(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
13 September 2007 (13.09.2007)

PCT

(10) International Publication Number
WO 2007/101721 A3

(51) International Patent Classification:
G01C 21/36 (2006.01) *H04M 1/60* (2006.01)

(21) International Application Number:
PCT/EP2007/002169

(22) International Filing Date: 8 March 2007 (08.03.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

0604709.6	8 March 2006 (08.03.2006)	GB
0604708.8	8 March 2006 (08.03.2006)	GB
0604710.4	8 March 2006 (08.03.2006)	GB
0604704.7	8 March 2006 (08.03.2006)	GB
0604706.2	8 March 2006 (08.03.2006)	GB

(71) Applicant *(for all designated States except US)*: **TOM TOM INTERNATIONAL B.V.** [NL/NL]; Rembrandtplein 35, NL-1017 CT Amsterdam (NL).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: **DEURWAARDER, William** [NL/NL]; TomTom International B.V., Rembrandtplein 35, NL-1017 CT Amsterdam (NL).

(74) Agent: **EISENBERG, Jacob**; TomTom International B.V., Rembrandtplein 35, NL-1017 CT Amsterdam (NL).

(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, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

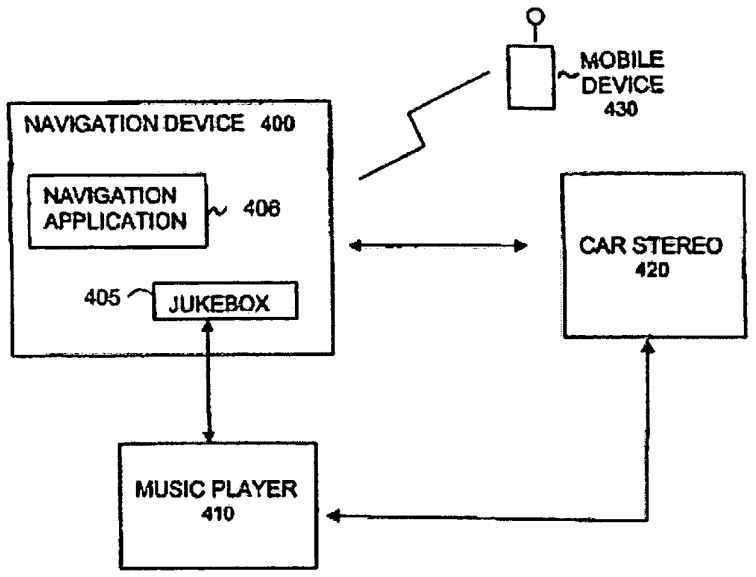
(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, 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:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(88) Date of publication of the international search report:
21 December 2007

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: NAVIGATION DEVICE AND METHOD OF IMPLEMENTING AUDIO FEATURES IN A NAVIGATION DEVICE



(57) Abstract: A method of integrating audio features using a navigation device is disclosed herein. For example, in one embodiment the method may include receiving an interruption signal for interruption of audio playback, determining to interrupt audio playback using the navigation device in response to receipt of the interruption signal, and storing an interruption state of audio playback upon determining to interrupt the audio playback.

WO 2007/101721 A3

NAVIGATION DEVICE AND METHOD OF IMPLEMENTING AUDIO FEATURES IN A NAVIGATION DEVICE

Co-pending Applications

[0001] The following applications are being filed concurrently with the present applications. The entire contents of each of the following applications is hereby incorporated herein by reference: **A NAVIGATION DEVICE AND METHOD FOR STORING AND UTILIZING A LAST DOCKED LOCATION** (Attorney docket number 06P057US16) filed on even date herewith; **A METHOD AND DEVICE FOR UTILIZING A SELECTABLE LOCATION MARKER FOR RELATIONAL DISPLAY OF POINT OF INTEREST ENTRIES** (Attorney docket number 06P057US15) filed on even date herewith; **A METHOD AND DEVICE FOR MAP SWITCHING** (Attorney docket number 06P057US14) filed on even date herewith; **A NAVIGATION DEVICE AND METHOD FOR CONVEYING INFORMATION RELATIONSHIPS** (Attorney docket number 06P057US20) filed on even date herewith; **A NAVIGATION DEVICE AND METHOD OF UPDATING INFORMATION ON A NAVIGATION DEVICE** (Attorney docket number 06P057US18) filed on even date herewith; **A NAVIGATION DEVICE, SERVER, AND METHOD FOR COMMUNICATING THEREBETWEEN** (Attorney docket number 06P057US17) filed on even date herewith; **A METHOD AND DEVICE FOR PROVIDING PREFERENCES DURING ROUTE TRAVEL CALCULATION ON A NAVIGATION DEVICE** (Attorney docket number 06P057US13) filed on even date herewith; **A NAVIGATION DEVICE AND METHOD OF ACTIVATING INFORMATION ON A NAVIGATION DEVICE** (Attorney docket number 06P057US12) filed on even date herewith; **AUTOMATIC DISCOVERY OF WIRELESS COMMUNICATION SETTINGS** (Attorney docket number 06P057US04) filed on even date herewith; **METHODS OF CUSTOMIZING NAVIGATION SYSTEMS** (Attorney docket number 06P057US03) filed on even date herewith; and **A NAVIGATION DEVICE AND METHOD FOR SEQUENTIAL MAP DISPLAY** (Attorney docket number 06P057US22) filed on even date herewith.

Priority Statement

[0002] The present application hereby claims priority under 35 U.S.C. §119 on each of Great Britain Patent Application numbers 0604709.6 filed March 8, 2006; 0604708.8 filed March 8, 2006; 0604710.4 filed March 8, 2006; 0604704.7 filed March 8, 2006; and 0604706.2 filed March 8, 2006, the entire contents of each of which is hereby incorporated herein by reference.

Field

[0003] The present application generally relates to navigation devices. For example, example embodiments of the present application may relate to integration of audio features with a navigation device.

Background

[0004] Global Positioning System (GPS) equipped navigation devices are becoming more common. Conventionally, such navigation devices may provide a user with the ability to locate their current geographic position based on communications with multiple satellites. The user may wish to mount the navigation device into an automobile, onto a motorcycle, or onto some other form of personal transportation, such that their current geographical position may be available while in transit to a desired geographical location. Navigation devices may be relatively simple to use while in transit, and may have familiar touch-screen interfaces which enhance user interaction with the devices. However, a typical navigation device which prompts for directions while in transit may interfere with the user's interactions with other aspects of a vehicle, including audio features within the vehicle.

[0005] For example, a user may wish to listen to a car stereo or HI-FI audio playback device while in transit to a desired location. While listening to audio playback, the user may further wish to receive audio navigation prompts from a navigation device. However, the voice prompt of the navigation device may interfere with the audio playback of the audio device. As such, it may be difficult for a user to interpret navigation prompts while using a playback device, for example.

[0006] Similarly, a user may wish to enable hands-free voice calls with a mobile device while in transit to a desired geographical location. While in transit, the user may be actively conversing or alternatively actively listening using a mobile device on a voice call. Therefore, if navigation prompts are necessary from the navigation device, it may be difficult for the user to interpret prompts while actively conversing on the mobile device.

SUMMARY

[0007] It may be desirable to have integration of audio features with a navigation device to overcome at least one of the problems listed above, in addition to other issues in audio feature integration. Therefore, according to at least one example embodiment of the present application, a navigation device, and methods of implementing audio features on navigation devices are disclosed. For example, integrated navigation systems including navigation devices are disclosed which may enhance user interaction with multiple devices while in transit to a desired geographical location.

