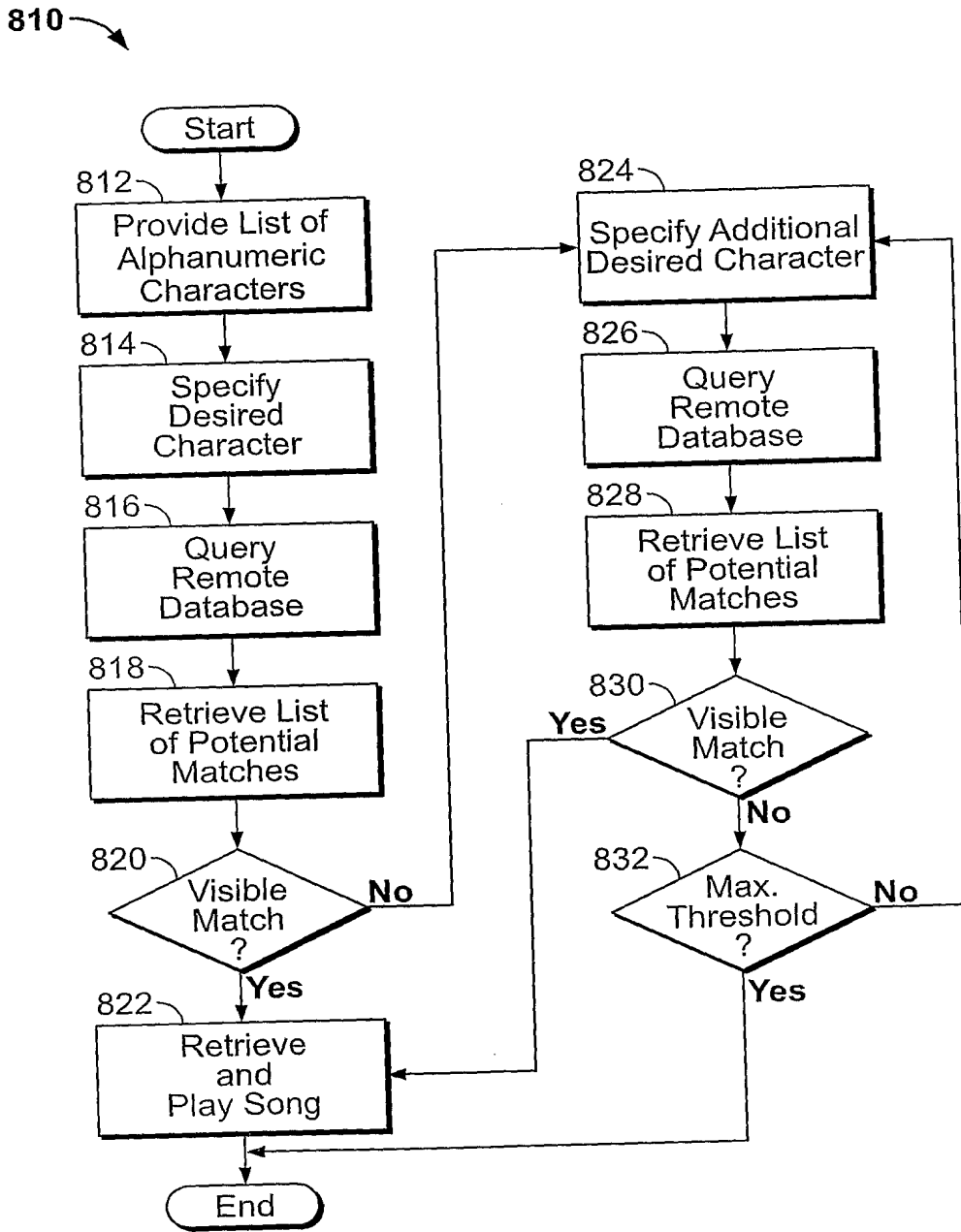


FIG. 16

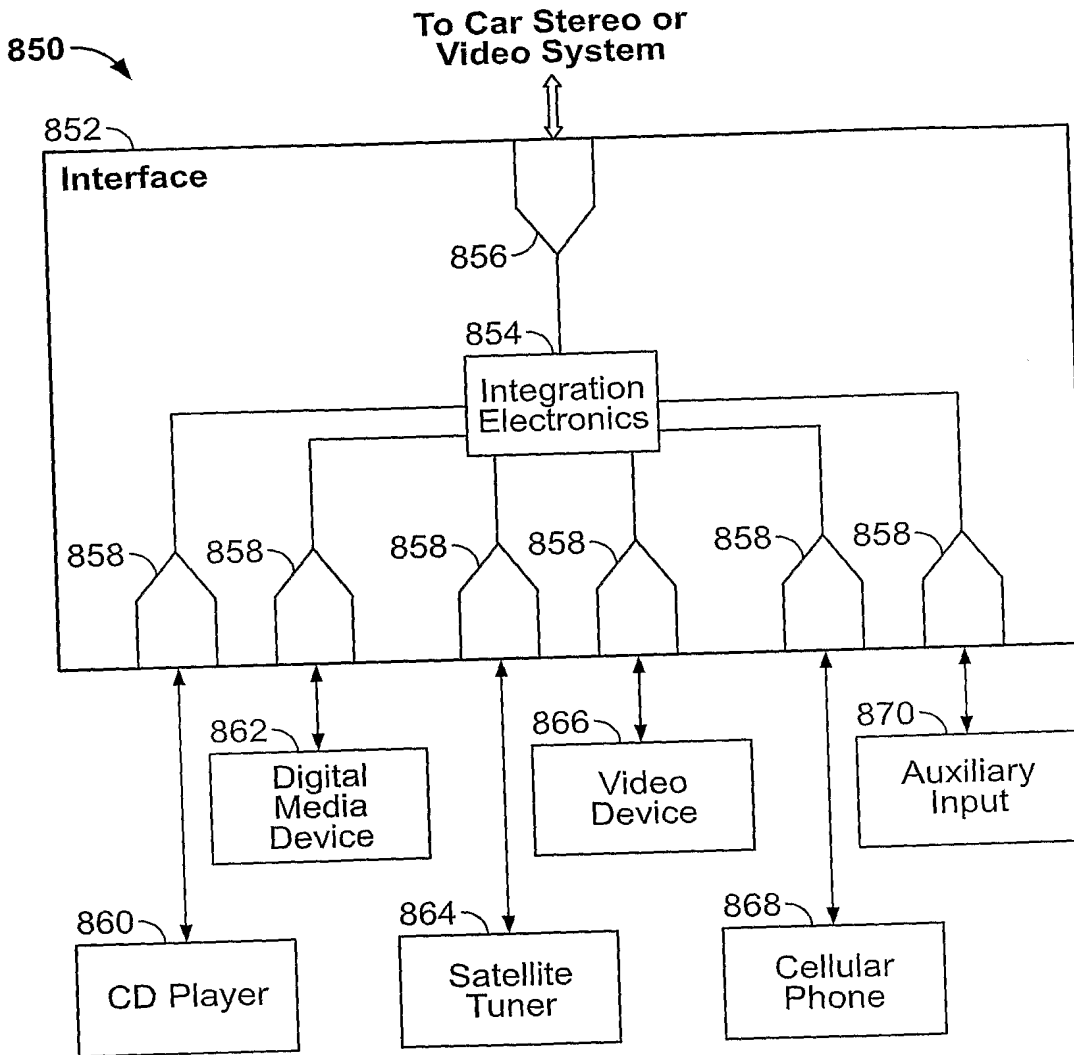


FIG. 17

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

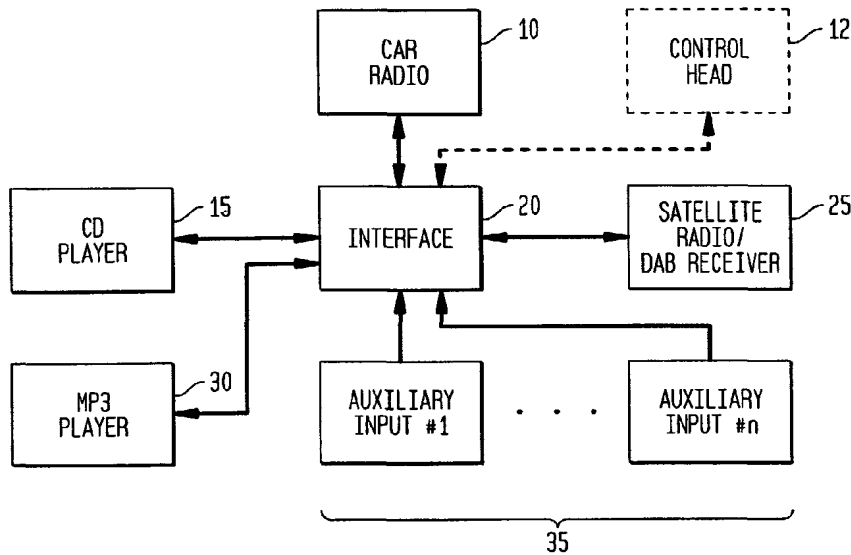
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[Continued on next page]

(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 from 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 present 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 **J1** 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 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

config
    movfw BMW_MM_stat           ;current status_MM , magazine
    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

track
    movfw BMW_TT_stat           ;current status_TT , current
    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

```

31

```

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 be 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, if 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** of **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.

CLAIMSWhat 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.

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FIG. 1

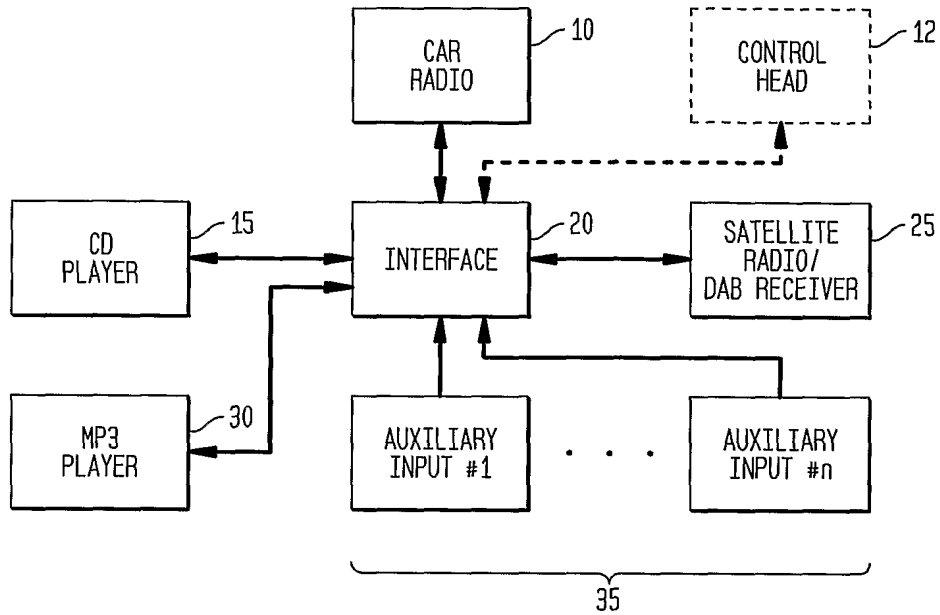
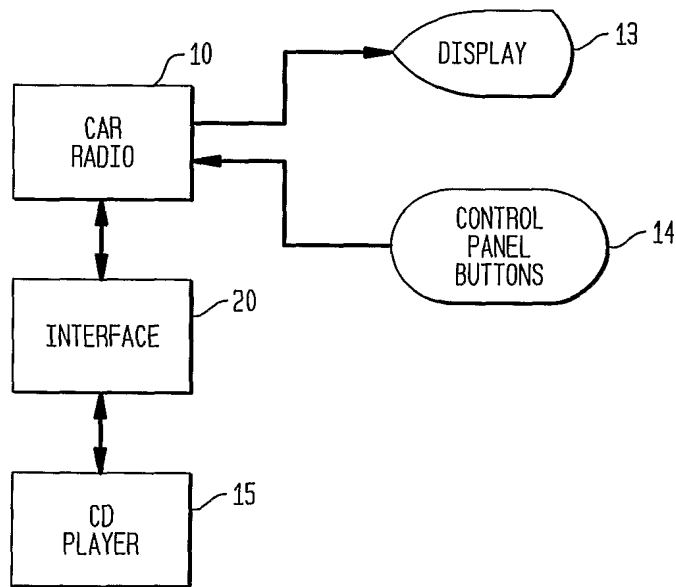


FIG. 2A



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FIG. 2B

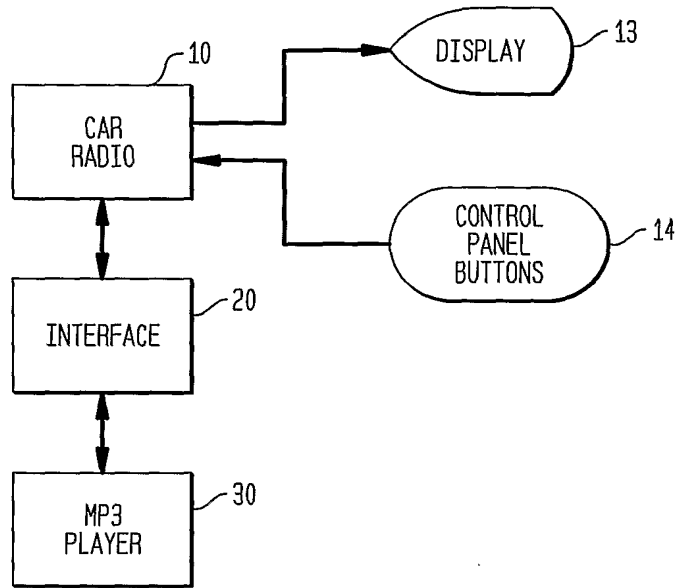
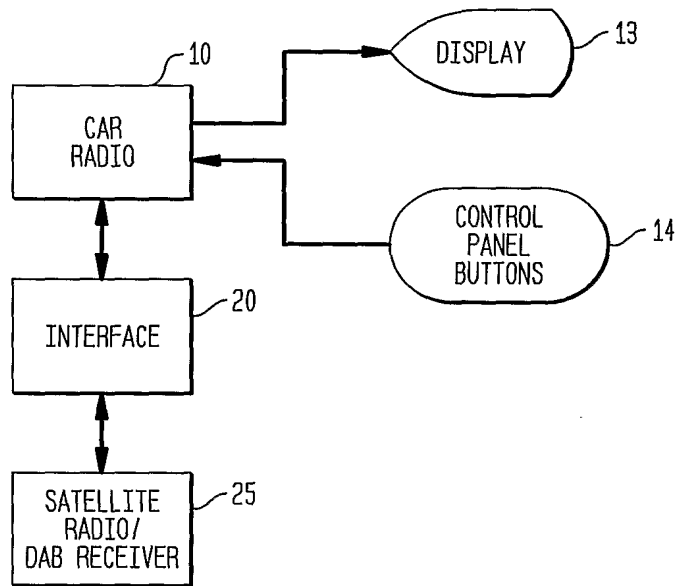


