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(71) **Applicant** *(for all designated States except US)*: **QUALCOMM Incorporated** [US/US]; Attn: International IP Administration, 5775 Morehouse Drive, San Diego, California 92121 (US).

(72) **Inventor; and**

(75) **Inventor/Applicant** *(for US only)*: **LAMBA, Gaurav** [IN/US]; 5775 Morehouse Drive, San Diego, California 92121 (US).

(74) **Agent**: **MAYS, Andrea L.**; Attn: International IP Administration, 5775 Morehouse Drive, San Diego, Califonia 92121 (US).

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[Continued on next page]

(54) **Title**: LOCATION DETERMINATION OF MOBILE DEVICE

(57) **Abstract**: The subject matter disclosed herein relates to determining a location fix of a mobile station (120) based on identification information of a cellular base station (170) included in a pilot signal (110).

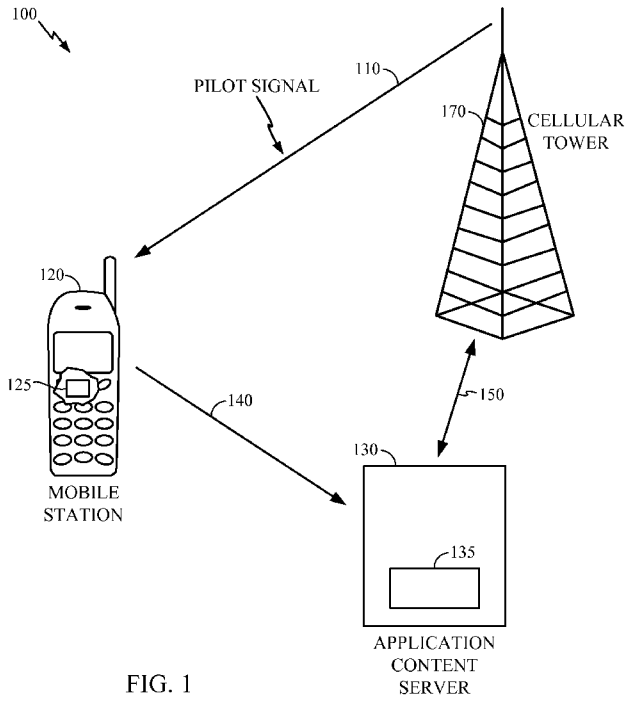

FIG. 1

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TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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Location Determination of Mobile Device

BACKGROUND

Field:

[0001] The subject matter disclosed herein relates to determining a location fix of a mobile station based on identification information of a cellular base station included in a pilot signal

Information:

[0002] A satellite positioning system (SPS), such as the Global Positioning System (GPS), typically comprises a system of earth orbiting satellite vehicles (SVs) enabling wireless devices, such as cellular telephones, personal communication system (PCS) devices, and other mobile stations (MSs), to determine their location on the earth based, at least in part, on signals received from the SVs. Such wireless devices may be equipped with an SPS receiver and be capable of processing SV signals to determine location. However, a relatively large portion of existing wireless devices may lack an SPS receiver and a capability to determine their location based on receipt of SPS signals.

BRIEF DESCRIPTION OF THE FIGURES

[0003] Non-limiting and non-exhaustive features will be described with reference to the following figures, wherein like reference numerals refer to like parts throughout the various figures

[0004] FIG. 1 is a schematic diagram of a positioning system, according to an implementation.

[0005] FIG. 2 is an example of a system parameter message, according to an implementation.

[0006] FIG. 3 is a flow chart showing a process for determining a location, according to an implementation.

[0007] FIG. 4 is a flow chart showing a process for determining a location, according to another implementation.

[0008] FIG. 5 is a schematic diagram of a device capable of communication with a wireless network, according to an implementation.

SUMMARY

[0009] In an implementation, a device, such as a mobile station is enabled to receive a pilot signal from a cellular base station, wherein said mobile station may be adapted to determine a location fix based on identification information included in the pilot signal. It should be understood, however, that this is merely an example of a particular implementation, and that claimed subject matter is not limited to this particular example.

DETAILED DESCRIPTION

[0010] Reference throughout this specification to "one example", "one feature", "an example" or "one feature" means that a particular feature, structure, or characteristic described in connection with the feature and/or example is included in at least one feature and/or example of claimed subject matter. Thus, the appearances of the phrase "in one example", "an example", "in one feature" or "a feature" in various places throughout this specification are not necessarily all referring to the same feature and/or

example. Furthermore, the particular features, structures, or characteristics may be combined in one or more examples and/or features.

[0011] Methodologies described herein may be implemented by various means depending upon applications according to particular features and/or examples. For example, such methodologies may be implemented in hardware, firmware, software, and/or combinations thereof. In a hardware implementation, for example, a processing unit may be implemented within one or more application specific integrated circuits (ASICs), digital signal processors (DSPs), digital signal processing devices (DSPDs), programmable logic devices (PLDs), field programmable gate arrays (FPGAs), processors, controllers, micro-controllers, microprocessors, electronic devices, other devices units designed to perform the functions described herein, and/or combinations thereof.

[0012] For a firmware and/or software implementation, methodologies may be implemented with modules (e.g., procedures, functions, and so on) that perform the functions described herein. Any machine-readable medium tangibly embodying instructions may be used in implementing the methodologies described herein. For example, software codes may be stored in a memory, for example the memory of a mobile station, and executed by a processor. Memory may be implemented within the processor or external to the processor. As used herein the term "memory" refers to any type of long term, short term, volatile, nonvolatile, or other memory and is not to be limited to any particular type of memory or number of memories, or type of media upon which memory is stored.

[0013] Position determination and/or estimation techniques described herein may be used for various wireless communication networks such as a wireless wide area network (WWAN), a wireless local area network (WLAN), a wireless personal area

network (WPAN), and so on. The term "network" and "system" may be used interchangeably herein. A WWAN may be a Code Division Multiple Access (CDMA) network, a Time Division Multiple Access (TDMA) network, a Frequency Division Multiple Access (FDMA) network, an Orthogonal Frequency Division Multiple Access (OFDMA) network, a Single-Carrier Frequency Division Multiple Access (SC-FDMA) network, and so on. A CDMA network may implement one or more radio access technologies (RATs) such as cdma2000, Wideband-CDMA (W-CDMA), to name just a few radio technologies. Here, cdma2000 may include technologies implemented according to IS-95, IS-2000, and IS-856 standards. A TDMA network may implement Global System for Mobile Communications (GSM), Digital Advanced Mobile Phone System (D-AMPS), or some other RAT. GSM and W-CDMA are described in documents from a consortium named "3rd Generation Partnership Project" (3GPP). Cdma2000 is described in documents from a consortium named "3rd Generation Partnership Project 2" (3GPP2). 3GPP and 3GPP2 documents are publicly available. A WLAN may comprise an IEEE 802.11x network, and a WPAN may comprise a Bluetooth network, an IEEE 802.15x, for example. Such position determination techniques described herein may also be used for any combination of WWAN, WLAN and/or WPAN.

