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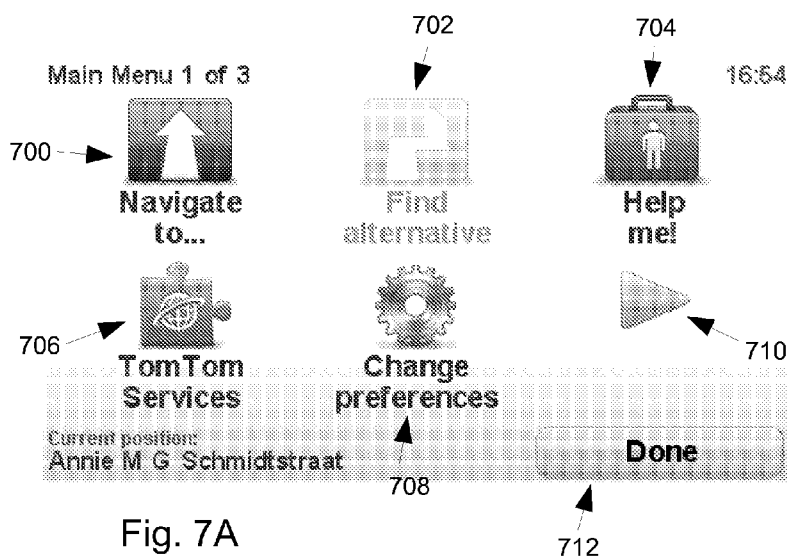


Fig. 7A

(57) Abstract: A method of generating routing instructions comprising the following steps: providing a navigation device (200) with entity data comprising a number of entries, with each entry detailing an entity having a number of different locations associated therewith; outputting the entity data on an output device (240) of the navigation device (200); selecting, using an input device (220) of the navigation device, one of the entities from the entity data; causing the navigation device (200) to determine its location; causing the navigation device (200) to determine a single location for the selected entity based upon a predetermined parameter; and causing the navigation device (200) to generate a route, based upon map data accessible thereby, to the determined single location.

NAVIGATION DEVICE AND METHOD OF GENERATING ROUTING INSTRUCTIONS

Field of the Invention

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This invention relates to navigation devices and to methods for generating routing instructions and in particular, but not exclusively, to displaying entity data, wherein each entity has a plurality of locations. Illustrative embodiments of the invention relate to portable navigation devices (so-called PNDs), in particular PNDs that include Global Positioning System (GPS) signal reception and processing functionality. Other embodiments relate, more generally, to any type of processing device that is configured to execute navigation software so as to provide route planning, and may be also navigation, functionality.

15 Background to the Invention

Portable navigation devices (PNDs) that include GPS (Global Positioning System) signal reception and processing functionality are well known and are widely employed as in-car or other vehicle navigation systems. Such PND's are a subset of Navigation devices in general and it is convenient to describe such PND's.

In general terms, a modern PNDs comprises a processor, memory (at least one of volatile and non-volatile, and commonly both), and map data stored within said memory. The processor and memory cooperate to provide an execution environment in which a software operating system may be established, and additionally it is commonplace for one or more additional software programs to be provided to enable the functionality of the PND to be controlled, and to provide various other functions.

Typically these devices further comprise one or more input interfaces that allow a user to interact with and control the device, and one or more output interfaces by means of which information may be relayed to the user. Illustrative examples of

output interfaces include a visual display and a speaker for audible output. Illustrative examples of input interfaces include one or more physical buttons to control on/off operation or other features of the device (which buttons need not necessarily be on the device itself but could be on a steering wheel if the device is
5 built into a vehicle), and a microphone for detecting user speech. In some embodiments, the output interface display may be configured as a touch sensitive display (by means of a touch sensitive overlay or otherwise) to additionally provide an input interface by means of which a user can operate the device by touch.

10 Devices of this type will also often include one or more physical connector interfaces by means of which power and optionally data signals can be transmitted to and received from the device, and optionally one or more wireless transmitters/receivers to allow communication over cellular telecommunications and other signal and data networks, for example Wi-Fi, Wi-Max GSM and the like.

15 PND devices of this type also include a GPS antenna by means of which satellite-broadcast signals, including location data, can be received and subsequently processed to determine a current location of the device.

20 The PND device may also include electronic gyroscopes and accelerometers which produce signals that can be processed to determine the current angular and linear acceleration, and in turn, and in conjunction with location information derived from the GPS signal, velocity and relative displacement of the device and thus the vehicle in which it is mounted. Typically such features are most commonly
25 provided in in-vehicle navigation systems, but may also be provided in PND devices if it is expedient to do so.

The utility of such PNDs is manifested primarily in their ability to determine a route between a first location (typically a start or current location) and a second
30 location (typically a destination). These locations can be input by a user of the device, by any of a wide variety of different methods, for example by postcode, street name and house number, previously stored "well known" destinations (such

as famous locations, municipal locations (such as sports grounds or swimming baths) or other points of interest), and favourite or recently visited destinations.

Typically, the PND is enabled by software for computing a "best" or "optimum" route between the start and destination address locations from the map data. A "best" or "optimum" route is determined on the basis of predetermined criteria and need not necessarily be the fastest or shortest route. The selection of the route along which to guide the driver can be sophisticated, and the selected route may take into account existing, predicted and dynamically and/or wirelessly received traffic and road information, historical information about road speeds, and the driver's own preferences for the factors determining road choice (for example the driver may specify that the route should not include motorways or toll roads), or any other suitable criteria.

In addition, the device may continually monitor road and traffic conditions, and offer to or choose to change the route over which the remainder of the journey is to be made due to changed conditions. Real time traffic monitoring systems, based on various technologies (e.g. mobile phone data exchanges, fixed cameras, GPS fleet tracking) are being used to identify traffic delays and to feed the information into notification systems.

PNDs of this type may typically be mounted on the dashboard or windscreen of a vehicle, but may also be formed as part of an on-board computer of the vehicle radio or indeed as part of the control system of the vehicle itself. The navigation device may also be part of a hand-held system, such as a PDA (Portable Digital Assistant) a media player, a mobile phone or the like, and in these cases, the normal functionality of the hand-held system is extended by means of the installation of software on the device to perform both route calculation and navigation along a calculated route.

30

In the context of a PND, once a route has been calculated, the user interacts with the navigation device to select the desired calculated route, optionally from a list of

proposed routes. Optionally, the user may intervene in, or guide the route selection process, for example by specifying that certain routes, roads, locations or criteria are to be avoided or are mandatory for a particular journey. The route calculation aspect of the PND forms one primary function, and navigation along such a route is
5 another primary function.

During navigation along a calculated route, it is usual for such PNDs to provide visual and/or audible instructions to guide the user along a chosen route to the end of that route, i.e. the desired destination. It is also usual for PNDs to display map
10 information on-screen during the navigation, such information regularly being updated on-screen so that the map information displayed is representative of the current location of the device, and thus of the user or user's vehicle if the device is being used for in-vehicle navigation.

15 An icon displayed on-screen typically denotes the current device location, and is centred with the map information of current and surrounding roads in the vicinity of the current device location and other map features also being displayed. Additionally, navigation information may be displayed, optionally in a status bar above, below or to one side of the displayed map information, examples of
20 navigation information include a distance to the next deviation from the current road required to be taken by the user, the nature of that deviation possibly being represented by a further icon suggestive of the particular type of deviation, for example a left or right turn. The navigation function also determines the content, duration and timing of audible instructions by means of which the user can be
25 guided along the route. As can be appreciated a simple instruction such as "turn left in 100 m" requires significant processing and analysis. As previously mentioned, user interaction with the device may be by a touch screen, or additionally or alternately by steering column mounted remote control, by voice activation or by any other suitable method.

30

A further function provided by the device is automatic route re-calculation in the event that: a user deviates from the previously calculated route during navigation

(either by accident or intentionally); real-time traffic conditions dictate that an alternative route would be more expedient and the device is suitably enabled to recognize such conditions automatically, or if a user actively causes the device to perform route re-calculation for any reason.

5

It is also known to allow a route to be calculated with user defined criteria; for example, the user may prefer a scenic route to be calculated by the device, or may wish to avoid any roads on which traffic congestion is likely, expected or currently prevailing. The device software would then calculate various routes and weigh
10 more favourably those that include along their route the highest number of points of interest (known as POIs) tagged as being for example of scenic beauty, or, using stored information indicative of prevailing traffic conditions on particular roads, order the calculated routes in terms of a level of likely congestion or delay on account thereof. Other POI-based and traffic information-based route calculation
15 and navigation criteria are also possible.

