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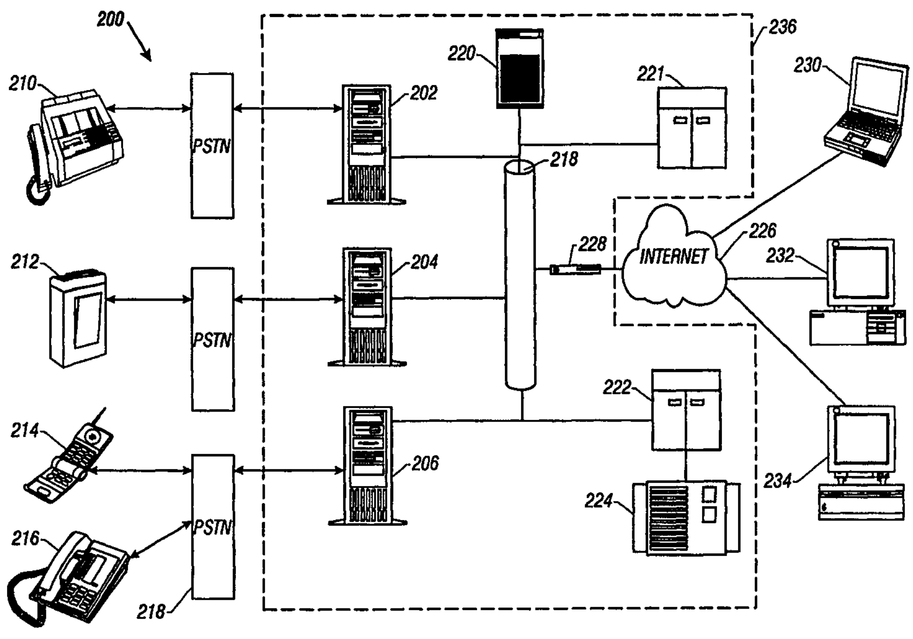
(57) Abstract



A system and method for processing informaion that is accessible via a global computer network (226). The system includes a plurality of audio processors (202, 204, 206) for processing audio information, a plurality of data processors (220, 221), coupled to the global computer network, and a plurality of computers, also coupled to the global computer network. The data processors receive a signal representing audio information from the audio processors, compresses the audio information signal into a compressed audio signal, and stores the compressed audio signal. The data processors also are capable of storing multiple files and multiple functional programs. The computers enable a user to access the stored compressed audio signal by receiving the compressed audio signal from the data processors via the global computer network and decompressing the compressed audio signal. During playback of the audio signal, for example, at least one command can be selected that controls delivery of the compressed audio signal as it is being sent to the computer by the data processors via the global computer network. The computer also enables a user to access the files and the functional programs from the data processors via the global computer network. The result is a controllable, real-time voice mail system and a virtual electronic office, accessible via computers coupled to a global computer network, such as the Internet.

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SYSTEM AND METHOD FOR PROCESSING INFORMATION VIA A GLOBAL COMPUTER NETWORK

TECHNICAL FIELD

The present invention is a system and method for processing information via a computer network. More particularly, the present invention is a system and method for providing virtual office functions, including a computerized voice mail system, in which applications software and digitized audio information, such as telephone messages, can be accessed and controlled via a global computer network, such as the Internet.

BACKGROUND

The Internet is a worldwide network of computers connecting many countries throughout the world. The Internet is accessible by government organizations, private organizations, corporations, and individuals throughout the world. This web of interconnectivity is made possible by computers frequently referred to as "servers," which provide a link between the Internet and users' computers. There are currently many thousands of servers positioned throughout the world to provide Internet access to Internet users.

Through the Internet and other important and wide-spread communications media, the world has experienced an information and communication explosion. Other media for communicating information and data include conventional public switched telephone networks ("PSTN"), paging networks, cellular telephone networks, and digital wireless telephone networks. Each network may be interconnected to improve the ease with which information can be exchanged. The efficient exchange of information is critical in today's society, because office workers are required to be mobile more frequently and need different types of information at any given time throughout their business travel. To stay in contact with important clients, customers, and suppliers, today's office workers must have quick and cost efficient access to email, voicemail, fax services, and other methods of communication.

