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(54) Title: NAVIGATION APPARATUS AND METHOD AND COMPUTER SOFTWARE FOR USE IN THE SAME

(57) Abstract: An embodiment of the present invention provides a navigation device (200) comprising a traffic information receiving means (168) for receiving traffic information corresponding to a plurality of geographical areas; a memory (214) storing route information indicative of a route between at least first and second locations; and a processor (202) which is arranged to selectively utilise traffic information corresponding to geographical areas according to the route information.

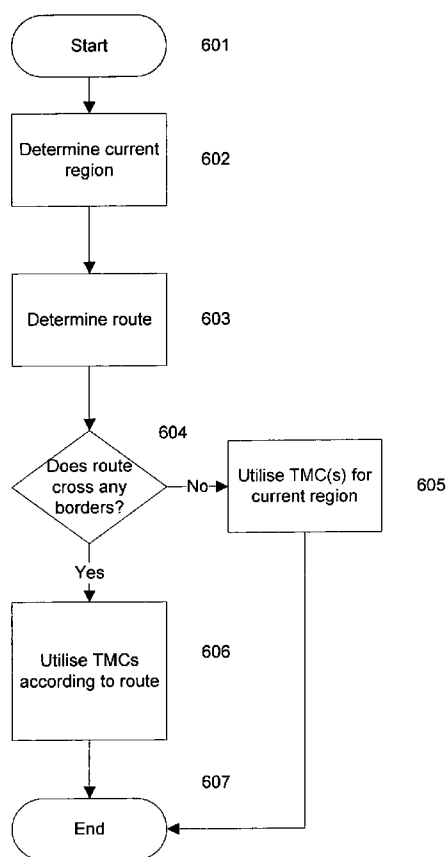


FIG. 7



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NAVIGATION APPARATUS AND METHOD AND COMPUTER SOFTWARE FOR USE IN THE SAME

Field of the Invention

The present invention relates to a navigation apparatus of the type that receives
5 dynamically and/or wirelessly traffic and/or road information and a method for use
therein. In particular, although not exclusively, the present invention relates to a
navigation apparatus that, for example, provides traffic or road condition information to a
user and/or determines a navigation route by taking account of traffic or road condition
information and method for use therein.

10

Background to the Invention

Portable computing devices, for example 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
15 navigation systems.

In general terms, a modern PND 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
20 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
25 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 built into a vehicle), and a
microphone for detecting user speech. In one particular arrangement, the output
30 interface display may be configured as a touch sensitive display (by means of a touch
sensitive overlay or otherwise) additionally to provide an input interface by means of
which a user can operate the device by touch.

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
35 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 Bluetooth, Wi-Fi, Wi-Max, GSM, UMTS and the like.

PNDs 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.

5 The PND 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 provided in in-vehicle
10 navigation systems, but may also be provided in PNDs 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 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
15 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
20 "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 very 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
25 for the factors determining road choice (for example the driver may specify that the route should not include motorways or toll roads).

 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
30 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
35 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.

Route planning and navigation functionality may also be provided by a desktop or mobile computing resource running appropriate software. For example, the Royal Automobile Club (RAC) provides an on-line route planning and navigation facility at <http://www.rac.co.uk>, which facility allows a user to enter a start point and a destination whereupon the server with which the user's computing resource is communicating calculates a route (aspects of which may be user specified), generates a map, and generates a set of exhaustive navigation instructions for guiding the user from the selected start point to the selected destination. The facility also provides for pseudo three-dimensional rendering of a calculated route, and route preview functionality which simulates a user travelling along the route and thereby provides the user with a preview of the calculated route.

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 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 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.

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 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 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.

A further important 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.

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 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 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 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.

Devices of the type described above, for example the 920T model manufactured and supplied by TomTom International B.V., provide a reliable means for enabling users to navigate from one position to another. Such devices are of great utility when the user is not familiar with the route to the destination to which they are navigating.

As noted above, a PND may monitor traffic or road conditions and may recalculate a route avoid areas of congestion, such as traffic jams caused by excess traffic volumes or accidents. In order to achieve this, some PNDs comprise, or are connectable to, a radio receiver for receiving a Traffic Message Channel (TMC) which is a digitally coded source of traffic information. TMCs are generally broadcast as an FM-

RDS signal. Using TMCs, PNDs are able to calculate a route which avoids congested roads. However, in some circumstances, it is difficult for a PND to select an appropriate TMC.

It is an aim of the present invention to address this problem, in particular to enable a PND to select one or more appropriate sources of traffic information from amongst a plurality of available sources of traffic information.

Summary of the Invention

According to a first aspect of the present invention, there is provided a navigation device comprising a traffic information receiving means for receiving traffic information corresponding to a plurality of geographical areas, a memory storing route information indicative of a route between at least first and second locations, and a processor arranged to selectively utilise traffic information corresponding to geographical areas according to the route information.

Traffic information for each geographical area may be broadcast separately and the processor may be arranged to select broadcast sources according to the route information. Preferably, each source of traffic information carries an indication of a geographic area for which it provides relevant information. The indication may be a country code. Traffic information may be broadcast as a digitally encoded RF signal. A source of traffic information may be a Traffic Message Channel (TMC).

The geographical areas may be regions having borders there-between. The geographical areas may be countries, or states.

The navigation device may utilise current location information in combination with the route information to determine whether to utilise traffic information. The navigation device may determine whether it is within a predetermined distance of a geographical area for which traffic information is provided in order to utilise that traffic information.

According to a second aspect of the present invention, there is provided a method for use in a navigation device comprising receiving traffic information corresponding to a plurality of geographical areas, determining whether to use received traffic information for each of the plurality of geographical areas according to route information indicative of a route between a plurality of locations.

The method may further comprise the step of re-calculating a current route according to the utilised traffic information. Alternatively, or additionally, the method may comprise a step of displaying utilised traffic information on a display device or producing an audible output according to the utilised traffic information.

It is thus possible to provide an apparatus and method capable of improved utilisation of traffic information with relevance to a route to be travelled. Consequently, user experience is enhanced, because irrelevant traffic information is not utilised in route calculation/recalculation or provided to the user.

5

Brief Description of the Drawings

At least one embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic illustration of an exemplary part of a Global Positioning
10 System (GPS) usable by a navigation device;

Figure 2 is a schematic diagram of a communications system for communication between a navigation device and a server;

Figure 3 is a schematic illustration of electronic components of the navigation device of Figure 2 or any other suitable navigation device;

15 Figure 4 is a schematic diagram of an arrangement of mounting and/or docking a navigation device;

Figure 5 is a schematic representation of an architectural stack employed by the navigation device of Figure 3;

20 Figure 6 is a schematic diagram illustrating a navigation device in the vicinity of a border dividing a pair of geographical regions or areas in respect of each of which a traffic information source is broadcast;

Figure 7 is a flow diagram illustrating a method of an embodiment of the invention;

25 Figure 8 is a schematic diagram illustrating a navigation device in the vicinity of a border dividing a pair of geographical regions and a route between a current location of a navigation device and a destination;

Figure 9 is a further schematic diagram illustrating a navigation device in the vicinity of a border dividing a pair of geographical regions and a route between a current location of a navigation device and a destination;

30 Figure 10 is another schematic diagram illustrating a navigation device in the vicinity of a border dividing a pair of geographical regions and a route between a current location of a navigation device and a destination; and

35 Figure 11 is a still further schematic diagram illustrating a navigation device in the vicinity of a border dividing a pair of geographical regions and a route between a current location of a navigation device and a destination.

Detailed Description of Preferred Embodiments

Throughout the following description identical reference numerals will be used to identify like parts.

Embodiments of the present invention will now be described with particular reference to a 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 is configured to execute navigation software in a portable manner 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 vehicle such as an automobile, or indeed a portable computing resource, for example a portable personal computer (PC), a mobile telephone or a Personal Digital Assistant (PDA) executing route planning and navigation software.

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.

With the above provisos in mind, the Global Positioning System (GPS) of Figure 1 and the like are used for a variety of purposes. In general, the 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. Formerly known as NAVSTAR, the GPS incorporates a plurality of satellites which orbit the earth in extremely precise orbits. Based on these precise orbits, GPS satellites can relay their location to any number of receiving units.

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 allows the receiving device to calculate its three
5 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.