Although the route calculation and navigation functions are fundamental to the overall utility of PNDs, it is possible to use the device purely for information display, or “free-driving”, in which only map information relevant to the current
20 device location is displayed, and in which no route has been calculated and no navigation is currently being performed by the device. Such a mode of operation is often applicable when the user already knows the route along which it is desired to travel and does not require navigation assistance.

25 Devices of the type described above, for example the 720T model manufactured and supplied by TomTom International B.V., provide a reliable means for enabling users to navigate from one position to another.

It is known that electronic devices that a user may wish to carry are proliferating.
30 For example, a user may wish to carry a mobile telephone, a portable navigation device, a Personal Digital Assistant (PDA), a lap-top computer, a camera, etc. Each of these devices has a specific use for which it is intended although there is now

cross over between the capabilities of device. For example, it is often now the case that mobile telephones have cameras built into them.

Navigation devices can be used to guide a user thereof to a location that the user
5 inputs. Use of the navigation device to provide such guidance can make it easier for a user to get to his/her destination. Such prior art devices do assume however, that a user knows the location to which he/she wishes to be guided.

Moreover, navigation devices are generally used in environments in which there is
10 limited access to network connections and/or in environments in which a user has limited access to the device. For example, when a user is using a device within a vehicle there may be limited, intermittent, etc. network coverage and it is likely that they will be able to make limited inputs to the device whilst driving.

15 **Summary of the Invention**

According to a first aspect of the invention there is provided a method of generating routing instructions comprising the following steps:

providing a navigation device with entity data comprising a number of
20 entries, with each entry detailing an entity having a number of different locations;
outputting the entity data on an output device of the navigation device;
selecting, using an input device of the navigation device, one of the entities from the entity data;
causing the navigation device to determine its location;
25 causing the navigation device to determine a single location for the selected entity based upon a predetermined parameter; and
causing the navigation device to generate a route, based upon map data accessible thereby, to the determined single location.

30 Such a method is convenient as it can facilitate a user being able to select an entity from a single device and generate a route thereto. Thus, the user need not know the location to which he/she is to be routed and need only select the entity.

The method may comprise connecting the navigation device to a network and obtaining the entity data from the network. Such a method may allow up-to-date entity data to be obtained.

5

In some embodiments, the network may be the Internet.

The navigation device may obtain the entity data from an entity server connected to the network. The entity server from which the navigation device obtains the entity
10 data may be arranged to collate the entity data from a plurality of sources. Embodiments, that use such collation may allow a navigation device to obtain entity data from a single source, which facilitates access to the data from a multiple of sources.

15 The entity server may format the entity data into a predetermined format. Such formatting of the entity data may allow navigation devices running different Operating Systems (OS) to access the entity data. As discussed elsewhere herein, a variety of different devices, such as mobile telephones, PDA's, etc. can all act as navigation devices by running appropriate software such as, for example, TomTom
20 NavigatorTM software. Thus, any particular navigation device may have different capabilities in the data that it can process and output to its output device. Conveniently, the entity server formats the data into a platform independent format.

In some embodiments, the entity data may be downloaded as a single file. In other
25 embodiments, there may be a plurality of files. The downloaded file(s) may provide data in a platform independent format. For example, the file(s) may provide provide one or more PDF (Portable Document Format) files.

The skilled person will appreciate that there are a variety of other data formats that
30 may be suitable. The data may for example, be in mark-up language as exemplified by Hyper-Text Mark-up Language (HTML), Extensible Mark-up Language (XML), or any other suitable format.

Additionally, or alternatively, the entity data may be stored within a memory of the processing device and output to the output device whilst the device is not connected to a network (ie is off-line). In such embodiments, the entity data may
5 also be viewed whilst the processing device is connected to a network (ie is on-line).

The entity data may relate to goods and/or services that a user may wish to use. In some embodiments, the entities detailed in the entity data may be tickets for travel,
10 such as airline tickets, railway tickets, or the like.

Generally the entity data is provided in addition to the map data. An advantage of such an arrangement is that the entity data may be caused to change more frequently than the map data which is likely to remain static. As such, the entity
15 data may be arranged to alert the user to products and or services that he/she may wish to make use of.

Conveniently, the method may categorise the entity data. Such categorisation may make it convenient for a user of the navigation device to view entities within the
20 entity data. Categorisation may be performed by the navigation device. However, in other embodiments, each entity within the entity data may comprise meta-data specifying a category in which the entity belongs. Meta data associated with an entity may specify a plurality of categories for each entity. The navigation device may allow a user to browse the entity data according to the meta-data.

25

The predetermined parameter may correspond to category of meta-data.

For example, entities within the entity data have associated therewith a price; the name of a store from which the entity may be obtained (whether a good or a
30 service); a customer rating, opening times of the store, whether there are special offers available, or the like.

In some embodiments, the predetermined parameter that is used to determine the single location may be selected by a user, may be from a predetermined selection of parameters.

- 5 In some embodiments, the predetermined parameter may be the distance to the single location. Such a method may allow a user to have generated therefore a route to the closest location at which the entity may be found.

- 10 In alternative or additional embodiments, the predetermined parameter may be the cost of the entity. Such a method may allow a user to have generated therefore a route to the location at which the entity can be found at the lowest cost.

- 15 In other embodiments, the user may allow a user to select a plurality of parameters which are used to determine the single location. The user may be able to set weightings to each of the parameters that have been selected.

- 20 For example, in some embodiments a user may wish to select cost and distance as parameters. In some such embodiments, a user may weight each parameter according to his/her preference. It will be appreciated that many user may not wish to travel a substantial distance to save a small cost and may be more willing to travel a short distance to obtain the entity at a similar cost.

- 25 In some embodiments, the method may comprise displaying the entity data on a screen of the navigation device. This may include displaying the downloaded file(s) on the screen of the navigation device.

- 30 The method may comprise collating data upon entities contained in the entity data from a plurality of sources. The method may allow third parties to supply data upon entities for inclusion in the entity data sent to the navigation device. The method may comprise charging a fee to allow third parties to supply data upon entities for inclusion in the entity data.

The method may include charging a fee to the party providing data upon an entity should a user select that entity; generate a route to based upon that entity or the like. Such a method may be used to generate revenue for the provider of the method and yet provide a beneficial service to users of the navigation device
5 directing them to locations from which he/she can obtain the entity in which he/she is interested.

Conveniently, embodiments of the invention determine the location using a GPS receiver. However, this need not be the case any suitable method of generating a
10 position may be used. For example, some embodiments may use data generated from mobile phones, or the like.

According to a second aspect of the invention there is provided a system comprising:

15 a server arranged to send data to and receive data from a network the server being arranged to generate entity data and send the entity data to a network to which it is connected;

a navigation device arranged to send data to and receive data from a network;

20 the navigation device comprising:

processing circuitry arranged to process data received from a network to which the device is connected;

an output arranged to output data that has been processed by the processing circuitry; and

25 an input device arranged to accept an input made by a user of the device and generate input data which is sent to the processing circuitry;

wherein the server is arranged to generate entity data listing one or more user selectable entities and send the entity data across a network;

the navigation is arranged to receive the entity data from a network, output
30 that entity data using the output, receive an input from the input device selecting at least one entity and determine a route according to a predetermined parameter associated with the entity selected by a user of the device.

According to a third aspect of the invention there is provided a navigation device comprising:

5 a network connector arranged to send data to and receive data from a network;

processing circuitry arranged to process data received from a network to which the device is connected;

an output arranged to output data that has been processed by the processing circuitry;

10 an input device arranged to accept an input made by a user of the device and generate input data which is sent to the processing circuitry;

wherein the processing circuitry is arranged to receive entity data from a network, the entity data comprising details about one or more entities, output that entity data using the output, receive an input from the input device selecting at least
15 one entity and determine a route according to a predetermined parameter associated with the entity selected by a user of the device.

According to a fourth aspect of the invention there is provided a machine readable medium containing instructions which when read onto a machine cause that
20 machine to perform the method of the first aspect of the invention.

According to a fifth aspect of the invention there is provided a machine readable medium containing instructions which when read onto a machine cause that machine to perform as either the server and/or the navigation device of the second
25 aspect of the invention.

According to a sixth aspect of the invention there is provided a machine readable medium containing instructions which when read onto a machine cause that machine to perform as the navigation device according to a third aspect of the
30 invention.

The skilled person will appreciate that a feature described in relation to any one of

the aspects of the invention may be applied mutatis mutandis to any other one of the aspects of the invention.

In any of the above aspects of the invention the machine readable medium may
5 comprise any of the following: a floppy disk, a CD ROM, a DVD ROM / RAM
(including a -R/-RW and + R/+RW), a hard drive, a memory (including a USB
memory key, an SD card, a MemorystickTM, a compact flash card, or the like), a
tape, any other form of magneto optical storage, a transmitted signal (including an
Internet download, an FTP transfer, etc), a wire, or any other suitable medium.