[0014] Handheld systems, including cell phones, or an entity such as a mobile station (MS) for example, may comprise a receiver capable of receiving and processing SPS signals. However, receiving and processing hardware may add cost to such systems. Techniques and processes shown herein allow location services without processing SPS signals, enabling inexpensive handsets to provide location services.

[0015] In one particular implementation, a location service may include a location fix of an entity such as an MS. A location fix may provide geographic

information, such as latitude and longitude, a geographical map, and/or any information that may convey a location and/or position of an MS. A location fix may include relative location information, wherein a location is provided in terms relative to another location, such as a location of a landmark, a region, a marketplace, a cellular tower, an airport, a second mobile station, and a previous location fix, just to name a few examples.

[0016] An entity such as an MS may communicate with a network, operated by a wireless service provider, for example. Such an MS may comprise a cellular telephone, a personal digital assistant (PDA), or a notebook computer, just to name a few examples. In one aspect of a wireless communication network, data may be requested and exchanged among entities operating in the network. For example, an MS may receive data from a wireless communication network to determine the position of the MS operating within the network. However, these are merely examples of data exchange between an MS and a network in a particular aspect, and claimed subject matter in not limited in these respects.

[0017] An MS may communicate with any number of cellular base stations. Each base station may provide communication for a respective coverage area or cell. The term "cell" may refer to a base station and/or its coverage area. To increase system capacity, a coverage area of a base station may be partitioned into sectors. The term "base station" as used herein may refer to a base station that serves a cell and/or a base station that serves a sector.

[0018] An MS may include a capability to determine its location using SPS signals, such as in the Global Positioning System (GPS) and/or other global navigation satellite systems. However, a large portion of mobile stations lack any capability to process SPS signals. Such devices may determine a location without processing such

SPS signals, according to an implementation. For example, an MS, which lacks an ability to process SPS signals, may communicate with a cellular base station, such as a cell tower, while it is within a "cell" of the cell tower. A portion of this communication may include a pilot signal, described in further detail below, transmitted by the cell tower. The pilot signal may include identification of the transmitting cell tower. Such identification may include latitude/longitude of the cell tower and/or an identification code of the cell tower and a wireless carrier. In one aspect, an MS may include a resident application that may identify and extract cell tower identification from the pilot signal. If the cell tower identification includes latitude/longitude of the cell tower, for example, then the MS may determine its position by extracting such identification from the pilot signal. The determined position may be that of the cell tower, but the location of the MS may be known to be somewhere within the coverage area of the cell tower, or the uncertainty region. The accuracy of this method of determining the approximate MS position may depend in part on the cell size, or coverage area, which may range between two kilometers and thirty two kilometers in radius, for example. Accordingly, at least within a limited uncertainty, an MS, which lacks a GPS positioning ability, may nevertheless determine its position using a pilot signal.

[0019] In another aspect, the cell tower identification may not include latitude/longitude of a cell tower, but instead include an identification code of a cell tower and a wireless carrier. In such a case, an MS may include a look-up table that includes identification codes of cell towers and information associated with their respective geographical locations, for example. Geographical information may include latitude and longitude of a cell tower, or other information which represents the cell tower location. In one implementation, a look-up table may be stored in a memory of a computer platform included in an MS, which will be described below in relation with

FIG. 5. Accordingly, the MS may determine its position by extracting cell tower identification from the pilot signal and using a look-up table to find a corresponding location of the cell tower. Again, the determined position may be that of the cell tower, but the MS may be assumed to be relatively nearby, at least within the cell tower's "cell".

[0020] In yet another aspect, as in the case described above, the cell tower identification may not include latitude/longitude of a cell tower, but instead include an identification code associated with the cell tower. In such a case, an application content server (ACS), which may be remote from an MS, may include a look-up table associating identification codes of cell towers and their respective geographical locations, for example. In one implementation, such a look-up table may be stored in a memory of a computer platform included in a the ACS. Accordingly, the MS may determine a location fix by extracting cell tower identification from the pilot signal and transmitting such extracted information to an ACS. Here, the ACS may use a look-up table to find a corresponding location of the cell tower. The ACS may then transmit cell tower location back to the MS. Again, the determined position may be that of the cell tower, but the MS may be assumed to be relatively nearby, at least within the cell tower's "cell". Of course, this is merely one implementation of a process for determining a location fix, and claimed subject matter is not so limited, which is only described here to help illustrate various implementations.

[0021] FIG. 1 is a schematic diagram of a positioning system 100, according to an implementation. MS 120 may be enabled to receive pilot signal 110 from cellular base station 170. Such a pilot signal is well-known in the art, and may be dictated by IS-95A, IS 2000, and J-STD-008 standards, for example. Cellular base station 170 may comprise a code division multiple access (CDMA) radio access network (RAN). A

pilot signal, which may be carrier modulated by a pseudonoise (PN) sequence, may be used for time synchronization, handoff among cellular base stations, and provision of a coherent reference, to name a few examples. A pilot signal may include a system parameters message (SPM), which will be explained in detail below with reference to FIG. 2.

[0022] Through a cellular base station, such as cellular base station 170 in FIG. 1, a wireless carrier may provide a variety of services to an MS user, or subscriber. Communication between a cellular base station and an MS may provide a wireless link that a subscriber may use to download different applications, depending on a service to which the subscriber chooses. Such applications may then be stored in a memory associated with a computing platform of an MS, as will be explained below. For example, a subscriber may choose one or more of many types of location services. Each such service may provide a different level of quality and/or a different subscription rate plan, just to name a few examples of what may be offered by a wireless carrier. Examples of services may also include voice, email, text messaging, and internet browsing.

[0023] MS 120 may include an application module 125 comprising an application that allows MS 120 to identifying and extract identification information of said cellular base station included in a received pilot signal. Such an application may be based on, for example, binary runtime environment for wireless (BREW) software, which is a platform that can download and run small programs for playing games, sending messages, sharing photos, etc. BREW may run between the application and the mobile station's chip operating system. Other software platforms may be used, including Java, Windows, just to name a few examples. Such an application or other related information may be downloaded, for example, from a wireless network via short

message service (SMS) communications protocol. A downloaded application may be provided by a wireless carrier as an add-on feature for a service provided by a wireless carrier. In other words, an MS user may desire services in addition to those to which the user presently subscribes. In such a case, a user may subscribe to additional services offered by a wireless carrier. The additional services may involve downloading an application from the wireless carrier via a cellular base station to an MS. In one implementation, such a process of communication may also include updating applications already stored in a memory associated with an MS. In another implementation, such a process of communication may involve executing an application stored in a memory associated with an MS remotely from a third-party entity on the wireless network, such as another mobile station. For example, a user of one MS may execute an application to determine a location fix of a second MS, wherein such an application may be resident on the second MS. Accordingly, this enables a wireless carrier and/or service provider to provide location and/or position determination service to subscribers using inexpensive devices (e.g., cellular handsets) that do not have the ability to require/process SPS signals.

