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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
14 February 2002 (14.02.2002)

PCT

(10) International Publication Number
WO 02/13496 A2

(51) International Patent Classification[7]: H04M 3/00

(21) International Application Number: PCT/US01/24839

(22) International Filing Date: 8 August 2001 (08.08.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/634,741 8 August 2000 (08.08.2000) US

(71) Applicant *(for all designated States except US)*: **NOKIA MOBILE PHONES LTD.** [FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **DEEDS, Douglas** [US/US]; 821 Voltamp Drive, Fort Worth, TX 76108 (US).

(74) Agents: **RIVERS, Brian, T.** et al.; Nokia Inc., 6000 Connection Drive, MS 1-4-755, Irving, TX 75039 (US).

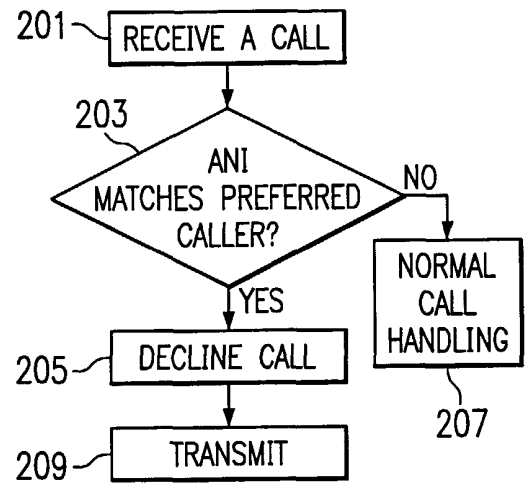
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND APPARATUS FOR PROGRAMMED CALL RETURN ATTEMPTS



(57) Abstract: Disclosed is a way to return a call (209) to a caller whose included automatic number identification (ANI) is known (203) at the called terminal device to be among the preferred callers. The called terminal device automatically becomes the calling device or calling party, provided the first calling device has the right identity. An intermediate step of rejecting (205) the inbound call at the terminal device embodiment may be required.

WO 02/13496 A2

METHOD AND APPARATUS FOR PROGRAMMED CALL RETURN ATTEMPTS

Field of the Invention

This invention relates to telephonic communication origination, and more particularly to a method of returning calls at a terminal device following receipt of a source address from another terminal device.

Background of the Invention

Long distance telephone calls typically involve additional fees to be paid by the maker of such calls. Frequently, those fees are higher in relation to the distance between the calling party and the called party. There may also be fees charged if the call is an international call, usually because the call must be handled by switches and transmission facilities of multiple telephony operators. Such fees can be determined in advance where the phones in use are both fixed in their location, e.g. wired telephones. The fees involved can become difficult to know where one or more of the phones is a wireless phone, e.g. a cellular phone. This can be particularly troubling in a jurisdiction or telephony system where the calling party pays some or all of the costs of transmitting and maintaining the call to a wireless phone.
In some jurisdictions, this problem does not occur because for calls made to a mobile station, e.g. a mobile phone, the called party pays any additional fees for transmitting the call wirelessly, and for the wired portion of the call that occurs while the called party roams outside his home market.

Some jurisdictions that have implemented Calling Party Pays (CPP) do force the cost of wireless transmission on the caller, including costs associated with roaming. In order to minimize confusion in this area, often the allocation of blocks of phone numbers in CPP jurisdictions is made such that the prefix of the wireless phone is among a distinct set of numbers that are publicized as being for wireless phones. Thus, the caller may know in advance that extra charges may accrue (of a possibility that the called party is) roaming, sometimes overseas. Nevertheless, people can often forget or not be aware of the distinctive numbering scheme for mobile stations in effect in a particular jurisdiction. This occurs for reasons of youth, forgetfulness or lack of access to the publicity concerning the segregation of wireless numbers. Thus customers may still find surprisingly high charges to phones that they had no reason to suspect were mobile.

In the United States, Calling Party Pays currently applies to calls made from wired phone to wired phone, with at least one exception. Callers do not pay per-

minute fees for calls made to numbers having a '800' or '888' prefix.