10

Brief Description of the Drawings

Various aspects of the teachings of embodiments of the present invention, and
arrangements embodying those teachings, will hereafter be described by way of
15 illustrative example with reference to the accompanying drawings, in which:

Figure 1 is a schematic illustration of a Global Positioning System (GPS);

Figure 2 is a schematic illustration of electronic components arranged to
20 provide a navigation device;

Figure 3 is a schematic illustration of the manner in which a navigation
device may receive information over a wireless communication channel;

25 **Figures 4A and 4B** are illustrative perspective views of a navigation
device;

Figure 5 is a schematic representation of the software employed by the
navigation device.

30

Figure 6 shows a system according to one embodiment of the invention;

Figures 7A to 7D show schematic representations of screen displays from a device realising one embodiment of the present invention; and

Figure 8 shows a flowchart of how the embodiment of Figure 7 is used.

5

Detailed Description of Embodiments of the Present Invention

Embodiments of the present invention will now be described with particular reference to a Portable Navigation Device (PND). It should be remembered, however, that the teachings of the present invention are not limited to PNDs but are instead universally applicable to any type of processing device that will generally be configured to execute navigation software so as to provide route planning and navigation functionality. It follows therefore that in the context of the present application, a navigation device is intended to include (without limitation) any type of route planning and navigation device, irrespective of whether that device is embodied as a PND, a navigation device built into a vehicle, or indeed a computing device (such as a desktop or portable personal computer (PC), mobile telephone or portable digital assistant (PDA)) which may execute route planning and navigation software.

20

It will also be apparent from the following that the teachings of the present invention even have utility in circumstances where a user is not seeking instructions on how to navigate from one point to another, but merely wishes to be provided with a view of a given location. In such circumstances the “destination” location selected by the user need not have a corresponding start location from which the user wishes to start navigating, and as a consequence references herein to the “destination” location or indeed to a “destination” view should not be interpreted to mean that the generation of a route is essential, that travelling to the “destination” must occur, or indeed that the presence of a destination requires the designation of a corresponding start location.

30

With the above provisos in mind, Fig. 1 illustrates an example view of Global

Positioning System (GPS), usable by navigation devices. 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.

5 Formerly known as NAVSTAR, the GPS incorporates a plurality of satellites which orbit the earth in precise orbits. Based on these precise orbits, GPS satellites can relay their location to any number of receiving units. However, it will be understood that Global Positioning systems could be used, such as GLOSNASS, the European Galileo positioning system, COMPASS positioning system or IRNSS
10 (Indian Regional Navigational Satellite System).

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
15 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
20 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
25 users.

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
30 and, in fact, is likely asynchronous. A GPS receiver 140 is shown receiving spread spectrum GPS satellite signals 160 from the various satellites 120.

The spread spectrum signals 160, continuously transmitted from each satellite 120, utilize an accurate frequency standard accomplished with an 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.

Figure 2 is an illustrative representation of electronic components of a navigation device 200 according to an embodiment of the present invention, 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.

The navigation device 200 is located within a housing (not shown). The housing includes processing circuitry which in the embodiment being described is provided by a processor 210 connected to an input device 220 and a display screen 240, the display screen providing one example of an output device. The input device 220 can include a keyboard device, voice input device, touch panel and/or any other known input device utilised to input information; and the display screen 240 can include any type of display screen such as an LCD display, for example. In one embodiment the input device 220 and display screen 240 are integrated into an integrated input and display device, including a touchpad or touchscreen input so that 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.

The navigation device may include other examples of an output device such as an audible output device (e.g. a loudspeaker). As loudspeaker 260 can produce audible information for a user of the navigation device 200, it should equally be

understood that input device 240 can include a microphone and software for receiving input voice commands as well.

In the navigation device 200, processor 210 is operatively connected to and set to
5 receive input information from input device 220 via a connection 225, and
operatively connected to at least one of display screen 240 and loudspeaker 260,
via output connections 245, to output information thereto. Further, the processor
210 is operably coupled to a memory resource 230 via connection 235 and is
further adapted to receive/send information from/to input/output (I/O) ports 270 via
10 connection 275, wherein the I/O port 270 is connectible to an I/O device 280
external to the navigation device 200. The memory resource 230 comprises, for
example, a volatile memory, such as a Random Access Memory (RAM) and a non-
volatile memory, for example a digital memory, such as a flash memory. The
memory resource also comprises a port 228, which communicates with the
15 processor 210 via connection 235, to allow a removable memory card (commonly
referred to as a card) to be added to the device 200. In the embodiment being
described the port is arranged to allow an SD (Secure Digital) card to be added. In
other embodiments, the port may allow other formats of memory to be connected
(such as Compact Flash (CF) cards, Memory SticksTM, xD memory cards, USB
20 (Universal Serial Bus) Flash drives, MMC (MultiMedia) cards, SmartMedia cards,
Microdrives, or the like).

The memory 230 is generally arranged to hold map data allowing the PND 200 to
generate routes. Thus, the PND 200 has map data accessible thereto. It is
25 conceivable that the PND 200 accesses map data held remote therefrom in order to
generate routes.

The external I/O device 280 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
30 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.

5

Fig. 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
10 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.

Further, it will be understood by one of ordinary skill in the art that the electronic
15 components shown in Fig. 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 Fig. 2 are considered to be within the scope of the present application. For example, the components shown in Fig. 2 may be in communication with one another via wired and/or wireless
20 connections and the like. Thus, the scope of the navigation device 200 of the present application includes a portable or handheld navigation device 200.

In addition, the portable or handheld navigation device 200 of Fig. 2 can be connected or “docked” in a known manner to a vehicle such as a bicycle, a
25 motorbike, a car or a boat for example. Such a navigation device 200 is then removable from the docked location for portable or handheld navigation use.

Referring now to Fig. 3, the navigation device 200 may establish a “mobile” or telecommunications network connection with a server 302 via a mobile device (not
30 shown) (such as a mobile phone, PDA, and/or any device with mobile phone technology) establishing a digital connection (such as a digital connection via known Bluetooth technology for example). Thereafter, through its network service

provider, the mobile device can establish a network connection (through the internet for example) with a server 302. As such, a “mobile” network connection is established between the navigation device 200 (which can be, and often times is mobile as it travels alone and/or in a vehicle) and the server 302 to provide a “real-time” or at least very “up to date” gateway for information.

The establishing of the network connection between the mobile device (via a service provider) and another device such as the server 302, using an internet (such as the World Wide Web) for example, can be done in a known manner. This can include use of TCP/IP layered protocol for example. The mobile device can utilize any number of communication standards such as CDMA, GSM, WAN, etc.

As such, an internet connection may be utilised which is achieved via data connection, via a mobile phone or mobile phone technology within the navigation device 200 for example. For this connection, an internet connection between the server 302 and the navigation device 200 is established. This can be done, for example, through a mobile phone or other mobile device and a GPRS connection (General Packet Radio Service), a UMTS (Universal Mobile Telephone System)- or other 3G connection. (GPRS and UMTS connections provide a high-speed data connection for mobile devices provided by telecom operators; GPRS and UMTS each provide methods to connect to the internet).

The navigation device 200 can further complete a data connection with the mobile device, and eventually with the internet and server 302, via existing Bluetooth technology for example, in a known manner, wherein the data protocol can utilize any number of standards, such as the GSRM, the Data Protocol Standard for the GSM standard, for example.

The navigation device 200 may include its own mobile phone technology within the navigation device 200 itself (including an antenna for example, or optionally using the internal antenna of the navigation device 200). The mobile phone technology within the navigation device 200 can include internal components as

specified above, and/or can include an insertable card (e.g. Subscriber Identity Module or SIM card), complete with necessary mobile phone technology and/or an antenna for example. As such, mobile phone technology within the navigation device 200 can similarly establish a network connection between the navigation
5 device 200 and the server 302, via the internet for example, in a manner similar to that of any mobile device.

For GRPS phone settings, a Bluetooth enabled navigation device may be used to correctly work with the ever changing spectrum of mobile phone models,
10 manufacturers, etc., model/manufacture specific settings may be stored on the navigation device 200 for example. The data stored for this information can be updated.

In Fig. 3 the navigation device 200 is depicted as being in communication with the
15 server 302 via a generic communications channel 318 that can be implemented by any of a number of different arrangements. The server 302 and a navigation device 200 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
20 personal computer via the internet, etc.).

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
25 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
30 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.

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
5 communication link 314. The mass storage device 312 contains a store of map and entity data, and can again be a separate device from the server 302 or can be incorporated into the server 302.