[0024] In one implementation, base station identification information (BSID) may be transmitted via path 140 to an application content server (ACS) 130. In another implementation, MS 120 may communicate with ACS 130 to transmit BSID via cellular base station 170, as indicated by path 150 in FIG. 1. Such transmission may be performed via a short message service (SMS) communications protocol or via a Packet Data call (over IS2000/GPRS/UMTS or wireless LAN), just to name a few examples. ACS 130 may use the BSID to determine applicable location sensitive content that may be transmitted back to MS 120. In a particular implementation, ACS may include, or have access to, a data base 135 of location sensitive content, such as cellular base

station locations, geographical maps, business locations, advertisements, travel directions based on current location, location-based coupons, and/or points of interest, just to name a few examples. Such a data base may also include a look-up table, for example, that includes base station ID's and their respective geographical locations. MS 120 may use location sensitive content to determine a location fix.

[0025] In one aspect, MS 120 may determine its location from BSID, which may comprise a portion of a pilot signal, as discussed above. FIG. 2 is an example of a system parameter message (SPM) 200, according to one implementation. Such an SPM may be included in a pilot signal, such as pilot signal 110 shown in FIG. 1. SPM 200 may include information regarding a cellular base station, such as cellular base station 170 shown in FIG. 1. For example, system ID code 220 and base station ID 210 may uniquely identify a cellular base station. Using such a unique base station ID, an application content server, such as ACS 130 shown in FIG. 1, may determine a location of the base station according to a data base, such as data base 135 shown in FIG. 1. In another example, an MS may determine a location of a cellular base station using base station location 230, which may be included in a pilot signal from the cellular base station.

[0026] Base station ID (BSID), such as BSID shown in FIG. 1, may include system ID code 220, base station ID 210, and base station location 230, for example. As discussed above, an MS may extract BSID from a pilot signal from a particular cellular base station. Since the BSID may provide a location of the cellular base station with which the MS is communicating, a location of the MS may be determined, considering that a cellular base station and MS are close to each other to enable the MS to acquire the pilot signal.

[0027] If an MS changes location enough so that it begins to use a different cellular base station, then a pilot signal, including an SPM, may change accordingly. The new SPM may include a new BSID including the new cellular base station location. In this fashion, an MS may determine its location, as it is within a "cell" of the cellular base station.

[0028] As explained above, an MS may determine its location by extracting location information included in a pilot signal transmitted by a cellular base station. Accordingly, such an MS may not include a satellite positioning system (SPS) receiver, for example, since a location fix of the MS may be based solely on the pilot signal.

[0029] In an alternative implementation, an MS may include an SPS receiver. Such an MS may determining location fixes based, at least in part, on said SPS signals. In one aspect, an MS may be enabled to transition from determining location fixes based, at least in part, on said SPS signals to determining location fixes based solely on said pilot signal. Such a transition may occur, for example, if SPS signals are less than adequate to provide enough information to determine a location of the MS. For instance, an urban canyon or indoor conditions may block a mobile station's "view" of one or more SPS satellites. For whatever reason, the MS may transition away from determining its location using SPS signals. Instead, the MS may use a pilot signal received from a cellular base station to determine its location.

[0030] FIG. 3 is a flow chart showing a process 300 for determining a location, according to one implementation. At block 320, an MS, such as MS 120 shown in FIG. 1, may receive a pilot signal. As described above, a pilot signal may include location information and/or other identification of a cellular base station. An MS, as depicted at block 330, may identify such location and/or identification, such as BSID shown in FIG. 1. At block 340, an MS may transmit BSID to an application content server, such as

ACS 130 shown in FIG. 1. At block 350, ACS may determine location content regarding the cellular base station with which the BSID is associated. Such location content may include a location of the cellular base station or geographic points of interest, just to name a few examples. At block 360, the MS may receive location sensitive content transmitted by the ACS. As depicted at block 370, the MS may determine its location based on the received location sensitive content, which may be based on the pilot signal mentioned above.

[0031] In another implementation, processes depicted at blocks 340, 350, and 360 may be skipped while performing the process 300. For example, an MS may extract cellular base station location information, such as base station location 230 shown in FIG. 2, from a pilot signal. Such information may be sufficient to enable the MS to determine its location, since the MS may be relatively close to, and within the "cell" of said cellular base station. In another implementation, a pilot signal may not include base station location. In such a case, an MS may include a look-up table that includes identification codes of cell towers and their respective geographical locations, for example. Accordingly, the MS may determine its position by extracting cell tower identification from the pilot signal and using a look-up table to find a corresponding location of the cell tower.

[0032] As just described, determining a location of an MS may not involve an ACS. If, however, as in yet another implementation, a pilot signal does not include base station location and an MS does not include a look-up table as described above. Then processes depicted at blocks 340, 350, and 360 may be performed. In this case, an ACS may be utilized to determine base station location using base station ID, such as base station ID 210 shown in FIG. 2. The MS may send a base station ID to an ACS (block 340). ACS may then access a look-up table, for example, that includes base station ID's

and their respective geographical locations (block 350). Such location information may then be transmitted to the MS (block 360). Of course, these processes are only examples, and claimed subject matter is not limited in this respect.

[0033] FIG. 4 is a flow chart showing a process 400 for determining a location, according to another implementation. At block 420, an MS equipped with an SPS receiver may receive SPS signals. Such an MS may also be enabled to determine its location based on received SPS signals, as depicted at block 430. At block 440, process 400 returns to block 420 to continue to receive SPS signals if determination of MS location based on said SPS signals is successful. If unsuccessful, however, the MS may transition from determining location fixes based on SPS signals to determining location fixes based solely on identification information included in a pilot signal, as at block 450. An MS may receive a pilot signal as long as it is within a "cell" of a cellular base station. Often, it is more likely that an MS may "see" a cellular base station rather than "see" a sufficient number of satellites to determine a location fix. Accordingly, such a transitioning MS may continue to determine location fixes during conditions that prevent reception of SPS signals.

