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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
7 March 2002 (07.03.2002)

PCT

(10) International Publication Number
WO 02/19678 A1

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

(21) International Application Number: PCT/US01/24712

(22) International Filing Date: 7 August 2001 (07.08.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/650,877 30 August 2000 (30.08.2000) US

(71) Applicant: **BBNT SOLUTIONS LLC** [US/US]; 10 Moulton Street, Cambridge, MA 02138 (US).

(72) Inventor: **WINNETT, Steven, R.**; 1443 Beacon Street, Apartment 317, Brookline, MA 02446 (US).

(74) Agent: **SUCHYTA, Leonard, C.**; c/o Christian R. Andersen, 600 Hidden Ridge Drive, Mailcode HQE03H01, Irving, TX 75038 (US).

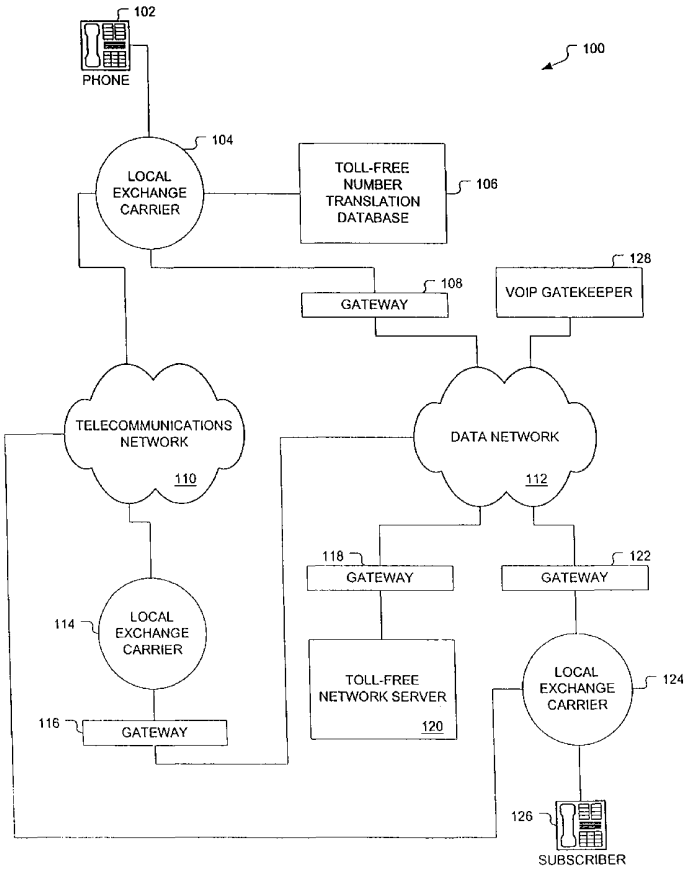
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, 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:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

[Continued on next page]

(54) Title: ROUTING TOLL-FREE TELECOMMUNICATIONS TRAFFIC OVER DATA NETWORKS



(57) Abstract: A system according to the principles of the invention provides toll-free calling that transports calls using a data network (112) such as the Internet. One or more gateways (108, 116, 118, 122) may be provided the transfer incoming call traffic from LECs (104, 114) to a data network (112). Calls may be transported over the data network (112) using any suitable addressing technique, such as Internet Protocol ("IP") addresses. A receiving node on the data network (112) may connect incoming call traffic directly to a toll-free call center (126), or the receiving node may connect to a second LEC (124) which can connect incoming calls to a toll-free subscriber (126) or a toll-free call center (126).

WO 02/19678 A1

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.

ROUTING TOLL-FREE TELECOMMUNICATIONS TRAFFIC OVER DATA NETWORKS

1. Technical Field

This application relates to the field of telecommunications and data networks, and more particularly to the field of routing toll-free telecommunications traffic over data networks.

2. Background

Using toll-free numbers, a caller may place a telephone call without incurring the costs associated therewith. In the United States, toll free numbers are generally signaled by using an exchange, such as 800, 888, or 877, before a seven-digit telephone number. Within these exchanges, a call recipient bears the costs of a call, and the caller generally is not billed, regardless of the geographic separation between parties and the duration of the call.

Conventional toll-free calls may have a number of commercial entities involved in provisioning the call. If the subscriber, i.e., the party receiving toll-free calls, has a dedicated connection to an Inter-Exchange Carrier ("IXC"), then the toll-free call is provided by a Local Exchange Carrier ("LEC") originating the call, and the IXC. The subscriber may instead use switched toll-free service, where a terminating LEC is used to connect a call between the IXC and the subscriber.

Typically, a call will be placed to an LEC, which may use a Signaling System 7 ("SS7") network to access a database for translating a toll-free number into a "real" number that is used the by telecommunications network to route the call. The LEC may then connect the call to the IXC, which transports the call to a suitable switch – either a circuit to a subscriber's customer premises equipment ("CPE") such as a Private Branch

Exchange ("PBX"), or a terminating LEC that handles the call in a conventional fashion.

As a significant disadvantage, these toll-free calling systems require activity by several different entities, which results in substantial charges to a subscriber. A database access charge may be incurred for each SS7 access to the toll-free number database. A metered charge may be incurred from the originating LEC. A transport charge may be incurred from the IXC. A fixed monthly charge may be incurred from the IXC for providing the toll-free circuit(s). Finally, in the case of switched toll-free service, a metered charge may be incurred from the terminating LEC.

There remains a need for a toll-free calling system that alleviates costs to a toll-free number subscriber.

Summary

A system according to the principles of the invention provides toll-free calling that transports calls using a data network such as the Internet. One or more gateways may be provided to transfer incoming call traffic from LECs to a data network. Calls may then be transported over the data network using any suitable addressing technique, such as Internet Protocol ("IP") addresses. A receiving node on the data network may connect incoming call traffic directly to a toll-free call center, or the receiving node may connect to a second LEC which can connect incoming calls to a toll-free subscriber or a toll-free call center.