The navigation device 200 is adapted to communicate with the server 302 through
10 communications channel 318, and includes processor, memory, etc. as previously described with regard to Fig. 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
15 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.

Software stored in server memory 306 provides instructions for the processor 304
20 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. Another service provided by the server 302 includes processing the navigation data using various algorithms for a desired
25 application and sending the results of these calculations to the navigation device 200.

As described in more detail below, the server 306 also contains, or has access to, schedule information that can be accessed by the navigation device 200 across the
30 communication channel 318.

The communication channel 318 generically represents the propagating medium or

path that connects the navigation device 200 and the server 302. 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.

5

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, 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, fibre optic cables, converters, radio-frequency (RF) waves, the atmosphere, empty space, etc. Furthermore, the communication channel 318 can include intermediate devices such as routers, repeaters, buffers, transmitters, and receivers, for example.

In one illustrative arrangement, the communication channel 318 includes telephone and computer networks. Furthermore, the communication channel 318 may be capable of accommodating wireless communication such as radio frequency, microwave frequency, infrared communication, etc. Additionally, the communication channel 318 can accommodate satellite communication.

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 Access (CDMA), Global System for Mobile Communications (GSM), etc. Both digital and analogue signals can be transmitted through the communication channel 318. These signals may be modulated, encrypted and/or compressed signals as may be desirable for the communication technology.

The server 302 includes a remote server accessible by the navigation device 200 via a wireless channel. The server 302 may include a network server located on a local area network (LAN), wide area network (WAN), virtual private network
5 (VPN), etc.

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
10 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.

15 The navigation device 200 may be provided with information from the server 302 via information downloads which may be updated automatically from time to time, perhaps periodically, or upon a user connecting navigation device 200 to the server 302 and/or may be more dynamic upon a more constant or frequent connection
20 being made between the server 302 and navigation device 200 via a wireless mobile connection device and TCP/IP 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
25 a server 302.

As indicated above in Fig. 2, a navigation device 200 includes a processor 210, an input device 220, and a display screen 240. The input device 220 and display screen 240 are integrated into an integrated input and display device to enable both
30 input of information (via direct input, menu selection, etc.) and display of information through a touch panel screen, for example. Such a screen may be a touch input LCD screen, for example, as is well known to those of ordinary skill in

the art. Further, the navigation device 200 can also include any additional input device 220 and/or any additional output device 241, such as audio input/output devices for example.

- 5 Figs 4A and 4B are perspective views of a navigation device 200. As shown in Fig. 4A, the navigation device 200 may be a unit that includes an integrated input and display device 290 (a touch panel screen for example) and the other components of fig. 2 (including but not limited to internal GPS receiver 250, microprocessor 210, a power supply, memory systems 230, etc.).

10

The navigation device 200 may sit on an arm 292, which itself may be secured to a vehicle dashboard/window/etc. using a suction cup 294. This arm 292 is one example of a docking station to which the navigation device 200 can be docked.

- 15 As shown in Fig. 4B, the navigation device 200 can be docked or otherwise connected to an arm 292 of the docking station by snap connecting the navigation device 292 to the arm 292 for example. The navigation device 200 may then be rotatable on the arm 292, as shown by the arrow of Fig. 4B. To release the connection between the navigation device 200 and the docking station, a button on
20 the navigation device 200 may be pressed, for example. Other equally suitable arrangements for coupling and decoupling the navigation device to a docking station are well known to persons of ordinary skill in the art.

- Referring now to Fig. 5 of the accompanying drawings, the memory resource 230
25 stores a boot loader program (not shown) that is executed by the processor 210 in order to load an operating system 470 from the memory resource 230 for execution by functional hardware components 460, which provides an environment in which application software 480 can run. The operating system 470 serves to control the functional hardware components 460 and resides between the application software
30 480 and the functional hardware components 460. The application software 480 provides an operational environment including the GUI that supports core functions of the navigation device 200, for example map viewing, route planning,

navigation functions and any other functions associated therewith.

Figure 6 shows a system according to one embodiment of the present invention. The embodiment comprises a PND 600 which is arranged to connect via a wireless
5 network, such as a mobile telephone network 602, and a WAN (Wide Area Network), such as the Internet 604 to an entity server 606. The skilled person will appreciate that the telephone network 602 and the WAN are providing the communication channel 318 which is described further in relation to Figure 3. The PND 600 may be the PND described hereinbefore.

10

The entity server 606 is arranged to communicate via a network, which may be a WAN, such as the Internet 604 with a second server 608. The second server 608 may or may not be remote from the entity server 606 but will generally be situated remotely.

15

The skilled person will appreciate that whilst the entity server 606 and second server 608 are represented and described as being single machines, they may in fact be provided by a plurality of different machines which may include or be virtual machines.

20

In the embodiment being described, the entity server 606 is a server to which the user of the PND 600 has an account and it may for example be a server provided by a company that provides map data, etc. to the PND 600.

25 The second server 608 contains entity data and may for example be a server provided by a party other than the provider of the entity server 606. The entity data comprises data about a plurality of goods that a user may wish to purchase. The entity data also includes meta-data about each of the entities within the entity data. For example, the meta-data specifies the price, size, locations from which the entity
30 is available, and the availability of the entity at at least some of those locations. However regardless of who provides the second server 608 the entity data provides information regarding entities in which the user of the PND 600 may be interested.

In the embodiment being described, the second server 608 is arranged, from time to time, to send entity data to the entity server 606. There may be a plurality of second servers 608 each of which is arranged to send such entity data to the entity server 606. As such, the entity server 606 contains a database of entity data that a user of a PND 600 may request. Such embodiments are perhaps convenient as they may allow retrieval of entity data to a PND 600 requesting the data quicker than other arrangements.

10 In other embodiments, the entity server 606 may be arranged to request entity data from a second server 608 when a request for entity data is received from a PND 600. Such embodiments, may perhaps reduce overall network traffic and storage requirements on the entity server 606. Any other suitable mechanism for allowing the entity server 606 to access the entity data may be provided.

15 However, regardless of whether it is the entity server 606 or the second server 608 which initiates the transfer of the entity data, it is entity server 606 that collates entity data generally from a plurality of second servers 608. As such, data is fused from a number of sources. The entity server 606 also formats the data into a format suitable for sending to and viewing on the navigation devices to which it is sent. In the embodiment being described, the entity server 606 formats the data into one or more embedded PDF (Portable Document Format) files.

25 A method of using a PND 600 obtain entity data is now described in relation to Figures 7 and 8.

Figure 7A shows a display (step 800) that the processor 210 causes the display device 240 to provide allowing a user of the PND 600 to make an input thereto. The display includes seven virtual buttons 700-712 that a user may press to cause an input to the processor 210 and thus, the virtual buttons provide an input device.

In the example being given, a user presses the button 706 (step 802) which causes

the processor 210 to display (step 804) the screen shown in Figure 7B on the display device 240 which provides a first screen showing services that a user may select. In the example being given, a user presses the virtual button 714 (step 806) causing the processor 210 to display (step 808) a second screen of services as
5 shown in Figure 7C.

A user presses the virtual button 716, in step 809, which is labelled TomtomTM Deals which causes the processor 210 to display on the display device 240, in step 810, a further screen allowing a user to select a store in which he/she is interested.
10

An example screen is shown in Figure 7D. In the embodiment represented by this Figure, a list of shops is shown, each represented by an icon showing the trade mark of that shop and five shops are shown in the Figure (718 to 726). A user can select the shop represented by an icon by touching the icon thus providing an input
15 to the processor 210. The virtual button 728 allows a user to access more icons. Once an icon representing a shop 718-726 has been pressed then entity data representing entities (ie goods in this embodiment) available from that shop is displayed on the display device 240, the entity data having previously been downloaded to the memory resource 230 of the device 200.

20 Thus, the entity data may already reside within the memory resource 230 of the navigation device 200 which may have been downloaded to the device 200 previously. For example, in such an embodiment, the entity data may be downloaded when a user synchronises his/her navigation device with her / her
25 home computer, such as via the TomTom HomeTM software. Downloading the entity data in this manner may be convenient as it allows the data to be downloaded over what is likely to be a fast network connection compared to a wireless connection that may be present from a navigation device.

30 Pressing the button 716 causes the PND 600 to output on the output device, which in this embodiment comprises the display device 240, the entity data that is resident with the memory resource 230. In this embodiment, the entity data comprises data

upon a plurality of goods in which a user may be interested. Each of the good may be thought of as an entity. In other embodiments, the entities may not be goods but may be the stores themselves, services, perhaps airline flights, or the like.