Automatic Number Identification (ANI) is a telephony feature that has two components: the telephony network and the telephone terminal. In essence, the feature is a data signal that may be generated at the central office during call set-up. The signal may be a series of audio tones carried over wires, or it may be a radio frequency modulated signal for use by a wireless phone. The telephone terminal component, frequently consists of circuits that recognize the tones or radio frequency modulated signals, and converts such signals to a form easy to work with, such as a numeric representation of the terminal device that initiated the communication. The ANI signal is an identifier that is unique to a communication service, and often is associated with a single wired telephone subscriber or a single mobile station. Sometimes the ANI provides an identifier that is unique to a group of wired communication lines that are aggregated together, such as, by a Private Branch Exchange (PBX). There are an abundance of implementations of ANI globally, and it may be called by various names, such as Calling Number Display (CND). Often, the equipment at the terminal that recognizes the signals is called caller ID.

Using conventional telephones, equipped with a caller ID, a called party is able to return calls based upon a number of criteria: the called person recognizes the voice of the caller; the called person asks for and obtains the calling persons number; or the called person obtains the calling persons number based on a caller ID. The steps necessary, short of speaking with the caller, to return a call are: 1) identify the calling number from the caller ID device; 2) initiate a call to that number. Unfortunately, in mobile phones and other telephones, returning such a call may require seven or more keystrokes in order to look up the name and/or number of the caller and place the call. In the rapid-paced life people live, entering more than a few buttons for purposes of reversing the called/calling party roles is a hassle, particularly when someone is out and about, using public transportation or engaged in other activities. Hence there is a need for a rapid and automatic way to connect to a calling terminal device but as the calling party, rather than the called party.

Summary of the Invention

An embodiment of the invention provides a means to reduce the cost to a party of obtaining a premium two-way telecommunication service. Such a two-way telecommunication service may be the ability to reach a wireless phone, in a billing regime that typically imposes the burden of paying on the caller or initiator of the telecommunication service. The embodiment makes it possible to shift all or most of the charges associated with a call to a called party, by reversing the roles of the

parties and starting a second call originating with the called party, so that the called party becomes the calling party. The embodiment includes receiving a first incoming call communication from a first terminal device, the communication having a source address. The second terminal device, according to the embodiment, declines establishment of communication. The second terminal transmits a second incoming call communication to the first terminal device.

Another embodiment provides a method to receive a telephone communication having a number of a telephone. The embodiment matches the number to a criterion. The embodiment transmits, in response to matching to the criterion, the number of the telephone to initiate a call back to the telephone.

Among the advantages of the invention, one or more embodiments may provide a means, in a telecommunications terminal, to designate preferred device addresses for which it is desirable to reverse roles upon receipt of a communication. A role reversal may be between calling party and called party.

Another advantage of the invention may be an efficient method to return a call while reducing the time between a first caller calling, and a return call from a terminal device of an embodiment of the invention.

Brief Description of the Drawings

The disclosed inventions will be described with reference to the accompanying drawings, which show important sample embodiments of the invention, wherein:

Fig. 1 shows a block diagram of a mobile station according to an embodiment of the invention;

Fig. 2 shows a general block diagram of steps for automatically returning a call according to an embodiment;

Fig. 3 shows a detailed block diagram of steps for automatically returning a call according to an embodiment;

Fig. 4 shows a block diagram of a telephone according to an embodiment of the invention; and

Fig. 5 shows the steps for automatically returning a call according to an embodiment.

Detailed Description of the Preferred Embodiments

The discussion of telephone calls includes initiating actions at a location. The term 'at' means to perform the action such that the action occurs either within the device, or at a location that is indistinguishable from the device, as the

communications appear at a switch, such as a central office of a public switched telephone network (PSTN) or at a public land mobile network (PLMN). For example, an answering machine may be 'at' a telephone, even though the answering machine is separated from the telephone by a number of meters. To a switch, though, if the answering machine is on the same circuit and responds by providing off-hook, on-hook and other telephone signals, the answering machine is 'at' the telephone. It is this electrical meaning of the word 'at' that is intended, and the device that operates using the same address or number as the telephone, is 'at' that telephone or terminal device, regardless of whether the connecting medium is twisted pair, coaxial cable, or the like. It is understood that the terms party, telephone, and terminal device may be used interchangeably to discuss a) a single wireless telephony device; b) a twisted pair or other wired line having one or more extensions on a party-line; or c) the owner or user of such devices.