Brief Description Of Drawings

The foregoing and other objects and advantages of the invention will be appreciated more fully from the following further description thereof, with reference to the accompanying drawings, wherein:

Fig. 1 is a block diagram of a switched toll-free service for personal use according to the principles of the invention;

Fig. 2 is a flow chart showing a process for providing personal toll-free service according to the principles of the invention;

Fig. 3 is a block diagram of a toll-free call center according to the principles of the invention; and

Fig. 4 is a flow chart showing a process for providing a toll-free call center according to the principles of the invention.

Detailed Description

To provide an overall understanding of the invention, certain illustrative embodiments will now be described, including a system for routing toll-free calls through a data network. However, it will be understood by those of ordinary skill in the art that the methods and systems described herein can be suitably adapted to any network or combination of networks capable of transporting data at speeds consistent with telephony. The principles of the invention are particularly applicable to those environments where a data network can provide a lower-cost alternative to existing toll-free services, and to those environments where call routing includes LEC access to a database for number translation, such as local number portability.

Fig. 1 is a block diagram of a switched toll-free service for personal use according to the principles of the invention. A system 100 according to the invention includes a phone 102, a first LEC 104, a toll-free number translation database 106, a gateway 108, a telecommunications network 110, a data network 112, a second LEC 114, a second gateway 116, a third gateway 118, a toll-free network server 120, a fourth gateway 122, a third LEC 124, a subscriber 126, and a VoIP gatekeeper 128. As will be described below, the system 100 operates generally to receive an incoming toll-free call from the phone 102, and to route the incoming toll-free call from the phone 102 to the subscriber 126 through the data network 112.

The phone 102 originates an incoming toll-free call by, for example,

dialing a toll-free number from a conventional telephone. This is presented as a call request to the first LEC 104. It will be appreciated that the first LEC 104, and the other LEC's referred to herein, may be any carrier capable of receiving incoming calls from local subscribers, including any local exchange carrier, a competitive local exchange carrier, an incumbent local exchange carrier, or the like. It will further be appreciated that the phone 102 may instead be a wireless telephone such as a cellular handset using Global System for Mobile Communications ("GSM"), Code Division Multiple Access ("CDMA"), Time Division Multiple Access ("TDMA"), Personal Communications Service ("PCS"), or any other wireless standard for communicating with a wireless base station, which may in turn connect to the Public Switched Telephone Network ("PSTN"). Any wireless or wired telephone and phone service is intended to be included within the scope of the invention described herein.

Where the call origination includes a toll-free exchange, such as 800, 888, 877, and so forth, the first LEC 104 may access the toll-free number translation database 106 to obtain exchange and local dialing numbers for call routing of the toll-free call. For example, where the first LEC includes a Signal Service Point ("SSP") according to the Signaling System 7 ("SS7") protocol, and the toll-free number translation database 106 includes a Service Control Point ("SCP"), a database inquiry may be performed through a message to the SCP using the Transaction Control Application Part ("TCAP") layer of the SS7 protocol. It will be appreciated that any number lookup system may be used with the invention provided that it can respond to a request from the first LEC 104 with dialing or routing information for a toll-free service.

The toll-free number translation database 106 may maintain a one-to-many relationship with a toll-free number and "real" numbers or addresses associated therewith. The toll-free number translation database 106 may return, for example, an address or phone number for the first local exchange

carrier 104 to reach the gateway 108, or the toll-free number translation database 106 may return a number for the second LEC 114, which includes the second gateway 116 for accessing the data network 112. The first LEC 104 may connect a call to the second LEC 114 through, for example, the PSTN or any other network. The toll-free number translation database 106 may optionally return a local exchange number for the subscriber 126, where, for example, the subscriber 126 shares a local exchange with the phone 102 that originated the toll-free call.

The gateway 108 may connect calls from the first LEC 104 through the data network 112. Although shown in Fig. 1 as a single component of the personal toll-free system 100, it will be appreciated that the gateway 108 may include, for example, two components that may be at a single location, or at remote locations connected in a communicating relationship. A first component may be a competitive local exchange carrier ("CLEC") or other telecommunications system connected to the first LEC 104. A second component may be a data network point-of-presence connected in a communicating relationship with the data network 112. The gateway 108 may include an interface between these two components, the interface converting signals between a form suitable for the PSTN and a form suitable for the data network 112. The gateway 108 may, for example, transfer voice traffic or other calls using a proprietary protocol, a standard such as H.323 or Media Gateway Control Protocol ("MGCP"), or any other format suitable for transmitting voice over the data network 112. The gateway 108 may have one or more Internet Protocol ("IP") addresses for sending and receiving data over the data network 112. The interface between the data network point-of-presence and the CLEC may include, for example, an Integrated Services Digital Network ("ISDN") Primary Rate Interface ("PRI") connection, or, where traffic is backhauled, ISDN PRI encapsulated in T1.

The gateway 108 may include a processor and memory, such as a computer or server. The processor may be programmed to control operation

of the gateway 108, and to perform operations associated with the gateway 108. For example, the processor may operate as a translator, for example performing translations between voice traffic carried over the PSTN and voice traffic carried over the data network 112. The processor may also control connections to the data network 112 and the LEC 104, etc. The gateway 108 may similarly perform any other functions required to connect voice traffic on one hand, and data network traffic on the other. This may include hardware and/or software for coding and decoding voice traffic, adaptations of signaling information, communication of call setup and tear down information between PSTN representations (e.g., analog or digital local loop) and, for example H.323 representations, and so forth.

The gateway may also execute flow control for calling through the system 100, using, for example, software executing on the processor. Flow control may include, for example, managing connections to the gatekeeper to obtain addresses of other gateways in the system 100, or maintaining persistence of a call with the first LEC 104 while .

The telecommunications network 110 may be, for example, the PSTN or any other network suitable for circuit-switched or other telecommunications traffic. The data network 112 may be the Internet or any other network suitable for packet-switched or other data traffic.