[0008] According to an example embodiment, a method of integrating audio features using a navigation device may include receiving an interruption signal for interruption of audio playback, determining to interrupt audio playback using the navigation device in response to receipt of the interruption signal, and storing an interruption state of audio playback upon determining to interrupt the audio playback.

[0009] According to an example embodiment, a navigation device may include means for receiving an interruption signal for interruption of audio playback, means for determining to interrupt audio playback using the navigation device in response to receipt of the interruption signal, and means for storing an interruption state of audio playback upon determining to interrupt the audio playback.

[0010] According to an example embodiment, a navigation device may include a processor to receive an interruption signal for interruption of audio playback and to determine to interrupt audio playback using the navigation device in response to receipt of the interruption signal, and memory to store an

interruption state of audio playback upon determining to interrupt the audio playback.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The present application will be described in more detail below by using example embodiments, which will be explained with the aid of the drawings, in which:

[0012] Figure 1 illustrates an example view of a Global Positioning System (GPS);

[0013] Figure 2 illustrates an example block diagram of electronic components of a navigation device of an embodiment of the present application;

[0014] Figure 3 illustrates an example block diagram of a server, navigation device and connection therebetween of an embodiment of the present application;

[0015] Figure 4 illustrates an integrated navigation system, according to an example embodiment;

[0016] Figure 5 illustrates a method of implementing audio features on a navigation device, according to an example embodiment; and

[0017] Figures 6A-6C illustrate methods of determining subsequent playback, according to example embodiments.

DETAILED DESCRIPTION OF THE EXAMPLE EMBODIMENTS

[0018] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the present invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "includes" and/or "including", when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0019] In describing example embodiments illustrated in the drawings, specific terminology is employed for the sake of clarity. However, the disclosure

of this patent specification is not intended to be limited to the specific terminology so selected and it is to be understood that each specific element includes all technical equivalents that operate in a similar manner.

[0020] Referencing the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views, example embodiments of the present patent application are hereafter described.

[0021] Figure 1 illustrates an example view of Global Positioning System (GPS), usable by navigation devices, including the navigation device of embodiments of the present application. Such systems are known and are used for a variety of purposes. In general, GPS is a satellite-radio based navigation system capable of determining continuous position, velocity, time, and in some instances direction information for an unlimited number of users.

[0022] Formerly known as NAVSTAR, the GPS incorporates a plurality of satellites which work with the earth in extremely precise orbits. Based on these precise orbits, GPS satellites can relay their location to any number of receiving units.

[0023] The GPS system is implemented when a device, specially equipped to receive GPS data, begins scanning radio frequencies for GPS satellite signals. Upon receiving a radio signal from a GPS satellite, the device determines the precise location of that satellite via one of a plurality of different conventional methods. The device will continue scanning, in most instances, for signals until it has acquired at least three different satellite signals (noting that position is not normally, but can be determined, with only two signals using other triangulation techniques). Implementing geometric triangulation, the receiver utilizes the three known positions to determine its own two-dimensional position relative to the satellites. This can be done in a known manner. Additionally, acquiring a fourth satellite signal will allow the receiving device to calculate its three dimensional position by the same geometrical calculation in a known manner. The position and velocity data can be updated in real time on a continuous basis by an unlimited number of users.

[0024] As shown in Figure 1, the GPS system is denoted generally by reference numeral 100. A plurality of satellites 120 are in orbit about the earth 124. The orbit of each satellite 120 is not necessarily synchronous with the

orbits of other satellites 120 and, in fact, is likely asynchronous. A GPS receiver 140, usable in embodiments of navigation devices of the present application, is shown receiving spread spectrum GPS satellite signals 160 from the various satellites 120.

[0025] The spread spectrum signals 160, continuously transmitted from each satellite 120, utilize a highly accurate frequency standard accomplished with an extremely accurate atomic clock. Each satellite 120, as part of its data signal transmission 160, transmits a data stream indicative of that particular satellite 120. It is appreciated by those skilled in the relevant art that the GPS receiver device 140 generally acquires spread spectrum GPS satellite signals 160 from at least three satellites 120 for the GPS receiver device 140 to calculate its two-dimensional position by triangulation. Acquisition of an additional signal, resulting in signals 160 from a total of four satellites 120, permits the GPS receiver device 140 to calculate its three-dimensional position in a known manner.

[0026] Figure 2 illustrates an example block diagram of electronic components of a navigation device 200 of an embodiment of the present application, in block component format. It should be noted that the block diagram of the navigation device 200 is not inclusive of all components of the navigation device, but is only representative of many example components.

[0027] The navigation device 200 is located within a housing (not shown). The housing includes a processor 210 connected to an input device 220 and a display screen 240. The input device 220 can include a keyboard device, voice input device, and/or any other known input device utilized to input information; and the display screen 240 can include any type of display screen such as an LCD display, for example. In at least one embodiment of the present application, the input device 220 and display screen 240 are integrated into an integrated input and display device, including a touchpad or touchscreen input wherein a user need only touch a portion of the display screen 240 to select one of a plurality of display choices or to activate one of a plurality of virtual buttons.

[0028] In addition, other types of output devices 250 can also include, including but not limited to, an audible output device. As output device 250

can produce audible information to a user of the navigation device 200, it is equally understood that input device 240 can also include a microphone and software for receiving input voice commands as well.

[0029] In the navigation device 200, processor 210 is operatively connected to and set to receive input information from input device 240 via a connection 225, and operatively connected to at least one of display screen 240 and output device 250, via output connections 245, to output information thereto. Further, the processor 210 is operatively connected to memory 230 via connection 235 and is further adapted to receive/send information from/to input/output (I/O) ports 270 via connection 275, wherein the I/O port 270 is connectible to an I/O device 280 external to the navigation device 200. The external I/O device 270 may include, but is not limited to an external listening device such as an earpiece for example. The connection to I/O device 280 can further be a wired or wireless connection to any other external device such as a car stereo unit for hands-free operation and/or for voice activated operation for example, for connection to an ear piece or head phones, and/or for connection to a mobile phone for example, wherein the mobile phone connection may be used to establish a data connection between the navigation device 200 and the internet or any other network for example, and/or to establish a connection to a server via the internet or some other network for example.

[0030] Figure 2 further illustrates an operative connection between the processor 210 and an antenna/receiver 250 via connection 255, wherein the antenna/receiver 250 can be a GPS antenna/receiver for example. It will be understood that the antenna and receiver designated by reference numeral 250 are combined schematically for illustration, but that the antenna and receiver may be separately located components, and that the antenna may be a GPS patch antenna or helical antenna for example.

[0031] It should be understood that the processor 210 of navigation device 200 is capable of executing software and program instructions to achieve a desired result. For example, the processor 210 is capable of processing a navigation application, and any other application. The other application may be a customized application or, according to example embodiments, a jukebox application for audio playback. In addition, the processor 210 is capable of

retrieving and storing instructions from/to memory 230, data from/to memory 230, and audio files or other file information from/to memory 230. Therefore, the navigation device includes means for processing a navigation application, means for processing a jukebox application, means for storing audio information, means for retrieving audio information, and/or other suitable means. For example, an I/O device, as described above, may communicate with processor 210 such that information retrieved form the I/O device may be processed by an application with the processor 210.

[0032] Further, it will be understood by one of ordinary skill in the art that the electronic components shown in Figure 2 are powered by power sources (not shown) in a conventional manner. As will be understood by one of ordinary skill in the art, different configurations of the components shown in Figure 2 are considered within the scope of the present application. For example, in one embodiment, the components shown in Figure 2 may be in communication with one another via wired and/or wireless connections and the like. Thus, the scope of the navigation device 200 of the present application includes a portable or handheld navigation device 200.