A voice circuit is a channel to a switch carried by a physical media. The transmission mode of a voice circuit may be analog or digital. The switch may be a central office, or private branch exchange (PBX). A single physical media may be capable of supporting multiple voice circuits according to various multiplexing methods known in the art, thus the presence of a single physical connection to a terminal device may provide the physical device access to one or more voice circuits. One or more voice circuits may be occupied by a call initiation attempt, or actual exchange of voice communication, and thus be unavailable for new calls.

Fig. 1 shows the hardware of a typical mobile station. The mobile station may be a mobile phone. An antenna **101** may be used to receive signals and transmit signals. Transceiver **103** may provide the ability to convert signals from analog to a digital baseband signal and from a digital baseband signal to analog. Processor **115** may receive data from the transceiver **103** and provide such data as analog or digital signals to output devices. Processor **115** may include a central processing unit or processor **115** may include a digital signal processor. An audio output or audio renderer **105** provides a sound output. Audio output **105** may take its input in analog or digital form from the processor **115**. Processor may provide output to a display **107**. The display **107** may be a LCD, LED a raster scanning device among others. Processor **115** may rely on storage **109** for occasional storage and retrieval of data. Such data may include information providing a context of a state machine, or other program. Such data may include audio or visual data in compressed or uncompressed formats.

Fig. 2 also shows some input devices. An actuating means **111** may include

a device capable of detecting inputs along a two-dimensional plane, including keypads, touch-pads, graphic tablets and mice. Inputs may be converted to a digital signal and fed to the processor **115** for action in accordance with program control. In some cases, an input means may be overlaid over, or interspersed with some display elements, or illuminating means. Microphone **113** may provide voice control inputs to the processor **115**. Microphone may provide a communication signal, such as voice, to the transceiver **103**. Transceiver **103** may provide analog to digital conversion of voice signals from the microphone **113**. Transceiver **103** may modulate data signals for wireless transmission over the air. Transceiver **103** may receive wireless transmissions and convert such transmissions to wired baseband signals, which may include, power control commands, text messaging, identifying information of the transmitting device.

A user of the mobile station may program an identity of a favored terminal device's telephone number or source address of the terminal device. Such a process is sometimes referred to as 'programming in', wherein an owner of a terminal device programs in the name and number of a friend, for example. Such a process may include associating alphanumeric text with the number, a special alert tone, a graphic, among other identifying indicia known in the art. Terminal devices having an embodiment of the invention further include software or hardware for interpreting Automatic Number Identification (ANI) signals. A software implementation would implement the antenna transceiver processor and storage by means known in the art.

The process of programming in, according to the embodiment, may include, on a case by case basis, a field where the owner toggles the operation of the embodiment as either on or off. Alternatively, an owner of the terminal device may toggle the operation of the embodiment to operate on a class of programmed in numbers, or for that matter, set a criteria for the embodiment to operate based on data associated with the programmed in number. In the end, a database is created on the terminal device which may be consulted to operate the embodiment. Such a database may be very simple, e.g. a single bit stored in a register, wherein the single bit signifies that all numbers on an incoming call should be given preferential treatment, and thus trigger a call back according to the embodiment.

Fig. 2 shows an embodiment of the steps of the invention while using a terminal device such as in Fig. 1. The first step is to receive a call **201**. A test **203** of whether the data in the call, such as ANI data, is made against a database of

preferred callers. The terminal device declines **205** the call in the event of a positive match between the data and the database of preferred callers. The failure of a match against the database results in normal call handling **207** by the terminal device, which may include making an alert, such as loud ringing or vibrating of the terminal device. Following the terminal device declining **205** the call, transmit **209** occurs. Transmit steps provide for the usual steps for starting a call, e.g. dialing the digits and sending them to the telephony network, either Plain Old Telephone System, or Public Land Mobile Network. The digits used are those digits available from the data of the inbound call from step **201**.

Fig. 3 shows a more detailed view of the steps of Fig. 2 in an embodiment wherein the terminal device is a mobile station.

An embodiment operates according to the following steps. An incoming call communication is received **301** at the terminal device wherein a signal having an ANI is also received at the terminal device. The ANI information is stored **303**. The ANI operates as a source address of the calling terminal device. The embodiment looks up **305** in the database stored in storage, and determines whether to proceed with a call back routine, or to handle the call as a normal incoming call by means known in the art. A successful matching of the source address to the database triggers the selection of the call-back routine.