FIG. 2C



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FIG. 2D

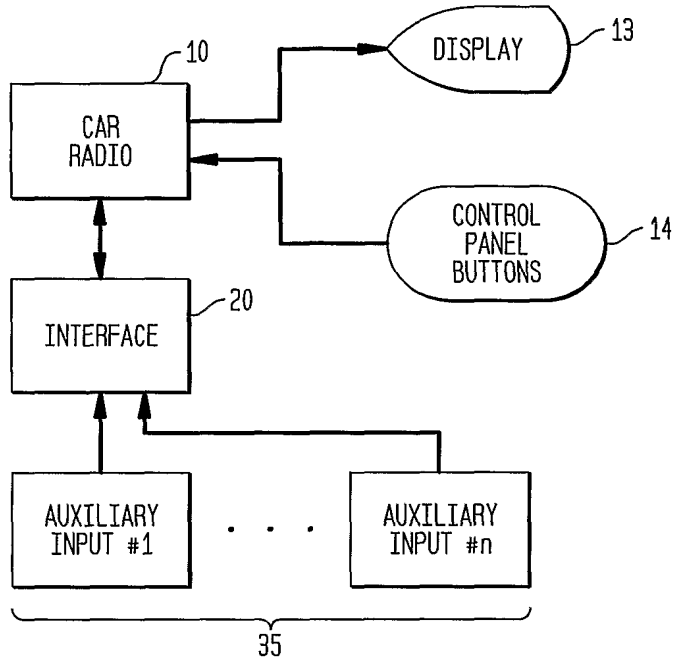
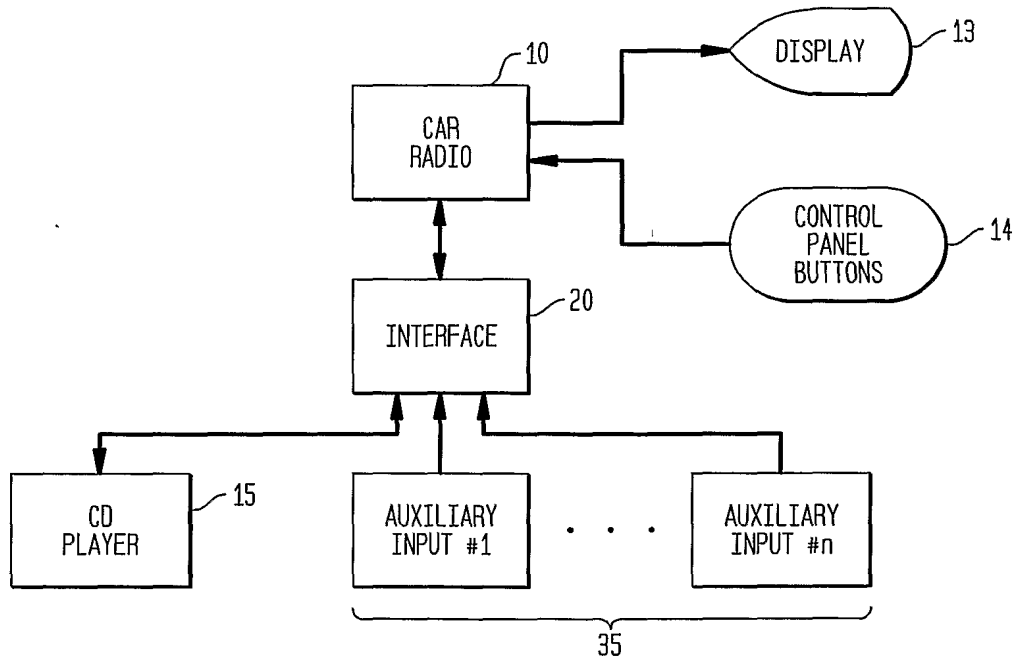


FIG. 2E



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FIG. 2F

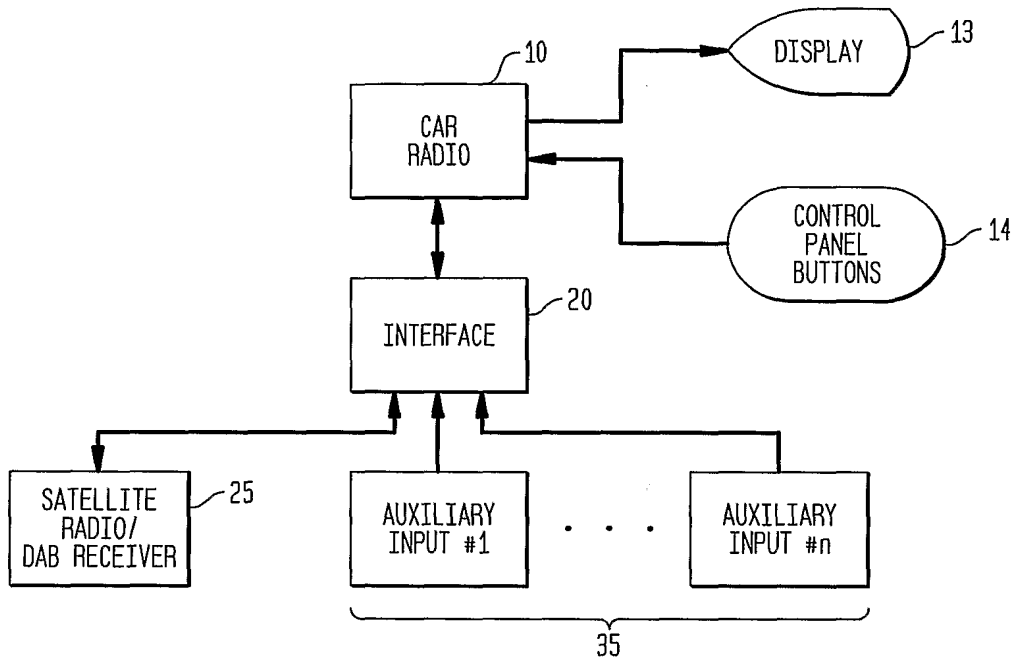


FIG. 2G

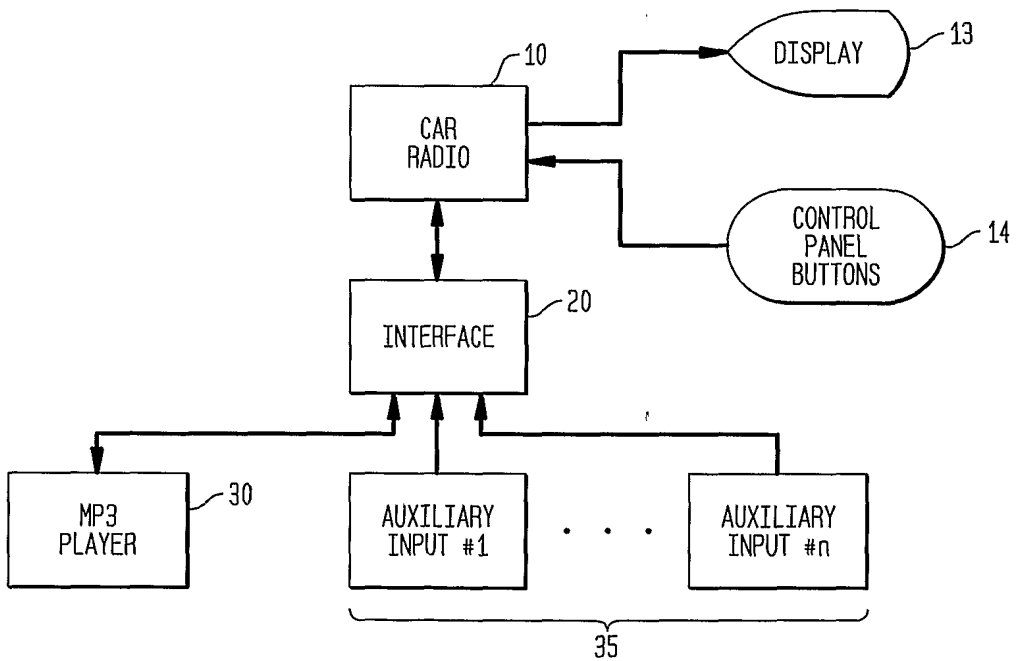


FIG. 2H

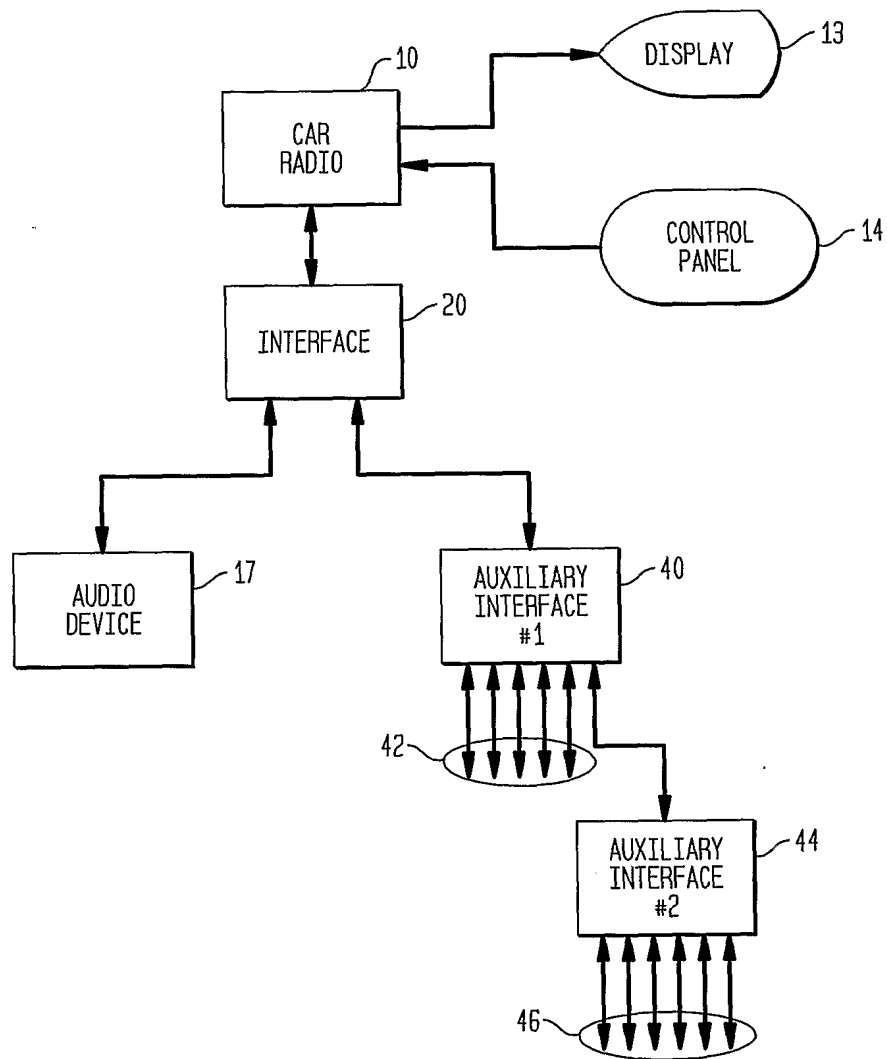
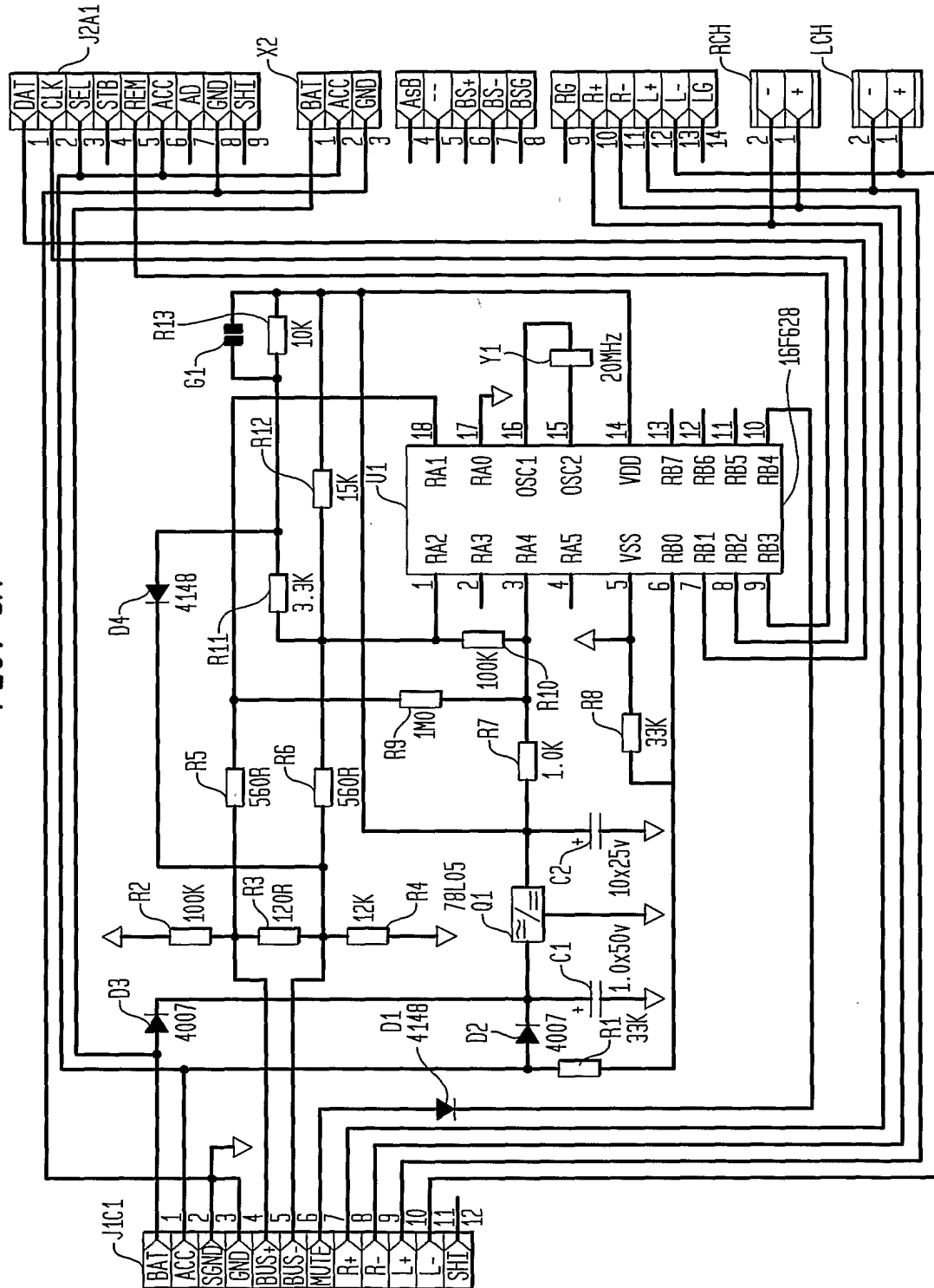
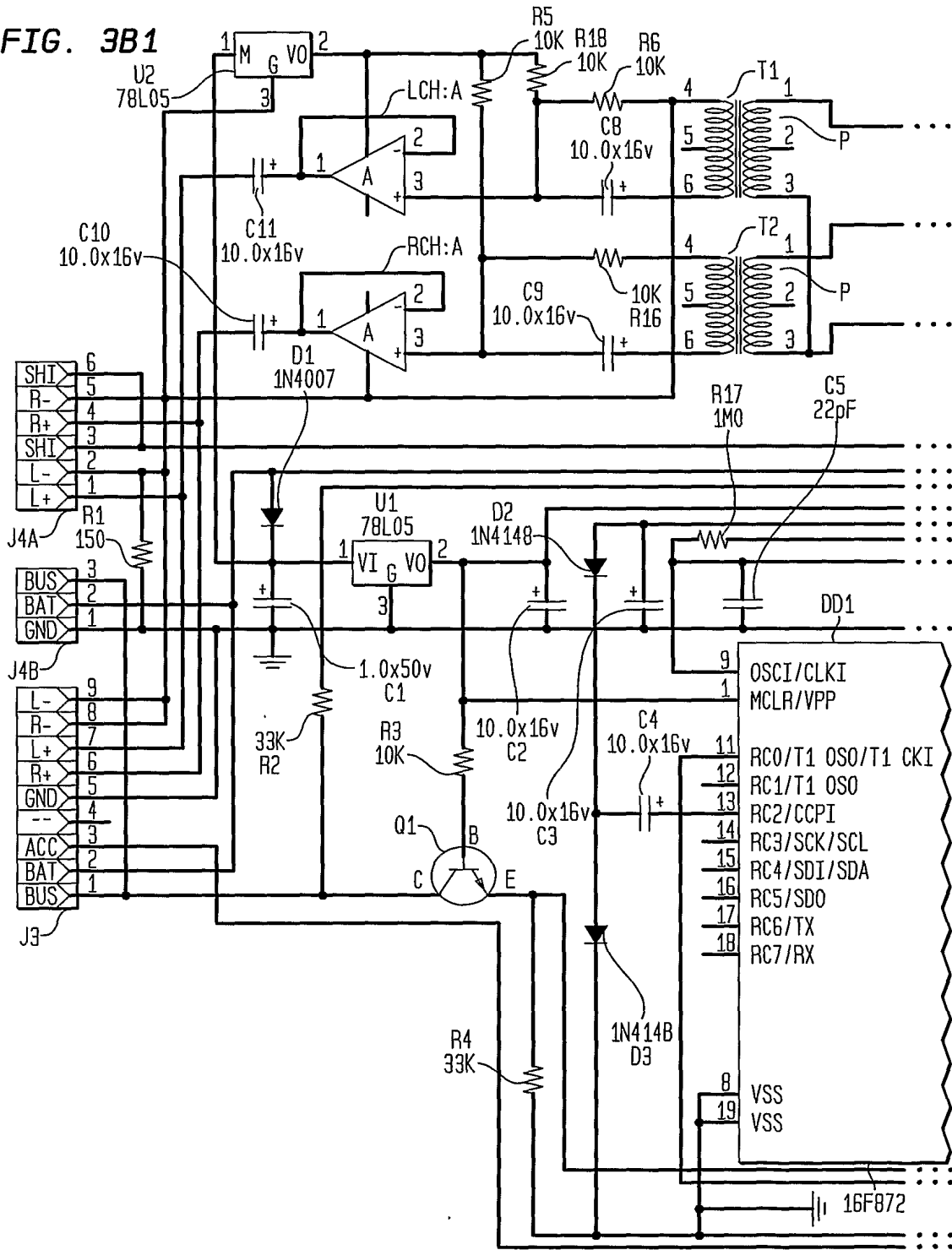