[0034] FIG. 5 is a schematic diagram of a device 500 capable of communication with a wireless network, according to one implementation. Such a device may include an MS, such as MS 120 shown in FIG. 1, for example. Device 500 may include a two-way communication system 520, such as but not limited to a cellular communication system, which may transmit and receive signals via antenna 522. The communication system 520 may include a modem adapted to process information for communication in one or more of the aforementioned networks. In one alternative implementation, device 500 may include a position location system, such as a Satellite Positioning System (SPS) receiver to receive SPS signals. The modem and SPS receiver may communicate

with one another, and such communication may include, for example, the cellular identification of the device, estimates of time and/or location, frequency, or other radio information. In another implementation, device 500 may not include a position location system, so that the device lacks any inherent ability to acquire SPS signals.

[0035] Mobile control 540 may comprise a central processing unit (CPU) 542 and associated memory 544, hardware, software, and firmware. It will be understood as used herein that the CPU 542 can, but need not necessarily include, one or more microprocessors, embedded processors, controllers, application specific integrated circuits (ASICs), digital signal processors (DSPs), and the like. The term CPU is intended to describe the functions implemented by the system rather than specific hardware. In an alternative embodiment memory 544 may include a look-up table, as discussed above. Memory 544 may store machine-readable instructions which, if executed by CPU 542, may enable device 500 to determine its location, as in at least the implementations described above. Such machine-readable instructions may be downloaded, e.g., received via two-way communication 520, from a remote entity such as a wireless carrier, for example. Machine-readable instructions may include an application, such as application module 125 shown in FIG. 1, that allows device 500 to identify and extract identification information of a cellular base station included in a pilot signal. Such an application may also include a look-up table of cellular base station information for a region or the world. Of course, claimed subject matter is not limited to these examples, which are only described here to help illustrate various implementations.

[0036] Memory 544 may comprise one or more types of storage media identified above. A user interface 550 may allow a user to enter information into and

receive information, such as voice or data, from device 500. The user interface 550 may include, for example, a keypad, a display screen, a microphone, and a speaker.

[0037] While there has been illustrated and described what are presently considered to be example features, it will be understood by those skilled in the art that various other modifications may be made, and equivalents may be substituted, without departing from claimed subject matter. Additionally, many modifications may be made to adapt a particular situation to the teachings of claimed subject matter without departing from the central concept described herein. Therefore, it is intended that claimed subject matter not be limited to the particular examples disclosed, but that such claimed subject matter may also include all aspects falling within the scope of appended claims, and equivalents thereof.

CLAIMS

What is claimed is:

1. A method, comprising:

obtaining identification information associated with a cellular base station included in a pilot signal received from a cellular base station; and

obtaining a location fix of a mobile station based on said identification information.

2. The method of claim 1, further comprising:

transitioning from determining location fixes based, at least in part, on satellite positioning system (SPS) signals to determining location fixes based on said identification information included in said pilot signal.

3. The method of claim 1, further comprising:

downloading machine-readable instructions which, if executed, are adapted to perform the determination of said location fix.

4. The method of claim 1, wherein said pilot signal includes a system parameters message.

5. The method of claim 1, further comprising obtaining location sensitive content that includes at least one of a cellular base station location, a geographical map, a business location, an advertisement, and/or points of interest.

6. The method of claim 1, further comprising:

subscribing to a service provided by said cellular base station; and

downloading an application to process said service.

7. The method of claim 6, further comprising executing a binary runtime environment for wireless (BREW) software application platform to download and run said application to determine said location fix.

8. The method of claim 6, wherein said service includes location services.

9. The method of claim 1, wherein obtaining identification information includes using a look-up table that includes an identification code of a cell tower and geographical information of said cell tower.

10. The method of claim 6, wherein said identification information is obtained via short message service (SMS) communications protocol from an application content server (ACS).

11. A mobile station, comprising:

a receiver to receive a pilot signal from a cellular base station,

wherein

said mobile station is adapted to obtain a location fix of said mobile station based on identification information included in said pilot signal.

12. The mobile station of claim 11, further comprising:

an application module to identifying said identification information of said cellular base station.

13. The mobile station of claim 12, wherein said application module comprises a look-up data table including identification information of one or more cellular base stations and their corresponding geographical information.

14. The mobile station of claim 11, wherein said mobile station does not include a satellite positioning system (SPS) receiver.

15. The mobile station of claim 11, wherein said mobile station is adapted to obtain said location fix by transmitting said identification information of said pilot signal to an application content server and is capable of receiving said location fix from said application content server.

16. The mobile station of claim 15, wherein said application content server comprises a look-up data table including identification information of one or more cellular base stations and their corresponding geographical information.

17. The mobile station of claim 11, further comprising:

machine-readable instructions stored in a memory with said mobile station which, if executed, are adapted to perform the obtaining of said location fix, wherein said instructions are downloaded as part of a subscription service.

18. The mobile station of claim 11, wherein said cellular base station comprises a code division multiple access (CDMA) radio access network.

19. The mobile station of claim 11, further comprising:

a satellite positioning system (SPS) receiver disposed with said mobile station, said SPS receiver enabled to receive SPS signals, wherein said mobile station is enabled to transition from obtaining location fixes based, at least in part, on said SPS signals to obtaining location fixes based on said identification information included in said pilot signal.

20. An article comprising a storage medium comprising machine-readable instructions stored thereon which, if executed by a computing platform, are adapted to enable said computing platform to:

identify identification information of said cellular base station included in a pilot signal received from a cellular base station; and

obtain a location fix of a mobile station based, at least in part, on said identification information without information obtained from reception of satellite positioning system (SPS) signals.

21. The article of claim 20, wherein said machine-readable instructions, if executed by a computing platform, are further adapted to enable said computing platform to:

transition from obtaining location fixes based, at least in part, on satellite positioning system (SPS) signals to obtaining location fixes based on said identification information included in said pilot signal.

22. The article of claim 20, wherein said cellular base station is part of a code division multiple access (CDMA) radio access network.

23. An apparatus, comprising:

means for identifying identification information associated with a cellular base station included in a pilot signal received from said cellular base station; and

means for obtaining a location fix of a mobile station based on said identification information.

24. The apparatus of claim 23, further comprising:

means for transitioning from obtaining location fixes based, at least in part, on satellite positioning system (SPS) signals to obtaining location fixes based on said identification information included in said pilot signal.

25. The apparatus of claim 23, further comprising:

means for downloading machine-readable instructions which, if executed, are adapted to perform the obtaining of said location fix.