As noted above, where no gateway to a data network is available from the first LEC 104, such as the first gateway 108 to the data network 112, the toll-free number translation database 106 may return a number of a suitable exchange that can be reached through the telecommunications network 110, such as the second LEC 114. Where a number of suitable exchanges are available, the toll-free number translation database 106 may provide a suitable exchange according to cost, physical distance, gateway loading, or any other criteria. The second gateway 116 may be, for example, a gateway similar to the first gateway 108. As shown in Fig. 1, the toll-free call may be

transported through the telecommunication network 110 directly to the third LEC 124, where, for example, no gateway is available to the first gateway 108.

A toll-free call that is being connected through the data network 112 may first be routed to the toll-free network server 120. For example, an incoming call being routed through the first gateway 108 or the second gateway 116 may be routed to the toll-free network server 120 through the third gateway 118, using, for example, the IP address of the third gateway 118. The IP address of the third gateway 118 may be known to the gateway 108, 116 handling the incoming call, or the IP address of the third gateway 118 may be determined through a request to the VoIP gatekeeper 128. The connection between the third gateway 118 and the toll-free network server 120 need not include any exchange or other telecommunications network components. The third gateway 118 may, nonetheless provide services for communicating with other gateways within the system 100, such as H.323 or other Voice-over-IP protocols. It will be appreciated that a number of toll-free network servers 120 may be provided according to the principles of the invention, and that access to a particular one of the toll-free network servers 120 may be determined according to proximity to the gateway handling an incoming call, load balancing among the servers, or some other criteria.

Where the incoming call is directed to a toll-free number for a unique subscriber, the toll-free network server 120 may return gateway (i.e., data network) and exchange (i.e., telecommunications network) information for connecting the phone 102 to the subscriber 126, and the call may be completed directly.

The incoming call may optionally contain a number for a personal toll-free service managed by the toll-free network server 120. In this case, the toll-free network server 120 may include an Interactive Voice Response ("IVR") system which prompts a user at the phone 102 to identify a call

destination. The call destination may be indicated by a seven or ten digit calling number, an identification number of any length, or by a name of a receiving party. Data may be entered using, for example, dual-tone multi-frequency signaling or voice recognition software running on the toll-free network server 120. The toll-free network server 120 may also provide a human operator to assist in placing a call.

When a call destination has been identified, information for call setup over the data network 112 may be returned to the first gateway 108 (or the second gateway 116 if this is the source of the call) using, for example, H.450 or H.323 call setup capabilities. Addressing information used to connect gateways may be provided by the toll-free network server 120. Optionally, the VoIP gatekeeper 128 may be accessed by the first gateway 108, and the VoIP gatekeeper 128 may provide any routing information required to complete a call setup between two gateways over the data network 112. The first gateway 108 may then establish a connection to the fourth gateway 122.

The fourth gateway 122 may receive call setup information from, for example, the first gateway 108, and complete a call request to the subscriber 126 through the third LEC 124. The subscriber 126 is responsive to the call request as a conventional telephone. The incoming call may be indicated at the subscriber 126 through any technique, including conventional ringing, flashing, or vibration ring indicators. If the subscriber 126 answers the incoming call, voice communication may be conducted between the phone 102 and the subscriber 126, as connected through the first LEC 104, the first gateway 108, the data network 112, the fourth gateway 122, and the third LEC 124.

Optionally, the toll-free number translation database 106 may have sufficient capacity to store full calling information for each personal toll-free service subscriber 126. In this case, a call may be completed by simply

accessing the toll-free number translation database 106 from the first LEC 104, and receiving in return information for completing the call through the first gateway 108, the data network 112, the fourth gateway 122, and the third LEC 124, without an intermediate access to the toll-free network server 120. In another configuration, the toll-free number translation database 106 may be configured to access the toll-free network server 120, either through a public network or a private network, to obtain some or all of the information required to set up a toll-free call between the phone 102 and the subscriber 126.

Figure 2 is a flow chart showing a process for providing personal toll-free service according to the principles of the invention. The process 200 begins when an incoming toll-free call is received at an LEC, as shown in step 202. As shown in step 204, the LEC accesses a database, such as the toll-free number translation database 106 of Fig. 1, to resolve the toll-free number into dialing information for a toll-free subscriber. This number may be a number for a gateway to a data network, such as the first gateway 108 or the second gateway 116 of Fig. 1.

As shown in step 206, if a gateway is accessible from the LEC, then the LEC connects the call to that gateway and the process 200 proceeds to step 208. If a gateway is not accessible from the LEC, then the LEC connects the call to another LEC that does have access to a gateway, as shown in step 210. The process 200 may then proceed to step 208.

Once the call is connected to a gateway, a subscriber gateway address may be resolved, as shown in step 208. This may include accessing a server such as the toll-free network server 120 of Fig. 1, and prompting a caller to provide identifying information for a toll-free subscriber. The server may then provide an address and other information for a gateway that shares an LEC with the toll-free subscriber and the call may be connected to that gateway.

As shown in step 212, a determination may be made whether the toll-free subscriber is within the same local calling area as the originator of the call, e.g., if the subscriber and the originator share an LEC. If the call is a local call, then the subscriber and the originator may be connected through the LEC, as shown in step 214.

If the call is not a local call, then the gateway that received the call is connected to a gateway for the subscriber, as shown in step 218. When the gateways are connected to carry a call, dialing information for the subscriber may be transmitted to an LEC local to the subscriber. The phone call may then be completed through the LEC, as shown in step 216.

Fig. 3 is a block diagram of a toll-free call center according to the principles of the invention. A system 300 according to the invention includes a phone 302, a first LEC 304, a toll-free number translation database 306, a gateway 308, a telecommunications network 310, a data network 312, a second LEC 314, a second gateway 316, a third gateway 322, a call center 324, and a VoIP gatekeeper 328. As will be described below, the system 300 operates generally to receive an incoming toll-free call from the phone 302, and to route the incoming toll-free call from the phone 302 to the call center 324 through the data network 312.