The call-back routine includes declining **320** the inbound call. Declining the inbound call means to stop call progress, or minimize any voice or chargeable telecommunication time by accepting a call, and then rapidly terminating the call.

The mobile station sends a radio signal to the network that a call is accepted **321**, and then sends a radio signal to the network that a call is terminated **323** or completed. In either case a voice channel is established briefly, although it is not required that the microphone of the terminal device be connected to the voice channel. In other words, silence may be all that is carried by the voice channel.

After the call is declined **320**, the transmit routine **330** is started, wherein an incoming call communication is transmitted from the terminal device of the embodiment to the terminal device that had called the embodiment. Such a dial back may include a check by the terminal device of the availability of wireless resources from the wireless network infrastructure. If the wireless terminal device detects the absence of an available radio frequency (RF) voice channel **335**, the wireless terminal device waits **337** a period. This step may be followed by one or more additional attempts to detect an available voice channel later. If the wireless terminal device obtains a voice channel assignment from the wireless network infrastructure,

a radio frequency call proceeds, which includes sending **341** the source address obtained in step **301**. The source address is sent to the wireless network infrastructure as a wireless telephony incoming call communication.
The wireless network infrastructure may provide a responsive signal from the wireless network infrastructure. Such a responsive signal may be the periodic tones associated with call progress, e.g. fast busy; slow busy; ringing. If the periodic tone is the latter, the wireless terminal device may filter the signal to detect **343** the alternating tone and silence, that is, detecting a ring-tone signal in the first responsive signal. The wireless network infrastructure may send a second responsive signal to the wireless terminal device in the form of an indication that a voice connection is available. The second responsive signal may be the sound of voice from the called terminal device. The second responsive signal detects the voice connection **345**. Based on the detection of a voice connection, the wireless terminal device may make an alert **349**, using any combination of sound, display or vibration, thus signaling to the owner and possibly persons nearby, that there is a completed voice connection.

Fig. 4 shows a second embodiment. A telephone is shown **400** which connects to at least one wired line to a switch of the PSTN, which may be a PBX or central office. The telephone includes a processor **401** and a storage **403** which may monitor and control access to the one or more wired lines.

Fig. 5 shows the method of the second embodiment as it operates at a telephone such as in fig. 4. The terminal device receives a telephone communication **501**, which includes a number of a second telephone, the calling telephone. The number is provided as an ANI signal by means known in the art. The terminal device matches **503** the second telephone number to a criterion. The criterion may be based on a database of preferred callers. Such a database may be stored on the terminal device or elsewhere.

The terminal device may initiate a call to the second telephone by sending the second telephone number to a switch. The terminal device may call the second telephone on an available voice circuit. The terminal device may have to wait **507** for a voice circuit to become available. Once a free voice circuit is available **505**, the terminal device may initiate a call **509** using the number obtained in the call from the second telephone.

As an alternative to waiting for free voice circuit, the terminal device may reject the incoming call initiation attempt. This may be done by establishing a voice circuit to the second telephone, followed by terminating the voice circuit to the second telephone.

Although the invention has been described in the context of particular embodiments, various alternative embodiments are possible. Thus, while the invention has been particularly shown and described with respect to specific embodiments thereof, it will be understood by those skilled in the art that changes in form and configuration may be made therein without departing from the scope and spirit of the invention.

CLAIMS

What is claimed is:

1. A method for initiating a telephony communication between a second terminal device and a first terminal device comprising the steps of:

receiving a first incoming call communication from the first terminal device, wherein said first incoming call communication has a source address;

declining a establishment of communication between said first terminal device and said second terminal device based on said first incoming call communication; and

transmitting a second incoming call communication to the first terminal device from said second terminal device.

2. The method of claim 1 wherein the step of receiving comprises the steps of:

detecting an incoming call communication addressed to the second terminal device; and

detecting the source address in the incoming call communication.

3. The method of claim 2 wherein the step of detecting the source address comprises the step of:

matching the source address to a database of preferred addresses in the first terminal device.

4. The method of claim 3 wherein the step of receiving further comprises the step of storing the source address.

5. The method of claim 1 wherein the step of declining establishment of communication comprises the steps of:

establishing a voice channel to the first terminal device; and

terminating the voice channel to the first terminal device.

6. Communication comprises the steps of:

displaying a message;

establishing a voice circuit to the first terminal device; and

terminating the voice circuit to the first terminal device.