26. The apparatus of claim 23, wherein said cellular base station comprises a CDMA radio access network.

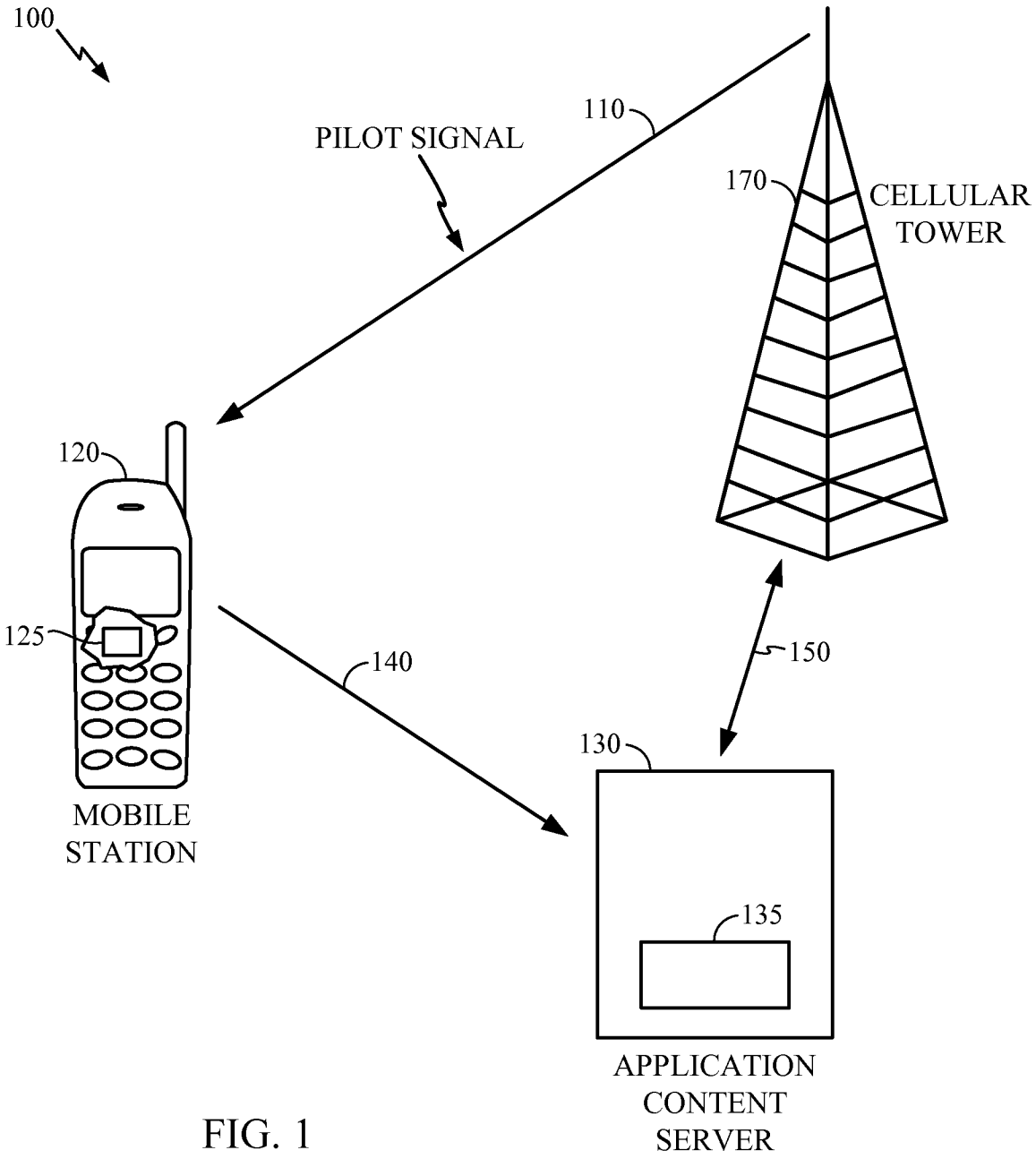
100
110
PILOT SIGNAL
170
CELLULAR TOWER
120
125
140
150
130
135
MOBILE STATION
APPLICATION CONTENT SERVER

FIG. 1

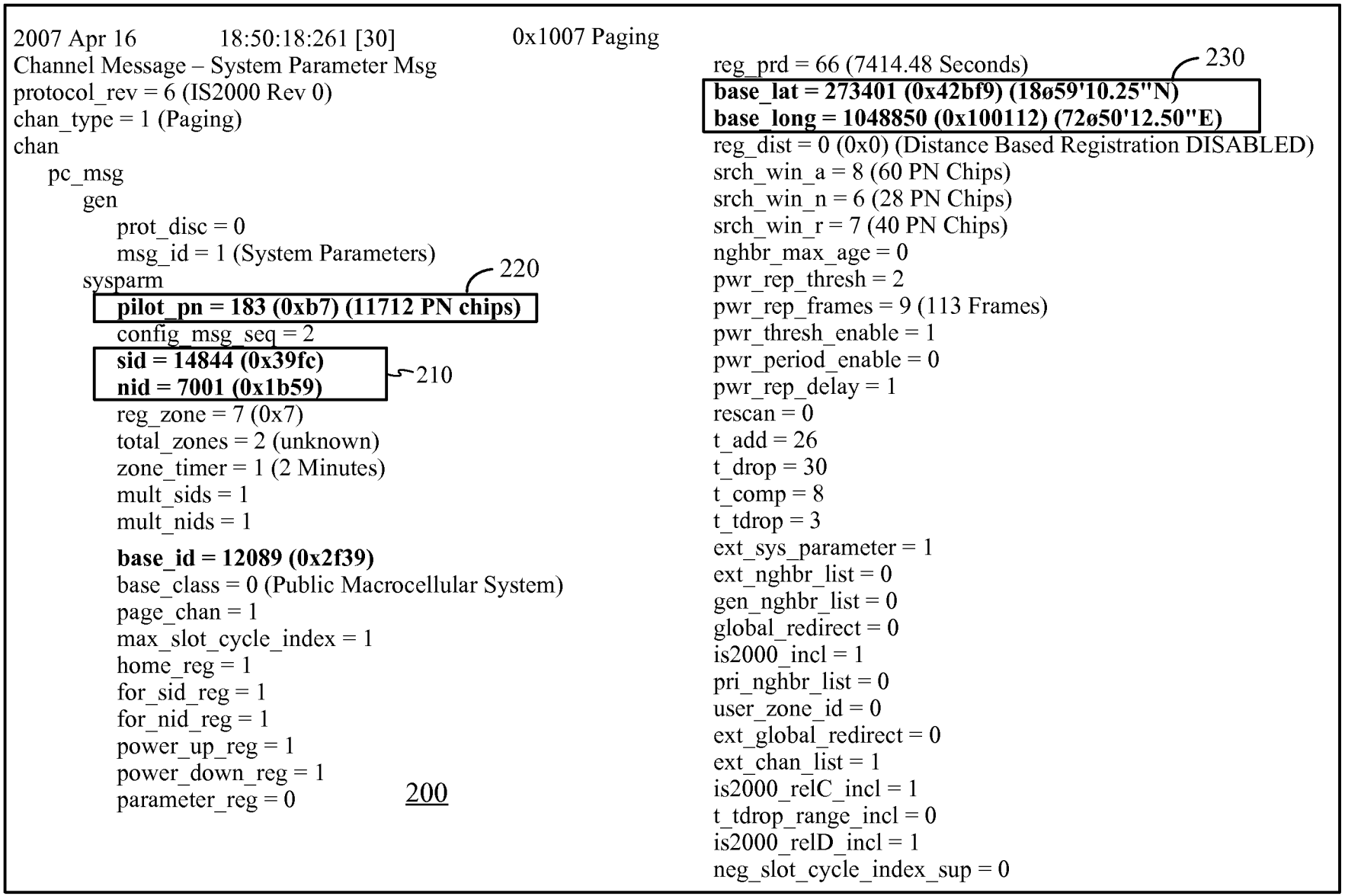
2007 Apr 16 18:50:18:261 [30] 0x1007 Paging
Channel Message – System Parameter Msg
protocol_rev = 6 (IS2000 Rev 0)
chan_type = 1 (Paging)
chan
pc_msg
gen
prot_disc = 0
msg_id = 1 (System Parameters)
sysparm
pilot_pn = 183 (0xb7) (11712 PN chips)
config_msg_seq = 2
sid = 14844 (0x39fc)
nid = 7001 (0x1b59)
reg_zone = 7 (0x7)
total_zones = 2 (unknown)
zone_timer = 1 (2 Minutes)
mult_sids = 1
mult_nids = 1
base_id = 12089 (0x2f39)
base_class = 0 (Public Macrocellular System)
page_chan = 1
max_slot_cycle_index = 1
home_reg = 1
for_sid_reg = 1
for_nid_reg = 1
power_up_reg = 1
power_down_reg = 1
parameter_reg = 0
200
220
210
reg_prd = 66 (7414.48 Seconds)
base_lat = 273401 (0x42bf9) (18ø59'10.25"N)
base_long = 1048850 (0x100112) (72ø50'12.50"E)
230
reg_dist = 0 (0x0) (Distance Based Registration DISABLED)
srch_win_a = 8 (60 PN Chips)
srch_win_n = 6 (28 PN Chips)
srch_win_r = 7 (40 PN Chips)
nghbr_max_age = 0
pwr_rep_thresh = 2
pwr_rep_frames = 9 (113 Frames)
pwr_thresh_enable = 1
pwr_period_enable = 0
pwr_rep_delay = 1
rescan = 0
t_add = 26
t_drop = 30
t_comp = 8
t_tdrop = 3
ext_sys_parameter = 1
ext_nghbr_list = 0
gen_nghbr_list = 0
global_redirect = 0
is2000_incl = 1
pri_nghbr_list = 0
user_zone_id = 0
ext_global_redirect = 0
ext_chan_list = 1
is2000_relC_incl = 1
t_tdrop_range_incl = 0
is2000_relD_incl = 1
neg_slot_cycle_index_sup = 0