In all of these networks, one of the most important means of communication is leaving messages for a user. For example, paging systems are strictly message-based; that is, a person desiring to leave a message for a paging system user does not communicate with the user directly and verbally in real-time, but rather must leave a message for the user, which the user can later return or ignore. PSTN and wireless telephone users generally communicate directly in real-time: that is, they are able to converse verbally and audibly with one other via the PSTN or cellular networks. PSTN and wireless telephone users often also have voice mail or messaging systems, by which messages can be left in a "voice-mailbox" for later retrieval and "play-back" by the user. In these cases, unlike paging networks, which save messages strictly as digital data, PSTN and wireless messages are frequently left as verbal, audible messages in the voice-mailbox and can be accessed and played-back by the user. In addition, many voice-mail systems give the user real-time control over delivery of the saved voice messages, such that the user can fast-forward or rewind a message, go back to the beginning of a message, skip forward to a subsequent message, *etc.* Thus, delivery of the voice messages can be controlled on the fly, in real-time.

PSTN telephones, wireless telephones, and pagers may be connected to computer systems. For telephone and cellular, analog voice messages are converted to digital so as to be computer compatible. Digital paging messages and digital wireless telephone messages are already digitized; thus, no conversion is necessary.

Some systems are being proposed or are in various stages of development that implement a concept of a "unified messaging system," in which voicemail messages and faxes are embedded in email and retrieved through conventional email protocol. A conventional universal messaging system 100 is shown in FIGURE 1. A fax machine 102, cellular telephone 104, and standard PSTN telephone 106 are connected to a PBX system 108. The PBX 108 is then connected to a voice/fax server computer 110, which is in turn connected to local area network ("LAN") 112. A personal computer 114 is shown connected to the LAN 112, as is a standard e-mail server computer 116. The personal computer 114 can be connected to a global computer network 118 (*e.g.*, the Internet) via the LAN 112 and an Internet server 120, and thereby to a remote computer 122 that is not part of the LAN 112. The personal computer 114 and the remote computer 122 must each have a modem (not shown) to allow communication over the global computer network 118.

The conventional universal messaging system, such as system 100, has many significant drawbacks, however. In such systems, one is unable to control and quickly browse, skip, reply, rewind, and forward voicemail messages. Furthermore, the ability to access files and other resources is a crucial feature that is absent in current unified messaging systems. Some Internet service providers ("ISPs") have attempted to help by providing "shell accounts" to their mobile customers, allowing them to store files on servers that are connected to the global network. But this ISP solution still does not provide the same common look and feel of the office environment when users access their files. Also, the combination of both the unified messaging system and the "shell accounts" implementation still does not give users the same feature set that is available to them in the office environment.

Moreover, in current universal messaging systems, delivery of voicemail messages embedded in email significantly increases the bandwidth requirements for sending voice messages over a global computer network, such as the Internet. This, in turn, will cause data bottlenecks and hamper the speed of the Internet, especially when voicemail traffic becomes enormous, which is expected in the next few years. Similarly, the embedded email messages delivered in the conventional system may include a substantial amount of data, requiring a fast modem connection between the remote computer 122 and the Internet server 120 to process the data; otherwise, downloading the voicemail data from the Internet server 120 to the remote computer 122 may take an inordinate amount of time. This makes use of the global computer network 118 cumbersome and unpleasant. Still further, the conventional universal messaging system taxes the resources of the remote computer 122, because it must have the capacity to store all the messages intended for the user of the remote computer 122, as such messages are automatically delivered in their entirety to the remote computer 122.