- 5 As described above, other embodiments may retrieve the entity data from the entity server 606 when the button 716 is pressed. Yet further embodiments, may, from time to time, update the entity data held thereon across wireless connection thereto such as across the mobile telephone network 602 thereby keeping the entity data up-to date should a user decide to access this feature.

10

The entity data is displayed on the display device 240 of the PND 600 and is for example displayed as a list (step 810), with a picture of each entity and also meta-data associated with that entity. In the embodiment being described, the meta-data comprises a price for each entity, a brief description of each entity and also the store from which the entity is located. Thus, each entity may appear more than once

15

in the list if it is available from a plurality of different makes of store. Stores may supply entity data to the entity server 606 if they wish details of its goods to appear within the TomTom deals window.

- 20 If a user sees something that he/she wishes to purchase then, in step 812, he/she presses the picture of the entity that appears on the display device 240. The meta-data associated with that entity specifies the store from which that particular entity can be obtained at that price. There may of course be more than one branch of that store from which that entity may be obtained and therefore, the PND 600 is
- 25 arranged to send its current location to the entity server 606. The entity server 606 then returns, in step 814, the location of the closest store to that location to the PND 600. Thus, such an embodiment allows a user to obtain the goods that he / she wishes to purchase which are at a minimum distance from his/her current location and as such distance provides a predetermined parameter that is used to select a
- 30 single location to which the user should be guided.

Other embodiments may contain the data relating to the location of the shop, etc.

within the entity data held within the memory resource 230.

In some embodiments, the method may allow a user to select entities which are at a lowest price and have a route generated thereto and as such price provides a
5 predetermined parameter that is used to select a single location to which the user should be guided. Indeed, some embodiments may allow a user may be able to specify whether it is the nearest, cheapest, or some combination of the two that he/she wishes to form the basis for the generated route. Other embodiments, may allow a user to select the destination according to other predetermined parameters.

10

Once the location of the closest store has been obtained, then in step 816, the PND 600 generates a route to that store in order that the user can obtain the entity. As such, the PND 600 has determined a single location for the selected entity based upon the distance of the store to the current location of the PND 600 and thus in
15 this embodiment a method has been implemented in which a route to the entity is determined upon the distance as a predetermined parameter.

In other embodiments, the method may of generating a route to the entity selected by the user may vary from that described in Figures 7 and 8. For example, rather
20 than separately listing occurrences of the same entity from different stores, the method may group the same entity. In such an embodiment, when a user selects an entity he/she may then be provided with a further screen showing details of the stores and or prices, etc. for the entity. The user may then be able to select the store, price or some combination thereof at which he/she would like to obtain the
25 entity.

Further when the PND obtains the location of a store the method may also ascertain whether the store to which the PND will generate a route has the entity in stock. Such an embodiment is convenient in order to save wasted journeys for the user
30 and may also help to save traffic congestion since it may prevent vehicles from being routed to stores unnecessarily.

In some embodiments, the method may comprise reserving an entity at a store when a user selects the entity. In such embodiments, the entity server 606 may communicate the intended purchase of the entity to the second server 608 thereby allowing reservation of the entity. Such embodiments may provide convenient for
5 the user allowing them to be more certain that his/her journey will not be wasted.

In further embodiments, selection of an entity may cause a purchase of that entity to be made. In such an embodiment, the navigation device may communicate to the store (or other body providing the entity) an identifier from which payment may be
10 taken. The identifier may for example be a credit card number, an account number with that store, an online e-commerce site, such as PaypalTM or the like, or any other suitable means. The navigation device may subsequently be used to direct the user to that store in order that he / she can pick up the goods, etc. that have been pre-purchased.

15

When a user selects an entity, the navigation device may be arranged to send to the second server 608, from which the data for that entity originated, a purchase indicator, such as a code or the like. That is, the navigation device sends to the party providing the selected entity the purchase indicator. The party providing the
20 entity may then pay a commission to the party that runs the entity server 606 in return to the referral of the business.

In some embodiments, when a user selects an entity a message, such as an email, an SMS, an MMS or the like may be sent to a specified account. The message may
25 contain a link or the like, which when activated allows the user to purchase the entity according to the deal being offered by the entity data. Such embodiments, may conveniently be used to notify the party providing the entity that the purchase has been made as a result of the service provided by the navigation device.

30 Position information as described herein is described as being derived from GPS data. However such position information could for example be derived from position information derived from mobile phone operation, data received at toll

barriers, data obtained from induction loops embedded in roads, data obtained from number plate recognition system or any other suitable data.

CLAIMS

1. A method of generating routing instructions comprising the following steps:
5 providing a navigation device with entity data comprising a number of entries, with each entry detailing an entity having a number of different locations associated therewith ;
outputting the entity data on an output device of the navigation device;
selecting, using an input device of the navigation device, one of the entities
10 from the entity data;
causing the navigation device to determine its location;
causing the navigation device to determine a single location for the selected entity based upon a predetermined parameter; and
causing the navigation device to generate a route, based upon map data
15 accessible thereby, to the determined single location.
2. The method of claim 1 comprising connecting the navigation device to a network and obtaining the entity data from the network.
- 20 3. The method of claim 2 in which navigation device connects to an entity server, the entity server being arranged to collate the entity data from a plurality of sources.
4. The method of claim 3 in which the navigation device downloads entity
25 data thereto and stores the entity data within a memory resource of the navigation device.
5. The method of claim 4 in which the navigation device communicates with the entity server when a user selects an entity in order to determine the single
30 location.
6. The method of any preceding claim in which the entity data relates to goods

and/or services that a user may wish to use.

7. The method of any preceding claim which categorises the entity data according to meta-data associated with each entity within the entity data.

5

8. The method of claim 7 in which the predetermined parameter corresponds to a category of meta-data.

9. The method of any preceding claim which comprises displaying the entity data on a screen of the navigation device.

10. A system comprising:
an entity server arranged to send data to and receive data from a network
the entity server being arranged to generate entity data and send the entity data to a
network to which it is connected;

15 a navigation device arranged to send data to and receive data from a network;

the navigation device comprising:
processing circuitry arranged to process data received from a
network to which the device is connected;

20 an output device arranged to output data that has been processed by the processing circuitry; and

an input device arranged to accept an input made by a user of the device and generate input data which is sent to the processing circuitry;

25 wherein the entity server is arranged to generate entity data listing one or more user selectable entities and send the entity data across a network;

the navigation is arranged to receive the entity data from a network, output that entity data using the output device, receive an input from the input device selecting at least one entity and determine a route according to a predetermined
30 parameter associated with the entity selected by a user of the device.

11. The system of claim 10 in which the navigation device is arranged to

download, and store in a non-volatile memory resource thereof, entity data for output to the output device thereof.

12. The system of claim 10 or 11 in which the navigation device is arranged to
5 connect to an entity server and download data therefrom which allows the single location to be determined.

13. A navigation device comprising:
a network connector arranged to send data to and receive data from a
10 network;
processing circuitry arranged to process data received from a network to which the device is connected;
an output device arranged to output data that has been processed by the processing circuitry;
15 an input device arranged to accept an input made by a user of the device and generate input data which is sent to the processing circuitry;
wherein the processing circuitry is arranged to receive entity data from a network, the entity data comprising details about one or more entities, output that entity data using the output device, receive an input from the input device selecting
20 at least one entity and determine a route according to a predetermined parameter associated with the entity selected by a user of the device.

14. A machine readable medium containing instructions which when read onto a machine cause that machine to perform as any of the following:
25 the entity server of any of any of claims 10 to 12;
the navigation device of any of claims 10 to 12;
the navigation device of any of claim 13; and
the method of any of claims 1 to 9.