The phone 302 originates an incoming toll-free call by, for example, dialing a toll-free number from a conventional telephone. This is presented as a call request to the first LEC 304. It will be appreciated that the first LEC 304, and the other LEC's referred to herein, may be any carrier capable of receiving incoming calls from local subscribers, including any local exchange carrier, a competitive local exchange carrier, an incumbent local exchange carrier, or the like. It will further be appreciated that the phone 302 may instead be a wireless telephone such as a cellular handset using GSM, CDMA, TDMA, PCS, or any other wireless standard for communicating with a wireless base station, which may in turn connect to the Public Switched

Telephone Network ("PSTN"). Any wireless or wired telephone and phone service is intended to be included within the scope of the invention described herein.

Where the call origination includes a toll-free exchange, such as 800, 888, 877, and so forth, the first LEC 304 may access the toll-free number translation database 306 to obtain exchange and local dialing numbers for call routing of the toll-free call. For example, where the first LEC includes a Signal Service Point ("SSP") according to the Signaling System 7 ("SS7") protocol, and the toll-free number translation database 306 includes a Service Control Point ("SCP"), a database inquiry may be performed through a message to the SCP using the Transaction Control Application Part ("TCAP") layer of the SS7 protocol. It will be appreciated that any number lookup system may be used with the invention provided that it can respond to a request from the first LEC 304 with dialing or routing information for a toll-free service.

The toll-free number translation database 306 may maintain a one-to-many relationship with a toll-free number and "real" numbers or addresses associated therewith. The toll-free number translation database 306 may return, for example, an address or phone number for the first local exchange carrier 304 to reach the gateway 308. The toll-free number translation database 306 may optionally return a number for connecting to the call center 324 through the PSTN. The toll-free number translation database 306 may optionally return a local exchange number for the call center 324, where, for example, the call center 324 shares a local exchange with the phone 302 that originated the toll-free call.

The gateway 308 may connect calls from the first LEC 304 through the data network 312. Although shown in Fig. 3 as a single component of the toll-free system 300, it will be appreciated that the gateway 308 may include, for example, two components that may be at a single location, or at

remote locations connected in a communicating relationship. A first component may be a competitive local exchange carrier ("CLEC") or other telecommunications system connected to the first LEC 304. A second component may be a data network point-of-presence connected in a communicating relationship with the data network 312. The gateway 308 may include an interface between these two components, the interface converting signals between a form suitable for the PSTN and a form suitable for the data network 312. The gateway 308 may, for example, transfer voice traffic or other calls using a proprietary protocol, a standard such as H.323 or MGCP, or any other format suitable for transmitting voice over the data network 312. The first gateway 308 may have one or more Internet Protocol ("IP") addresses for sending and receiving data over the data network 312. The interface between the data network point-of-presence and the CLEC may include, for example, an Integrated Services Digital Network ("ISDN") Primary Rate Interface ("PRI") connection, or, where traffic is backhauled, ISDN PRI encapsulated in T1. In addition, although not shown in Fig. 3, the first gateway 308 may include a separate connection (i.e., not through the data network 112) to the VoIP gatekeeper 328, so that the VoIP gatekeeper may provide data networking address information to the first gateway 308 concerning other toll-free gateways connected to the data network 312.

The telecommunications network 310 may be, for example, the PSTN or any other network suitable for circuit-switched or other telecommunications traffic. The data network 312 may be the Internet or any other network suitable for packet-switched or other data traffic.

As noted above, where no gateway to a data network is available from the first LEC 304, such as the first gateway 308 to the data network 312, the toll-free number translation database 306 may return a number of a suitable exchange that can be reached through the telecommunications network 310, such as the second LEC 314. Where a number of suitable exchanges are available, the toll-free number translation database 306 may provide a

suitable exchange according to cost, physical distance, gateway loading, or any other criteria. For example, where a company maintains a number of geographically distributed call toll-free call centers 324, the toll-free number translation database 306 may choose a most cost effective call center 324 for a particular call, such as a call center 324 within the same state, a call center 324 within the same exchange area, etc.

The second gateway 316 may operate in a fashion similar to the second gateway 116 of Fig. 1. That is, the second gateway 316 may connect through the third gateway 322 to the call center 324 in order to reduce long haul network usage such as inter-exchange carriers, and associated costs. In the system 300 of Fig. 3, the second gateway 316 may also, or instead, function to connect the phone 302 to the second LEC 314, and in turn to provide a local, switched connection to the call center 324. In this manner, the call center 324 may provide switched toll-free service without associated costs such as inter-exchange carrier fees.

A toll-free call that is being connected through the data network 312 may instead be connected through a third gateway 322 directly to the call center equipment at the premises of the call center 324, such as a call center private branch exchange.

Optionally, the VoIP gatekeeper 328 may be accessed by the first gateway 308, and the VoIP gatekeeper 328 may provide any routing information required to complete a call setup between the first gateway 308 and the second or third gateway 316, 322 over the data network 312.

The third gateway 322 may receive call setup information from, for example, the first gateway 308, and complete a call request to the call center 324 through the third gateway 322, or through the second gateway 316 and the second LEC 314. The incoming call may be handled at the call center using any techniques, and may, for example, forwarded to a VRI system at

the call center 324, or placed into a queue for attention by an available operator.

Optionally, the toll-free number translation database 306 may have sufficient capacity to store full calling information for each call center 324. In this case, a call may be completed by simply accessing the toll-free number translation database 306 from the first LEC 304, and receiving in return information for completing the call through the first gateway 308, the data network 312, and the third gateway 322.

Fig. 4 is a flow chart showing a process for providing a toll-free call center according to the principles of the invention. The process 400 begins when an incoming toll-free call is received at an LEC, as shown in step 402. An access is made to a toll-free number translation database, as shown in step 404.

As shown in step 406, where a gateway is not accessible to the LEC, the process 400 proceeds to step 408 where the toll-free call may be connected to a call center through the PSTN or some other telecommunications network.

If a gateway is accessible, an address may be resolved for a call center gateway, as shown in step 410. This may include, for example access to the VoIP gatekeeper 328 of Fig. 3. As shown in step 412, the call may then be connected to, for example, the second gateway 316 or the third gateway 322, depending on whether the call center provides switched service through an LEC, or direct service through a gateway to the data network.