FIG. 3A



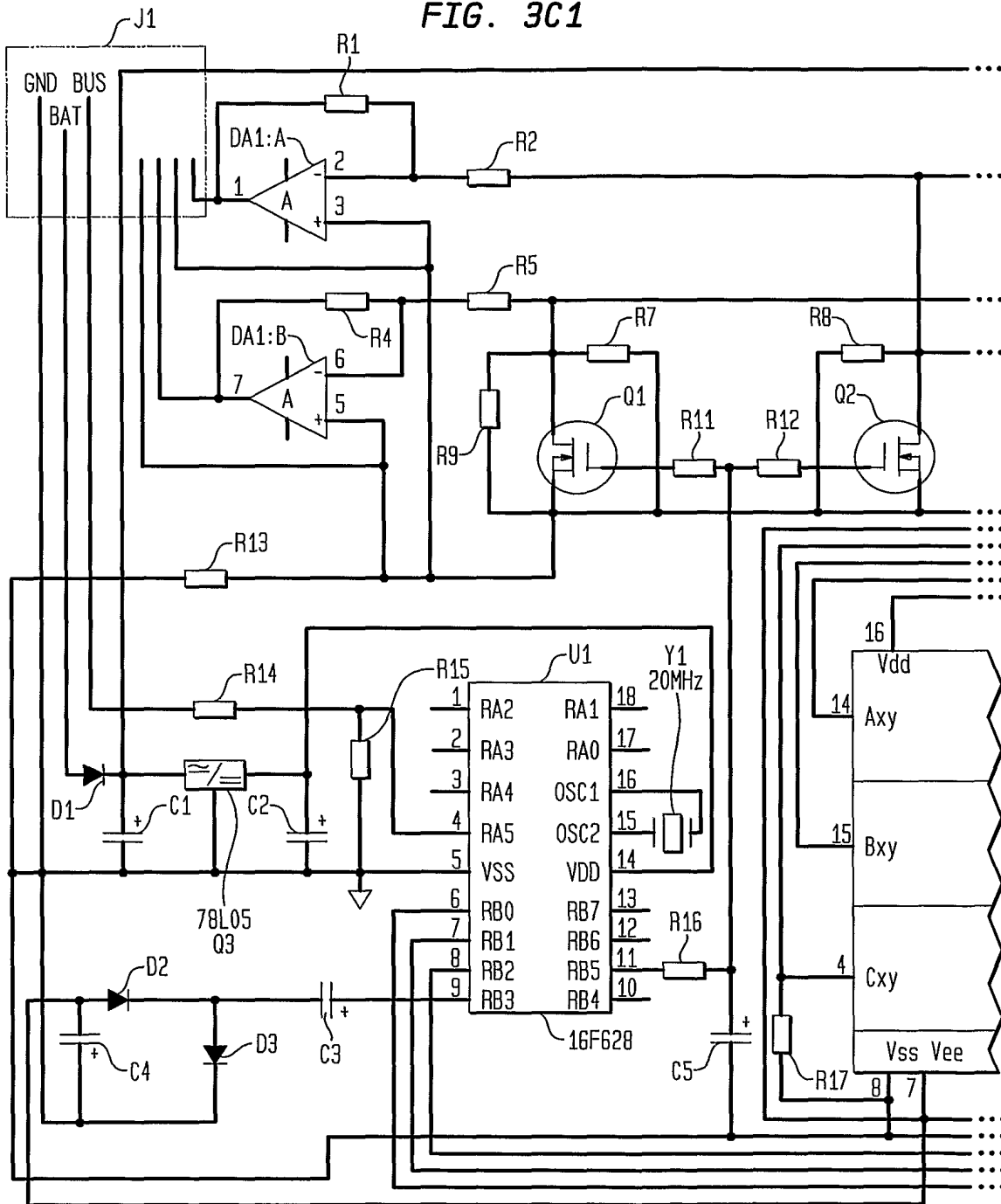
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FIG. 3B1