1/7

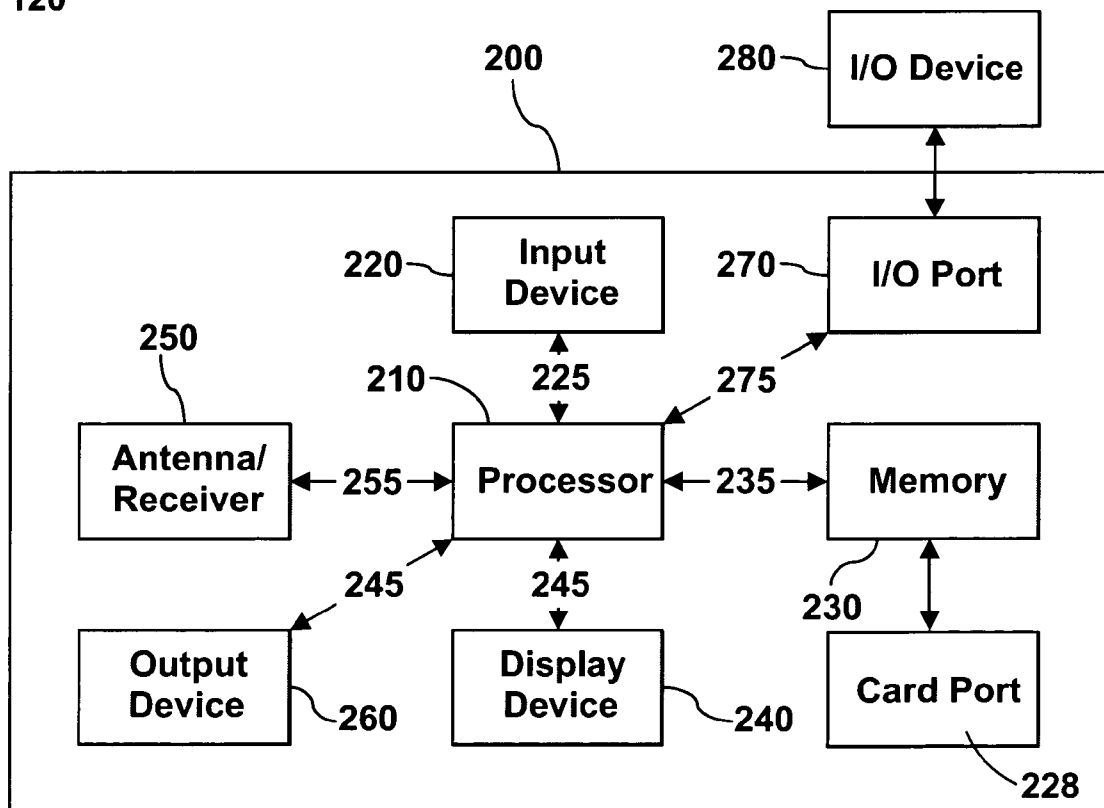
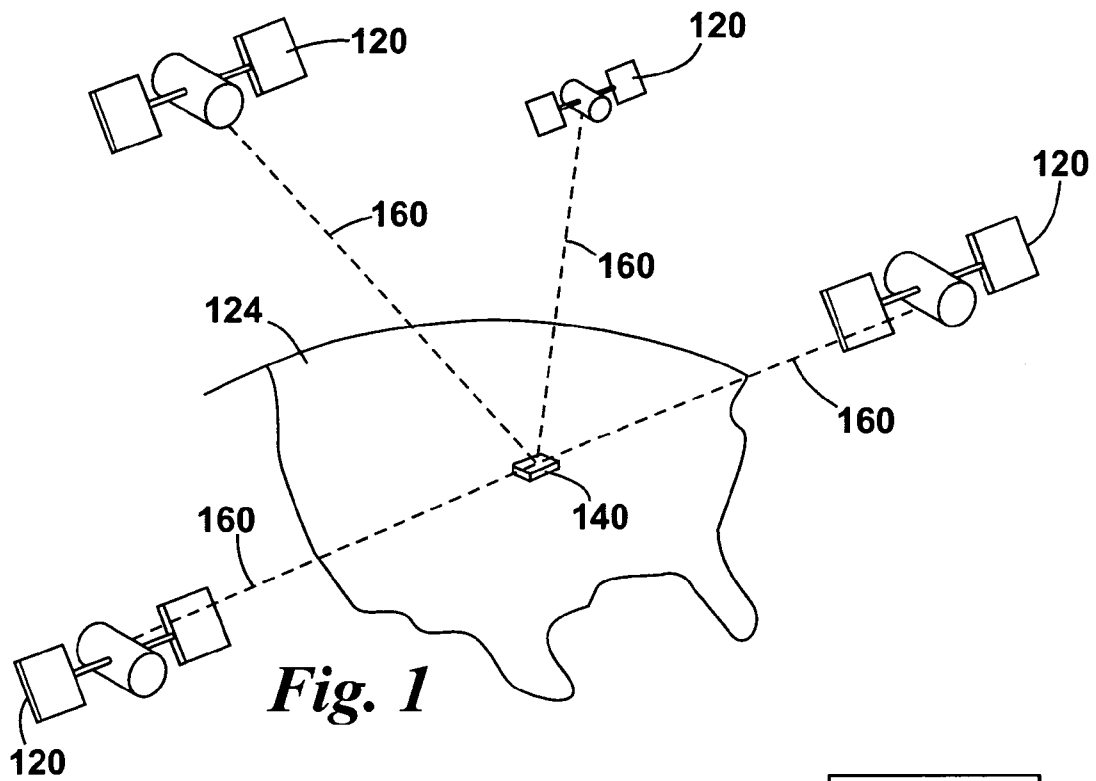