If the toll-free call center uses switched service, then the call is connected through a gateway to an LEC, as shown in step 414. In this configuration, the call center may maintain a conventional connection to the LEC. If the toll-free call center uses a network connection, then the call center

equipment may be connected directly to a gateway, such as the third gateway 322 of Fig. 3. The gateway may be configured to arbitrate between a protocol used to transport calls over the data network and a protocol used by the premises equipment, such as a private branch exchange, of the call center.

While the invention has been disclosed in connection with the preferred embodiments shown and described in detail, various modifications and improvements thereon will become readily apparent to those skilled in the art. It should be understood that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative, and not in a limiting sense.

WHAT IS CLAIMED IS:

1. A system for providing toll-free service comprising:

a first gateway connected through a first telecommunications network with a phone that originates a call request to a toll-free number;

a second gateway connected through a second telecommunications network with a subscriber, the subscriber being responsive to a call request to the toll-free number; and

a server connected through a data network with the first gateway and the second gateway, the server providing routing information to connect the first gateway and the second gateway in a communicating relationship that connects the phone to the subscriber.

2. The system of claim 1, the first telecommunications network and the second communications network further including the Public Switched Telephone Network.

3. The system of claim 1 wherein the first telecommunications network includes a first Local Exchange Carrier and the second telecommunications network includes a second Local Exchange Carrier.

4. The system of claim 1 wherein the first gateway includes a first Competitive Local Exchange Carrier and the second gateway includes a second Competitive Local Exchange Carrier.

5. The system of claim 1, the data network further including the Internet.

6. The system of claim 1, the server including an interactive voice response system.

7. The system of claim 6, the interactive voice response system

receiving identification information from the phone that identifies a subscriber, and the server applying the identification information to generate call setup data for connecting the phone to the subscriber.

8. The system of claim 1 wherein the first telecommunications network includes a database, the database translating toll-free numbers into other dialing information.

9. The system of claim 8, the other dialing information including an exchange of the subscriber.

10. The system of claim 8, the other dialing information including a number of the first gateway.

11. A system for providing toll-free service comprising:

a first gateway connected through a local exchange carrier with a phone that originates a call request to a toll-free number;

a second gateway connected with a call center, the call center being responsive to the call request to the toll-free number;

a database connected to the local exchange carrier, the database operable to translate the toll-free number to a number for the first gateway; and

a gatekeeper, the gatekeeper operable to provide an address of the second gateway to the first gateway;

whereby voice communications are established between the phone and the call center.

12. A system for providing toll-free service, the system comprising:

a first gateway connected through a telecommunications network with a phone that originates a call request to a toll-free number;

a second gateway connected with a subscriber, the subscriber being responsive to the call request to the toll-free number; and

a data network, the data network connecting the first gateway and the second gateway in a communicating relationship, the communicating relationship providing voice communication between the phone and the subscriber.

13. The system of claim 12, wherein the subscriber is a call center.

14. A system for providing toll-free service, the system comprising;

a phone;

a subscriber;

a data network;

a first connecting means for connecting the phone to the data network;

a second connecting means for connecting the subscriber to the data network; and

a third connecting means for connecting the first connecting means to the second connecting means through the data network to establish a communicating relationship between the phone and the subscriber.

15. A method for providing toll-free service, the method comprising:

receiving an incoming toll-free call;

connecting the incoming toll-free call to a first gateway;

connecting the first gateway to a second gateway; and

connecting the second gateway to a subscriber.

16. The method of claim 15, wherein connecting the incoming toll-free call to a first gateway further comprises accessing a database to obtain a number of the first gateway.

17. The method of claim 15 wherein connecting the first gateway to a second gateway further comprises requesting an address of the second gateway from a server.

18. The method of claim 15 wherein connecting the first gateway to a second gateway further comprises requesting an address of the second gateway from a gatekeeper.

19. The method of claim 15 wherein connecting the second gateway to a subscriber further comprises connecting the second gateway to a Local Exchange Carrier that is used by the subscriber.

20. A gateway for use in providing toll-free service, the gateway including:

a first connection to an exchange, the first connection being represented to the exchange by a translation of a toll-free number;

a second connection to a data network, the second connection adapted to carry voice traffic over the data network;

a third connection to a gatekeeper, the gatekeeper providing address information for one or more additional gateways that may communicate voice traffic through the second connection; and

a processor, the processor configured to control a connection between the first connection and the second connection.

21. The gateway of claim 20, wherein the exchange is a Local Exchange Carrier.

22. The gateway of claim 20, wherein the exchange is a Competitive Local Exchange Carrier.

23. The gateway of claim 20, wherein the exchange is an Incumbent Local Exchange Carrier.

24. A server for providing toll-free service through a data network, the server comprising:

a connection to a data network, the connection configured to communicate voice traffic and data traffic;

an interactive voice response system, the interactive voice response system configured to receive, as voice traffic, identifying information that identifies a toll-free subscriber, and to generate, as data traffic, address information that identifies a gateway that shares an exchange with the toll-free subscriber.