Accordingly, a need exists for a computer system and method that provide a "virtual" home office environment over a global computer network and that reduces bandwidth requirements for voicemail transmission over a global computer network and allows simple, easy to use integration of voicemail and email messaging systems, fax services, and other common tools available to modern office workers. The present invention provides such a system and method.

SUMMARY

The details of one or more embodiments of the invention are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the invention will be apparent from the description and drawings, and from the claims.

In a first embodiment, the present invention is a system or method for processing information that is accessible via a global computer network. The system includes an audio processor for processing audio information. The system also includes a data processor, coupled to the global computer network, for receiving a signal representing audio information from the audio processor, for compressing the audio information signal into a compressed audio signal, and for storing the compressed audio signal. Finally, the system includes a computer, coupled to the global computer network, for accessing the stored compressed audio signal from the data processor via the global computer network, for decompressing the compressed audio signal, and for selecting at least one command that controls delivery of the compressed audio signal as it is being sent by the data processor via the global computer network to the computer.

In another embodiment, the present invention is

DESCRIPTION OF DRAWINGS

FIGURE 1 is a block diagram showing a conventional universal messaging system.

FIGURE 2 is block diagram of an embodiment of the system of the present invention, in which a single computer server is used to provide virtual office services via a global computer network.

FIGURE 3 is a block diagram of another embodiment of the system of the present invention, in which multiple, distributed computer servers are used to provide virtual office services via a global computer network.

FIGURE 4 is a block diagram showing an exemplary voice processor, data engine, and storage device of FIGURE 2.

FIGURE 5 is a block diagram showing exemplary software modules resident in a global computer network server system in accordance with the present invention.

FIGURE 6 is a block diagram showing exemplary software modules and hardware resident in a computer coupled to the server system of FIGURE 5 via a global computer network.

FIGURE 7 is an exemplary flow diagram showing how an incoming telephone call is processed by the voice processor of FIGURE 4.

FIGURE 8 is a flow diagram showing an exemplary operation of the software modules of FIGURE 5.

FIGURE 9 is a flow diagram showing an exemplary operation of the software modules and hardware of FIGURE 6.

FIGURE 10 is a diagram showing exemplary applications that can be present in a user s home directory.

DETAILED DESCRIPTION

For purposes of this description and for simplicity, the term "Internet" will often be used as a substitute for the term "global computer network." It will be understood, however, that the present invention is not limited to the Internet. While the Internet is the primary use for which the present invention is intended, at least as of now, it is contemplated that other global computer networks may be developed in the future, and these networks are intended to fall within the scope of the present invention.

FIGURE 2 is a block diagram of an embodiment of a system 200 according to the present invention. The system 200 includes an Internet server system 236. The server system 236 includes at least one voice processor unit 202, 204, 206, each of which is depicted in FIGURE 2 as a computer. Each voice processor unit 202, 204, 206 is coupled to the PSTN 208, which can in turn be coupled to a fax machine 210, a pager 212, a wireless phone 214, and a standard wire-based phone 216. Each voice processor 202, 204, 206 may in turn be coupled to a local area network ("LAN"), such as the ethernet network 218 that is shown in FIGURE 2, which is part of the Internet server system 236. The Internet server system 236 also includes a web server computer 220 that is also coupled to the ethernet network 218. The web server 220 computer provides the contents of web pages to the Internet 236 so that they can be delivered to a remote computer and interacts with applications software running on remote computers connected to the web server 220 via the Internet in order to supply dynamic web content to the remote computers.

In addition, the Internet server system 236 includes a data engine 222 and a voice storage device 224, both of which are coupled to the ethernet network 218, and the ethernet network 218 is coupled to the Internet 226 by a router 228. In addition, the Internet server system 236 may have a dedicated e-mail server 221 coupled to the ethernet network 218 that stores and provides e-mail messages over the ethernet network 218 and also over the Internet 226 to users of the Internet server system. Users of the Internet server system 236, such as laptop computer 230, PC computer 232, and Macintosh computer 234, may also be coupled to the Internet 226 and hence to the Internet server system 236, in known fashion.