[0033] In addition, the portable or handheld navigation device 200 of Figure 2 can be connected or "docked" in a known manner to a motorized vehicle such as a car or boat for example. Such a navigation device 200 is then removable from the docked location for portable or handheld navigation use.

[0034] Figure 3 illustrates an example block diagram of a server 302 and a navigation device 200 of the present application, via a generic communications channel 318, of an embodiment of the present application. The server 302 and a navigation device 200 of the present application can communicate when a connection via communications channel 318 is established between the server 302 and the navigation device 200 (noting that such a connection can be a data connection via mobile device, a direct connection via personal computer via the internet, etc.).

[0035] The server 302 includes, in addition to other components which may not be illustrated, a processor 304 operatively connected to a memory 306 and further operatively connected, via a wired or wireless connection 314, to a mass data storage device 312. The processor 304 is further operatively connected to

transmitter 308 and receiver 310, to transmit and send information to and from navigation device 200 via communications channel 318. The signals sent and received may include data, communication, and/or other propagated signals. The transmitter 308 and receiver 310 may be selected or designed according to the communications requirement and communication technology used in the communication design for the navigation system 200. Further, it should be noted that the functions of transmitter 308 and receiver 310 may be combined into a signal transceiver.

[0036] Server 302 is further connected to (or includes) a mass storage device 312, noting that the mass storage device 312 may be coupled to the server 302 via communication link 314. The mass storage device 312 contains a store of navigation data and map information, and can again be a separate device from the server 302 or can be incorporated into the server 302.

[0037] The navigation device 200 is adapted to communicate with the server 302 through communications channel 318, and includes processor, memory, etc. as previously described with regard to Figure 2, as well as transmitter 320 and receiver 322 to send and receive signals and/or data through the communications channel 318, noting that these devices can further be used to communicate with devices other than server 302. Further, the transmitter 320 and receiver 322 are selected or designed according to communication requirements and communication technology used in the communication design for the navigation device 200 and the functions of the transmitter 320 and receiver 322 may be combined into a single transceiver.

[0038] Software stored in server memory 306 provides instructions for the processor 304 and allows the server 302 to provide services to the navigation device 200. One service provided by the server 302 involves processing requests from the navigation device 200 and transmitting navigation data from the mass data storage 312 to the navigation device 200. According to at least one embodiment of the present application, another service provided by the server 302 includes processing the navigation data using various algorithms for a desired application and sending the results of these calculations to the navigation device 200.

[0039] The communication channel 318 generically represents the propagating medium or path that connects the navigation device 200 and the server 302. According to at least one embodiment of the present application, both the server 302 and navigation device 200 include a transmitter for transmitting data through the communication channel and a receiver for receiving data that has been transmitted through the communication channel.

[0040] The communication channel 318 is not limited to a particular communication technology. Additionally, the communication channel 318 is not limited to a single communication technology; that is, the channel 318 may include several communication links that use a variety of technology. For example, according to at least one embodiment, the communication channel 318 can be adapted to provide a path for electrical, optical, and/or electromagnetic communications, etc. As such, the communication channel 318 includes, but is not limited to, one or a combination of the following: electric circuits, electrical conductors such as wires and coaxial cables, fiber optic cables, converters, radio-frequency (rf) waves, the atmosphere, empty space, etc. Furthermore, according to at least one various embodiment, the communication channel 318 can include intermediate devices such as routers, repeaters, buffers, transmitters, and receivers, for example.

[0041] In at least one embodiment of the present application, for example, the communication channel 318 includes telephone and computer networks. Furthermore, in at least one embodiment, the communication channel 318 may be capable of accommodating wireless communication such as radio frequency, microwave frequency, infrared communication, etc. Additionally, according to at least one embodiment, the communication channel 318 can accommodate satellite communication.

[0042] The communication signals transmitted through the communication channel 318 include, but are not limited to, signals as may be required or desired for given communication technology. For example, the signals may be adapted to be used in cellular communication technology such as Time Division Multiple Access (TDMA), Frequency Division Multiple Access (FDMA), Code Division Multiple Acess (CDMA), Global System for Mobile Communications (GSM), etc. Both digital and analogue signals can be transmitted through the

communication channel 318. According to at least one embodiment, these signals may be modulated, encrypted and/or compressed signals as may be desirable for the communication technology.

[0043] The mass data storage 312 includes sufficient memory for the desired navigation applications. Examples of the mass data storage 312 may include magnetic data storage media such as hard drives for example, optical storage media such as CD-Roms for example, charged data storage media such as flash memory for example, molecular memory, etc.

[0044] According to at least one embodiment of the present application, the server 302 includes a remote server accessible by the navigation device 200 via a wireless channel. According to at least one other embodiment of the application, the server 302 may include a network server located on a local area network (LAN), wide area network (WAN), virtual private network (VPN), etc.

[0045] According to at least one embodiment of the present application, the server 302 may include a personal computer such as a desktop or laptop computer, and the communication channel 318 may be a cable connected between the personal computer and the navigation device 200. Alternatively, a personal computer may be connected between the navigation device 200 and the server 302 to establish an internet connection between the server 302 and the navigation device 200. Alternatively, a mobile telephone or other handheld device may establish a wireless connection to the internet, for connecting the navigation device 200 to the server 302 via the internet.

[0046] The navigation device 200 may be provided with information from the server 302 via information downloads which may be periodically updated upon a user connecting navigation device 200 to the server 302 and/or may be more dynamic upon a more constant or frequent connection being made between the server 302 and navigation device 200 via a wireless mobile connection device and data connection for example. For many dynamic calculations, the processor 304 in the server 302 may be used to handle the bulk of the processing needs, however, processor 210 of navigation device 200 can also handle much processing and calculation, oftentimes independent of a connection to a server 302.

[0047] The mass storage device 312 connected to the server 302 can include volumes more cartographic and route data than that which is able to be maintained on the navigation device 200 itself, including maps, etc. The server 302 may process, for example, the majority of the devices of a navigation device 200 which travel along the route using a set of processing algorithms. Further, the cartographic and route data stored in memory 312 can operate on signals (e.g. GPS signals), originally received by the navigation device 200.

[0048] The navigation devices described above may be used in integrating audio features. An integrated navigation system, according to example embodiments, will be described in more detail below.

[0049] Figure 4 illustrates an integrated navigation system, according to an example embodiment. As illustrated in Figure 4, a navigation device 400 (which can include all of the elements/interrconnections of navigation device 200 above, wherein the numbers are merely changes for consistency with the figues) may include a plurality of applications running thereon. For example, a navigation device 400 may process a navigation application 406 such that the user of the navigation device may receive information pertaining to current geographical locations, or a desired geographical location.

[0050] For example, the navigation application 406 may allow the user to traverse different routes and locate desired geographical locations. The navigation application 406 may include programming to communicate with I/O devices, as described above with reference to Figure 2. Furthermore, the navigation application 406 may provide voice-prompts associated with routes being traversed by the navigation device. For example, upon detection that the navigation device 400 is within proximity to a navigation point or change, the navigation application 406 may determine that a voice-prompt is necessary to alert the user of the navigation point or change. The point or change may be at least one of a necessary change in route, a necessary change in direction, a change in street name, a point of interest, and an endpoint of a current route, however, example embodiments should not be limited to only these examples.

[0051] In addition to the navigation application 406, the navigation device 400 may also process a jukebox application 405 such that a user may listen to audio files stored on the navigation device 400. As illustrated, the jukebox

application 405 may be processed at substantially the same time as the navigation application 406, on the navigation device 400.