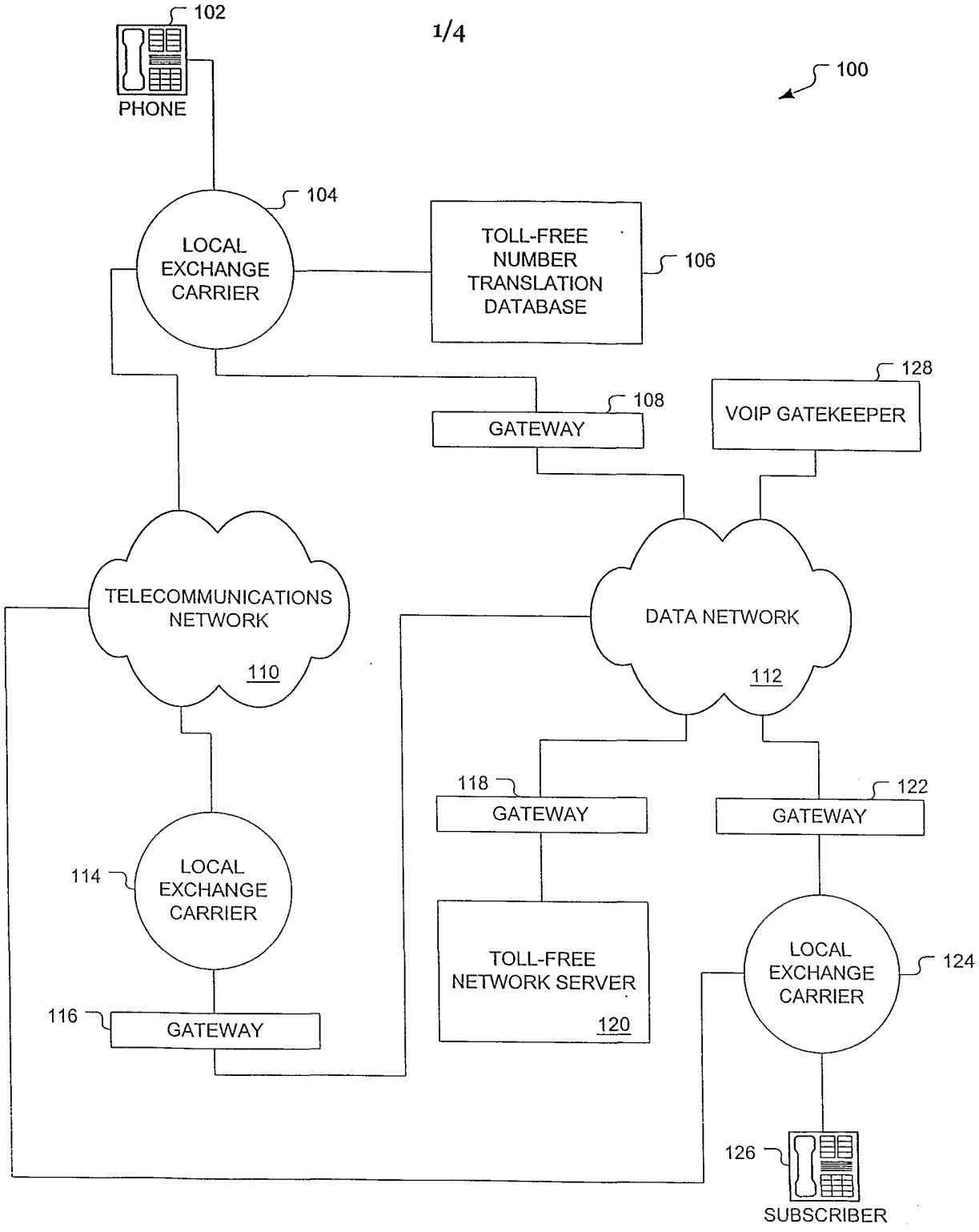

102
PHONE
100
104
LOCAL EXCHANGE CARRIER
TOLL-FREE NUMBER TRANSLATION DATABASE
106
128
108
GATEWAY
VOIP GATEKEEPER
TELECOMMUNICATIONS NETWORK
110
DATA NETWORK
112
118
GATEWAY
122
GATEWAY
114
LOCAL EXCHANGE CARRIER
TOLL-FREE NETWORK SERVER
120
LOCAL EXCHANGE CARRIER
124
116
GATEWAY
126
SUBSCRIBER