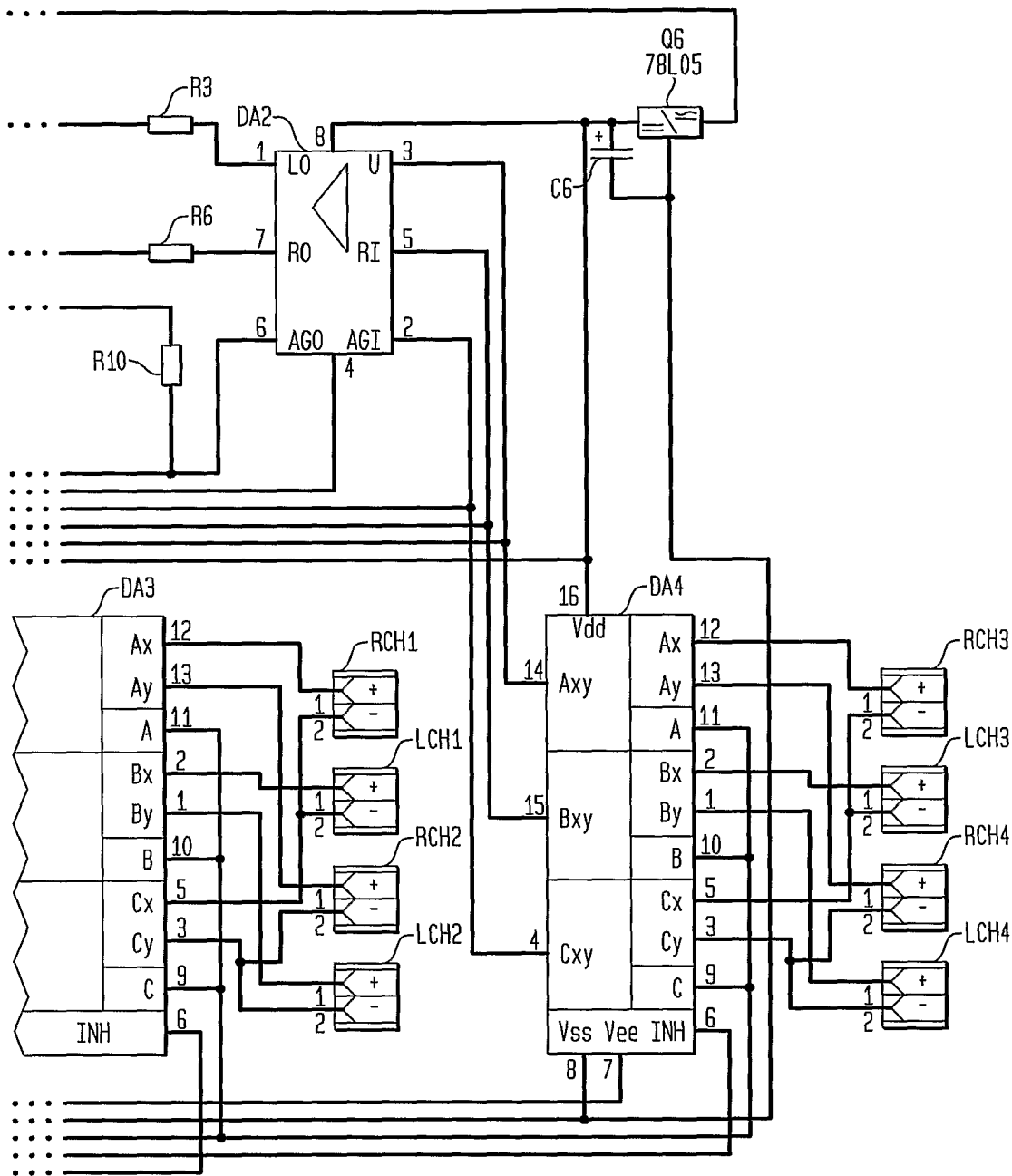


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FIG. 3C1

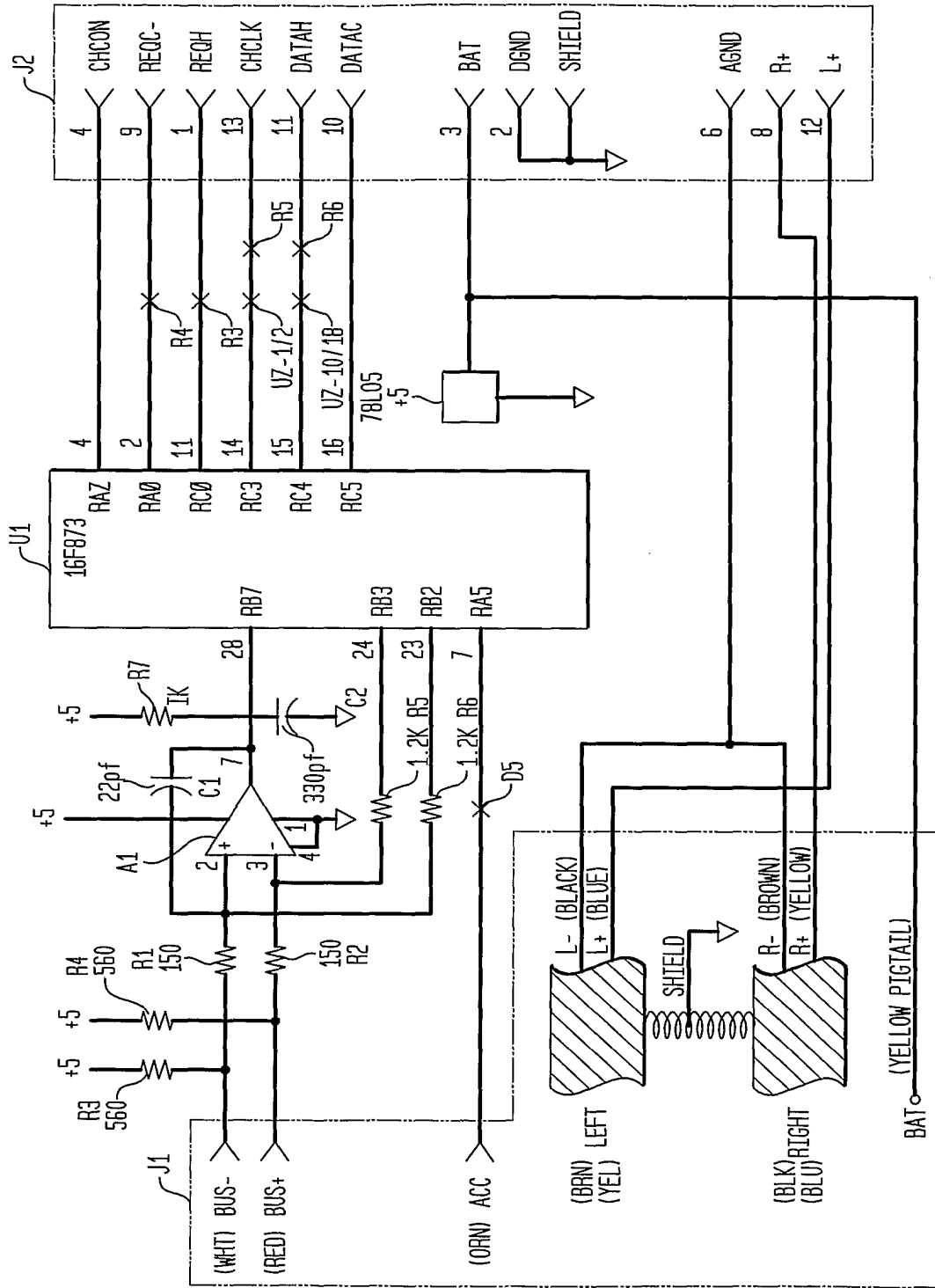


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FIG. 3C2



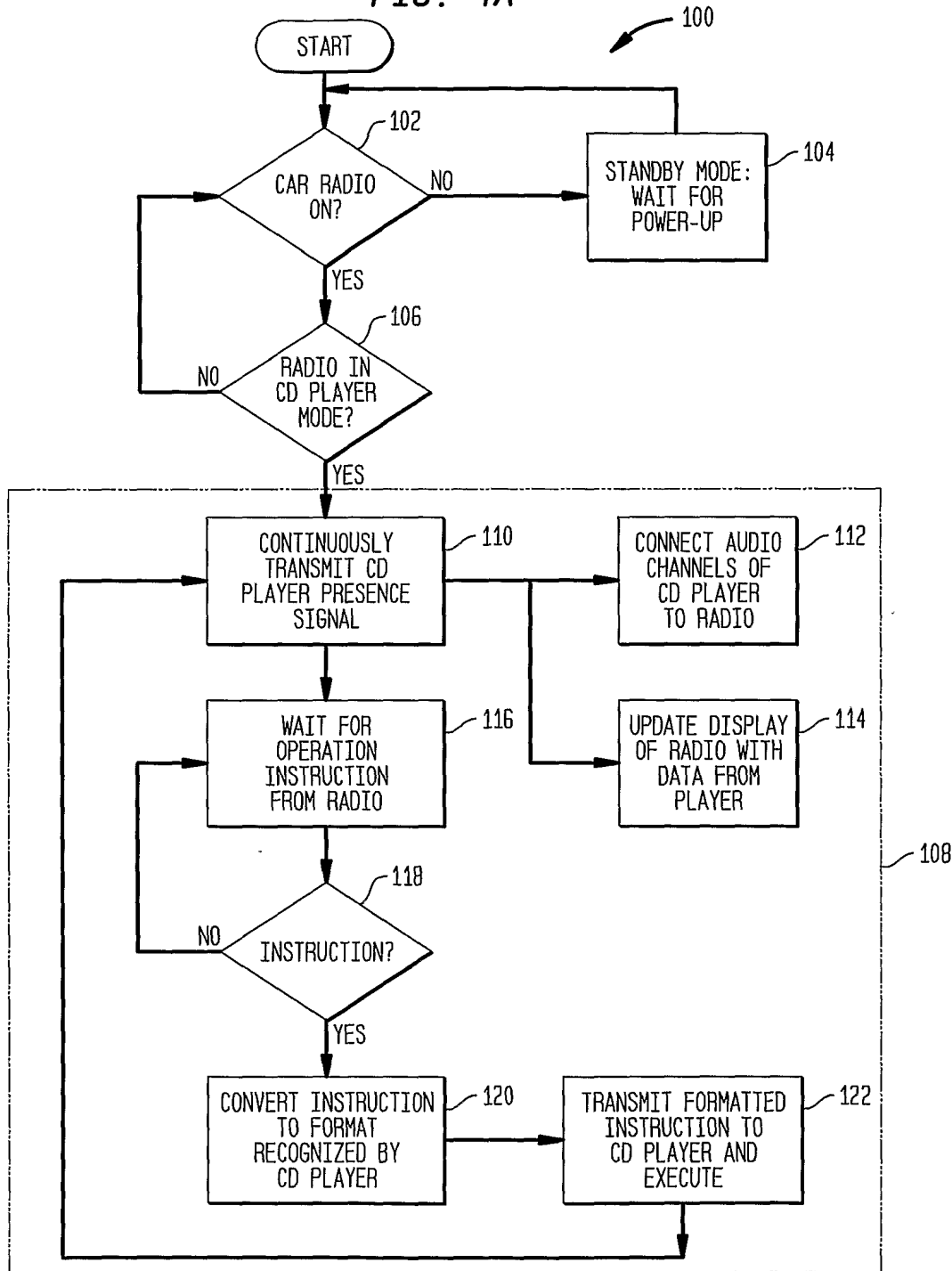
SUBSTITUTE SHEET (RULE 26)

FIG. 3D



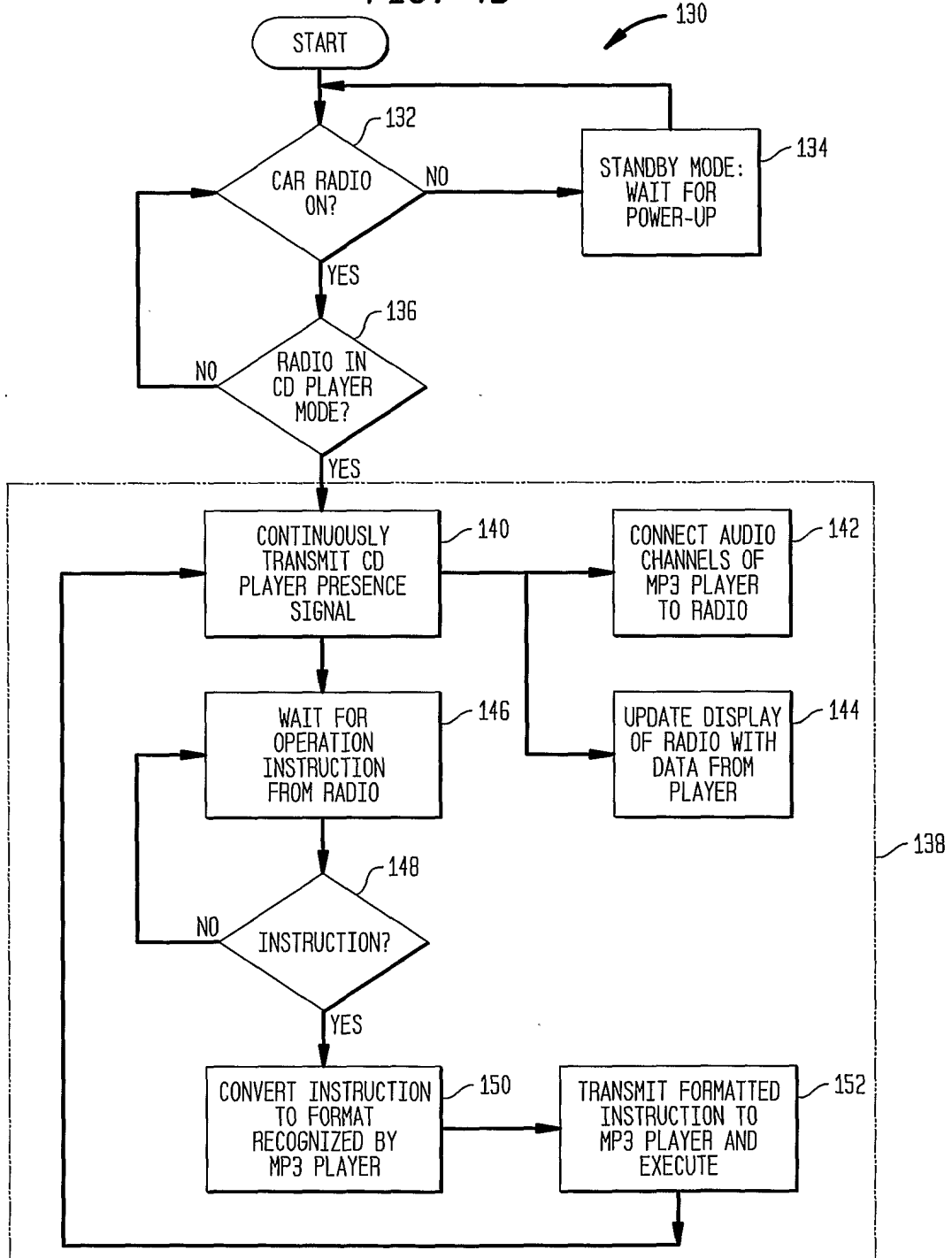
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FIG. 4A



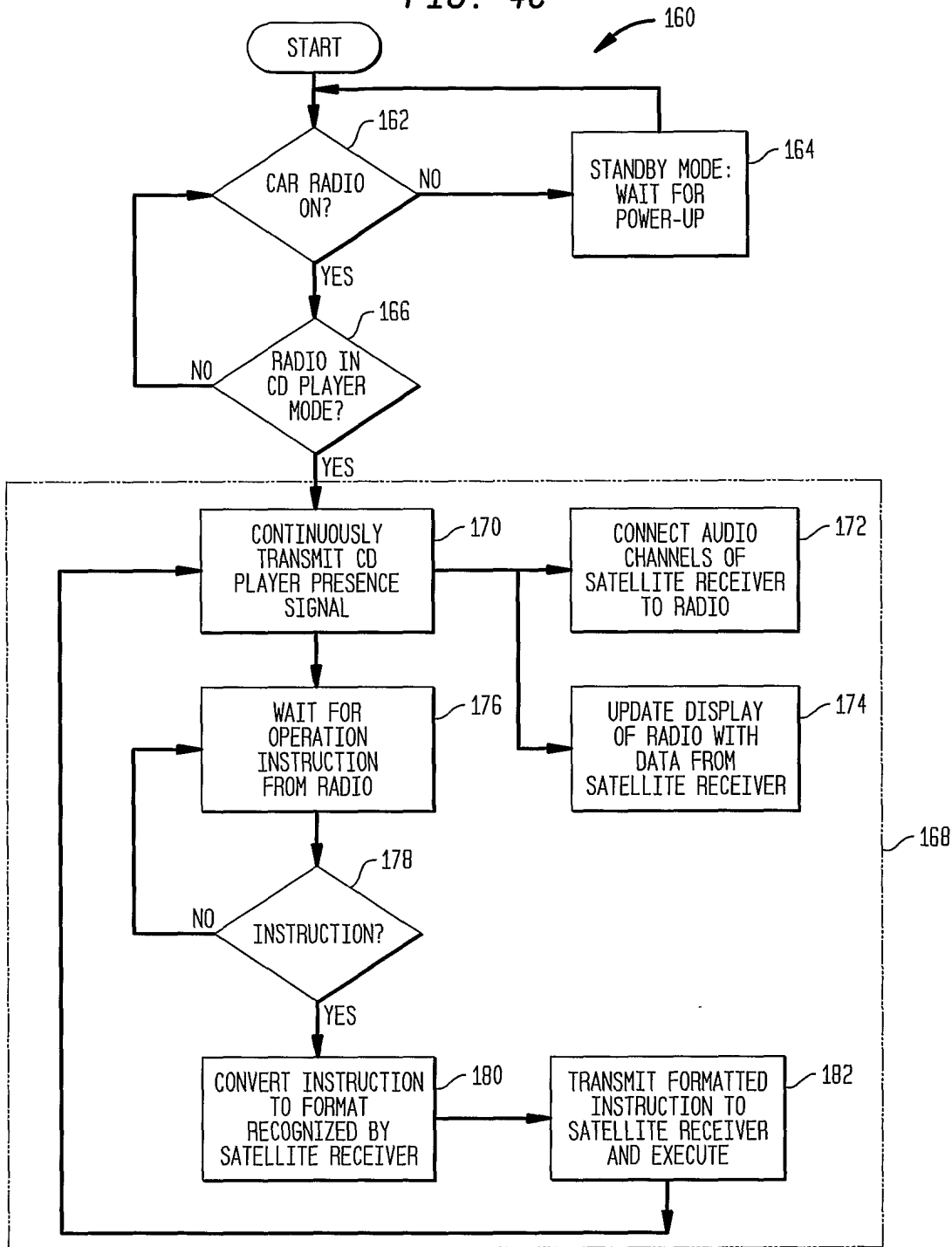
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FIG. 4B



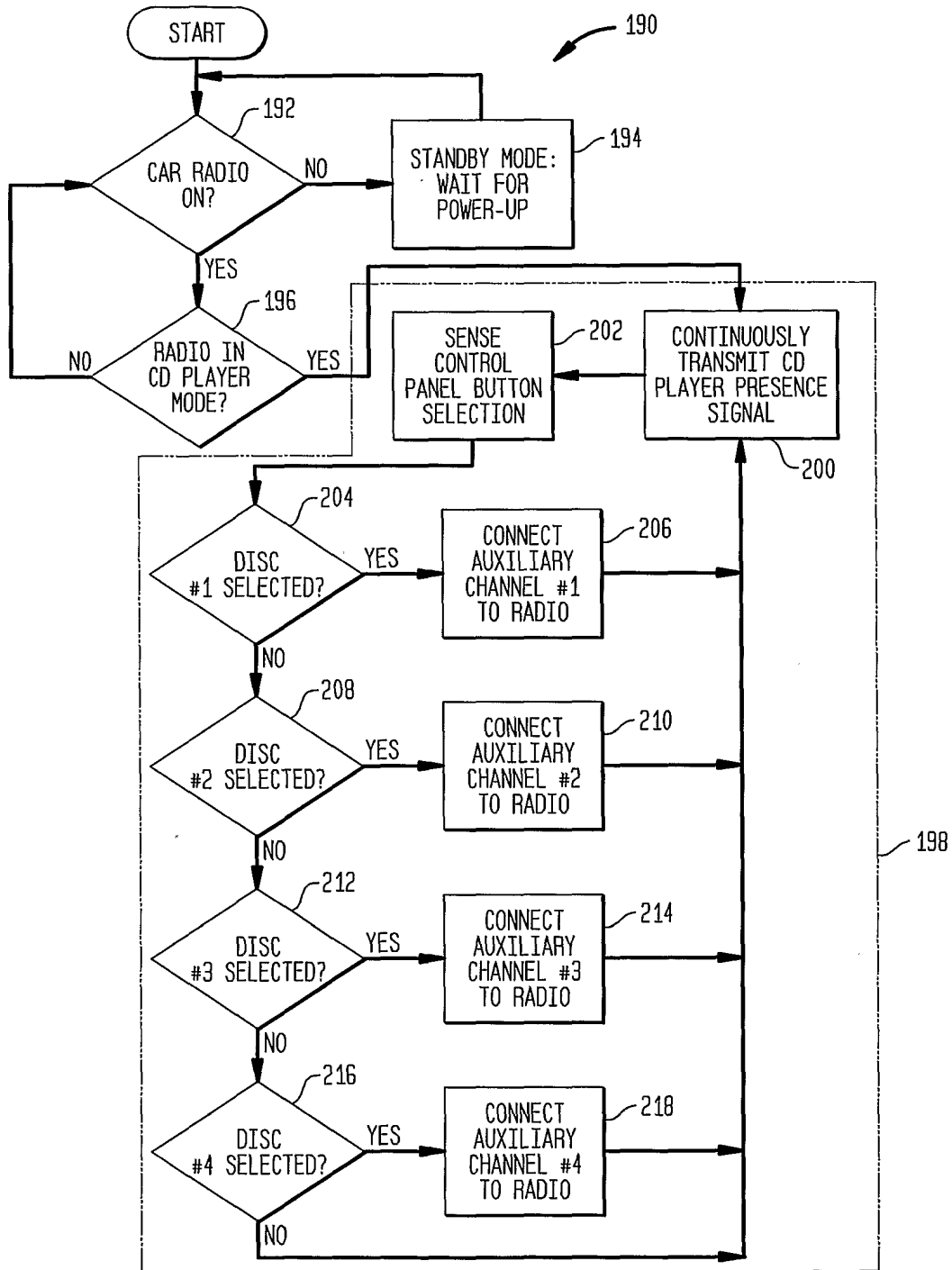
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FIG. 4C