As shown in Figure 1, the GPS system 100 comprises a plurality of satellites 102 orbiting about the earth 104. A GPS receiver 106 receives spread spectrum GPS
10 satellite data signals 108 from a number of the plurality of satellites 102. The spread spectrum data signals 108 are continuously transmitted from each satellite 102, the spread spectrum data signals 108 transmitted each comprise a data stream including information identifying a particular satellite 102 from which the data stream originates. The GPS receiver 106 generally requires spread spectrum data signals 108 from at least
15 three satellites 102 in order to be able to calculate a two-dimensional position. Receipt of a fourth spread spectrum data signal enables the GPS receiver 106 to calculate, using a known technique, a three-dimensional position.

Turning to Figure 2, a navigation device 200 comprising or coupled to the GPS receiver device 106, is capable of establishing a data session, if required, with network
20 hardware of a "mobile" or telecommunications network via a mobile device (not shown), for example a mobile telephone, PDA, and/or any device with mobile telephone technology, in order to establish a digital connection, for example a digital connection via known Bluetooth technology. Thereafter, through its network service provider, the mobile device can establish a network connection (through the Internet for example) with
25 a server 150. As such, a "mobile" network connection can be 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 150 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
30 service provider) and another device such as the server 150, using the Internet for example, can be done in a known manner. In this respect, any number of appropriate data communications protocols can be employed, for example the TCP/IP layered protocol. Furthermore, the mobile device can utilize any number of communication standards such as CDMA2000, GSM, IEEE 802.11 a/b/c/g/n, etc.

35 Hence, it can be seen that the internet connection may be utilised, which can be achieved via data connection, via a mobile phone or mobile phone technology within the

navigation device 200 for example.

Although not shown, the navigation device 200 may, of course, include its own mobile telephone 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, and/or can include an insertable card (e.g. Subscriber Identity Module (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 device 200 and the server 150, via the Internet for example, in a manner similar to that of any mobile device.

For telephone settings, a Bluetooth enabled navigation device may be used to work correctly with the ever changing spectrum of mobile phone models, 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 Figure 2, the navigation device 200 is depicted as being in communication with the server 150 via a generic communications channel 152 that can be implemented by any of a number of different arrangements. The communication channel 152 generically represents the propagating medium or path that connects the navigation device 200 and the server 150. The server 150 and the navigation device 200 can communicate when a connection via the communications channel 152 is established between the server 150 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.).

The communication channel 152 is not limited to a particular communication technology. Additionally, the communication channel 152 is not limited to a single communication technology; that is, the channel 152 may include several communication links that use a variety of technology. For example, the communication channel 152 can be adapted to provide a path for electrical, optical, and/or electromagnetic communications, etc. As such, the communication channel 152 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, free space, etc. Furthermore, the communication channel 152 can include intermediate devices such as routers, repeaters, buffers, transmitters, and receivers, for example.

In one illustrative arrangement, the communication channel 152 includes telephone and computer networks. Furthermore, the communication channel 152 may

be capable of accommodating wireless communication, for example, infrared communications, radio frequency communications, such as microwave frequency communications, etc. Additionally, the communication channel 152 can accommodate satellite communication.

5 The communication signals transmitted through the communication channel 152 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),
10 Global System for Mobile Communications (GSM), etc. Both digital and analogue signals can be transmitted through the communication channel 152. These signals may be modulated, encrypted and/or compressed signals as may be desirable for the communication technology.

 The server 150 includes, in addition to other components which may not be
15 illustrated, a processor 154 operatively connected to a memory 156 and further operatively connected, via a wired or wireless connection 158, to a mass data storage device 160. The mass storage device 160 contains a store of navigation data and map information, and can again be a separate device from the server 150 or can be incorporated into the server 150. The processor 154 is further operatively connected to
20 transmitter 162 and receiver 164, to transmit and receive information to and from navigation device 200 via communications channel 152. The signals sent and received may include data, communication, and/or other propagated signals. The transmitter 162 and receiver 164 may be selected or designed according to the communications requirement and communication technology used in the communication design for the
25 navigation system 200. Further, it should be noted that the functions of transmitter 162 and receiver 164 may be combined into a single transceiver.

 As mentioned above, the navigation device 200 can be arranged to communicate with the server 150 through communications channel 152, using transmitter 166 and receiver 168 to send and receive signals and/or data through the
30 communications channel 152, noting that these devices can further be used to communicate with devices other than server 150. Further, the transmitter 166 and receiver 168 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 166 and receiver 168 may be combined into a
35 single transceiver as described above in relation to Figure 2. Of course, the navigation device 200 comprises other hardware and/or functional parts, which will be described

later herein in further detail.

Software stored in server memory 156 provides instructions for the processor 154 and allows the server 150 to provide services to the navigation device 200. One service provided by the server 150 involves processing requests from the navigation device 200 and transmitting navigation data from the mass data storage 160 to the navigation device 200. Another service that can be provided by the server 150 includes processing the navigation data using various algorithms for a desired application and sending the results of these calculations to the navigation device 200.

The server 150 constitutes a remote source of data accessible by the navigation device 200 via a wireless channel. The server 150 may include a network server located on a local area network (LAN), wide area network (WAN), virtual private network (VPN), etc.

The server 150 may include a personal computer such as a desktop or laptop computer, and the communication channel 152 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 150 to establish an internet connection between the server 150 and the navigation device 200.

The navigation device 200 may be provided with information from the server 150 via information downloads which may be periodically updated automatically or upon a user connecting the navigation device 200 to the server 150 and/or may be more dynamic upon a more constant or frequent connection being made between the server 150 and navigation device 200 via a wireless mobile connection device and TCP/IP connection for example. For many dynamic calculations, the processor 154 in the server 150 may be used to handle the bulk of processing needs, however, a processor (not shown in Figure 2) of the navigation device 200 can also handle much processing and calculation, oftentimes independent of a connection to a server 150.

Referring to Figure 3, 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 navigation device 200 includes a processing resource comprising, for example, the processor 202 mentioned above, the processor 202 being coupled to an input device 204 and a display device, for example a display screen 206. Although reference is made here to the input device 204 in the singular, the skilled person should appreciate that the input device 204 represents any number of input devices, including a keyboard device, voice input device, touch panel and/or any other known input device utilised to input information. Likewise, the display screen 206 can

include any type of display screen such as a Liquid Crystal Display (LCD), for example.

In one arrangement, one aspect of the input device 204, the touch panel, and the display screen 206 are integrated so as to provide an integrated input and display device, including a touchpad or touchscreen input 250 (Figure 4) to enable both input of
5 information (via direct input, menu selection, etc.) and display of information through the touch panel screen so that a user need only touch a portion of the display screen 206 to select one of a plurality of display choices or to activate one of a plurality of virtual or "soft" buttons. In this respect, the processor 202 supports a Graphical User Interface (GUI) that operates in conjunction with the touchscreen.

10 In the navigation device 200, the processor 202 is operatively connected to and capable of receiving input information from input device 204 via a connection 210, and operatively connected to at least one of the display screen 206 and the output device 208, via respective output connections 212, to output information thereto. The navigation device 200 may include an output device 208, for example an audible output
15 device (e.g. a loudspeaker). As the output device 208 can produce audible information for a user of the navigation device 200, it is should equally be understood that input device 204 can include a microphone and software for receiving input voice commands as well. Further, the navigation device 200 can also include any additional input device 204 and/or any additional output device, such as audio input/output devices for example.

20 The processor 202 is operatively connected to memory 214 via connection 216 and is further adapted to receive/send information from/to input/output (I/O) ports 218 via connection 220, wherein the I/O port 218 is connectible to an I/O device 222 external to the navigation device 200. The external I/O device 222 may include, but is not limited to an external listening device, such as an earpiece for example. The connection to I/O
25 device 222 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 earpiece or headphones, and/or for connection to a mobile telephone for example, wherein the mobile telephone connection can be used to establish a data connection between the navigation device 200 and the Internet or any
30 other network for example, and/or to establish a connection to a server via the Internet or some other network for example.

Figure 3 further illustrates an operative connection between the processor 202 and an antenna/receiver 224 via connection 226, wherein the antenna/receiver 224 can be a GPS antenna/receiver for example. It should be understood that the antenna and
35 receiver designated by reference numeral 224 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.

It will, of course, be understood by one of ordinary skill in the art that the electronic components shown in Figure 3 are powered by one or more 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 3 are contemplated. For example, the components shown in Figure 3 may be in communication with one another via wired and/or wireless connections and the like. Thus, the navigation device 200 described herein can be a portable or handheld navigation device 200.

In addition, the portable or handheld navigation device 200 of Figure 3 can be connected or "docked" in a known manner to a vehicle such as a bicycle, a 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 to Figure 4, the navigation device 200 may be a unit that includes the integrated input and display device 206 and the other components of Figure 2 (including, but not limited to, the internal GPS receiver 224, the microprocessor 202, a power supply (not shown), memory systems 214, etc.).