Those skilled in the art will recognize that millions of computers and computer systems are coupled to the Internet 226, each of which computers is capable of interfacing with the computers and servers coupled to the Internet via the Ethernet network 218 running TCP/IP protocol. Those skilled in the art will also recognize that the elements shown in FIGURE 2 constituting the Internet server system 236 are exemplary only. Additional elements may be part of the system 236, or some of the elements shown may be omitted. For example, instead of an Ethernet network 218, the system 236 may employ a token ring network or ATM network. Other suitable modifications or additions may be made, in known fashion.

The system 200 is an example of a single-server system 236, in which a single physical location is used to process the information to be made accessible via the Internet 226. Thus, in the system 200, all incoming data, including fax messages from fax machine 210, paging messages from pager 212, and voice messages from wireless phone 214 and wired phone 216 are delivered to the Internet server system 236, which is located at a single physical location. It will be understood, however, that even though Internet server system 236 is at a single physical location, Internet server system 236 may be accessible by more than one telephone number and may be distributed over several physical structures or buildings all interconnected by Ethernet 218.

FIGURE 3 shows an example of a multiple-server system 300, in which multiple Internet server systems (in this example, four such systems) 302, 304, 306, 308 are distributed in different physical locations. Each of the Internet server systems 302, 304, 306, 308 may have equivalent elements to those shown for Internet server system 236, but, for simplicity, such elements are not shown in FIGURE 3. Each Internet server system 302, 304, 306, 308 is coupled, on one end, to the PSTN 208 and, on the other end, to the Internet 226, and each has at least one telephone number corresponding to it, by which a caller can access each of the systems 302, 304, 306, 308.

Each server system 302, 304, 306, 308 may be located in a different telephone area code. Accordingly, a caller wishing to leave a message on one of the server systems 302, 304, 306, 308, and who is located in the same area as one of the systems, need only make a local, toll-free call, rather than an expensive long-distance call. Alternatively, if the single-server system 200 is used, in order to reduce toll-charges to callers, the Internet server system 236 may be accessible by a local exchange number as well as a toll-free number (such as an "800" number). In a large enough system, Internet server systems may be located in literally hundreds of different area codes and all over the world. This means that a caller wishing to leave a message need not incur toll charges to do so. And, because the Internet 226 is virtually world-wide accessible, a user may access his or her messages from one of the Internet server systems simply by tying into the Internet 226 wherever access is available.

Preferably, in the distributed system 300, a group of users is assigned to each Internet server system 302, 304, 306, 308. Generally, each group will be assigned according to their geographic proximity to the particular Internet server system 302, 304, 306, 308. For example, a group located in proximity to San Diego, California, could be assigned to an Internet server system physically located in or near San Diego, and a group located in proximity to St. Louis, Missouri, could be assigned to an Internet server system located in or near St. Louis, in known fashion. This allows the system 300 to be scalable to millions of users and it allows for the use of local telephone numbers to give callers wishing to leave messages the ability in many areas to avoid long-distance toll charges.

In addition, the distributed system 300 may have a dedicated web server 310 and dedicated e-mail server 312. These servers can be used to store system users' web pages and their e-mail and to provide users' web pages over the Internet 236 and receive e-mail from users.

FIGURE 4 shows an exemplary embodiment of the voice processor unit 202, the data base engine 222, and the voice storage element 224 of FIGURE 2. It will be understood that embodiments for these elements 206, 222, and 224 are merely exemplary and that elements 206, 222, and 224 may be combined in a single unit or may be divided into additional elements. The voice processor 206 shown in FIGURE 4 includes an interface or port 403 that allows the voice processor 206 to be interfaced with standard telephone carriers 402 or other suitable wiring or connections, in known fashion. The port 403 is coupled to a voice card 404 and a fax module 406. The voice card 404 and fax module 406 are in turn coupled to a telephone control module 408, which is coupled to a voice encoder/decoder 410 and to a communication module 412 via line 414. The communication module 412 is also coupled to the voice encoder/decoder 410.