FIG. 2

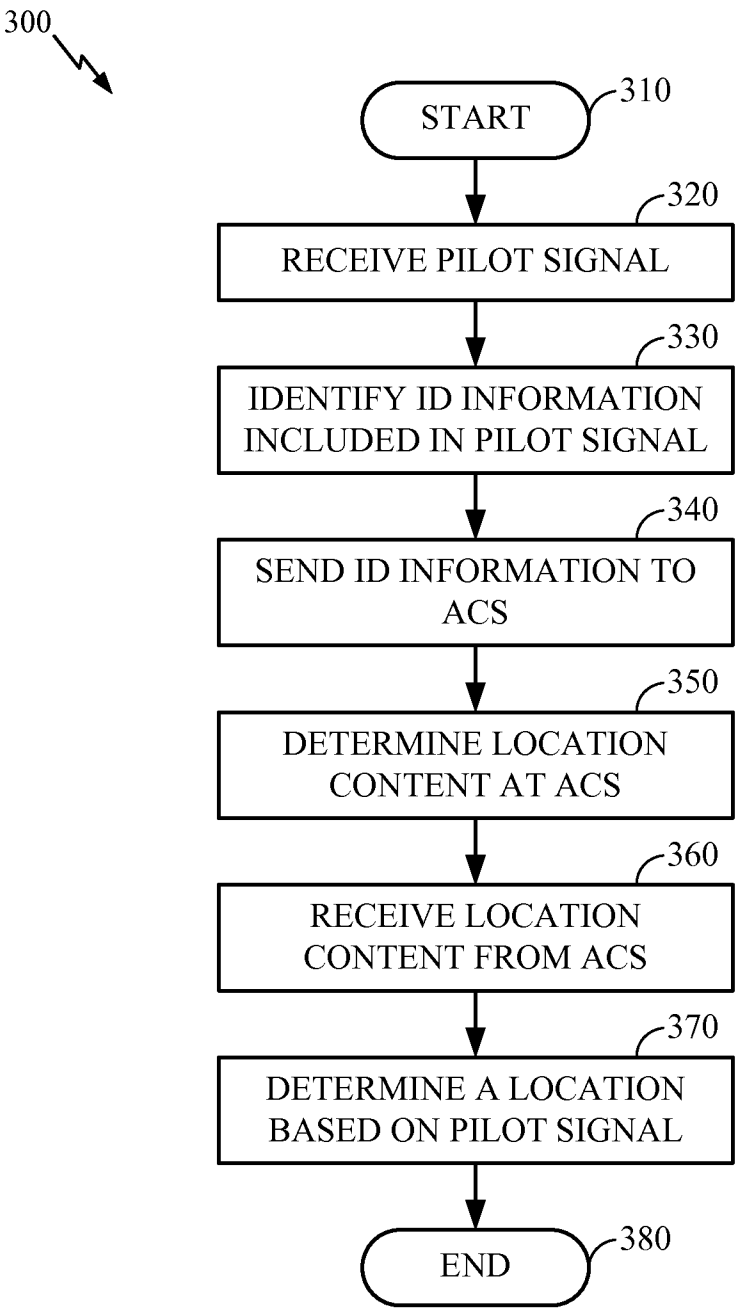
300
START
310
RECEIVE PILOT SIGNAL
320
IDENTIFY ID INFORMATION INCLUDED IN PILOT SIGNAL
330
SEND ID INFORMATION TO ACS
340
DETERMINE LOCATION CONTENT AT ACS
350
RECEIVE LOCATION CONTENT FROM ACS
360
DETERMINE A LOCATION BASED ON PILOT SIGNAL
370
END
380