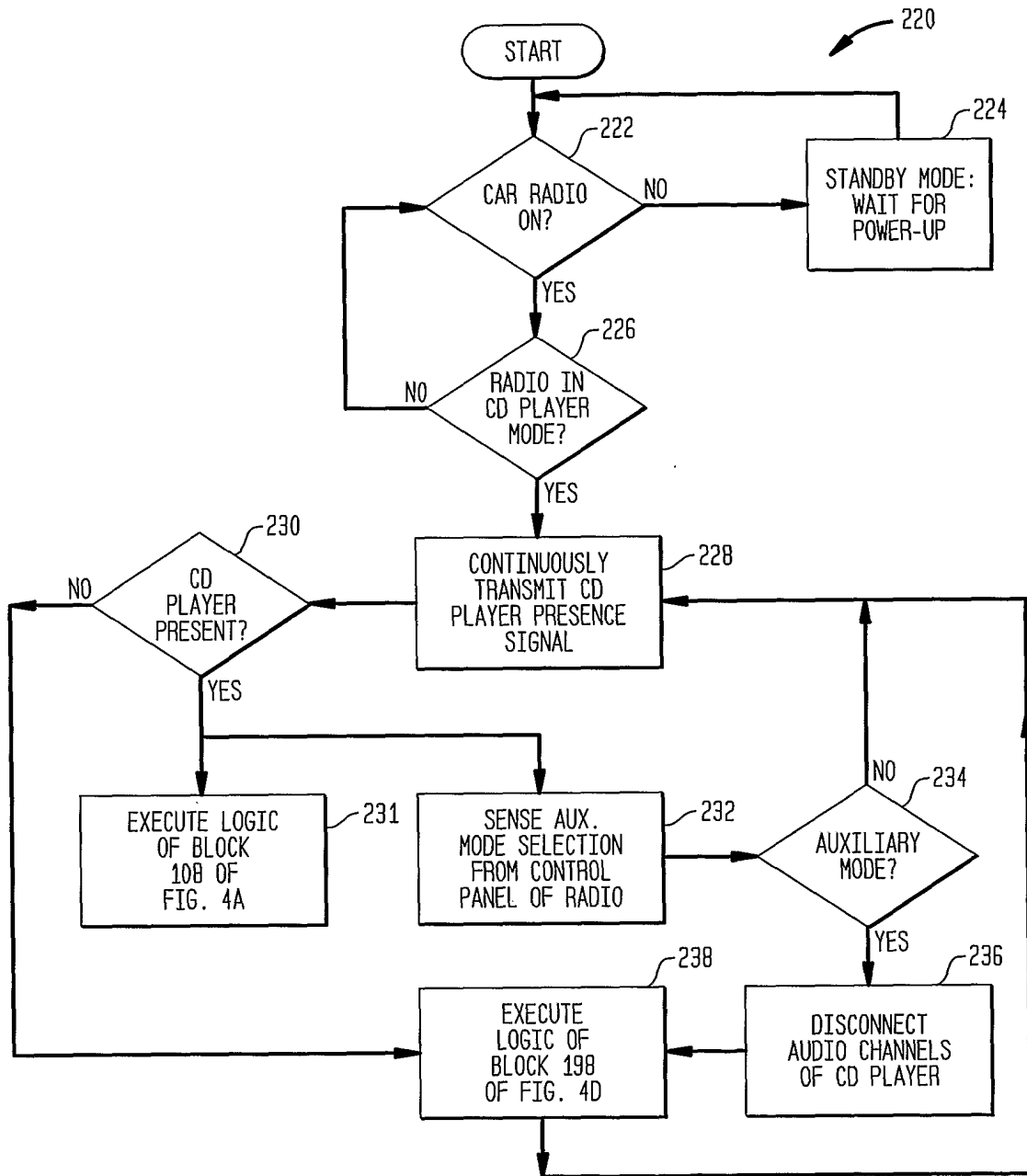
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FIG. 4D