The navigation device 200 may sit on an arm 252, which itself may be secured to a vehicle dashboard/window/etc. using a suction cup 254. This arm 252 is one example of a docking station to which the navigation device 200 can be docked. The navigation device 200 can be docked or otherwise connected to the arm 252 of the docking station by snap connecting the navigation device 200 to the arm 252 for example. The navigation device 200 may then be rotatable on the arm 252. To release the connection between the navigation device 200 and the docking station, a button (not shown) on the navigation device 200 may be pressed, for example. Other equally suitable arrangements for coupling and decoupling the navigation device 200 to a docking station are well known to persons of ordinary skill in the art.

Turning to Figure 5, the processor 202 and memory 214 cooperate to support a BIOS (Basic Input/Output System) 282 that functions as an interface between functional hardware components 280 of the navigation device 200 and the software executed by the device. The processor 202 then loads an operating system 284 from the memory 214, which provides an environment in which application software 286 (implementing some or all of the above described route planning and navigation functionality) can run. The application software 286 provides an operational environment including the GUI that supports core functions of the navigation device, for example map viewing, route planning, navigation functions and any other functions associated therewith. In this respect, part of the application software 286 comprises a view generation module 288.

As noted above, the server 150 is able to communicate with the navigation device 200 via the communications channel 152. In particular, the server 150 may supply traffic information to the navigation device 200 via the communications channel 152. The term traffic information is understood to mean information representing traffic and/or road conditions on one or more roads, such as, traffic speed, volume of traffic, dangerous road conditions ahead (fog, snow, ice and so on), etc. which may be used by the navigation device 200 to provide information to a user and/or to calculate or recalculate an appropriate route. For example, the navigation device 200 may determine a route to a destination which avoids an area having a high volume and/or low speed of traffic.

One particular source of traffic information is a Traffic Message Channel (TMC) which is generally transmitted as an FM-RDS radio signal. A TMC may be a commercial or freely-obtained service which provides traffic information for a region over which the TMC is broadcast. Thus, the navigation device 200 may be able to receive a plurality of TMCs at any one time and during navigation of a route reception of different TMCs will be gained and lost. It is therefore desired to improve the navigation device's ability to utilise traffic information which is provided simultaneously from multiple sources, such as TMCs.

A particular problem arises concerning selection from amongst multiple traffic information sources when a navigation device 200 is in a vicinity of a border. A border is a geographical demarcation line dividing geographical regions, such as countries, states, counties or other geographical areas. As shown in Figure 6, in the vicinity of a border 501, a navigation device 500 may be able to receive multiple sources of traffic information, such as TMCs, transmitted from either side of the border. For example, a first TMC 502 is broadcast from a first side of a border 501 over an area which extends into an opposing side of the border 501. Similarly, a second TMC 503 from the opposing side of the border 501 may have a broadcast area which extends onto the other side of the border 501. However, one or both of the TMCs may only carry traffic information applicable to their respective sides of the border 501. In one particular exemplary situation, the border 501 may divide two countries with the first and second TMCs 502, 503 only providing traffic information for each respective country whilst being receivable on both sides of the border 501. An aim of embodiments of the present invention is to utilise a plurality of sources of traffic information more efficiently, particularly with respect to areas in which a source of traffic information may be received in an area for which it does not provide relevant traffic information, such as in the presence of geographical borders.

Figure 7 shows a method according to an embodiment of the present invention which method begins in step 601. In step 602 the navigation device 200 determines a region in which it is located. As described above, the navigation device 200 determines its location by receiving GPS satellite signals. Having determined its current location, the navigation device 200 is then able to determine a region, such as a state, county or country in which it is located by reference to map data. In step 603 a route is determined corresponding to user input. For example, a route from the navigation device's current location to an input desired location may be determined with reference to the map data. In step 604, it is determined whether the route calculated in step 603 crosses any borders. If, in step 604 it is determined that the route does not cross any borders, in step 605 the navigation device 200 utilises one or more TMCs relevant to the current region in which the navigation device 200 is located. The navigation device 200 is able to select TMCs appropriate to a specific country by use of a country code forming part of the TMC broadcast. For example, the TMC Forum (www.tmcforum.com) specifies a country code F to represent France and a country code D to represent Germany. Thus the navigation device is able to utilise one or more TMCs appropriate to France which contain the country code F.

Referring to Figure 8, an example is shown wherein a navigation device 700 does not utilise traffic information from a received TMC since a route along which the navigation device is travelling does not enter into a region for which the TMC provides traffic information.

In more detail, a navigation device 700 is initially present in a departure region at a first side of a border 701. A first TMC 702 broadcasts traffic information applicable to the departure region across an area which extends over the border 701. A second TMC 703 broadcasts traffic information applicable to a second region on an opposing side of the border 701 over an area which extends across the border 701 into the departure region. The navigation device 700 determines in step 602 that it is initially present on the first side of the border and then, in step 603, determines a route 704 to a destination 705 which is also on the first side of the border 701. The route 704 does not cross the border 701, although it enters a region proximal to the border 701 from which the second TMC 703 may be received in combination with the first TMC 702. Since the navigation device 700 determines in step 604 that it does not cross the border 701, only the first TMC 702 is utilised for traffic information, although the second TMC 703 may be received for at least a portion of the route 704, it is not utilised since it provides traffic information relevant to opposing side of the border 701. That is, despite being able to receive the second TMC, the navigation device selectively chooses not to utilise that

traffic information as it is not appropriate to side of the border on which the route 704 lies.

If, in step 606, it is determined that the route crosses a border, such as between France and Germany, then the navigation device utilises the available TMCs according to a distance of the navigation device 500 along the route to a border crossing point. Further, embodiments of the present invention also selectively cease to use one or more TMCs once the navigation device has crossed the border. Various examples of how the navigation device utilises TMCs will now be provided with reference to Figures 9-11.

Referring to Figure 9, an example is shown in which a navigation device utilises traffic information from a TMC broadcast from an opposing side of a border when a route along which the navigation device is travelling crosses the border into the region for which the TMC carries traffic information. Furthermore, once the navigation device has crossed the border, utilisation of traffic information from the initial TMC is ceased, despite reception of the TMC still being possible, since the route does not re-enter the original departure region.

In more detail, a navigation device 800 is initially present in a departure region at a first side of a border 801. A first TMC 802 broadcasts traffic information applicable to the departure region across an area which extends over the border 801 into a second, destination, region. A second TMC 703 broadcasts traffic information applicable to the destination region on the opposing side of the border 801 across an area which extends over the border 801 into the departure region. The navigation device 800 determines in step 602 that it is initially present on the first side of the border 801 and then, in step 603, determines a route 804 to a destination 805 which lies across the border 801 in the destination region. In step 604, the navigation device 800 determines that the route 804 to the destination crosses the border 801 and that the destination 805 is on the opposing side of the border 801, such that the route 804 does not re-cross the border 801. The navigation device 800 consequently utilises traffic information from the second TMC 803 even whilst the navigation device is present in the departure region on the first side of the border 801. In some embodiments, the navigation device 800 begins to search for traffic information from the second TMC 703 once it travels to within a predetermined distance along the route 804 from a border crossing point. For example, the navigation device may begin searching for the second TMC 703 once it is 50km along the route from the border crossing point. The term "along the route" refers to a route distance or distance to be travelled, rather than "as the crow-flies". It will be noted that the figure of 50km is provided merely as an example and other distances may be utilised. Whilst the navigation device 800 is present in the departure region and utilisation of the second

TMC 703 has begun, the navigation device 800 may utilise traffic information from the second TMC 703 alone, or may combine traffic information from the second TMC 703 with traffic information from the first TMC 702. Once the navigation device 800 crosses the border 801, use of traffic information from the first TMC 702 is ceased since the route does not re-enter the first region for which the first TMC 702 broadcasts relevant traffic information.

Referring to Figure 10, an example is shown in which a navigation device does not immediately utilise received traffic information from a second TMC until the navigation device nears to within a predetermined distance of a border crossing point along a route.

As in previous examples, a navigation device 900 is present in a departure region on a first side of a border 901 for which a first TMC 902 broadcasts traffic information. A destination 905 exists on an opposing side of the border 902 in a destination region for which a second TMC 903 broadcasts traffic information. A route 904 is calculated to the destination 905 which enters a region proximal to the border 901 in which both first and second TMCs 902, 903 may be received, before proceeding generally parallel to the border 901 for a distance. The route 904 eventually turns and crosses the border 901 heading to the destination 905. Thus the navigation device 900 is able to receive the second TMC 903 for some time before the route 904 crosses the border 901. In this case, the navigation device 900, whilst being able to receive the second TMC 903, does not immediately utilise traffic information provided there-from until it is within a predetermined distance along the route from the border 901 crossing point. For example, the navigation device 900 may not utilise traffic information from the second TMC 903 until it is within 5km of the border crossing point.