FIG. 3

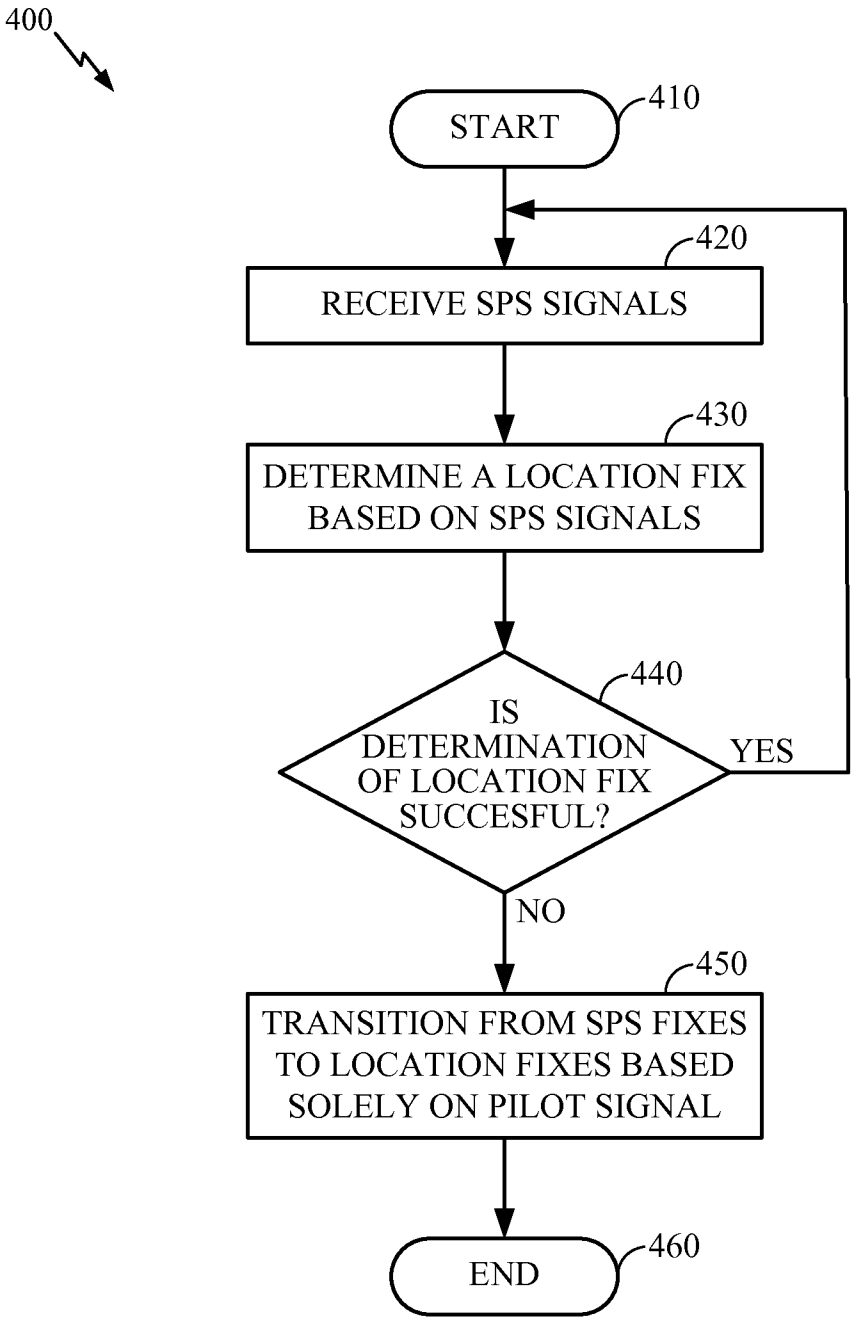
400
START
410
RECEIVE SPS SIGNALS
420
DETERMINE A LOCATION FIX BASED ON SPS SIGNALS
430
IS DETERMINATION OF LOCATION FIX SUCCESFUL?
440
YES
NO
TRANSITION FROM SPS FIXES TO LOCATION FIXES BASED SOLELY ON PILOT SIGNAL
450
END
460

FIG. 4

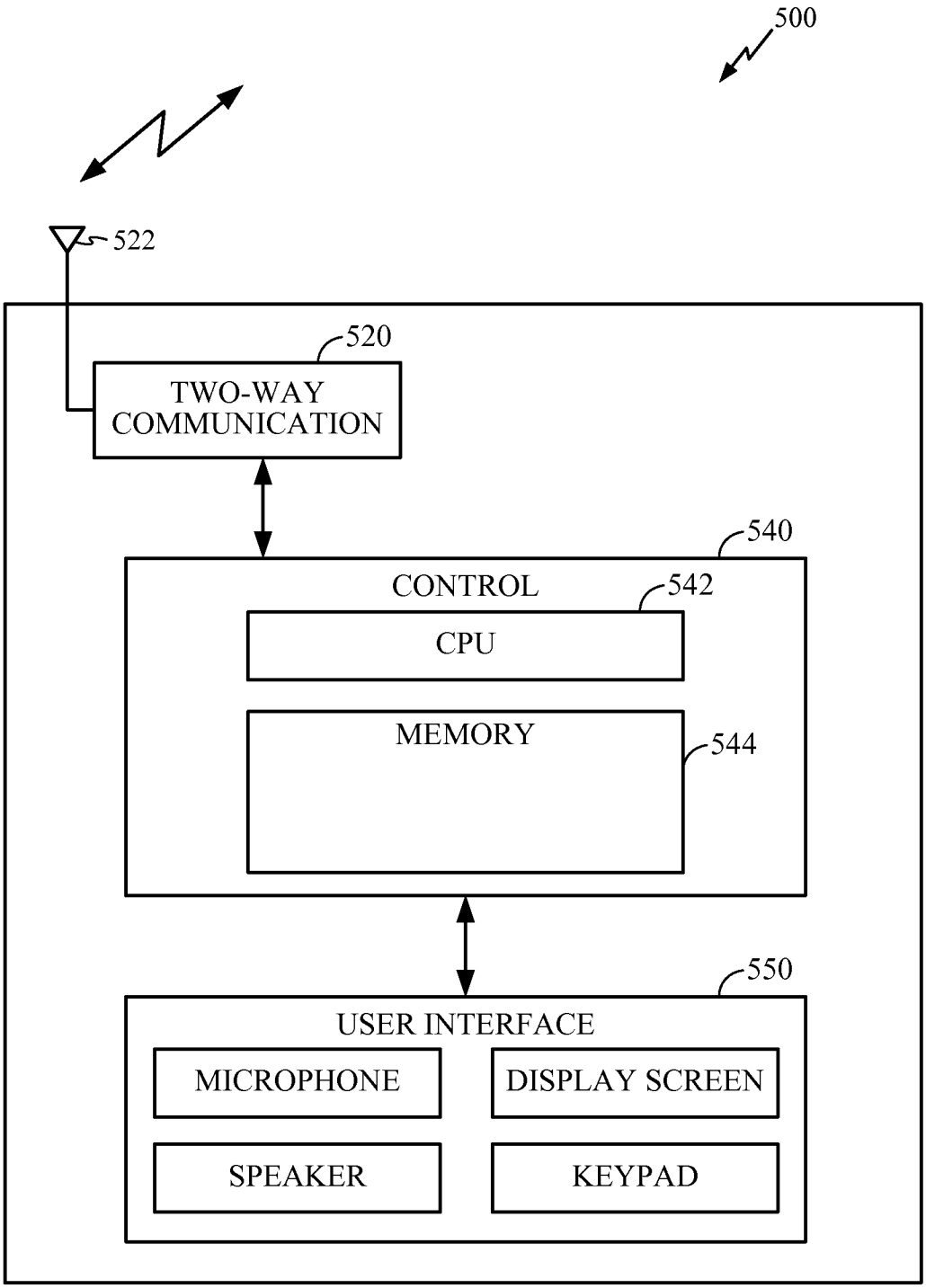
500
522
520
TWO-WAY COMMUNICATION
540
CONTROL
542
CPU
MEMORY
544
550
USER INTERFACE
MICROPHONE
DISPLAY SCREEN
SPEAKER
KEYPAD