As an example of operation, when a signal is sent to Internet server system 236 via voice processor 206, the signal may arrive at Internet server system 236 via telephone channel 402 through port 403 and be received by either the voice card 404 or the fax module 406, depending on the type of signal. For example, if the signal is a telephone (or voice) signal, it is passed from port 403 to the voice card 404. Alternatively, if the incoming signal is a facsimile transmission, it is passed from port 403 to the fax module 406. The voice card 404 and fax module 406 process the incoming voice and facsimile signals, respectively, and output them to the telephone control module 408.

The telephone control module 408 manages the voice hardware and interfaces with the callers through voice greetings and messages. The telephone control module 408 also interacts with the data engine 222 to retrieve information that is responsive to a caller's input or requests. If the incoming signal is a voice signal, the telephone control module 408 outputs the voice signal to the voice encoder/decoder 410, which compresses the voice signal using a suitable compression algorithm. Preferably, the compression algorithm that is used is the G-729 Internet telephony standard, although alternative compression methods may be used, as desired. The compressed voice data is then output from the voice encoder/decoder 410 to the communication module 412. If, on the other hand, the data received by the telephone control module 408 is facsimile data (or, e.g., pager data), the signal need not be compressed by a voice encoder/decoder 410, but rather may be output directly from the telephone control module 408 over line 414 to the communication module 412. Of course, those skilled in the art will understand that data such as facsimile and pager data may also be compressed, if desired. The communication module 412 then provides the basic communications protocols for the entire system, manages connections, and queries the database 422 to send information to the data engine 222.

FIGURE 7 is a flow diagram showing operation of the voice processor 206. Initially (Step 702), the voice processor 206 detects a ring signal from the telephone channels 402. When a ring is detected, the voice processor 206 answers the call (Step 704) and plays a greeting (Step 706) to the caller accessing the voice processor 206 via telephone channels 402. The voice processor 206 then gives the caller various options from which to choose (Step 708). The options from which the caller can pick include sending a facsimile, leaving a voice message for a system user, or listening to a message stored in the system (if the caller is also a system user and, preferably, has a password to the system).

If a caller wishes to send a fax, the voice processor 206 obtains a personal identification number from the caller pertaining to a particular system user (Step 710). The voice processor 206 then switches to fax module 406, which accesses port 403 (Step 712). The voice processor 206 then begins receiving the fax (Step 714) and continually queries whether receipt of the fax is complete (Step 716). If the voice processor determines whether the fax has not been completely received in Step 716, the voice processor 206 repeats the fax receiving Step 714. If, on the other hand, the voice processor 206 determines that the fax has been completely received, the voice processor 206 sends the fax via line 414 and communication module 412 through port 415 and over line 416 to the data engine 222 (Step 718). The voice processor 206 may then terminate the call (Step 720). Alternatively, the voice processor could query whether the caller has additional information to send or retrieve.

If the voice processor 206 determines (Step 208) that the caller wishes to leave a message, the voice processor 206 obtains the personal identification number from the caller (Step 722). The voice processor 206 then begins recording the message (Step 724) and continually queries whether message recording is complete (Step 726). When the voice processor 206 determines that recording is complete, the recorded message is passed to the voice encoder/decoder 410 for compression (Step 728), and the compressed recorded voice message is sent via communication module 412, port 415, and line 416, through port 417 of data engine 222, and the message is stored in a buffer (Step 730). Preferably, voice messages are recorded in voice storage unit 224, though, as described below, this is an optional part of the Internet server system 236. The voice processor 206 may then terminate the call (Step 720), or, as described above, may query the caller for additional data processing.