[0052] Further illustrated in Figure 4 is an operative connection between navigation device 400 and a music player 410. The music player 410 may be a typical music player, storing music files from a personal computer or computing device of a user. The music player 410 may have a plurality of different audio files stored thereon, and may allow a user to output music to an external speaker, external headphones, or alternatively, an internal speaker of the music player 410. Additionally, the music player 410 may be equipped with a wireless communication connection or available physical communication connection, such that navigation device 400 may communicate therewith. For example, the connection may be a BLUETOOTH connection, universal serial bus connection (USB), or any suitable connection.

[0053] As further illustrated in Figure 4, the operative connection between the music player 410 and the navigation device 400 may allow communication between jukebox application 405 and the music player 410. For example, the jukebox player application 405 may remotely control the music player 410 such that audio files stored on music player 410 are played according to instructions received from the jukebox application 405. Any available remote communication protocol may be used, or alternatively, a remote communication protocol may be provided by the music player 410. For example, the music player 410 may employ a client/server communication protocol such that instructions may be transmitted, by the navigation device 400, to the music player 410. Upon receipt of the instructions, the music player 410 may operate according to the received instructions. The instructions may include play, stop, rewind, fast-forward, skip, load play-list, dump play-list, or any other instruction which enables remote control of the music player 410. The instructions may be generated by the jukebox application 405, and may be transmitted over the communications protocol described above.

[0054] For example, the jukebox application 405 may initiate playback, pause playback, stop playback, store playback, or alter playback of audio files on the music player 410.

[0055] Furthermore, an operative connection between music player 410 and car stereo 420 is illustrated in Figure 4. It will be understood that this operative connection is optional, and it may be severed or omitted without departing from the scope of example embodiments. For example, playback of audio files may occur solely on the music player 410, or alternatively, through an internal speaker of the navigation device 400.

[0056] The music player 410 may output audio file information to car stereo 420 such that audio playback may occur on the car stereo 420. The connection between music player 410 and car stereo 420 is in contrast to navigation device 400 in that music player 410 may simply output analog music information being during playback on music player 410 such that the audio information is played through speakers connected to car stereo 420. Alternatively, a digital connection may be employed between music player 410 and car stereo 420 such that digitally encoded audio information is transmitted to car stereo 420.

[0057] As also illustrated in Figure 4, the navigation device 400 may include an operative connection to car stereo 420. For example the operative connection may include a wireless connection, a hardwired connection, or any suitable connection such that audio information may be transmitted from navigation device 400 to car stereo 420. In this manner, the jukebox application 405 may process audio files and direct transmission to the car stereo 420. Similarly, navigation application 406 may direct voice-prompts to the car stereo 420 such that they may be audible from speakers connected to the car stereo 420.

[0058] Figure 4 further illustrates an operative connection between navigation device 400 and mobile device 430. The operative connection may include a wireless or hardwired connection, such that the navigation device 400 may enable hands-free calling and other features included in device 430. It will also be understood that the operative connection between navigation device 400 and mobile device 430 is optional, and may be severed or omitted without departing from the scope of example embodiments.

[0059] Hereinafter, a more detailed description of an example embodiment of the jukebox application 405 will be given.

[0060] In the jukebox application 405, a user may select and begin playback of audio files for the navigation device. For example, the audio files may be in MP3 format or any standard audio format such that playback may occur on the navigation device 400. Using the jukebox application 405, the user may select a set of songs to play which are subsequently played one after the other. Other options may be available in the jukebox application 405 such that a selected set may be played at random order, the user may specify which song to start playback during a particular set of songs, or other options. For example, the jukebox application 405 may have virtual stop, skip, restart, pause, or other options which may substantially similar to audio playback programs and applications available on other devices. However, it will be appreciated that the jukebox application 405 may be tailored to be processed on the navigation device 400 alongside the navigation application 406. Therefore, the jukebox application 405 may more stably interact with the navigation application 406. For example, the jukebox application 405 may be tailored or customized to communicate with the navigation application 406.

[0061] Therefore, the jukebox application 405 may play audio files and audio information contained therein, and may communicate with the navigation application 406.

[0062] It should be further noted that audio files may contain, alongside audio information, pertinent information about the data contained therein. For example, the audio file may contain useful data concerning song titles, book titles, artist, albums, track numbers, composers, genres, and at the very least, a file name pertaining to the title of the audio file. Furthermore, the audio files may be in a format decipherable by the navigation device or a music player operatively connected to the navigation device.

[0063] Further examples of audio files may include audio books. For example, an audio book audio file may be an audio file containing spoken information about a text or book. A text or book may be dictated and recorded, or alternatively, translated using a text to speech application such that a user may listen to spoken words pertaining to the text. In this manner, a driver of an automobile may simultaneously listen to a desired text or book while operating a vehicle.

[0064] With regards to storage of audio files on the navigation device 400, it would be appreciated that the audio files may be stored on a portable memory or a storage disk, internal memory of the navigation device 400, a database within the navigation device 400, or any suitable means to store audio file information such that playback may occur using the jukebox application 405 on the navigation device 400.

[0065] Furthermore, audio files including MP3 files and audio books may be downloaded using an internet service provider or an audio file server. For example, an audio file server may be substantially similar to the server illustrated in Figure 3. The downloaded audio files may be stored on the navigation device 400 such that playback may occur using jukebox application 405. For example, a user of a computer device may use the computer device to download audio files from the internet. Thereafter, the audio files may be transferred to a removable storage medium such that they may be inserted into the navigation device 400. Upon insertion, the jukebox application 405 on the navigation device 400 may access the audio files and present playback for the user of the navigation device 400. Similarly, a user of the computer device may transfer the audio files directly to the navigation device 400 using a wireless protocol. Alternatively, the user may direct the navigation device 400 to download the audio files from the audio file server.

[0066] A detailed description of an example embodiment of operation of an integrated navigation system including audio file playback, for example as illustrated in Figure 4, will be described hereinafter in more detail with reference to Figure 5.

[0067] Figure 5 illustrates a method of implementing audio features on a navigation device, according to an example embodiment. As illustrated in Figure 5, a navigation device may play audio files using a jukebox application on the navigation device 200/400. For example, the audio files may be stored on a database or memory of the navigation device 200/400, and the navigation device 200/400 may be substantially similar to the navigation devices illustrated in Figures 2 and 4. Similarly, the jukebox application referenced in Figure 5 may be substantially similar to the jukebox application 406 illustrated in Figure 4.

[0068] During playback of the audio files, an interruption may be determined as appropriate by the navigation device 200/400. For example, a wireless call may be received at a mobile unit, or navigation prompt may be necessary. With regards to a call received, a mobile unit enabling hands-free call access may be operatively connected to the navigation device 200/400. If a call is received on the mobile unit, the mobile unit may prompt or send an interruption signal to the navigation device 200/400. The interruption signal may be an indication to answer the call using hands-free mode, for example. Conventionally, the navigation device 200/400 may simply patch through the wireless call and continue playback of the audio file(s). However, according to example embodiments, navigation device 200/400 may lower the volume on the playback device and/or pause audio file playback.

[0069] For example, the navigation device 200/400 may store a playback state of the audio file in response to the interruption signal. The playback state may be stored in a memory of the navigation device 200/400 for example, a database of the navigation device 200/400 for example, or any suitable storage medium accessible by the navigation device 200/400. The playback state (a state representing the interruption, or an interruption state) may enable the jukebox application to resume or restore playback of the audio file(s) at a later time. Similarly, the jukebox application may store the interruption state in response to an interruption signal generated by the navigation device 200/400. For example, the navigation device 200/400, interpreting that a call is being received at the mobile device, may transmit an interruption signal to the jukebox application such that the jukebox application may store the interruption state.