Fig. 2

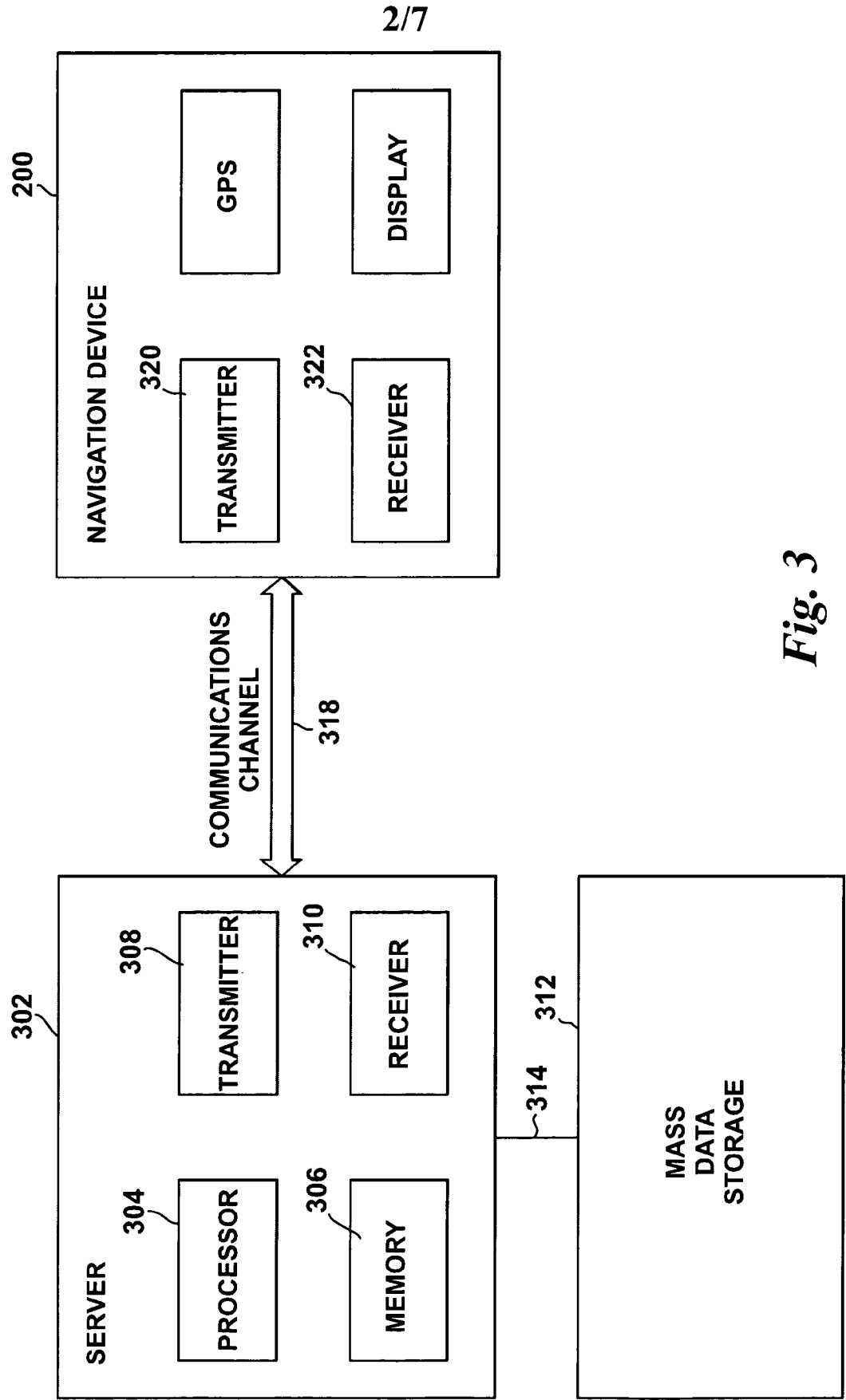
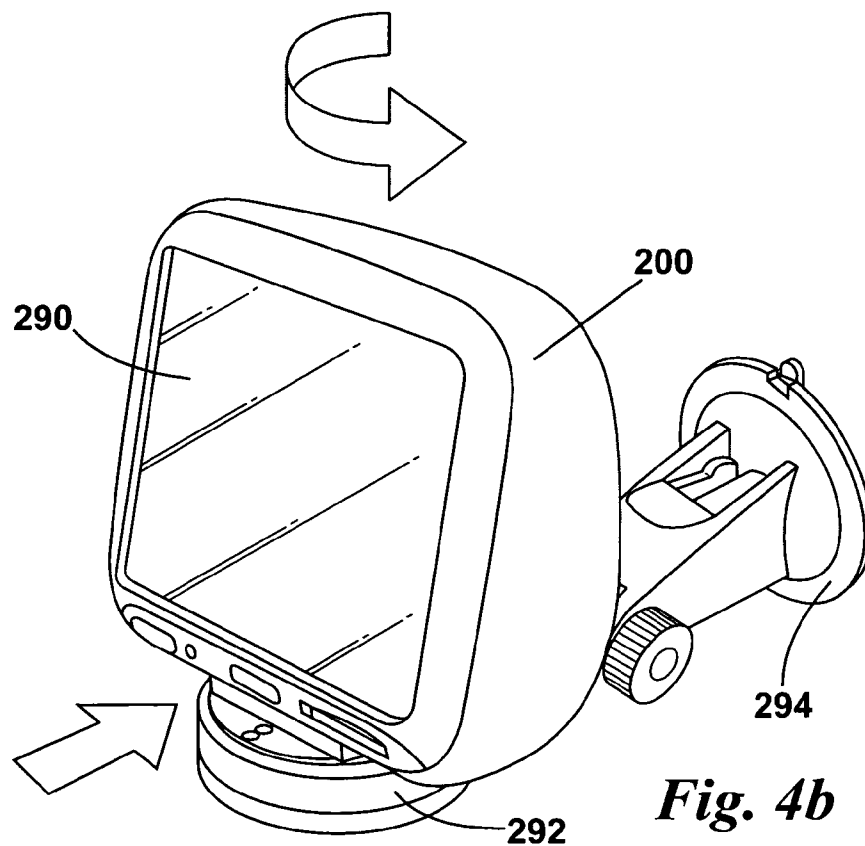
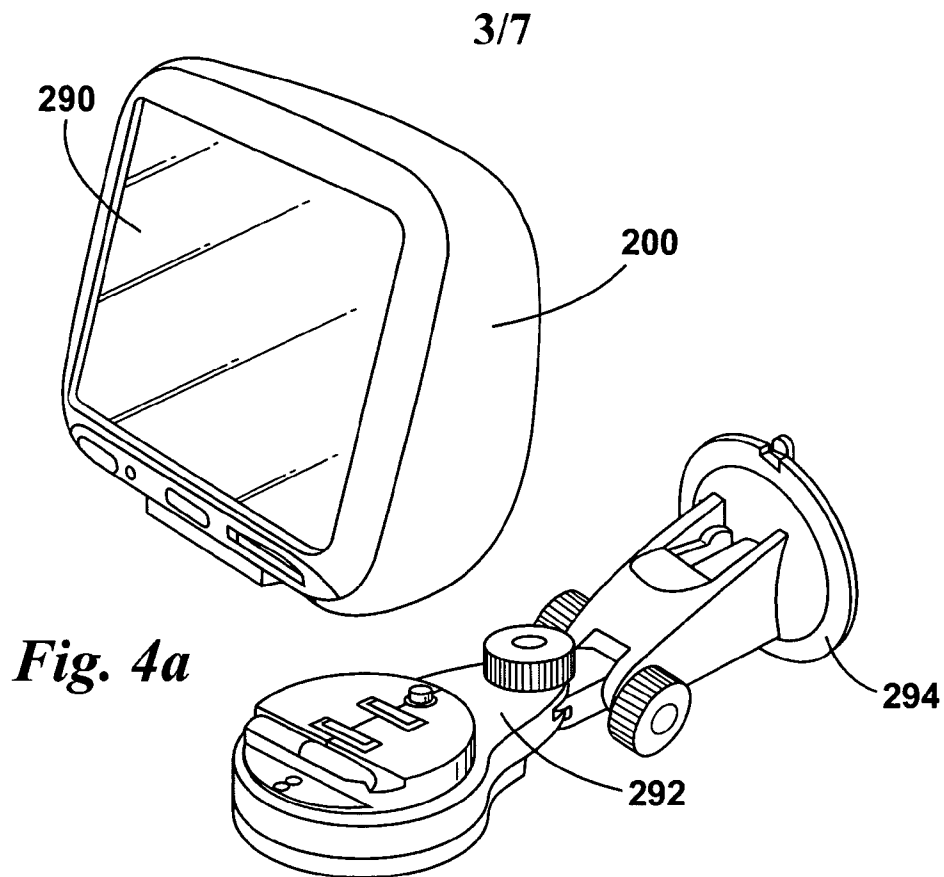
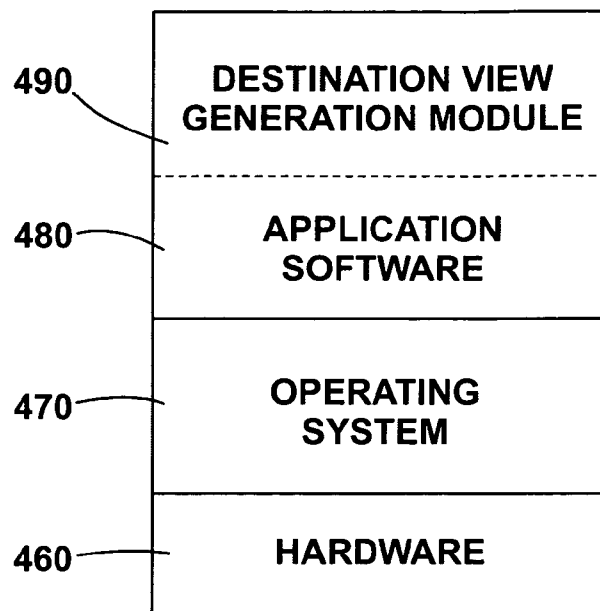
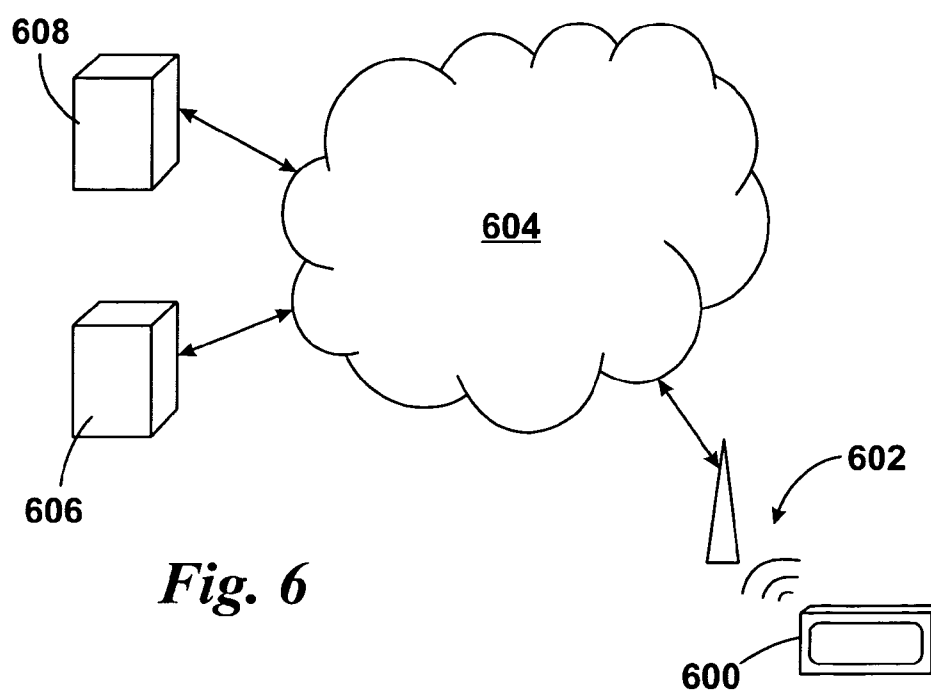