If the voice processor 206 determines in Step 708 that the caller is seeking to listen to a message from a user mailbox, the voice processor 206 obtains a personal identification number from the caller. This time, the personal identification number pertains to the caller's voice mailbox in the Internet server system 236. In addition, the caller may be asked to provide a password to the voice processor 206 (Step 734) in order to access voice messages from the Internet server system 236. If the caller provides the appropriate personal identification number and password, message headers are retrieved by the voice processor 206 from the data engine 222 (Step 736). Then, the voice processor 206 obtains options for the caller (Step 738) and retrieves compressed voice messages from the data engine 222 (Step 740). When the voice messages are retrieved, the voice encoder/decoder 410 decompresses the voice messages (Step 742) and passes the decompressed voice messages through the telephone control module 408, to the voice card 404, through port 403, and over a telephone channel 402 to the caller (Step 744). The voice processor 206 then determines whether the caller has retrieved all messages requested (Step 746). If not, the voice processor 206 again provides options to the caller (Step 738) and continues through Steps 740, 742, and 744, again determining in Step 746 whether the caller has retrieved all messages. If so, the voice processor 206 may terminate the call (Step 720).

As alluded to above, data from communication module 412 is output via port 415 and line 416 to the data engine 222, which includes a communication module 418, a data processing module 420, and a database 422. Data output on line 416 is input to port 417 on the data engine 222 and can thereby be processed by communication module 418 and the data processing module 420. Based on direct input from users and the voice processor 206 to retrieve different types of data, the data processing module 420 formulates different types of requests to the database 422. Because voicemail, email, and other data types may be received from different sources and retrieved by different means, the data processing module 420, with sufficient built-in intelligence, can handle all formatting protocol adjustments. The database 422 contains data that can be accessed by users of system 200, including users of laptop 230, PC 232, or Macintosh computer 234. These users can access the database 422 via the Internet 226 to obtain information from the Internet server system 236.

Optionally, voice storage unit 224 can be coupled to the data engine 222 via port 424 and line 426 for added storage for voice signals. In particular, voice signals processed and compressed by the voice processor 206 can be stored in the storage unit 224. These compressed voice signals are accessed by the data engine 222 via port 424 and line 426 and can be sent over the Internet 226 in a compressed format to users of laptop 230, PC 232 or Macintosh 234.

A data engine is also coupled via port 428 to the web server 220 via line 430. As shown in FIGURE 2, the data engine 222 and voice processor unit 206 may be coupled to an ethernet system 218 and thereby connected to the web server 220 and router 228. As those skilled in the art will understand, other computer networking configurations can be used in connection with the Internet server system 236, or the Internet server system 236 may be a stand-alone computer, coupled to the Internet 226 without a local area network.

Data engine 222 can communicate information via port 432 and line 434 to other data engines in a distributed system, such as that shown in FIGURE 3. Referring to FIGURE 3, for example, Internet Server System 304 can send information over a line such as line 434 through the Internet 226 to another Internet server system, e.g., Internet Server System 302.

FIGURE 5 is a block diagram of the web server 220. As described above in connection with FIGURE 4, the data engine 222 can communicate with the web server 220 (via line 430). The web server 220 includes a communication module 502, a streaming module 504, an active server module 506, a user look-up table 508, and a standard web server 510.

Operation of the web server 220 will be described in connection with the flow diagram of FIGURE 8. First, a user computer seeking access to the Internet server system 236, such as laptop computer 230, PC 232, or Macintosh 234, sends a request over the Internet 226 to the Internet server system 236, which is routed by router 228 through ethernet network system 218 to web server 220. With reference to FIGURE 5, standard web server 510, having received a request from the user via client connection 512, sends the request to the active server module 506, which accesses the user look-up table 508 to determine which data engine 222 corresponds to the user (Step 804). For example, in the distributed system of FIGURE 3, the user may access Internet server system 302, but the user's home system may actually be Internet server system 304. In this case, look-up table 508 would indicate that the user's data engine is located in Internet server system 304, and Internet server system 302 would hence route the user's communication to Internet server system 304.