[0070] With regards to a navigation prompt being appropriate, the navigation application may deem a navigation change or navigation point to be in proximity of the current geographical location of the navigation device. For example, the change or point may be substantially similar to the examples listed above. If a navigation prompt is necessary, the navigation application may transmit the interruption signal to the jukebox application, such that the jukebox application may store the state of audio playback. Alternatively, the

navigation application may store the interruption state and interrupt audio playback to enable the navigation prompt.

[0071] It will be appreciated that through storing an audio file playback state of interruption, a user may retain the current position of audio file playback such that less user interaction may be necessary to continue listening to a current audio file. For example, instead of manually pausing or stopping audio file playback to receive a wireless telephone call, the user may appreciate automatic pausing or saving of an audio file state such that playback may be resumed at a later time.

[0072] For example, the user may continue listening to the audio file after the call is terminated, or after navigation prompts are received. For reference to navigation prompts, the navigation device 200/400 may detect that the current geographic location of the navigation device 200/400 is in proximity to a route change or correction change to necessary to continue on a current route. Therefore, it may be necessary for the navigation device 200/400 to prompt the driver of the vehicle to begin braking or enable a turn signal such that the route may continue to be followed. It would be appreciated that if the navigation prompts were simply given during audio file playback, the user may have difficulty interpreting the navigation prompts. Therefore, according to example embodiments, the navigation device 200/400 may lower volume on the playback device, pause audio file playback, or interrupt audio playback. In this manner, the audio file may resume playback after receipt of the audio prompts, or at a later time as deemed necessary by the user.

[0073] As further illustrated by Figure 5, the navigation 200/400 may lower volume on the playback device, pause audio file playback, or interrupt audio playback may determine whether to resume playback. For example, default settings chosen by the user may direct the navigation device 200/400 to resume playback after a navigation prompt is successfully transferred, or after a wireless hands-free is call is terminated. Thereafter, playback of the audio file may be resumed until subsequent calls are received or until subsequent navigation prompts are necessary. Similarly, the navigation device 200/400 may prompt the user to choose whether to resume audio file playback. For example, the navigation device 200/400 may display a graphical choice on a

display device. The user may subsequently, using an input device, choose whether to resume playback.

[0074] With regards to a playback device performing playback, it will be understood that a playback device may include but is not limited to a car stereo a HI-FI playback device, the navigation device 200/400 itself, etc. For example, the car stereo may be operatively connected to the navigation device 200/400 such that audio information may be transferred to the car stereo and playback may occur through speakers in the vehicle. Similarly, the navigation device 200/400 may include an internal speaker such that audio files may be played back on the internal speaker. Alternatively, a music player or portable music player may include an internal speaker or headphones such that playback may occur on the music player. Therefore, a playback device may include but is not limited to a car stereo, a navigation device 200/400, a portable music player, etc.

[0075] Therefore, according to example embodiments, methods of integrating audio features using navigation devices 200/400 are disclosed.

[0076] It will be appreciated that several methods may be used to determine restoration of audio playback. For example, depending on the method of interruption (i.e., pausing playback, muting volume, lowering volume, storing interruption state, and/or any combination thereof), different restoration methods may be applicable. Figures 6A-6C illustrate methods of determining subsequent playback, according to example embodiments.

[0077] For example, with reference to Figure 5, the logical determination decision 550 is depicted in Figures 6A, 6B, and 6C.

[0078] With reference to Figure 6A, the navigation device 200/400 may determine whether audio playback has been muted. For example, playback may have been muted in response to receipt of a wireless hands-free telephone call or during transmission of a navigation prompt. Subsequent to determining whether playback has been muted, the navigation device 200/400 may thereafter restore a default or desired volume stored on the navigation device 200/400. In this manner, playback of the audio file may resume using a default or desired volume.

[0079] With reference to Figure 6B, the navigation device 200/400 may determine whether playback has been paused. For example, playback may have been paused in response to receipt of a wireless hands-free telephone call or during transmission of a navigation prompt. Subsequent to determining whether playback has been paused, the navigation device 200/400 may restore a previous state of audio file playback. For example, the navigation application may prompt the jukebox application to begin playback at the previously paused or stored state. In this manner, playback of audio file(s) may resume at a stored or paused state.

[0080] With reference to Figure 6C, the navigation device 200/400 may determine whether volume has been lowered. For example, the volume of playback may have been lowered in response to receipt of a wireless hands-free telephone call or during transmission of a navigation prompt. Subsequent to determining whether the volume has been lowered, the navigation device may restore the default or previous playback volume such that the user may continue to listen to audio files as the previous playback volume. In this manner, user interaction with the navigation device 200/400 may be limited such that the user may focus on navigation prompts, other audio features such as wireless hands-free telephone calls, or similar occurrences.

[0081] It should be noted that any combination of the above-described methods is intended to be within the scope of example embodiments. For example, a navigation or jukebox application may both mute and pause playback, lower volume and pause playback, store interruption state and mute playback, or any combination thereof. In determining audio playback restoration, the navigation application may resume and restore playback and restore volume, restore playback and use default volume, or any other combination thereof. As described above, navigation devices and processors therein may process both a navigation application and a jukebox application, determine whether to interrupt audio playback based on an interruption signal, and restore audio playback by a variety of methods. Therefore, example embodiments provide methods of integrating audio features with navigation devices. For example, in an embodiment, a method of integrating audio features using a navigation device includes receiving an interruption signal for

interruption of audio playback; determining to interrupt audio playback using the navigation device in response to receipt of the interruption signal; and storing an interruption state of audio playback upon determining to interrupt the audio playback.

[0082] Further, in an embodiment, a processor of a navigation device 200/400 can be used to receive an interruption signal for interruption of audio playback and to determine to interrupt audio playback in response to receipt of the interruption signal. Further, the navigation device 200/400 can include a memory to store an interruption state of audio playback upon determining to interrupt the audio playback.

[0083] Furthermore, the methods of at least one embodiment expressed above may be implemented as a computer data signal embodied in the carrier wave or propagated signal that represents a sequence of instructions which, when executed by a processor (such as processor 304 of server 302, and/or processor 210 of navigation device 200 for example) causes the processor to perform a respective method. In at least one other embodiment, at least one method provided above may be implemented above as a set of instructions contained on a computer readable or computer accessible medium, such as one of the memory devices previously described, for example, to perform the respective method when executed by a processor or other computer device. In varying embodiments, the medium may be a magnetic medium, electronic medium, optical medium, etc.

[0084] Even further, any of the aforementioned methods may be embodied in the form of a program. The program may be stored on a computer readable media and is adapted to perform any one of the aforementioned methods when run on a computer device (a device including a processor). Thus, the storage medium or computer readable medium, is adapted to store information and is adapted to interact with a data processing facility or computer device to perform the method of any of the above mentioned embodiments.

[0085] The storage medium may be a built-in medium installed inside a computer device main body or a removable medium arranged so that it can be separated from the computer device main body. Examples of the built-in medium include, but are not limited to, rewriteable non-volatile memories, such

as ROMs and flash memories, and hard disks. Examples of the removable medium include, but are not limited to, optical storage media such as CD-ROMs and DVDs; magneto-optical storage media, such as MOs; magnetism storage media, including but not limited to floppy disks (trademark), cassette tapes, and removable hard disks; media with a built-in rewriteable non-volatile memory, including but not limited to memory cards; and media with a built-in ROM, including but not limited to ROM cassettes; etc. Furthermore, various information regarding stored images, for example, property information, may be stored in any other form, or it may be provided in other ways.