Fig. 3



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*Fig. 5**Fig. 6*

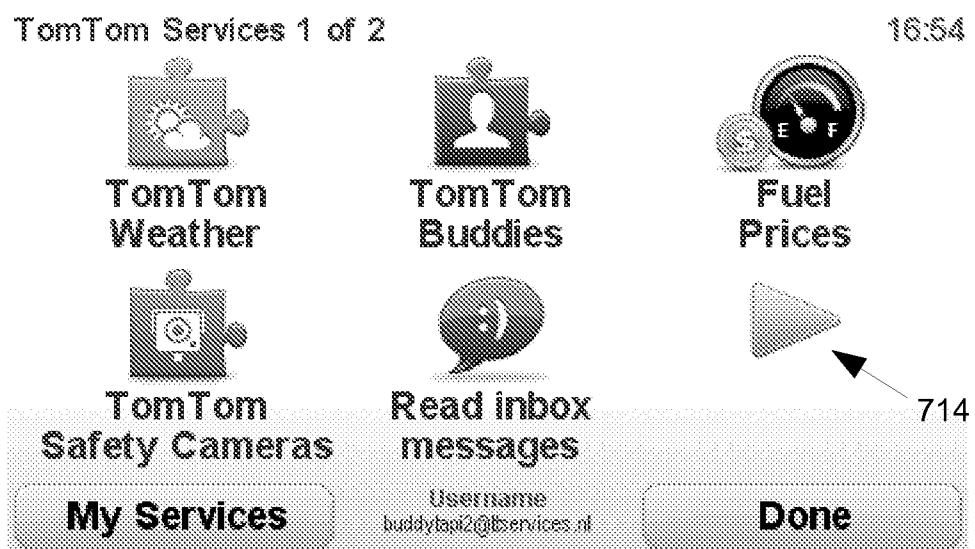
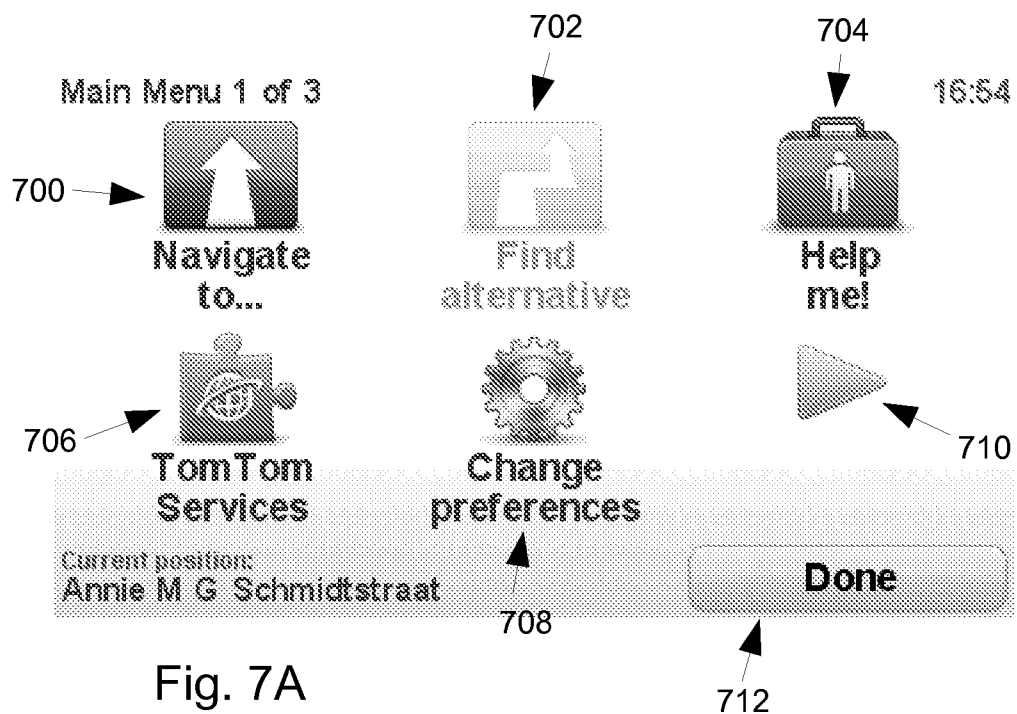


Fig. 7B

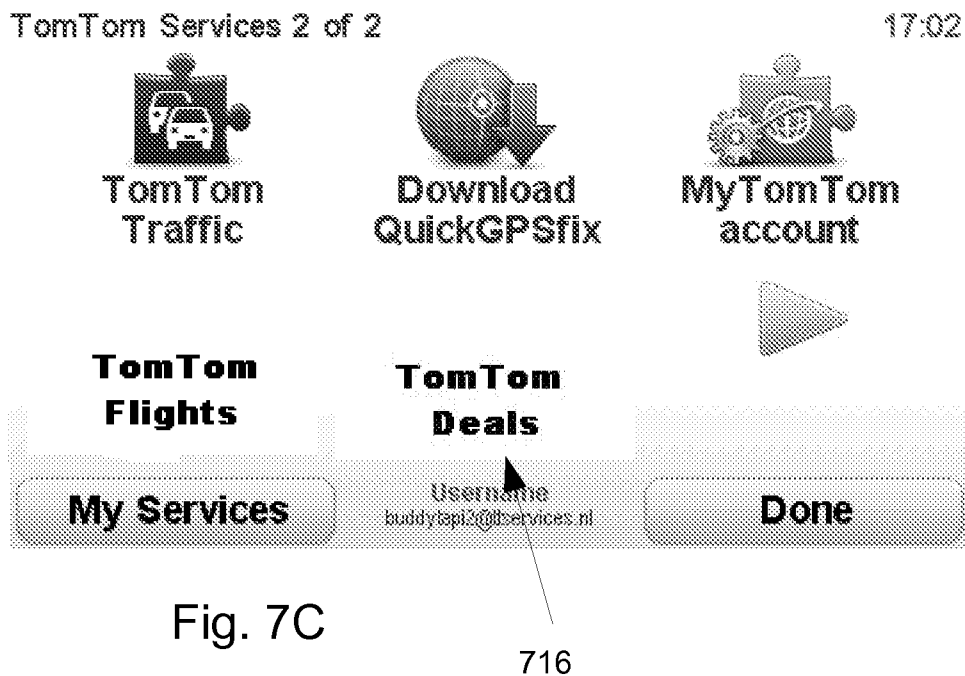


Fig. 7D

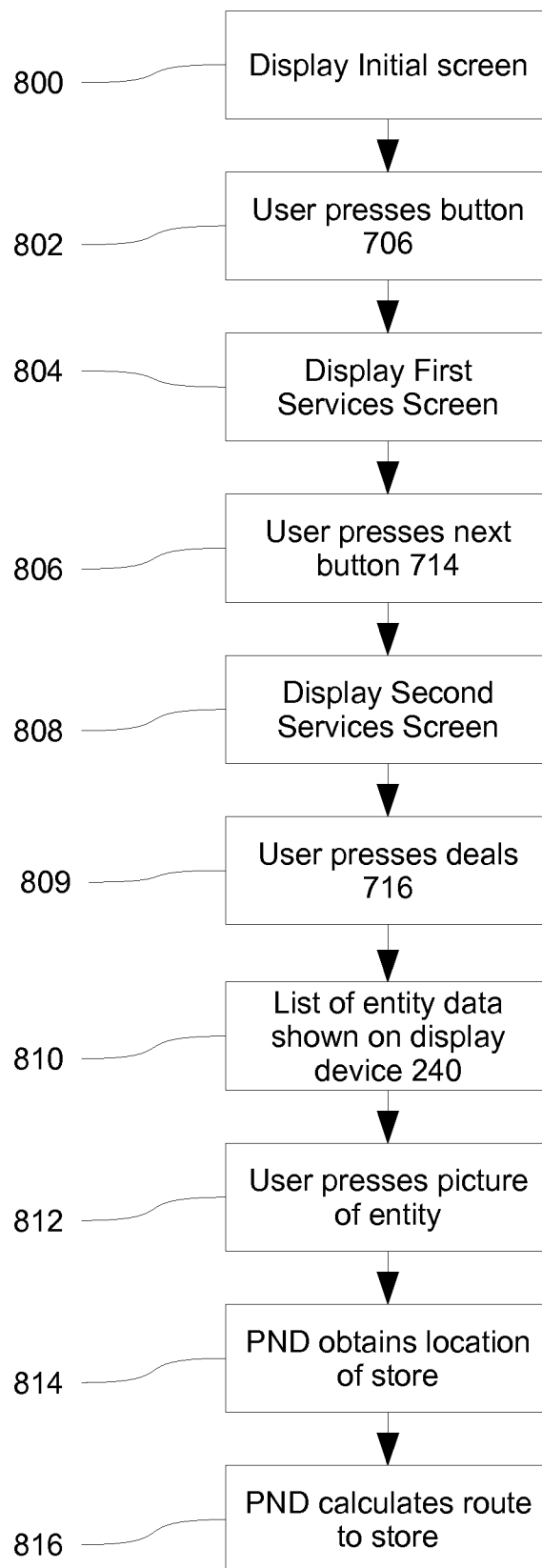


Fig. 8