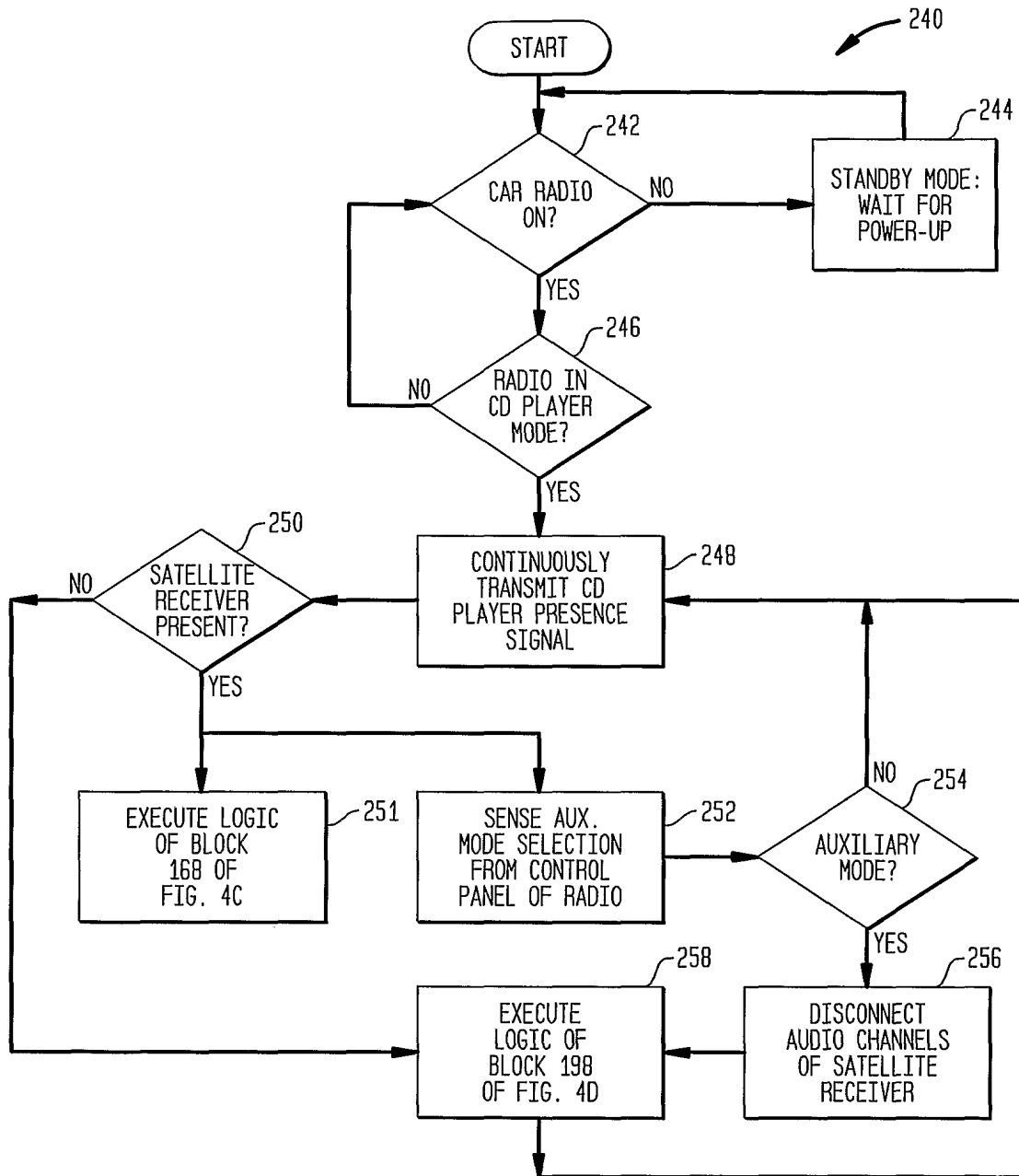


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FIG. 4E

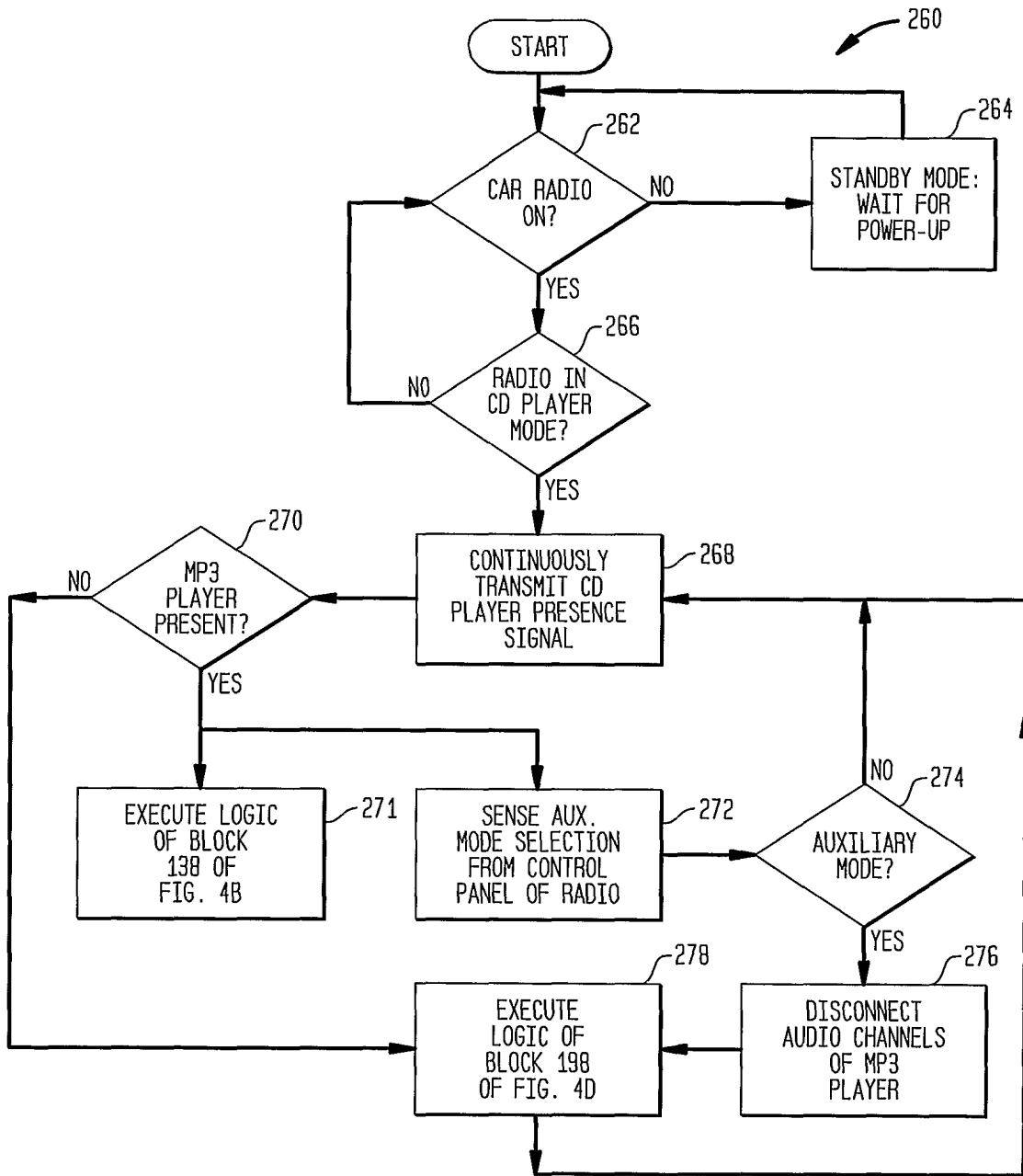


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FIG. 4F

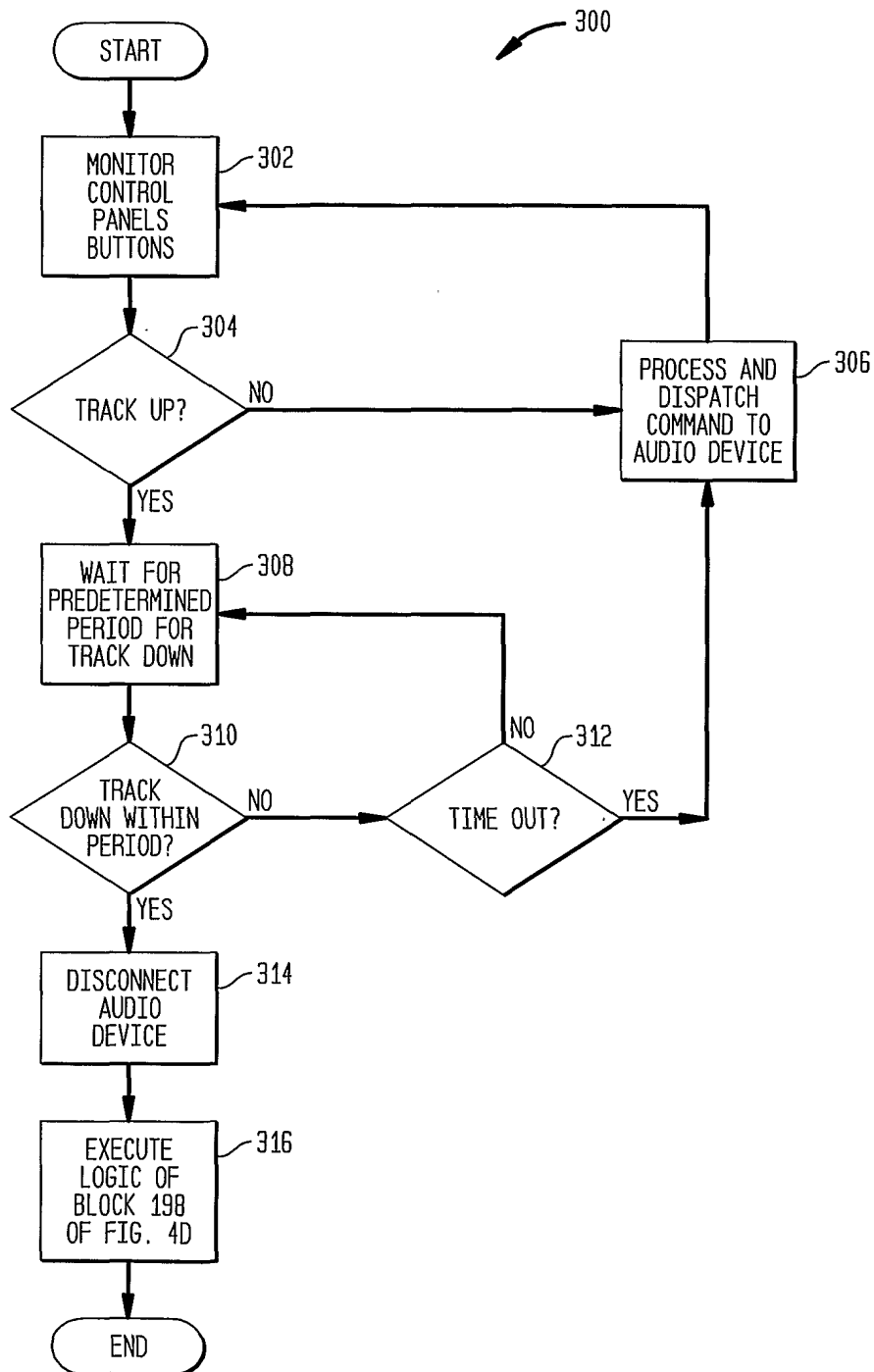


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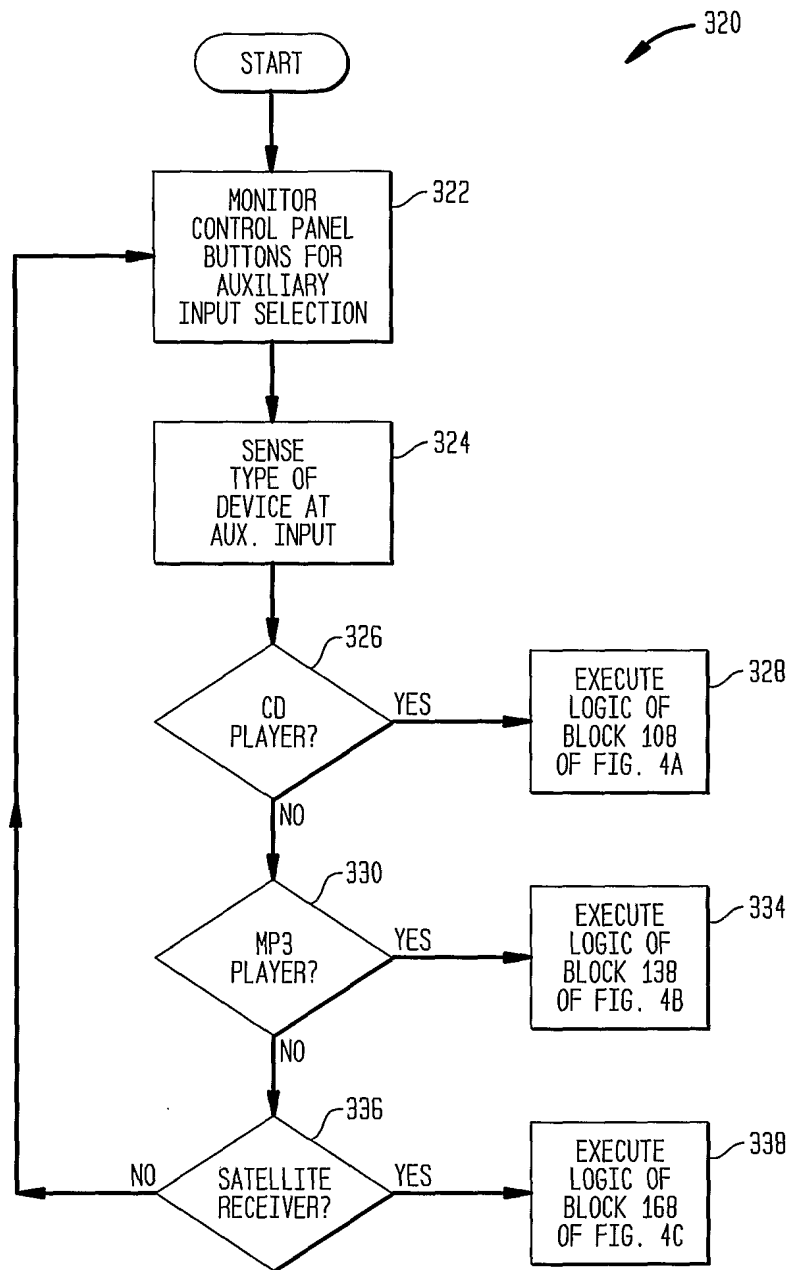
FIG. 4G



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FIG. 5



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FIG. 6



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FIG. 7A

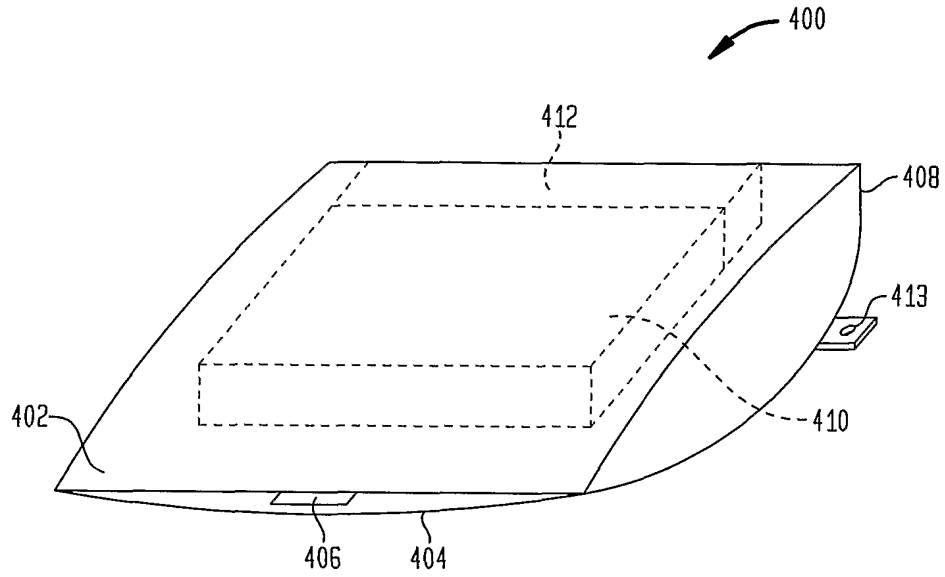


FIG. 7B

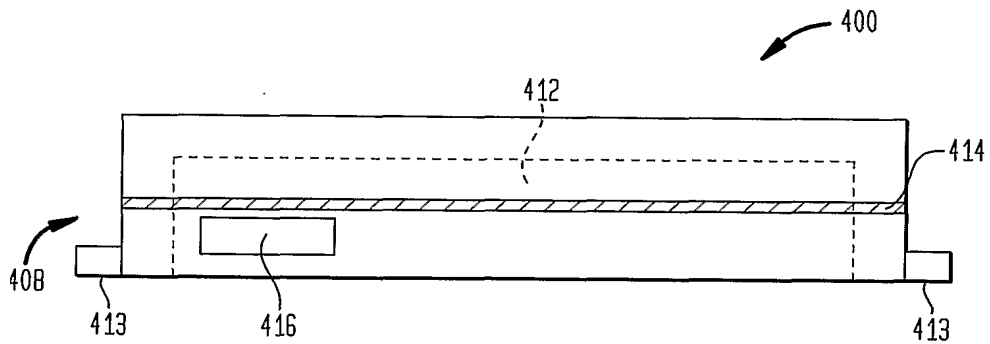
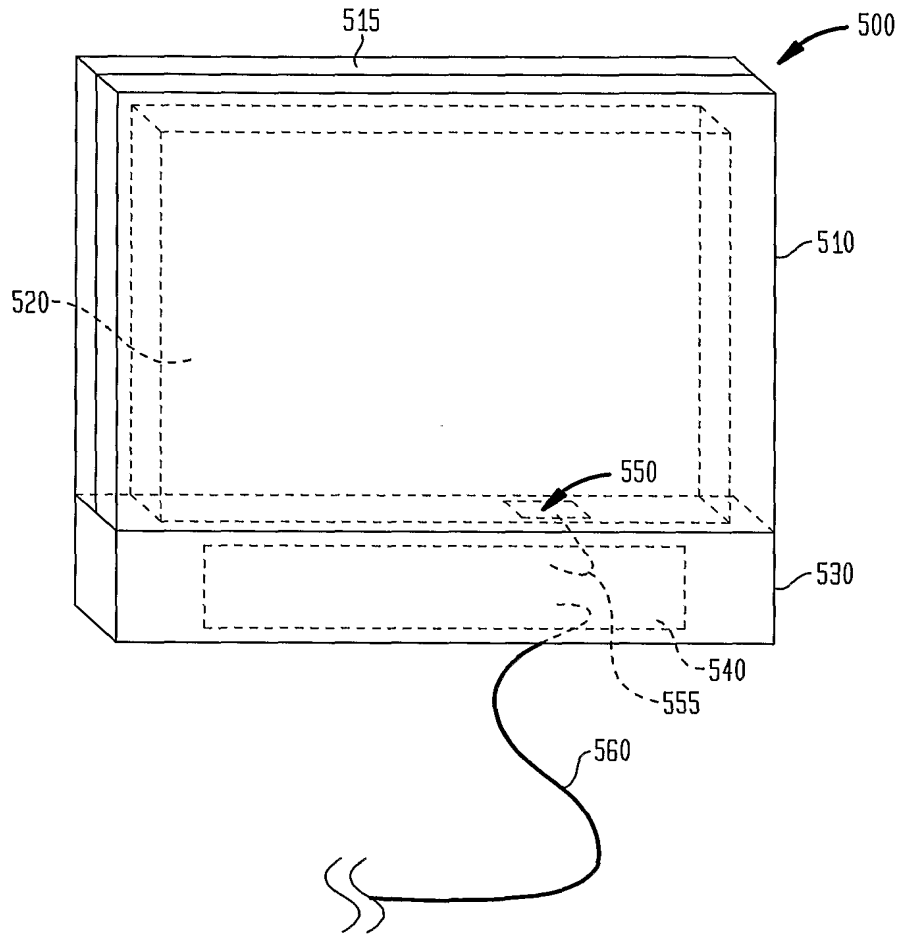


FIG. 8A



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FIG. 8B

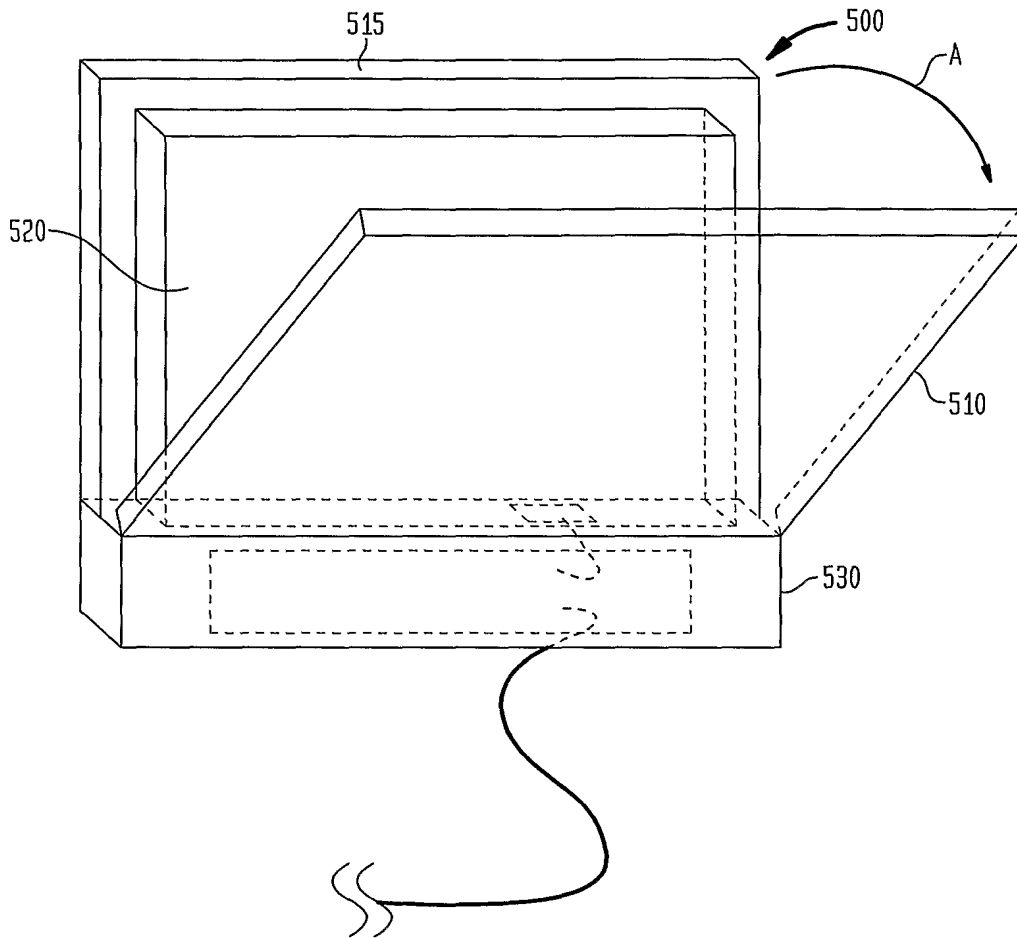
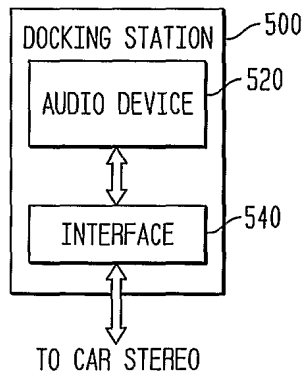


FIG. 9



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, 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:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
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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, Telephone No. 703-305-3900
Rugenia Logan

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

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KOREAN PATENT ABSTRACTS

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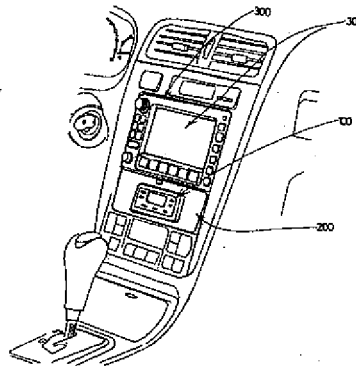
(21)Application number: 1019990042524
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 (51)Int. Cl G11B 20/10

(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.