The active server module 506 then determines the type of request sent by the user (Step 806). If the request from the user is to check voicemail, the active server module 506 validates the user (Step 808), e.g., by a password sent by the user, and a request is sent from the active server module 506 via the communication module 502 to the data engine 222 to retrieve voice message headers for that user (Step 810). The data engine 222 then sends the headers back to the web server 220, which in turn sends those headers back to the application software running on the user's computer (Step 812), e.g., laptop 230, PC 232, or Macintosh 234. The web server 220 then resets (Step 813).

If the user's request is determined (Step 806) to be a request to play a voice message, the active server module 506 sends a request via communication module 502 to the data engine 222 to retrieve the voice message requested by the user with a message identifier (Step 814). The active server module 506 also sets up a streaming buffer in the streaming module 504 (Step 816), and begins sending the message data to the user's application program running on the user's computer (Step 818). As described above, preferably, if the message data is a voicemail message, the data sent to the user over the Internet 226 is compressed. While the data is being sent to the user from the web server 220, the web server 220 monitors signals coming back from the user during "playback" of the voice message. If no command signal is received from the user during playback of the voice message (Step 820), the web server 220 determines whether the message was completely played-back to the user (Step 824), and, if so, the web server 220 resets (Step 826). If, on the other hand, during playback of the voice message from the web server 220 to the user (i.e., while the message is being delivered to the user and played-back), the user sends a command to the web server 220, then the web server 220 determines that a command has been received (Step 820) and processes the command (Step 822). After the command is processed, the web server 220 determines (Step 822) whether the message was completed before the command was processed. If playback of the message was not completed, in Step 824 the answer would be no, and the algorithm reverts to Step 818 and continues sending the user data that is stored (Step 816) in the streaming buffer of module 504. Thus, it is to be understood that the streaming module 504 can be used to store the voice messages so that a user can interact with the web server 220 during playback of voice messages, i.e., on the fly and in real-time, essentially without disturbing playback of the voice message, other than to process the various commands sent by the user. The web server 220 then resets (Step 826).

The types of commands that can be sent during playback of a voice message by the user include: fast-forward, slow-reverse, fast-reverse, skip to the next message, skip back to the beginning of the message being played-back, skip to another message within the user's mailbox, and any other playback- or record-type commands. Moreover, as stated above, unlike systems of the prior art, playback of the voice messages can be done on the fly, in real-time.

Referring back to FIGURE 8, if, in Step 806, the request sent by the user is to access "virtual office functions," web server 220 determines the type of data to which the user desires access (Step 828). For example, the user can access any type of document, an address book, e-mail messages, word processing, a calender, a personal web page, file storage, facsimile message, databases, and other desk-top computing functions. The web server 220 then formulates a request that is sent via the communication module 502 to the data engine 222 (Step 830). The request includes the type of data to which the user is seeking access. If the user is trying to upload data to the Internet server system 236 (Step 832), the data is received from the user (Step 834) and sent from the web server 220 to the data engine 222 (Step 836), which, in the embodiment of FIGURE 4, may store the user's data in database 422. Optionally, if the user is sending voice data to the Internet server system 236, the voice data may be stored in voice storage unit 224. The web server 220 then resets (Step 838).

The web server may determine (Step 832) that the user is not desiring to upload data to Internet server system 236, but that the user is seeking data from the data engine 222. In that case, web server 220 sends a message to the data engine 222 requesting access to data that is being requested by the user (Step 840). The data engine 222 sends the requested data to the web server 220, which is in turn sent to the user (Step 842). After the data is sent to the user, the web server 220 resets (Step 838).

FIGURE 6 is a block diagram showing the functional blocks of a user's computer 600, such as laptop 230, PC 232, and MacIntosh 234, which blocks may be implemented in hardware, software, or a combination of the two. The user's computer 600 may be coupled to the Internet 226 by a data streaming module 602. The data streaming module 602 is interfaced with an application interface 604 (preferably, a stored program) and a data encoder/decoder 606. The application interface 604 is in turn interfaced with standard Internet browser software 608 (e.g., "Netscape" or "Internet Explorer") and sound hardware 610 (e.g., a sound-card). In known fashion, the sound-card may be coupled to a speaker 612 and microphone 614.