Figure 11 shows an example in which a navigation device receives traffic information from a TMC broadcast from an opposing side of a border and continues to utilise traffic information broadcast from a departure side of a border when a route along which the navigation device is travelling re-crosses the border.

Similar to Figure 10, a navigation device 1000 initially present in a departure region on a first side of a border 1001 is initially able to receive a first TMC 1002 providing traffic information for a departure region. A destination 1005 exists on an opposing second side of the border 1001 for which a second TMC 1003 transmits traffic information. A route 1004 calculated to the destination 1005 enters a region proximal to the border 1001 in which both TMCs 1002, 1003 may be received, before crossing the border 1001 at a first border crossing point. The route then proceeds generally parallel to the border 1001 on the second side of the border before again crossing the border to

re-enter the departure region at a second border crossing point. As in the example explained with reference to Figure 9, the navigation device 1000 may begin to search for the second TMC when within a predetermined distance of the border 1001. However, traffic information provided from the second TMC 1003 may only be utilised when the navigation device 1000 is within a predetermined distance along the route from the first border crossing point. In this case, the navigation device may solely use traffic information provided from the second TMC or may combine traffic information from both TMCs. Once the navigation device 1000 crosses the border 1001 at the first crossing point, it then determines a distance to the second border crossing point. If the second border crossing point is within a predetermined distance along the route, then traffic information from the first TMC 1002 may continue to be utilised. However, if the second border crossing point is greater than the predetermined distance, the navigation device 1000 may cease to utilise traffic information provided from the first TMC 1002 for a period of time until the navigation device 1000 travels to within the predetermined distance from the second border crossing point. During this time, only traffic information provided from the second TMC 1003 is utilised. Once within the predetermined distance from the second border crossing point, information from both TMCs 1002, 1003 may be utilised until the navigation device crosses the border, or only the first TMC 1002 may be utilised.

Embodiments of the present invention improve utilisation of traffic information sources. In particular, embodiments of the present invention avoid providing unnecessary traffic information to a user, or using irrelevant traffic information in route calculation or recalculation.

It will also be appreciated that whilst various aspects and embodiments of the present invention have heretofore been described, the scope of the present invention is not limited to the particular arrangements set out herein and instead extends to encompass all arrangements, and modifications and alterations thereto, which fall within the scope of the appended claims.

Whilst embodiments described in the foregoing detailed description refer to GPS, it should be noted that the navigation device may utilise any kind of position sensing technology as an alternative to (or indeed in addition to) GPS. For example the navigation device may utilise using other global navigation satellite systems such as the European Galileo system. Equally, it is not limited to satellite based but could readily function using ground based beacons or any other kind of system that enables the device to determine its geographic location.

Alternative embodiments of the invention can be implemented as a computer

program product for use with a computer system, the computer program product being, for example, a series of computer instructions stored on a tangible data recording medium, such as a diskette, CD-ROM, ROM, or fixed disk, or embodied in a computer data signal, the signal being transmitted over a tangible medium or a wireless medium, for example, microwave or infrared. The series of computer instructions can constitute all or part of the functionality described above, and can also be stored in any memory device, volatile or non-volatile, such as semiconductor, magnetic, optical or other memory device.

It will also be well understood by persons of ordinary skill in the art that whilst the preferred embodiment implements certain functionality by means of software, that functionality could equally be implemented solely in hardware (for example by means of one or more ASICs (application specific integrated circuit)) or indeed by a mix of hardware and software. As such, the scope of the present invention should not be interpreted as being limited only to being implemented in software.

Lastly, it should also be noted that whilst the accompanying claims set out particular combinations of features described herein, the scope of the present invention is not limited to the particular combinations hereafter claimed, but instead extends to encompass any combination of features or embodiments herein disclosed irrespective of whether or not that particular combination has been specifically enumerated in the accompanying claims at this time.

CLAIMS

1. A navigation device (200) comprising:
 - a traffic information receiving means (168) for receiving traffic information
 - 5 corresponding to a plurality of geographical areas;
 - a memory (214) storing route information indicative of a route between at least first and second locations; and
 - a processor (202);
 - characterised in that:
 - 10 the processor (202) is arranged to selectively utilise traffic information corresponding to geographical areas according to the route information.
2. The navigation device (200) of claim 1, wherein traffic information corresponding to each geographical area is separately transmitted and the processor (202) is arranged
- 15 to determine whether to utilise each traffic information source according to the route information.
3. The navigation device (200) of claim 1 or 2, wherein the processor (202) is arranged to not utilise received traffic information corresponding to a geographical area if
- 20 the route does not enter the geographical area.
4. The navigation device (200) of claim 1, 2 or 3, wherein the processor (202) is arranged to not utilise received traffic information corresponding to a geographical area until the navigation device (200) is within a predetermined route distance of the
- 25 geographical area.
5. The navigation device (200) of any preceding claim, wherein the processor (202) is arranged to utilise received traffic information corresponding to a geographical area once the navigation device (200) is within a predetermined route distance of the
- 30 geographical area.
6. The navigation device (200) of any preceding claim, wherein the geographical area corresponds an area within a border and the processor (202) is arranged to utilise the traffic information for that geographical area once the navigation device (200) is
- 35 within a predetermined route distance of the border.

7. The navigation device (200) of any preceding claim, wherein the processor (202) is arranged to cease use of traffic information corresponding to a geographical area once the navigation device (200) leaves the geographical area and the route does not re-enter the geographical area.

5

8. The navigation device (200) of any preceding claim, wherein the processor (202) is arranged to cause the traffic information receiving means to search for traffic information corresponding to an upcoming geographical area on the route once the navigation device (200) is within a predetermined distance of the geographical area.

10

9. A method for use in a navigation device (200), comprising:

receiving traffic information corresponding to a plurality of geographical areas;

15

characterised by:

determining whether to use received traffic information for each of the plurality of geographical areas according to route information indicative of a route between a plurality of locations.

20

10. The method of claim 9, wherein the determining whether to use traffic information comprises comparing a current location of the navigation device (200) and the route information, and utilising traffic information corresponding to a geographical area once the navigation device (200) is within a predetermined route distance of a route location.

25

11. The method of claim 10, wherein the location on the route is a border crossing point.

12. The method of claim 9 or 10, wherein received traffic information corresponding to a geographical area is not utilised if the route does not enter the geographical area.

30

13. The method of any of claims 9 to 12, wherein received traffic information corresponding to a geographical area ceases to be utilised once the navigation device leaves the geographical area and the route does not re-enter the geographical area.