7. The method of claim 1 wherein the source address is a telephone number.

8. The method of claim 1 wherein the step of declining a full duplex communication comprises the steps of:

establishing a voice channel to the first terminal device; and

terminating the voice channel to the first terminal device.

9. The method of claim 1 wherein the first incoming call communication is a wireless telephony incoming call communication.

10. The method of claim 1 wherein the step of transmitting the second incoming call communication comprises the step of:

transmitting a request to connect to the source address to a wireless network infrastructure.

11. The method of claim 1 wherein the step of declining incoming call communication comprises the steps of:

establishing a voice channel to the first terminal device; and

terminating the voice channel to the first terminal device.

12. The method of claim 11 further comprising the steps of:

detecting absence of an available voice channel;

waiting a period; and

sending the source address to a wireless network infrastructure as a wireless telephony incoming call communication.

13. The method of claim 11 further comprising:

receiving a first responsive signal from the wireless network infrastructure;

detecting a ring-tone signal in the first responsive signal;

receiving a second responsive signal from the wireless network infrastructure;

detecting absence of a ring-tone signal in the second responsive signal; and

alerting the second terminal device.

14. A method for returning a telephone call received at a first telephone comprising the steps of:

receiving a telephone communication including a number of a second telephone, said telephone communication being a call initiation attempt from said second telephone to said first telephone;

matching the number of the second telephone to a criterion; and

transmitting, in response to matching the second telephone number to the criterion, the second telephone number to initiate a call from said first telephone to the second telephone.

15. The method of claim 14 wherein the step of transmitting comprises the steps of:

waiting until a telephony circuit is free; and

sending the source telephone number to a switch.

16. The method of claim 14 wherein the step of transmitting further comprises the step of rejecting the call initiation attempt from said second telephone to said first telephone.

17. The method of claim 16 wherein the step of rejecting the call initiation attempt from said second telephone to said first telephone further comprises the steps of:

establishing a voice circuit to the second telephone; and

terminating the voice circuit to the second telephone.