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/055364

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W64/00

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)
H04W

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

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 768 280 A1 (VODAFONE KK [JP]) 28 March 2007 (2007-03-28)	1-2,4,9, 11-13, 18-24,26
Y	abstract paragraph [0004] - paragraph [0008] paragraph [0016] paragraph [0021] paragraph [0042] - paragraph [0045] figures 3-5	3,5-8, 17,25

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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

"E" earlier document but published on or after the international filing date

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

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

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

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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 January 2010	27/01/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Matt, Stefan

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Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	NICO DEBLAUWE ET AL: "Combining GPS and GSM Cell-ID positioning for Proactive Location-based Services" MOBILE AND UBIQUITOUS SYSTEMS: NETWORKING&SERVICES, 2007. MOBIQUITOUS 2007. FOURTH ANNUAL INTERNATIONAL CONFERENCE ON, IEEE, PISCATAWAY, NJ, USA, 6 August 2007 (2007-08-06), pages 1-7, XP031230267 ISBN: 978-1-4244-1024-8 page 1, right-hand column - page 2, left-hand column	1-2,4,9, 11-13, 18-24,26
X	TOMISLAV KOS ET AL: "Mobile User Positioning in GSM/UMTS Cellular Networks" MULTIMEDIA SIGNAL PROCESSING AND COMMUNICATIONS, 48TH INTERNATIONAL SY MPOSIUM ELMAR-2006 FOCUSED ON, IEEE, PI, 1 June 2006 (2006-06-01), pages 185-188, XP031058375 ISBN: 978-953-7044-03-9 page 185, right-hand column - page 187, right-hand column	1,11,20, 23
X	SAMSUNG: "BCCH content delivery mechanism" 3GPP DRAFT; R2-061883, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG2, no. Cannes, France; 20060621, 21 June 2006 (2006-06-21), XP050141918 [retrieved on 2006-06-21] chapter 2. DISCUSSION (SIB15: Positionign info)	1,4,11, 20,23
Y	EP 0 935 227 A2 (MATSUSHITA ELECTRIC IND CO LTD [JP]) 11 August 1999 (1999-08-11) abstract paragraph [0006] paragraph [0015] paragraph [0065] paragraph [0068] paragraph [0080] figures 1,3	5
X	WO 02/080606 A1 (TELECOM ITALIA LAB SPA [IT]; SAMBIN MARCO [IT]) 10 October 2002 (2002-10-10) abstract page 3, line 11 - page 3, line 25 claim 1 figures 1-7	1,10-11, 14-16, 20,23

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/055364

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DRANE C ET AL: "POSITIONING GSM TELEPHONES" IEEE COMMUNICATIONS MAGAZINE, IEEE SERVICE CENTER, PISCATAWAY, US, vol. 36, no. 4, 1 April 1998 (1998-04-01), pages 46-54,58, XP000752570 ISSN: 0163-6804 page 50, right-hand column - page 52, left-hand column	1,10-11, 14-16
Y	"CELLULAR TELEPHONE WITH OVER-THE AIR SOFTWARE DOWNLOAD CAPABILITY DISCLOSED BY ERICSSON INC" IBM TECHNICAL DISCLOSURE BULLETIN, US,, vol. 41, no. 1, 1 January 1998 (1998-01-01), page 263, XP000772100 ISSN: 0018-8689 the whole document	3,6-8, 17,25
X	WO 2005/071894 A1 (TELECOM ITALIA SPA [IT]; CAPUZELLO ALESSANDRO [IT]; FILIZOLA DAVIDE [I) 4 August 2005 (2005-08-04) abstract page 4, line 31 - page 6, line 7 page 11, line 13 - page 17, column 6	1,3,6-8, 11,17, 20,23,25

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/055364

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-2, 4-5, 9, 11-13, 18-24, 26

   Transition from satellite based positioning SPS to cellular base station ID based positioning (claims 2, 19, 21, 24). Independent claims 1, 11, 20 and 23, which merely relate to the well-known positioning of a mobile device based on the received base station identification information as well as dependent claims 4, 5, 9, 12, 13, 18, 22 and 26 have also been assigned to said group as they could be searched without any additional effort.

   ---

2. claims: 10, 14-16

   Forwarding a message (SMS) by a mobile device to an application server, containing the base station identification information for deriving the position of said mobile device.

   ---

3. claims: 3, 6-8, 17, 25

   Download of a location determination application to a mobile device.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2009/055364

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1768280 A1	28-03-2007	WO 2006006530 A1	19-01-2006
		JP 4312233 B2	12-08-2009
		US 2007109186 A1	17-05-2007
EP 0935227 A2	11-08-1999	DE 69924772 D1	25-05-2005
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		US 6330453 B1	11-12-2001
WO 02080606 A1	10-10-2002	BR 0208583 A	30-03-2004
		CA 2442702 A1	10-10-2002
		CN 1509581 A	30-06-2004
		EP 1374624 A1	02-01-2004
		IT T020010296 A1	30-09-2002
		JP 2005505952 T	24-02-2005
		US 2004106413 A1	03-06-2004
		US 2006276203 A1	07-12-2006
WO 2005071894 A1	04-08-2005	AU 2003294154 A1	11-08-2005
		BR 0318665 A	28-11-2006
		CA 2548611 A1	04-08-2005
		EP 1704674 A1	27-09-2006
		US 2007010257 A1	11-01-2007