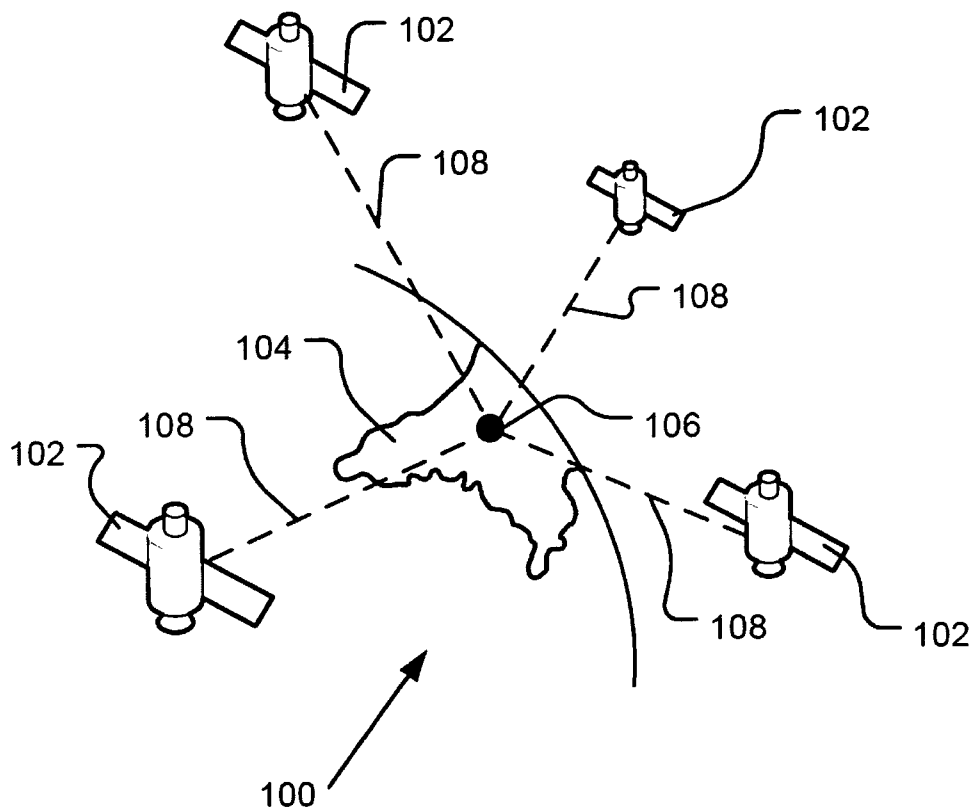
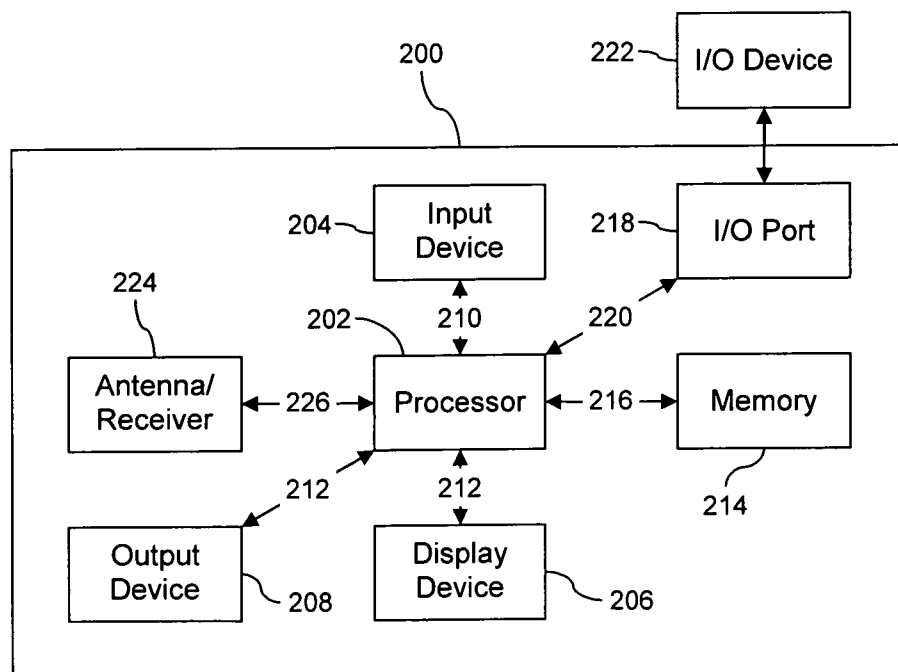
35

14. The method of any of claims 9 to 13, comprising searching for traffic information

corresponding to a geographical area into which the route crosses when the navigation device is within a predetermined route distance of the geographical area.

15. The apparatus or method of any preceding claim, wherein the geographical area
5 corresponds to one of a country, state, county, district or region.

16. Computer software comprising one or more software modules operable, when
executed in an execution environment, to cause a processor (210) to perform the
method of any of claims 9 to 15.

**FIG. 1****FIG. 2**

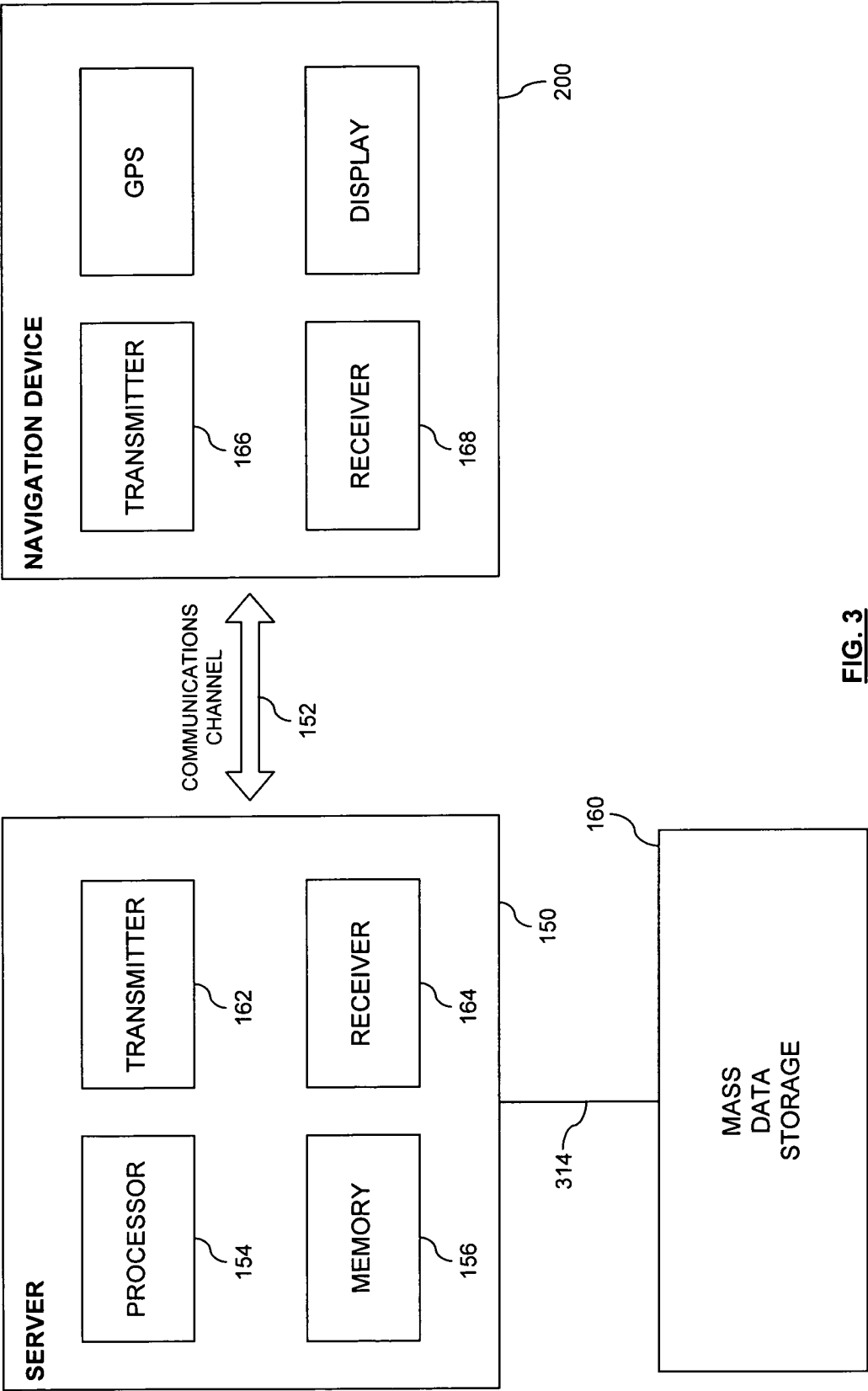
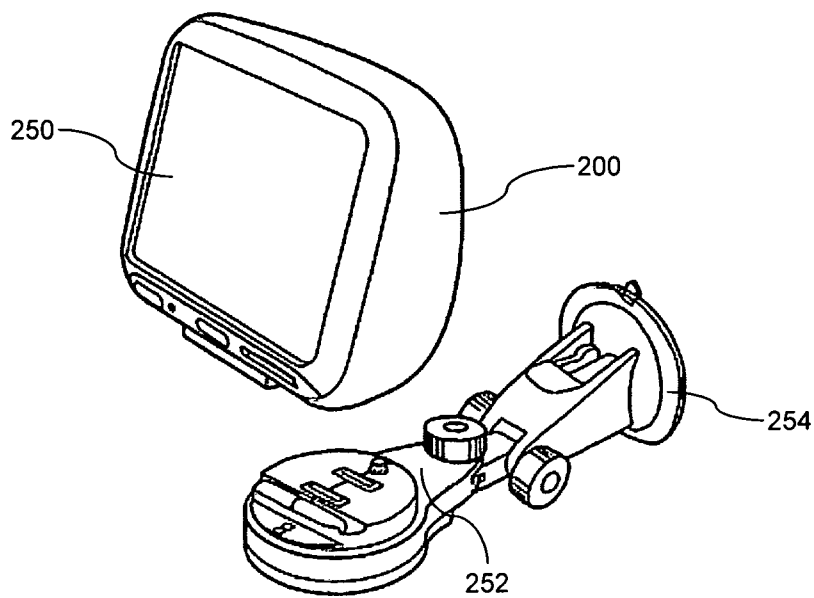
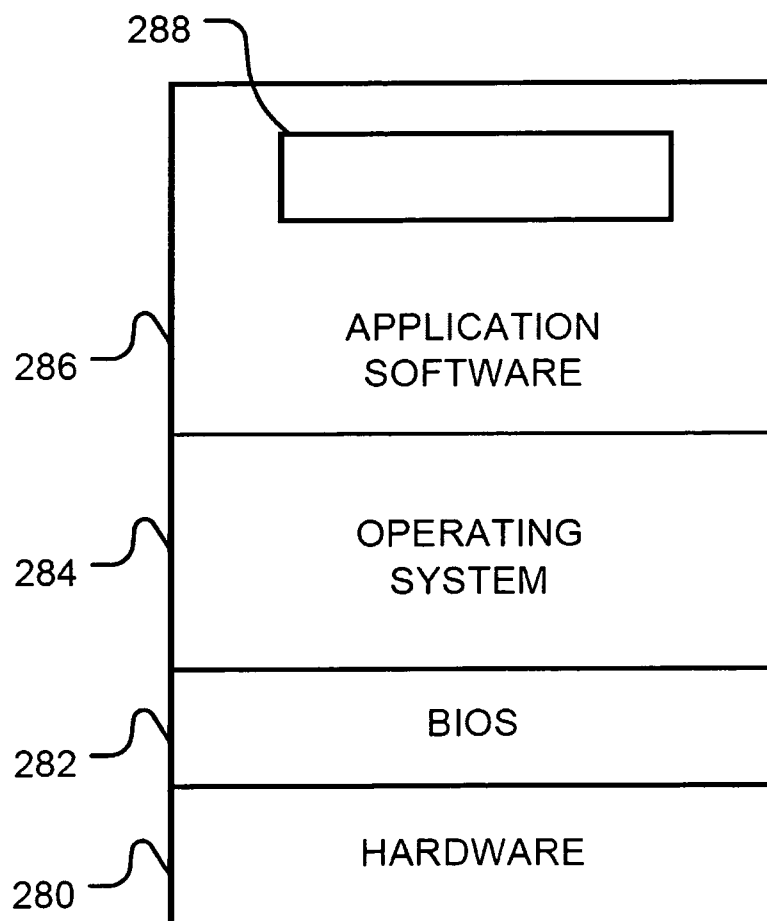