FIG. 1

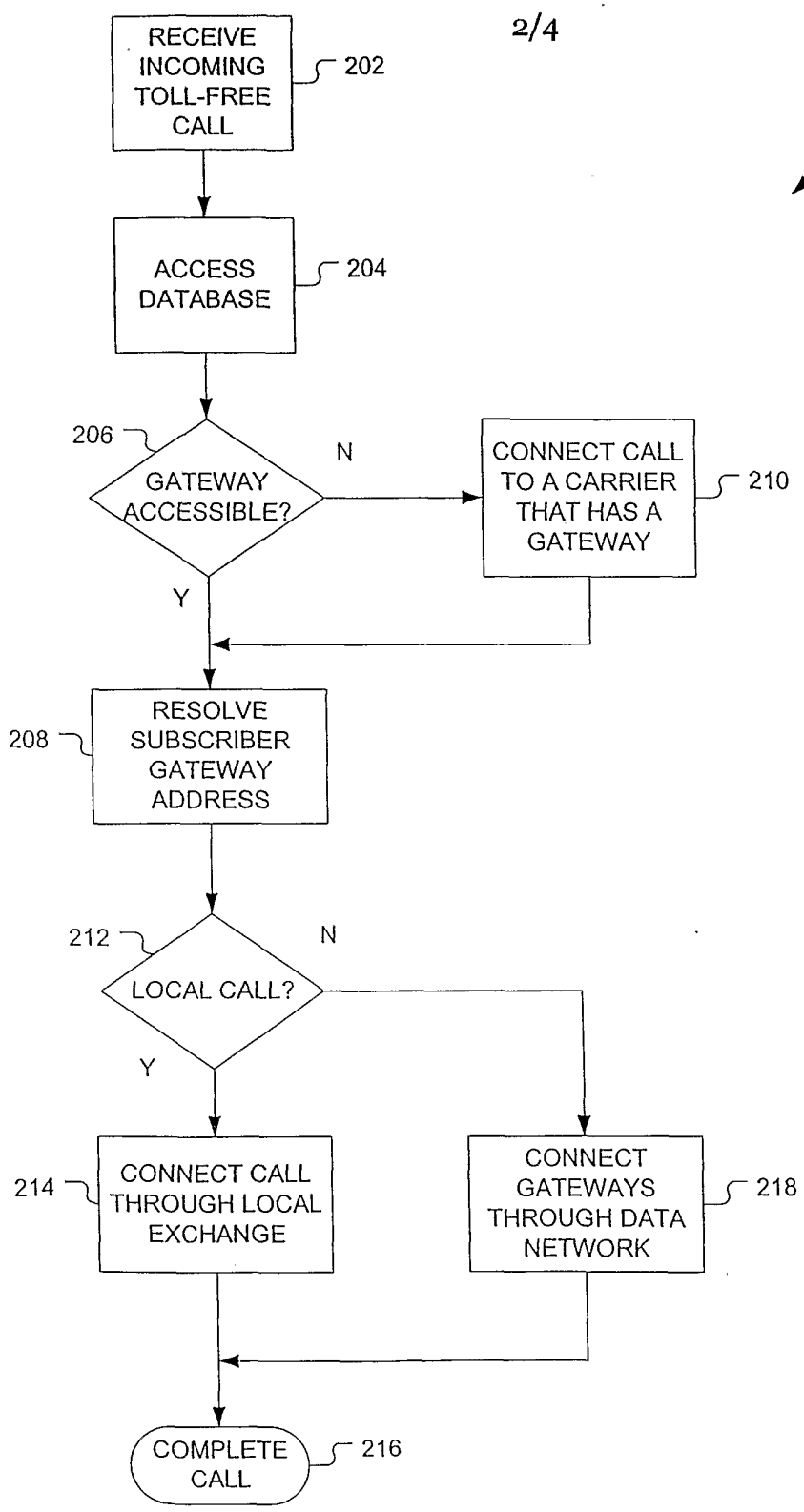

RECEIVE INCOMING TOLL-FREE CALL
202
200
ACCESS DATABASE
204
206
GATEWAY ACCESSIBLE?
N
CONNECT CALL TO A CARRIER THAT HAS A GATEWAY
210
Y
RESOLVE SUBSCRIBER GATEWAY ADDRESS
208
212
LOCAL CALL?
N
Y
CONNECT CALL THROUGH LOCAL EXCHANGE
214
CONNECT GATEWAYS THROUGH DATA NETWORK
218
COMPLETE CALL
216

FIG. 2

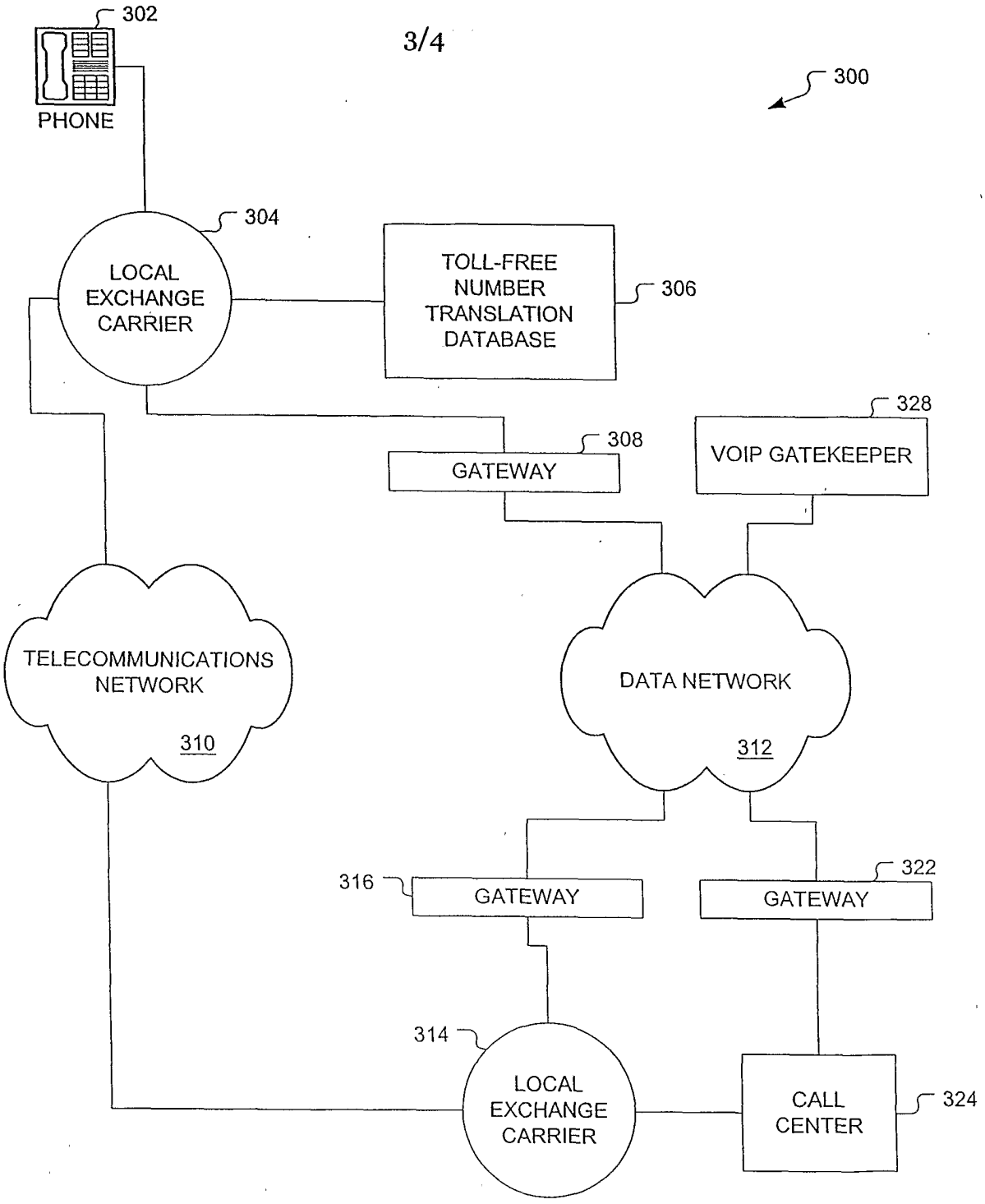

302
PHONE
300
304
LOCAL EXCHANGE CARRIER
TOLL-FREE NUMBER TRANSLATION DATABASE
306
328
308
GATEWAY
VOIP GATEKEEPER
TELECOMMUNICATIONS NETWORK
310
DATA NETWORK
312
316
GATEWAY
322
GATEWAY
314
LOCAL EXCHANGE CARRIER
CALL CENTER
324