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Date of opposition against the grant of a patent (00000000)
Number of trial against decision to refuse ()
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KOREAN PATENT ABSTRACTS XML 2(1-2)



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(19) KOREAN INTELLECTUAL PROPERTY OFFICE

KOREAN PATENT ABSTRACTS

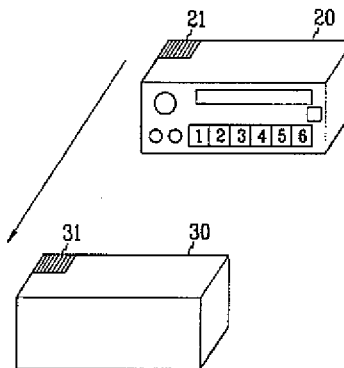
(11)Publication number: 1020010059192 A
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(21)Application number: 1019990066582	(71)Applicant: HYUNDAI MOTOR COMPANY
(22)Date of filing: 30.12.1999	(72)Inventor: LEE, JAE GWANG
(30)Priority: ..	
(51)Int. Cl: G11B 17/02	

(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.



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B 6 0 R 11/02		B 6 0 R 11/02	B 5 K 0 3 2
H 0 4 L 12/28		H 0 4 L 11/00	3 1 0 Z 5 K 0 3 3

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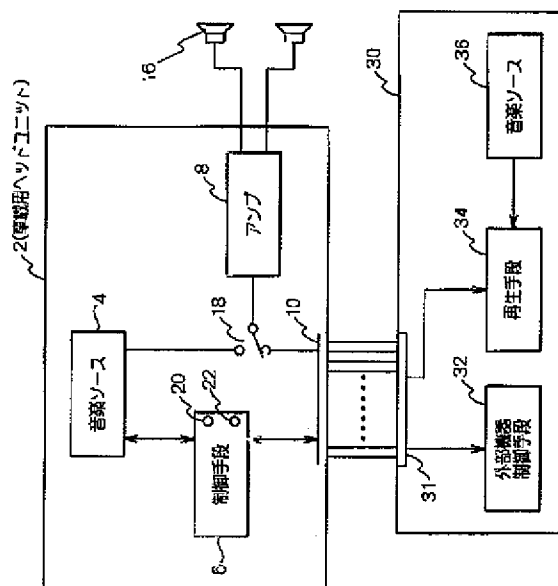
5K033 BA06 BA08 DB03 DB04

(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。

【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本のケーブルに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本のケーブルに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本のケーブルに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本のケーブルに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本のケーブルに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本のケーブルに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ふ。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、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を備えることよ。

【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ことよ。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ウ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ューム回路7と、このボリュー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。

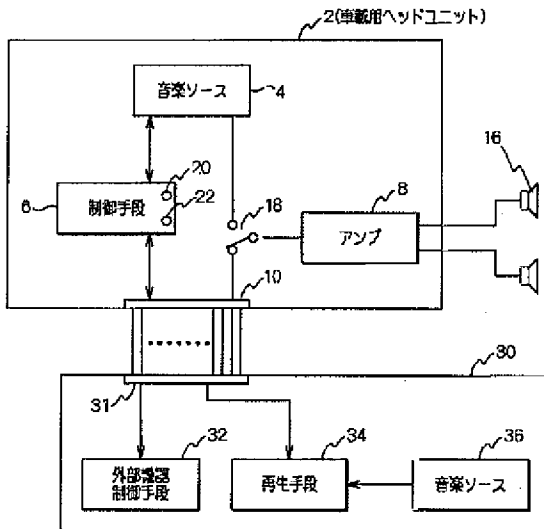
【図7】図6に示す接続チェック信号を用いた外部機器

側の接続確立処理の一例を示すフローチャートである。

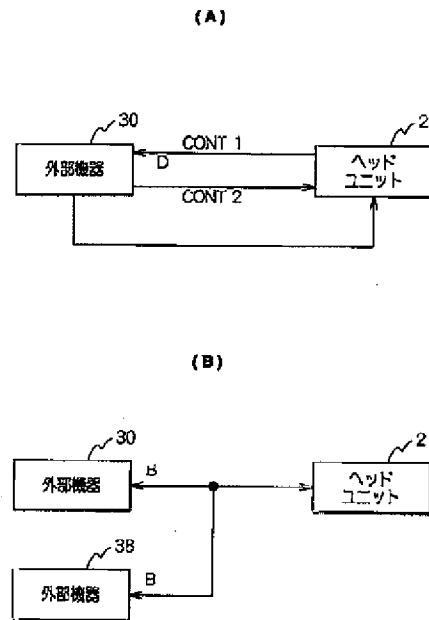
【符号の説明】

- 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)

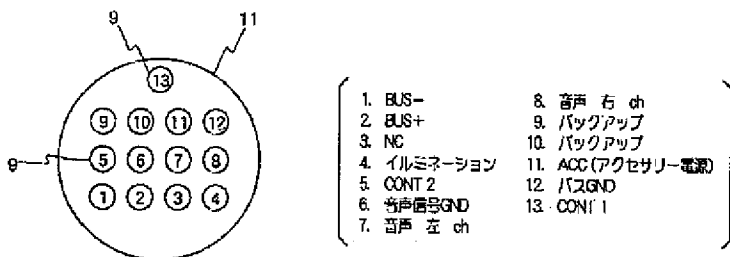
【図1】



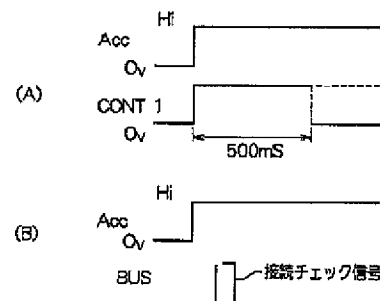
【図3】



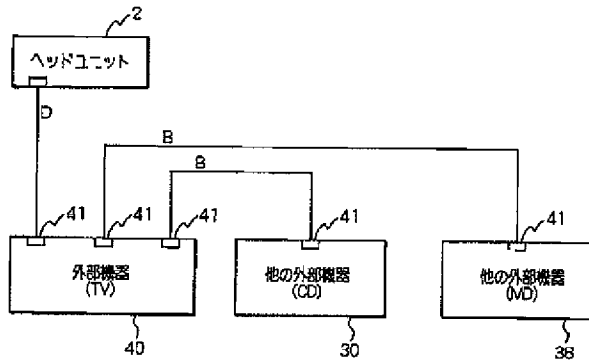
【図2】



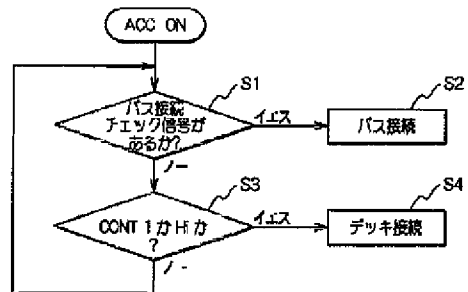
【図6】



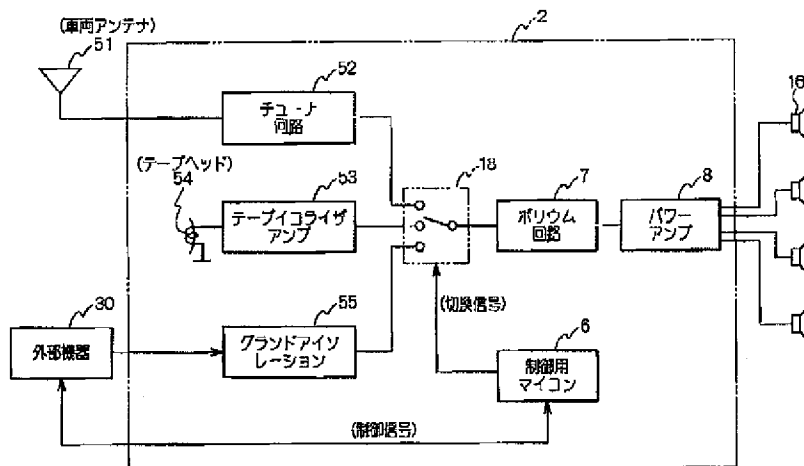
【図4】



【図7】



【図5】



PATENT ABSTRACTS OF JAPAN

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(21)Application number : 11-090570 (71)Applicant : SUZUKI MOTOR CORP

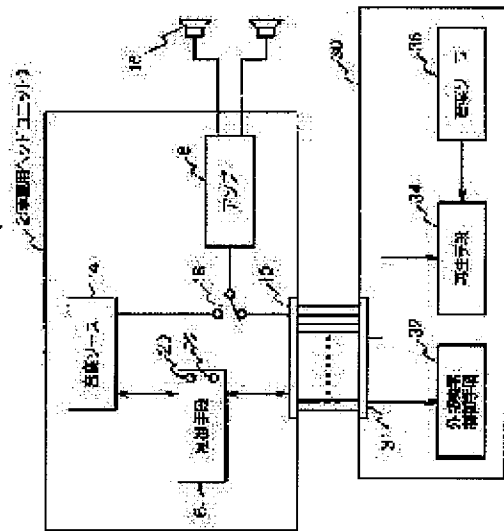
(22)Date of filing : 31.03.1999 (72)Inventor : UEMURA HIROSHI

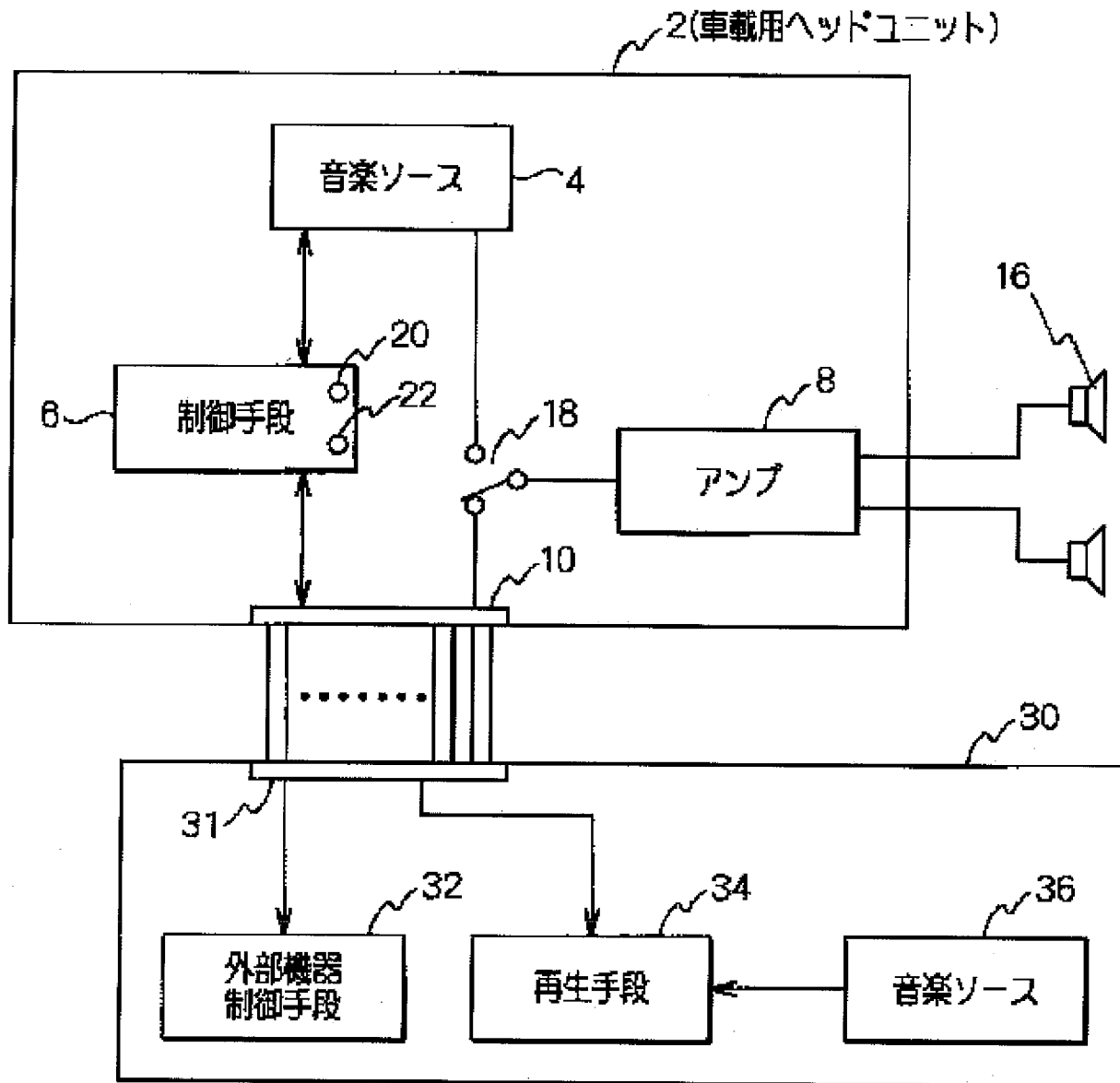
(54) ON-VEHICLE HEAD UNIT AND ON-VEHICLE EXTERNAL DEVICE

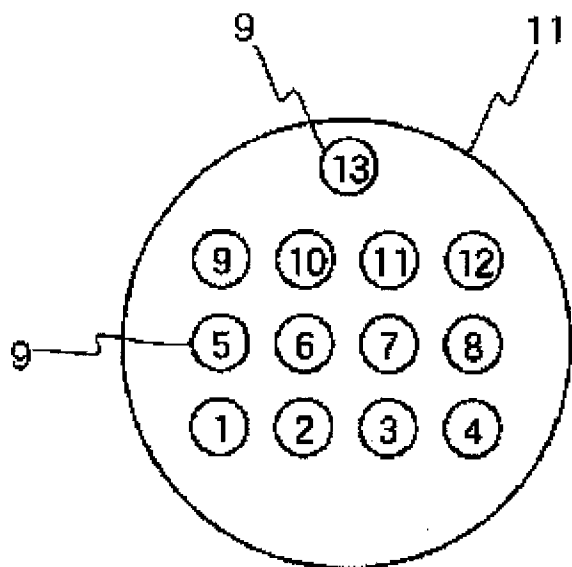
(57)Abstract:

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.