FIG. 3

**FIG. 4a****FIG. 5**

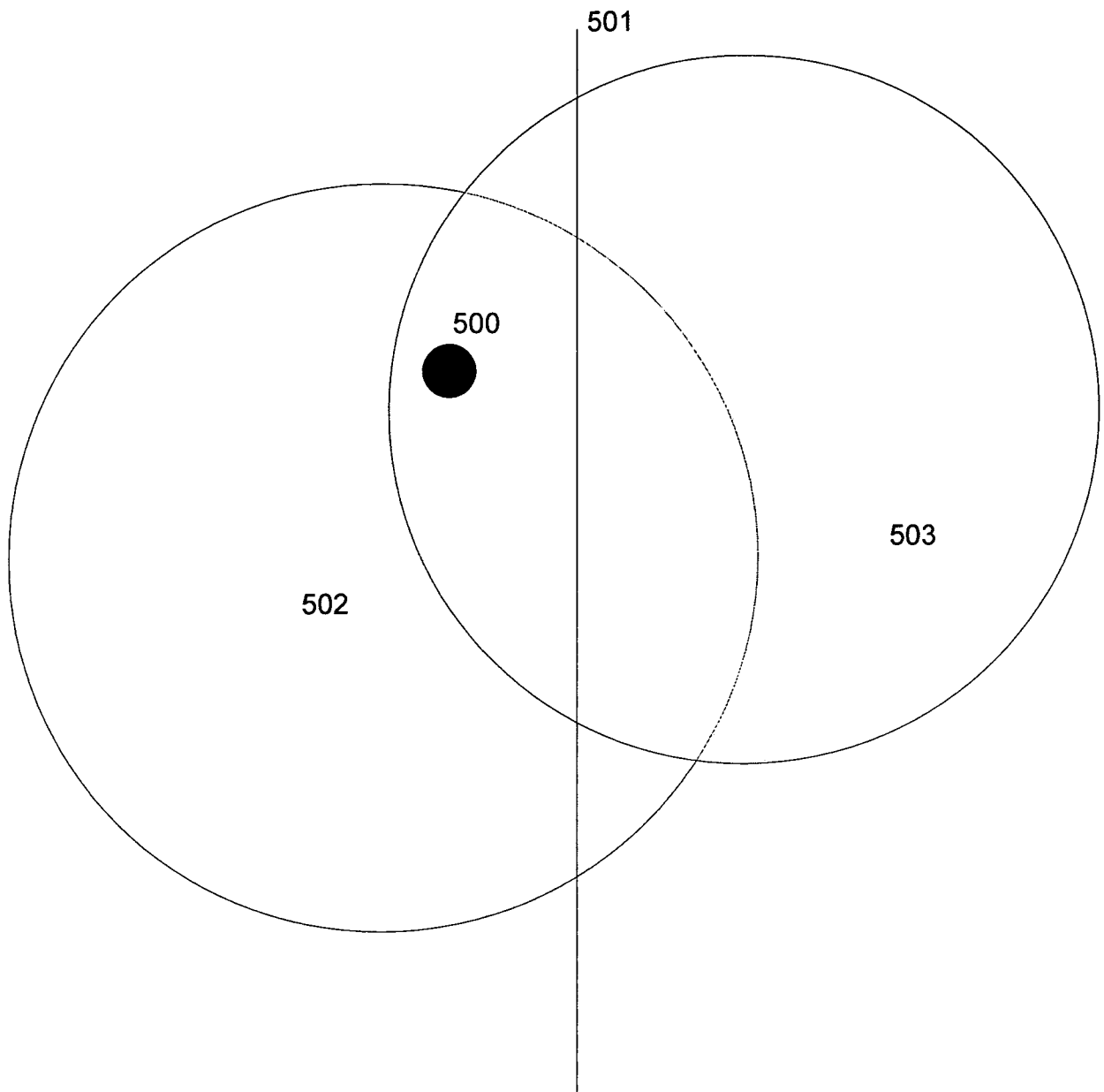
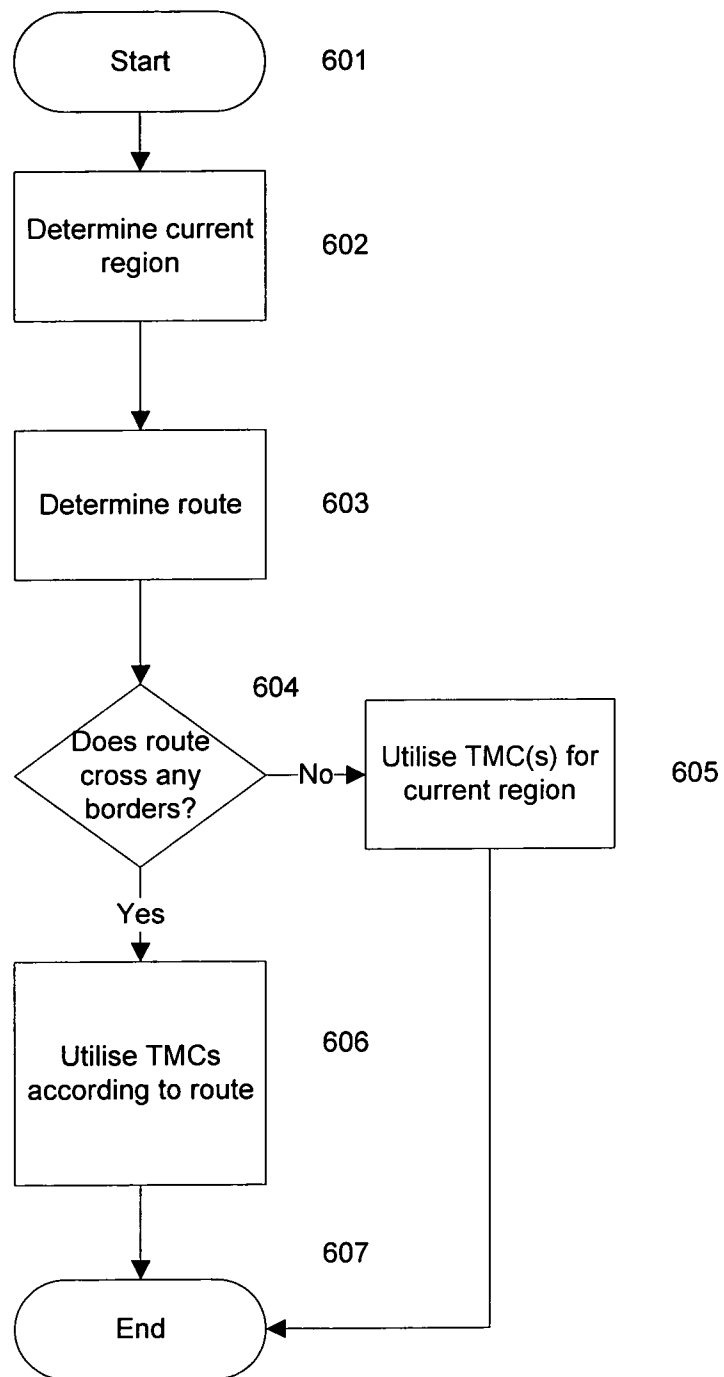