[0086] As one of ordinary skill in the art will understand upon reading the disclosure, the electronic components of the navigation device 200 and/or the components of the server 302 can be embodied as computer hardware circuitry or as a computer readable program, or as a combination of both.

[0087] The system and method of embodiments of the present application include software operative on the processor to perform at least one of the methods according to the teachings of the present application. One of ordinary skill in the art will understand, upon reading and comprehending this disclosure, the manner in which a software program can be launched from a computer readable medium in a computer based system to execute the functions found in the software program. One of ordinary skill in the art will further understand the various programming languages which may be employed to create a software program designed to implement and perform at least one of the methods of the present application.

[0088] The programs can be structured in an object-orientation using an object-oriented language including but not limited to JAVA, Smalltalk, C++, etc., and the programs can be structured in a procedural-orientation using a procedural language including but not limited to COBAL, C, etc. The software components can communicate in any number of ways that are well known to those of ordinary skill in the art, including but not limited to by application of program interfaces (API), interprocess communication techniques, including but not limited to report procedure call (RPC), common object request broker architecture (CORBA), Component Object Model (COM), Distributed Component Object Model (DCOM), Distributed System Object Model (DSOM), and Remote

Method Invocation (RMI). However, as will be appreciated by one of ordinary skill in the art upon reading the present application disclosure, the teachings of the present application are not limited to a particular programming language or environment.

[0089] The above systems, devices, and methods have been described by way of example and not by way of limitation with respect to improving accuracy, processor speed, and ease of user interaction, etc. with a navigation device 200.

[0090] Further, elements and/or features of different example embodiments may be combined with each other and/or substituted for each other within the scope of this disclosure and appended claims.

[0091] Still further, any one of the above-described and other example features of the present invention may be embodied in the form of an apparatus, method, system, computer program and computer program product. For example, of the aforementioned methods may be embodied in the form of a system or device, including, but not limited to, any of the structure for performing the methodology illustrated in the drawings.

[0092] Example embodiments being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the present invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

What is claimed is:

1. A method of integrating audio features using a navigation device, comprising:

receiving an interruption signal for interruption of audio playback;

determining to interrupt audio playback using the navigation device in response to receipt of the interruption signal; and

storing an interruption state of audio playback upon determining to interrupt the audio playback.

2. The method of claim 1, wherein the interruption signal is received from a mobile device in communication with the navigation device.

3. The method of claim 2, wherein the mobile device is in communication with the navigation device over a wireless communication link.

4. The method of claim 3, wherein the wireless communication link is a BLUETOOTH link.

5. The method of claim 2, wherein the mobile device is one of a cellular telephone, a personal digital assistant, and a laptop computer device.

6. The method of claims 1-5, wherein:

the interruption signal is generated by a navigation application processed by the navigation device; and

the interruption signal is received by a jukebox application processed by the navigation device.

7. The method of claim 6, wherein the jukebox application stores the interruption state of audio playback.

8. The method of claim 6, wherein the navigation application stores the interruption state of audio playback.

9. The method of claims 1-8, wherein a navigation application processed by the navigation device generates the interruption signal if a navigation prompt is appropriate.

10. The method of claim 9, wherein the navigation prompt is generated if a geographical location of the navigation device is in geographic proximity to at least one of a necessary change in route, a necessary change in direction, a change in street name, a point of interest, and an endpoint of a current route.

11. The method of claim 9, wherein the navigation prompt includes an audible prompt describing at least one of a necessary change in route, a necessary change in direction, a change in street name, a point of interest, and an endpoint of a current route.

12. The method of claims 1-11, further comprising:
restoring audio playback at the stored interruption state of audio playback, using the navigation device.

13. The method of claims 1-12, further comprising:
receiving user input for restoring audio playback; and
restoring audio playback at the stored interruption state of audio playback, using the navigation device, in response to the user input.

14. A computer readable medium including program segments for, when executed on a processor of the navigation device, causing the navigation device to implement the method of claim 1.

15. A navigation device, comprising:
a processor to process the method of claim 1.

16. A navigation device, comprising:

means for receiving an interruption signal for interruption of audio playback;

means for determining to interrupt audio playback using the navigation device in response to receipt of the interruption signal; and

means for storing an interruption state of audio playback upon determining to interrupt the audio playback.

17. The navigation device of claim 16, wherein the means for receiving the interruption signal includes a jukebox application processed on the navigation device.

18. The navigation device of claims 16-17, wherein the means for determining includes a navigation application processed on the navigation device.

19. The navigation device of claims 16-18, wherein the means for storing the interruption state includes a computer readable medium of the navigation device.

20. The navigation device of claims 16-19, wherein the interruption signal is generated by a mobile device in communication with the navigation device.

21. The navigation device of claim 20, wherein the mobile device is in communication with the navigation device over a wireless communication link.

22. The navigation device of claim 21, wherein the wireless communication link is a BLUETOOTH link.

23. The navigation device of claim 21, wherein the mobile device is one of a cellular telephone, a personal digital assistant, and a laptop computer device.

24. The navigation device of claims 16-23, wherein a navigation application processed by the navigation device generates the interruption signal if a navigation prompt is appropriate.

25. The navigation device of claim 24, wherein the navigation prompt is generated if a geographical location of the navigation device is in geographic proximity to at least one of a necessary change in route, a necessary change in direction, a change in street name, a point of interest, and an endpoint of a current route.

26. The navigation device of claim 24, wherein the navigation prompt includes an audible prompt describing at least one of a necessary change in route, a necessary change in direction, a change in street name, a point of interest, and an endpoint of a current route.

27. The navigation device of claims 16-26, further comprising:

means for restoring audio playback at the stored interruption state of audio playback, using the navigation device.

28. The navigation device of claims 16-27, further comprising:

means for receiving user input for restoring audio playback; and

means for restoring audio playback at the stored interruption state of audio playback, using the navigation device, in response to the user input.

29. A navigation device, comprising:

a processor to receive an interruption signal for interruption of audio playback and to determine to interrupt audio playback in response to receipt of the interruption signal; and

memory to store an interruption state of audio playback upon determining to interrupt the audio playback.

30. The navigation device of claim 29, wherein the interruption signal is generated by a mobile device in communication with the navigation device.

31. The navigation device of claim 30, wherein the mobile device is in communication with the navigation device over a wireless communication link.

32. The navigation device of claim 31, wherein the wireless communication link is a BLUETOOTH link.

33. The navigation device of claim 30, wherein the mobile device is one of a cellular telephone, a personal digital assistant, and a laptop computer device.

35. The navigation device of claims 29-34, wherein the processor utilizes a navigation application to determine to interrupt audio playback upon receipt of the interruption signal.

36. The navigation device of claim 35, wherein the navigation application generates a navigation prompt if a geographical location of the navigation device is in geographic proximity to at least one of a necessary change in route, a necessary change in direction, a change in street name, a point of interest, and an endpoint of a current route.

37. The navigation device of claim 36, wherein the navigation prompt includes an audible prompt describing at least one of a necessary change in route, a necessary change in direction, a change in street name, a point of interest, and an endpoint of a current route.

38. The navigation device of claims 29-37, wherein the processor restores audio playback at the stored interruption state of audio playback subsequent to receiving the interruption signal.

39. The navigation device of claim 38, wherein the processor utilizes a jukebox application to restore audio playback.

40. The navigation device of claims 29-39, further comprising:

an input device to receive user input for restoring audio playback, the processor restoring audio playback at the stored interruption state of audio playback in response to the user input.