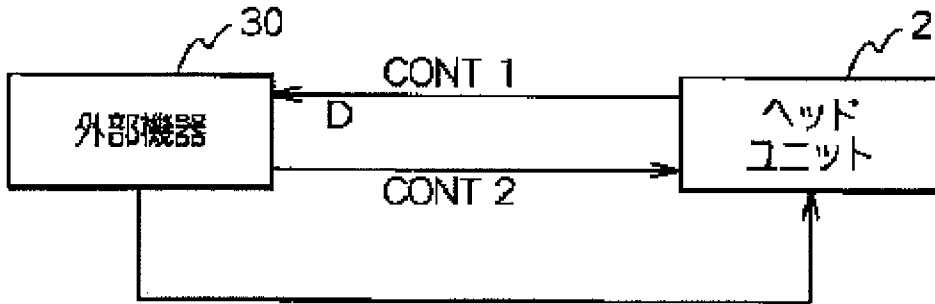




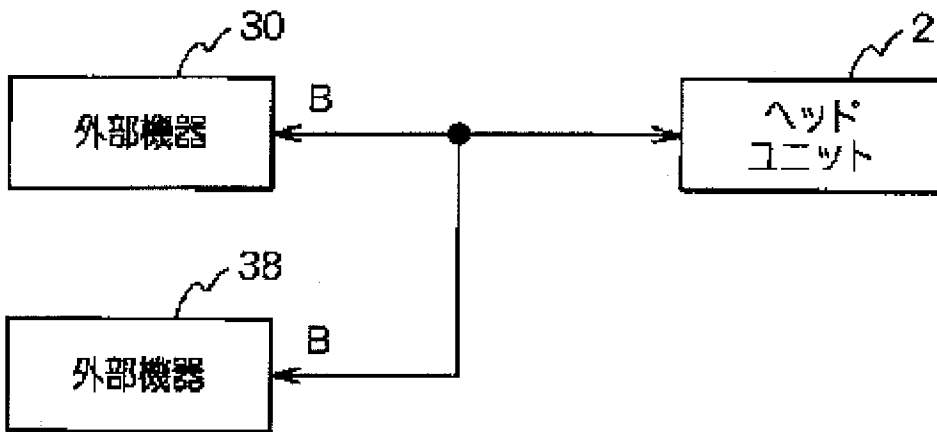


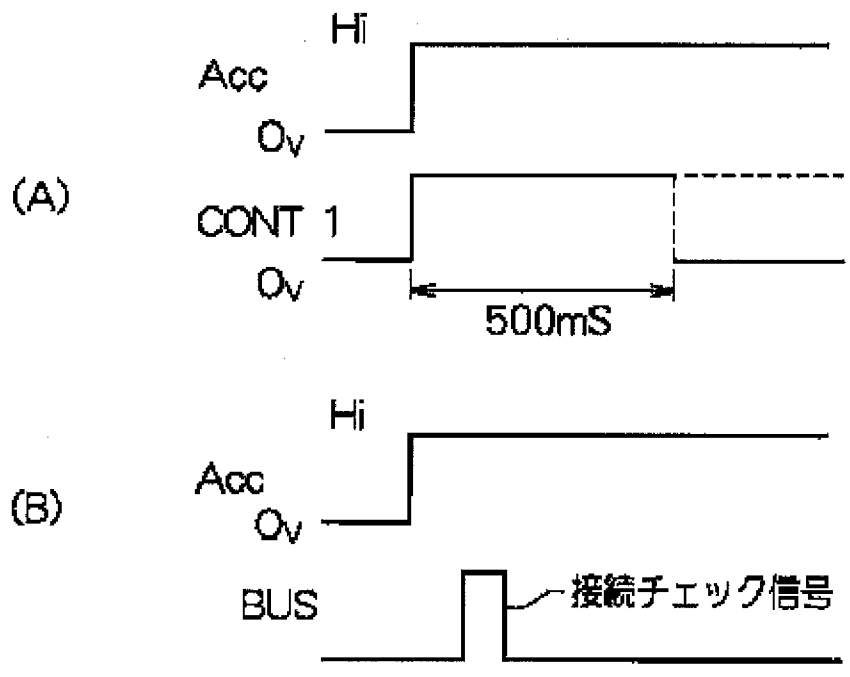
- | | |
|-------------|------------|
| 1. BUS- | 8. 音声 右 |
| 2. BUS+ | 9. バックア |
| 3. NC | 10. バックア |
| 4. イルミネーション | 11. ACC (ア |
| 5. CONT 2 | 12. バスGND |
| 6. 音声信号GND | 13. CONT 1 |
| 7. 音声 左 ch | |

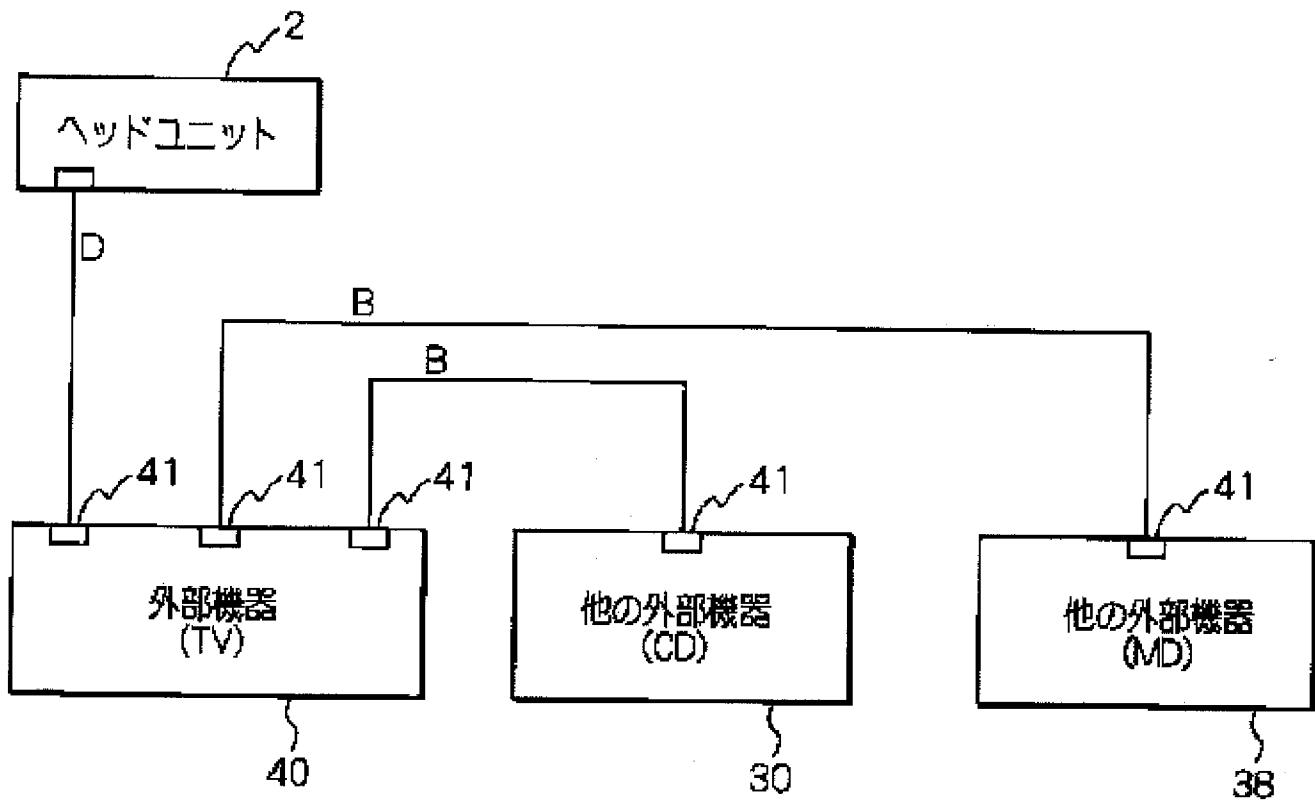
(A)

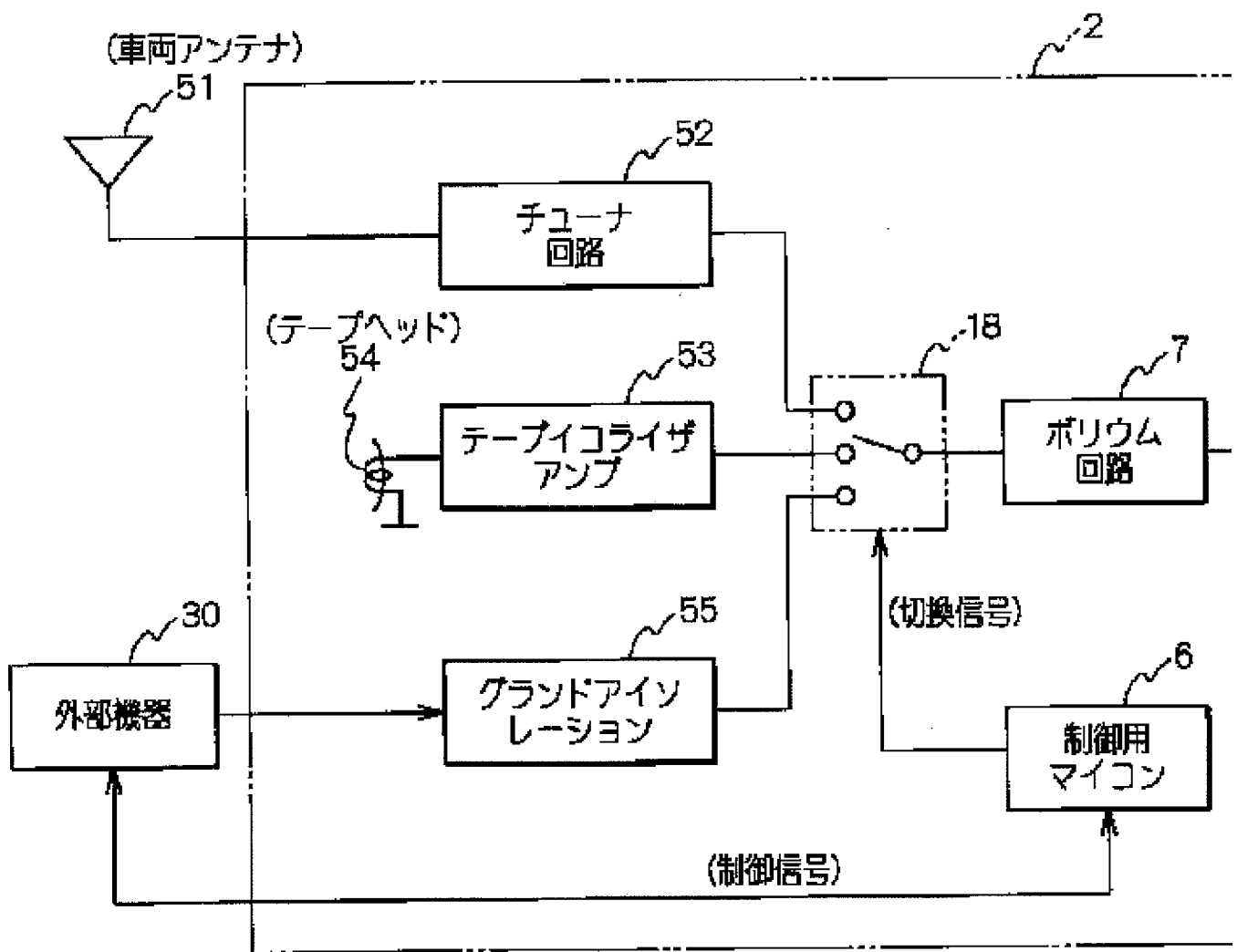


(B)

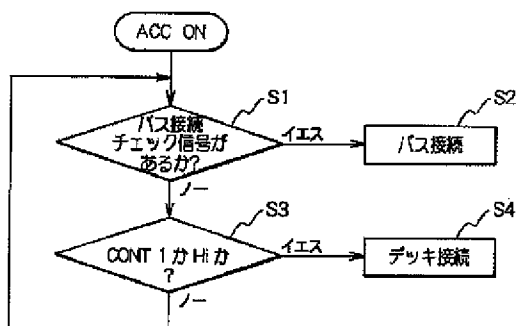








Drawing selection Drawing 7



[Translation done.]

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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.

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.]

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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.

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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.

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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.

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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.]

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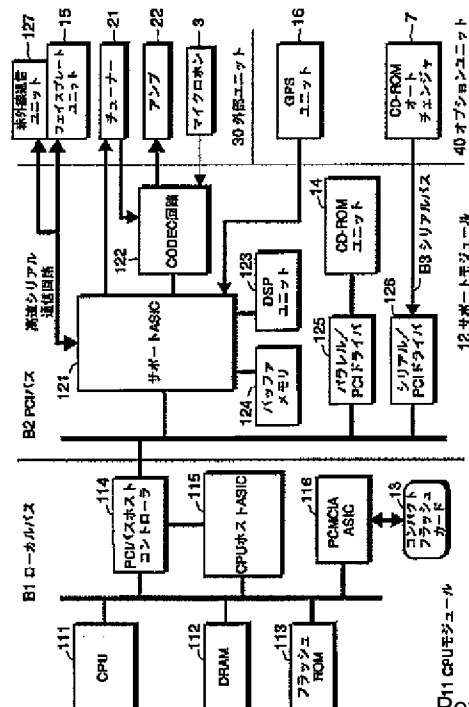
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(54)【発明の名称】 カーオーディオシステム、車載用コンピュータ及びカーオーディオシステムの制御方法

(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ズに行う。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ジチェー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ジチェー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動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動作させる、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、無駄なくスムーズ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ジチェーン方式で辛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ズ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、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ジタイズ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ジタイズ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、デジタイズ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ー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販売もできないことをさと、盗むことをあきらめるといって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. デイジーチェーン接続〕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ー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つに区切っており、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、チューナーアンブユニット2内に設けられたチューナー21とアンブ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/PCID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/PCID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-Transmitter)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にダイジーチェー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で処理したうへ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へ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へで、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)したうへでアンプ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「しーでいー」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「しーでいー」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使ったのかを認識し、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ASI

C121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上に作成したうえで、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、CPU111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「〇〇さんからです」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ることができる。

【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、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CPU11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