FIG. 3

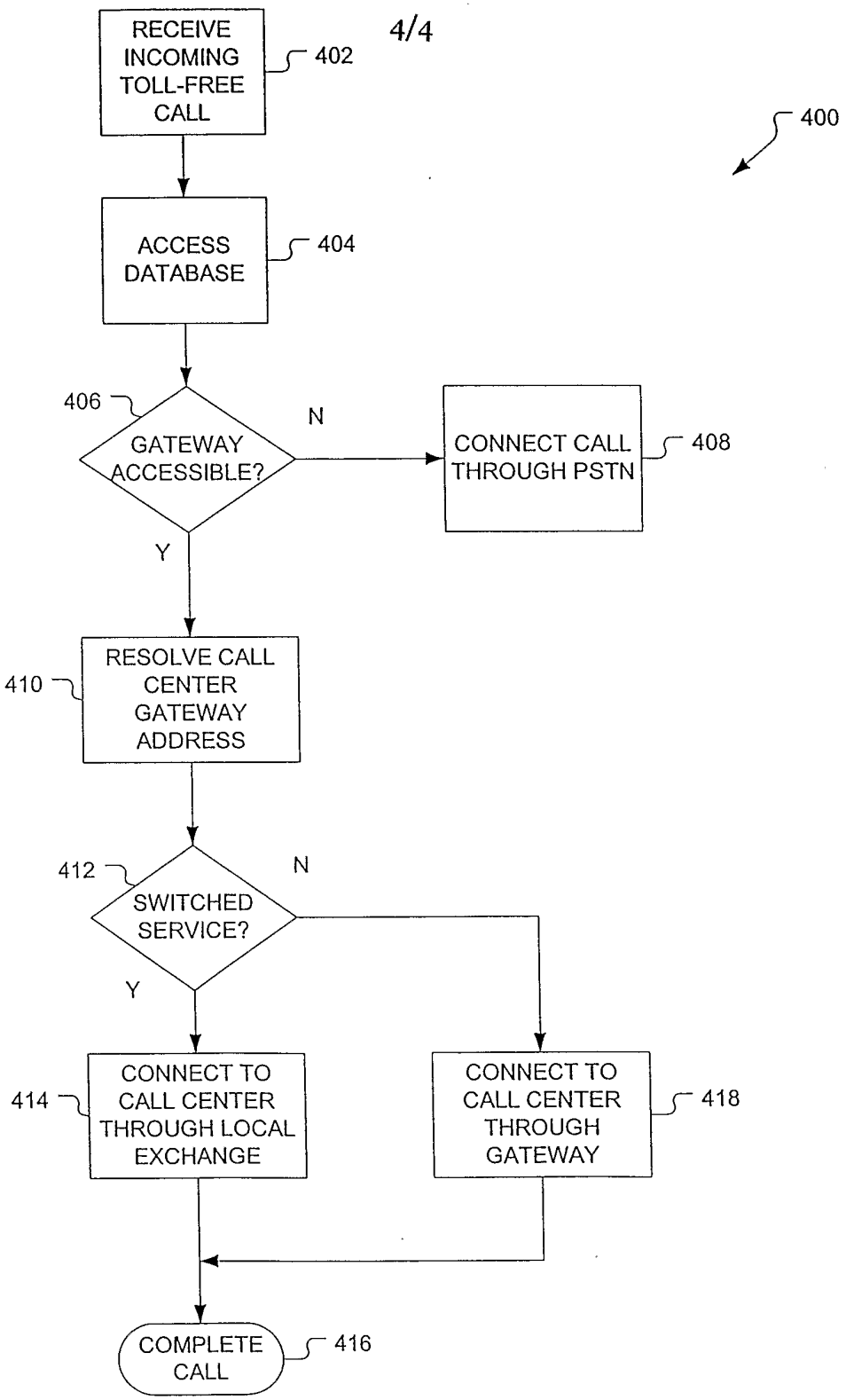

RECEIVE INCOMING TOLL-FREE CALL
402
400
ACCESS DATABASE
404
406
GATEWAY ACCESSIBLE?
N
CONNECT CALL THROUGH PSTN
408
Y
RESOLVE CALL CENTER GATEWAY ADDRESS
410
412
SWITCHED SERVICE?
N
Y
CONNECT TO CALL CENTER THROUGH LOCAL EXCHANGE
414
CONNECT TO CALL CENTER THROUGH GATEWAY
418
COMPLETE CALL
416

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/24712

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H04M 7/00
US CL :379/220.01

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)

U.S. : 379/220.01, 219, 220.02, 265.01, 265.02, 265.11, 900

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

NONE

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

EAST
SEARCH TERMS: DATA NETWORK, INTERNET, TOLL-FREE, GATEWAY, CALL CENTERS, POINT OF PRESENCE (POP), IVR OR VRU.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,011,844 A (UPPALURU et al) 04 January 2000, Figures 3 and 7, column 3, line 1-column 9, line 28.	1-24
Y	US 5,940,496 A (GISBY et al) 17 August 1999, Abstract, Figures 1 and 6, column 3, line 27-column 21, line 12.	1-24
Y	US 6,023,504 A (CONNOLLY) 08 February 2000, Abstract, Figure 1, column 2, line 52-column 5, line 3.	1-24
Y	US 6,049,602 A (FOLADARE et al) 11 April 2000, Abstract, Figure 1, column 1, line 53-column 12, line 37.	1-24

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"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
"A"	document defining the general state of the art which is not considered to be of particular relevance	"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
"E"	earlier document published on or after the international filing date	"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
"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)	"&"	document member of the same patent family
"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		

Date of the actual completion of the international search 17 SEPTEMBER 2001	Date of mailing of the international search report 06 FEB 2002
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer AHMAD MATAR Telephone No. (703) 305-4731

Form PCT/ISA/210 (second sheet) (July 1998)★

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/24712

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y , P	US 6,134,315 A (GALVIN) 17 October 2000, Abstract, Figure 1, column 4, line 10-column 9, line 50.	1-24
Y , P	US 6,181,690 B1 (CIVANLAR) 30 January 2001, Abstract, Figure 1, column 1, line 52-column 2, line 62.	1-24