FIG. 1

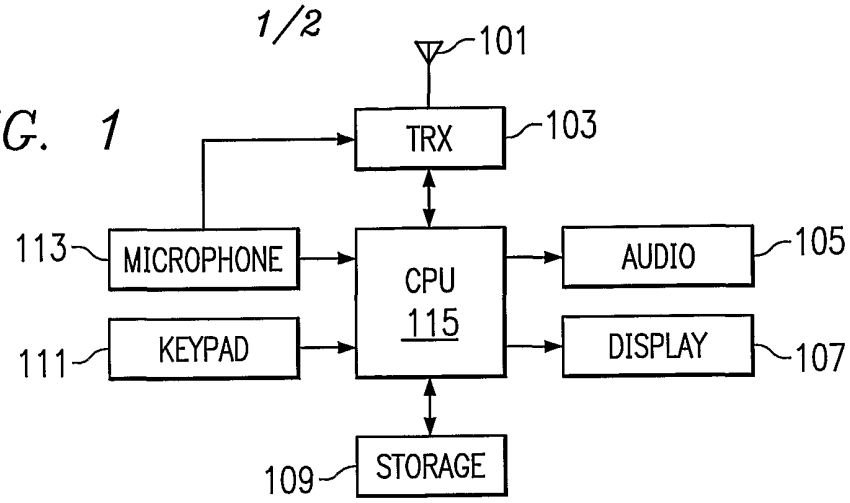


FIG. 2

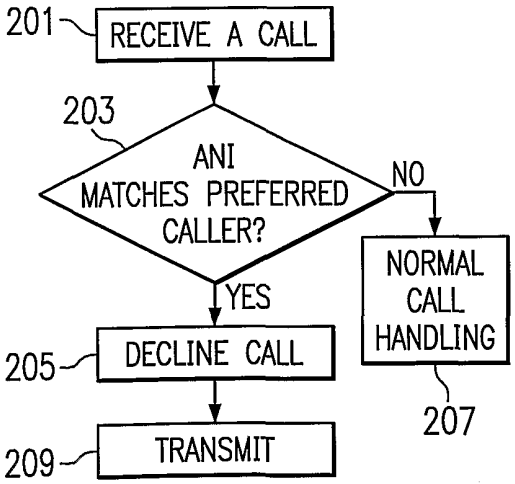
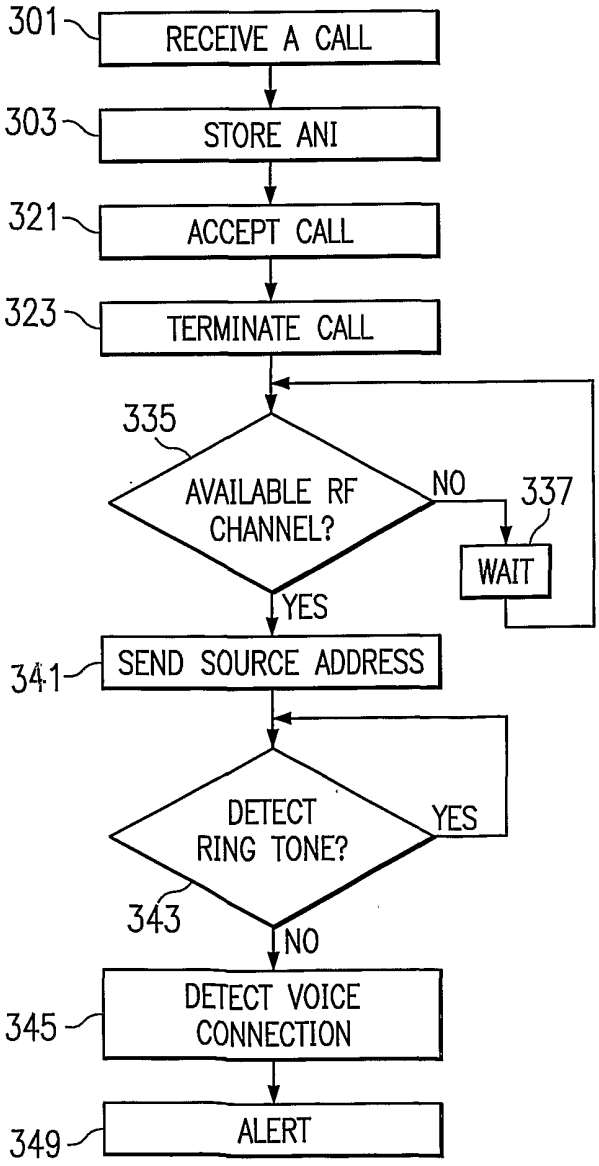


FIG. 3



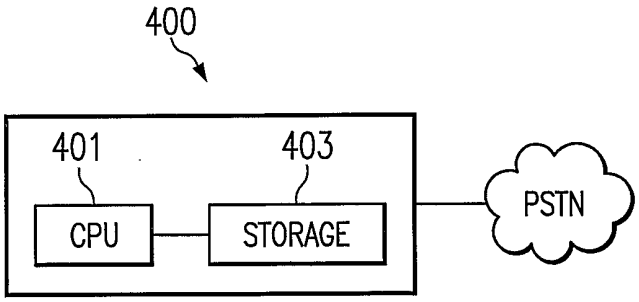
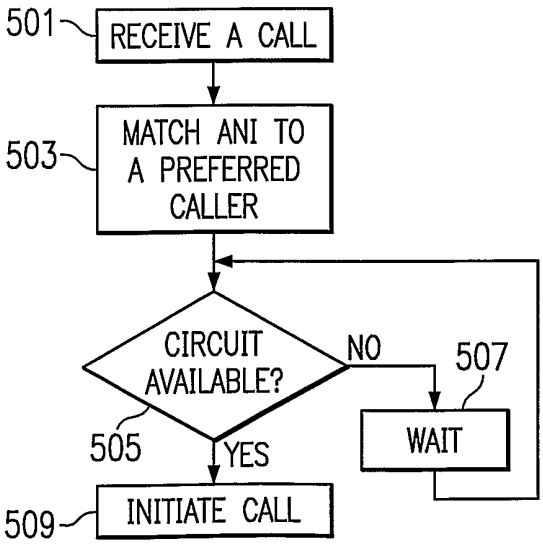

400
401
403
CPU
STORAGE
PSTN

FIG. 4

FIG. 5


501
RECEIVE A CALL
503
MATCH ANI TO A PREFERRED CALLER
CIRCUIT AVAILABLE?
NO
507
WAIT
505
YES
509
INITIATE CALL