FIG. 6

**FIG. 7**

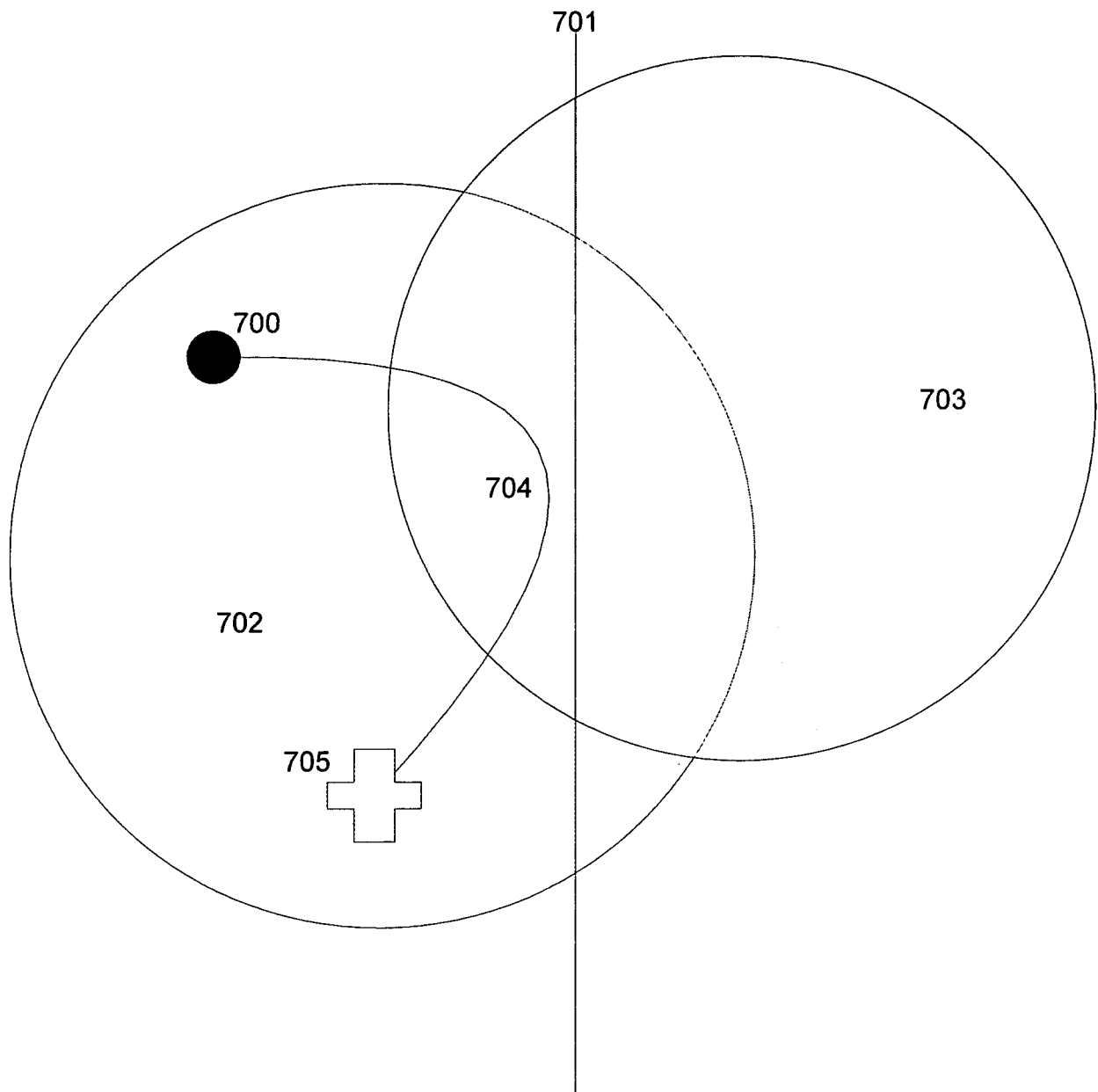


FIG. 8

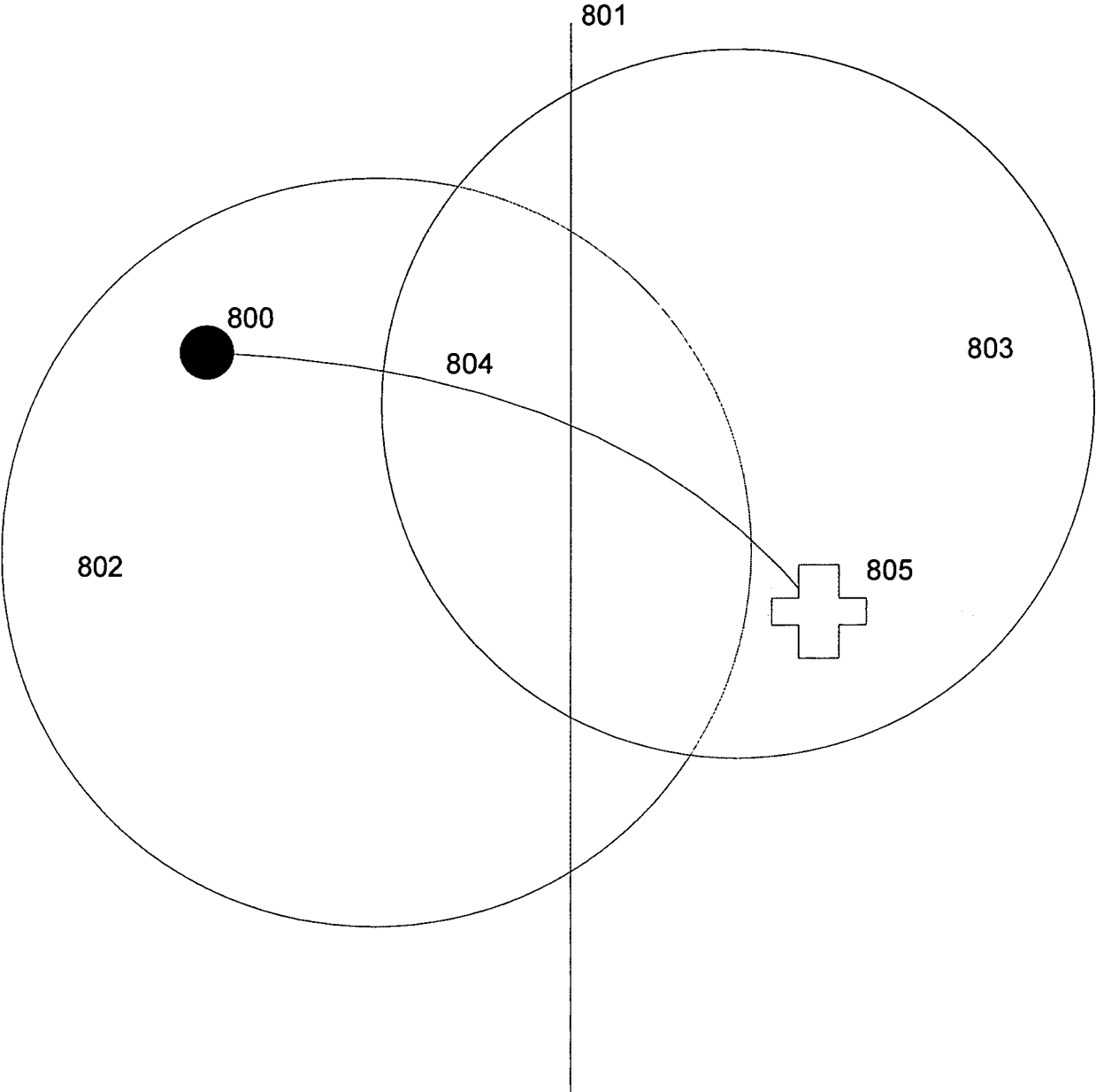


FIG. 9

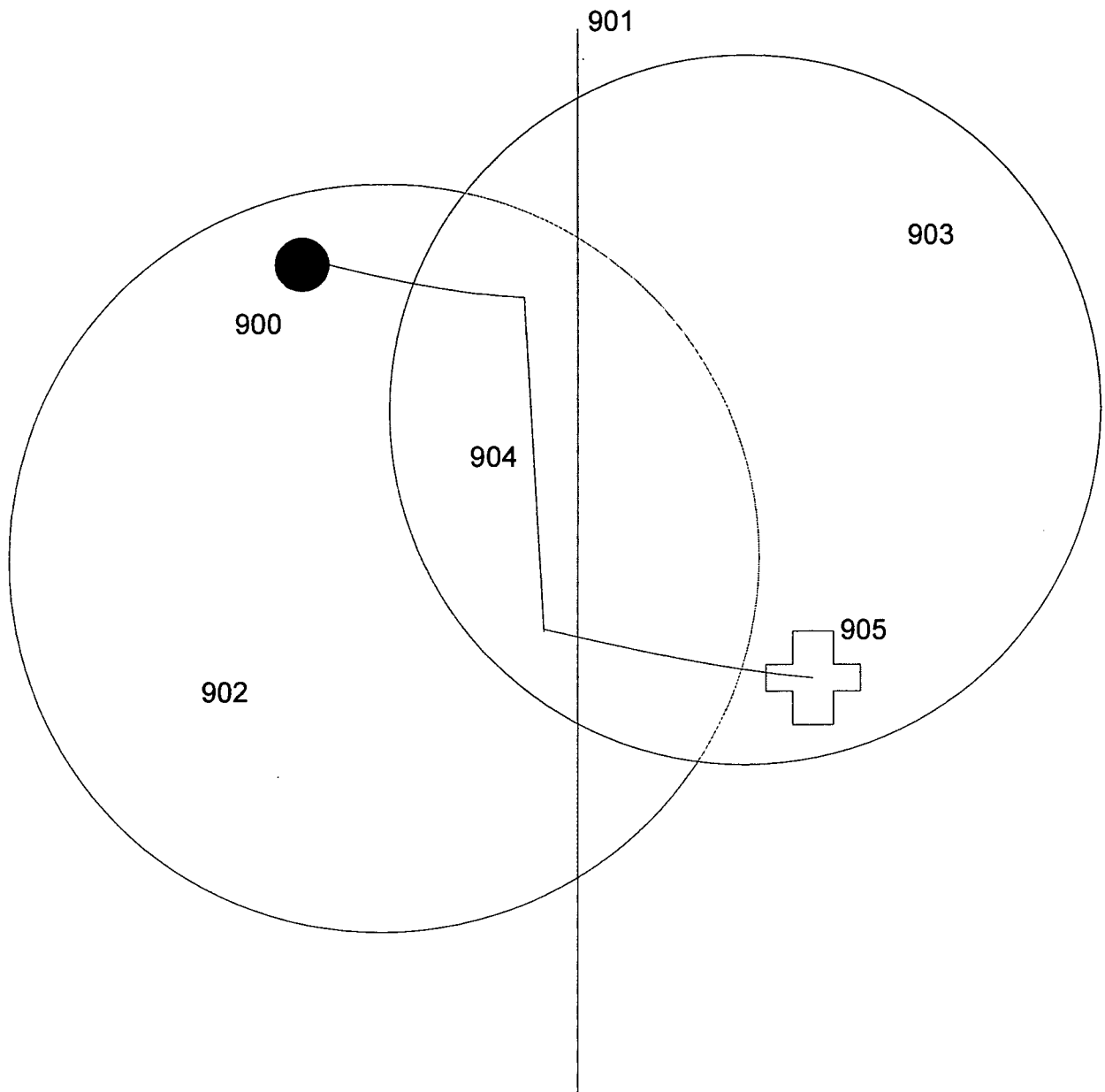
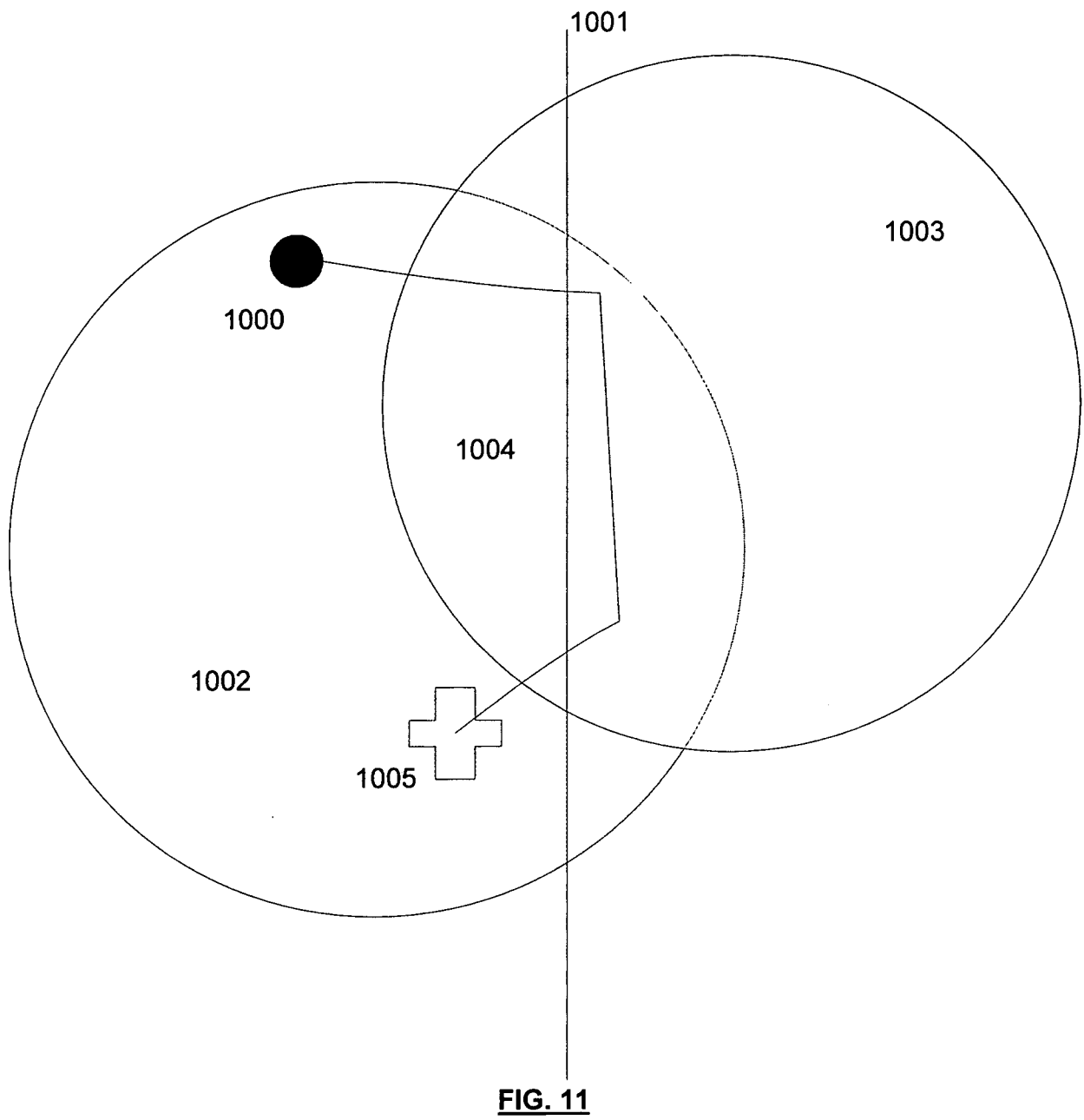


FIG. 10



INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2008/006454

A. CLASSIFICATION OF SUBJECT MATTER
INV. G01C21/26 G08G1/09

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G01C G08G H04H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	US 2005/162284 A1 (HANEBRINK THOMAS [DE]) 28 July 2005 (2005-07-28) page 2, paragraph 29 - page 4, paragraph 50; claim 14; figures 1-4	1-16
X	DE 197 50 775 A1 (MANNESSMANN AG [DE] ATX EUROP GMBH [DE]) 25 June 1998 (1998-06-25) the whole document	1-16
X	US 2008/091346 A1 (ZEROD RICHARD D [US] ET AL) 17 April 2008 (2008-04-17) page 1, paragraph 16 - page 3, paragraph 36; figures 1-4	1-16
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Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

8 April 2009

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17/04/2009

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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2008/006454

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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