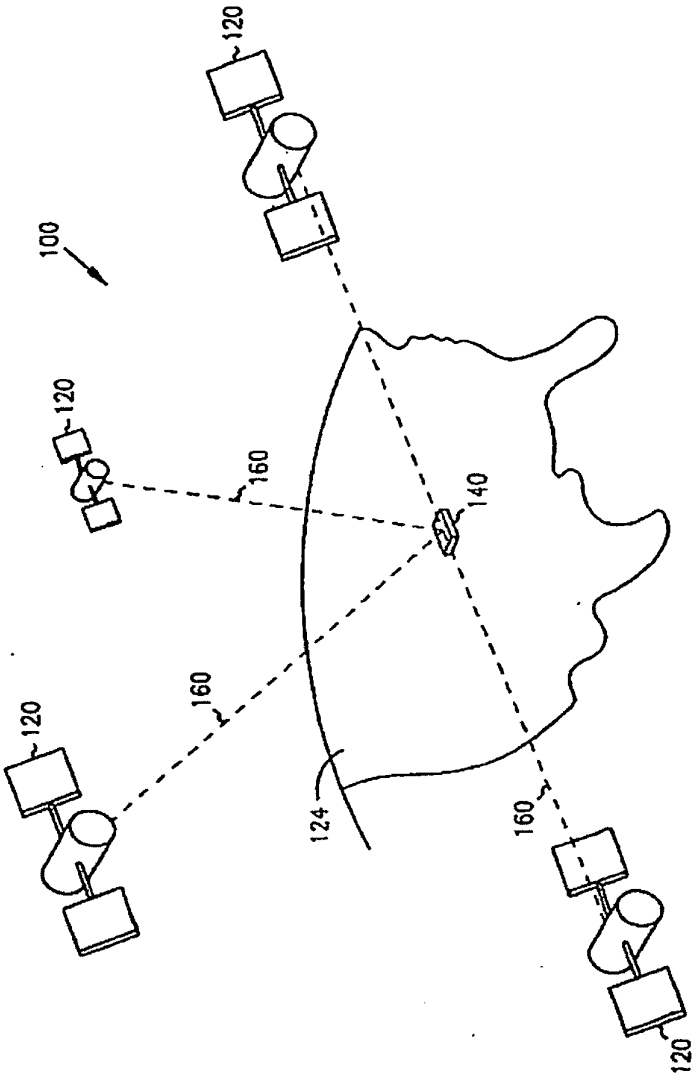


FIG. 1

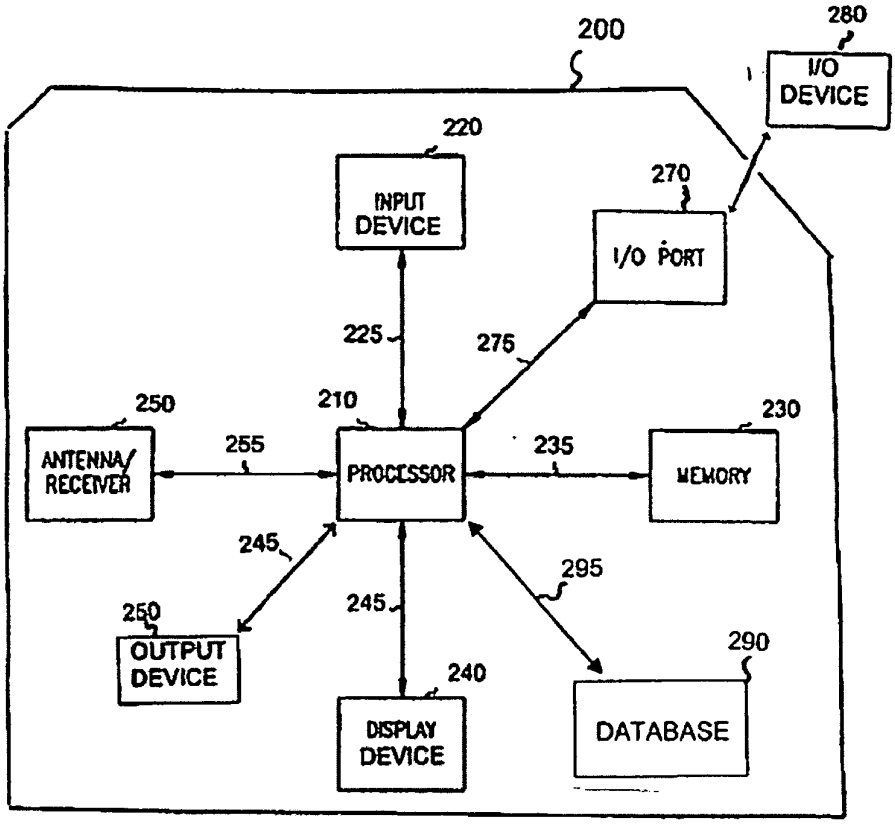

200
280
I/O DEVICE
220
INPUT DEVICE
270
I/O PORT
225
275
250
210
230
ANTENNA/ RECEIVER
255
PROCESSOR
235
MEMORY
245
295
245
260
OUTPUT DEVICE
290
240
DISPLAY DEVICE
DATABASE

Fig. 2

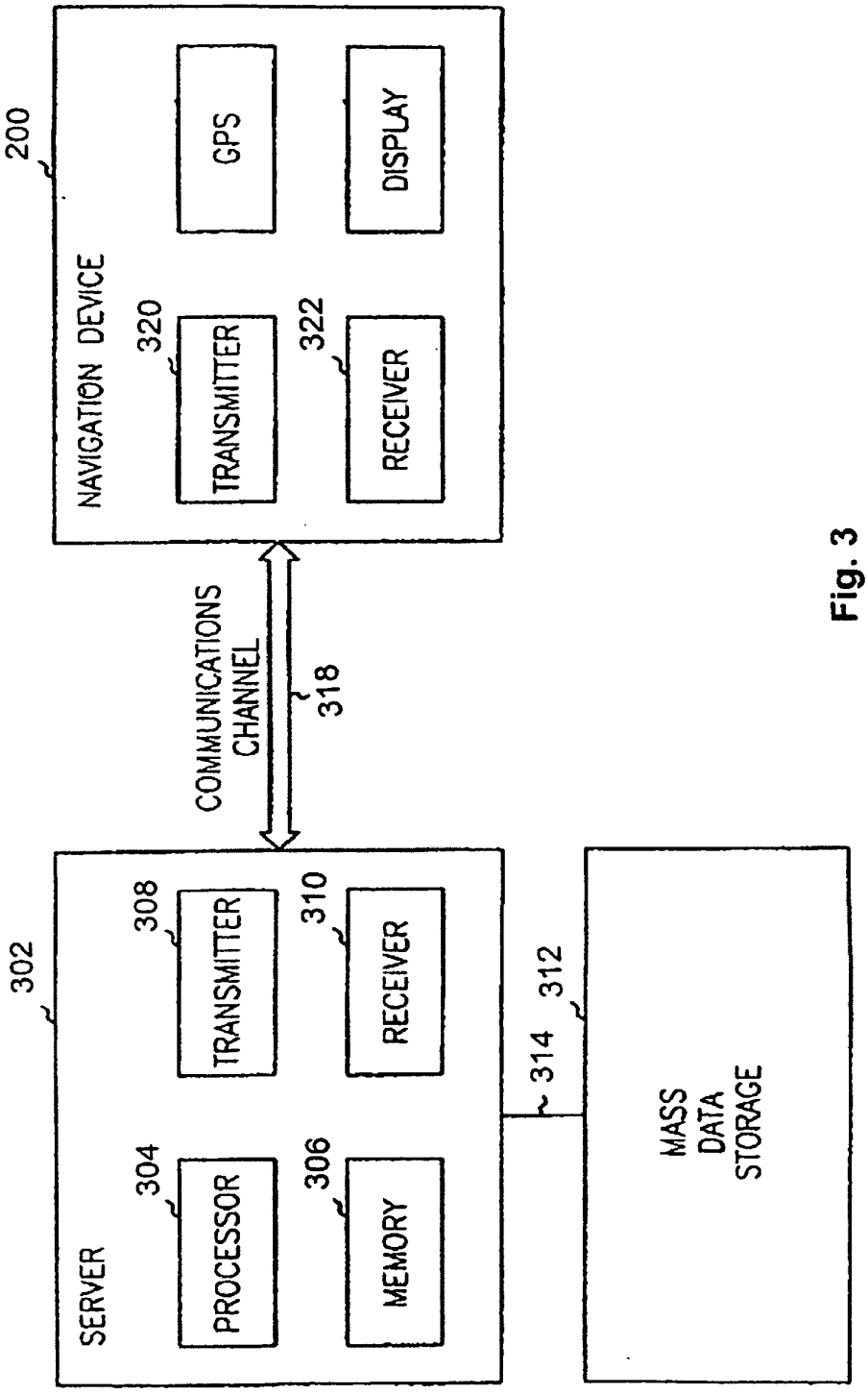

200
NAVIGATION DEVICE
GPS
DISPLAY
320
TRANSMITTER
322
RECEIVER
COMMUNICATIONS CHANNEL
318
302
SERVER
308
TRANSMITTER
310
RECEIVER
304
PROCESSOR
306
MEMORY
314
312
MASS DATA STORAGE

Fig. 3

Fig. 4

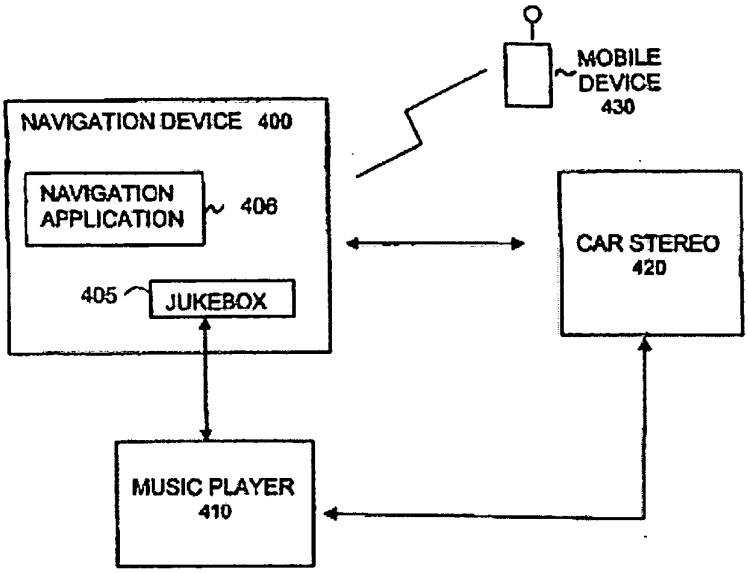

MOBILE DEVICE
430
NAVIGATION DEVICE 400
NAVIGATION APPLICATION
406
405
JUKEBOX
CAR STEREO
420
MUSIC PLAYER
410

Fig. 5

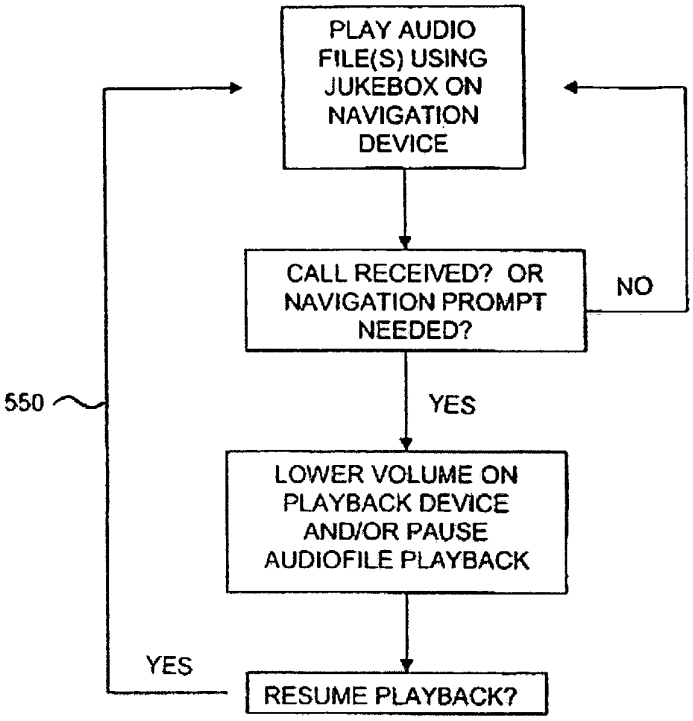

PLAY AUDIO FILE(S) USING JUKEBOX ON NAVIGATION DEVICE
CALL RECEIVED? OR NAVIGATION PROMPT NEEDED?
NO
YES
550
LOWER VOLUME ON PLAYBACK DEVICE AND/OR PAUSE AUDIOFILE PLAYBACK
YES
RESUME PLAYBACK?

Fig. 6A

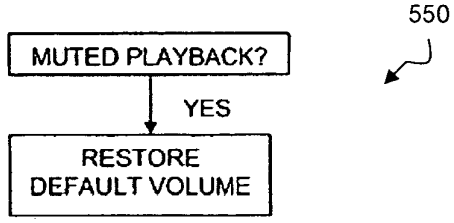


Fig. 6B

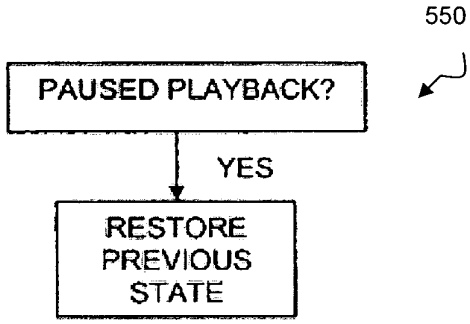
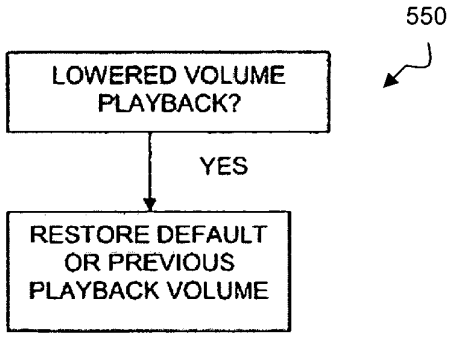


Fig. 6C



DACH

Item	Month to Date Shipped	To be shipped *planned*	To be shipped *credit hold*	Forecast	Delta
1N00.110	746	2000	432	14000	-10822
1N00.171	71	6960	5000	40000	-27969
1V00.570 + 1V00.571	2000	5652		28000	-20348
1V00.770 + 1V00.771	5367	5000		25000	-14633
1V00.970 + 1V00.971	1772	16513		22000	-3715

EASTERN EUROPE

Item	Month to Date Shipped	To be shipped *planned*	To be shipped *credit hold*	Forecast	Delta	
1N00.111					0	
1N00.176	682	600		2000	-718	
1V00.510					0	*not shipping in March*
1V00.710					0	*not shipping in March*
1V00.910	412	580		2600	-1608	

Customer On Credit Hold

Important Issues (short description)

File saved: Logistics/OM/Shipping Status/Shipping & Forecast per Region