FIGURE 9 is a flow diagram that explains exemplary operation of the user's application interface software 604. The user first logs-on the Internet via standard browser software 608 and accesses the Internet web site (or homepage) provided by the Internet server system 236. This web site provides the means by which the user can access the user's virtual office, including voicemail, word processing, and other functions. FIGURE 10 is a diagram showing an exemplary user's home directory stored and maintained at the Internet server system 236. The home directory shown in FIGURE 10 includes voice messages, fax messages, email messages, file storage, a desktop page, a personal web page, an address book, a calender, and personal classified ads. Of course, those skilled in the art will understand that many other applications could be available on the user's home directory, including word processing and database searching functions.

The web site is then displayed by the application interface 604 on the user's computer (Step 902). The user uses the application interface 604 to log-in to the remote user web site (Step 904) by providing, for example, a user identification number and password. The user's log-in information is then sent to the data engine 222 for validation of the user (Step 906). If it is determined that the user's log-in information is not valid (Step 908), then the application interface 604 returns to Step 904 and waits for the user to provide new log-in information. If, on the other hand, it is determined that the user's login information is valid (Step 908), the application interface 604 sends a request via the Internet 226 to the data engine 222, which then sends the user's personal desktop page back over the Internet 226 to the user's computer (Step 910). The user's computer may then display the user's personal desktop page (Step 912).

With the personal desktop page displayed on the computer, the application interface 604 interacts with the browser 608, the standard web server 510, and the active web server 506 to receive user input (Step 914). The application interface 604 then queries the user whether he or she wants to access the voicemail application (Step 916). If the user responds no, the application interface 604 returns to Step 914 (see reference numeral 922). If the answer is yes, the voicemail application is displayed to the user (Step 918), and the user is queried whether the user would like to playback a voicemail message (Step 920). If the answer is no, the application interface 604 returns to Step 914 (see reference numeral 922). If the answer is yes, the application interface 604 requests compressed voice data from the data engine 222 (Step 924), and the user's computer 600 receives the compressed voice data in the data streaming module 602 (Step 926), which stores the compressed data in a streaming buffer. The data stored in the streaming buffer is sent to the data encoder/decoder 606 (Step 928), which decompresses the voice data and provides the decompressed data to the sound hardware 610 (Step 930) for playback via the speaker 612.

The application interface 604 then determines whether playback of the voice message is complete or whether the user has sent a command during playback (Step 932). If the message has not been completely played and the user has not sent a command, the data streaming module 602 continues receiving data (Step 926) and sending the received data to the data encoder/decoder 606 (Step 928), and the decoded data is output via the sound hardware 610 (Step 930). If, on the other hand, voice message playback is complete or the user interrupts playback with a command, the application interface 604 may query whether the user would like to record a voice message on the Internet server system 236 (Step 934). Because a user is using the application interface 604 to interact with the application that is running, all of the commands are performed via the application interface 604. The application interface 604 does not know, however, how much voice data has been received by the streaming module 602 at the user side. If a command is received from the user during playback of a voice message, the application interface 604 directs the local streaming module 602 to stop the voice delivery immediately (or, if preferred, with a predetermined or calculated delay) or send a command to request the active server module 506 to intervene with the streaming module 504 upstream, at the delivery side.

If the user wishes to record a voice message, the user's record command is sent to the sound hardware 610 (Step 936), causing the sound hardware 610 to obtain the voice data from the microphone 614 and to send the obtained voice data to the application interface 604 (Step 938). If the user does not wish to record a message, control is returned to the application interface 604 (see reference numeral 922).

When the user is done recording (Step 940), the recorded voice data is compressed by the data encoder/decoder 606 (Step 942) and is sent over the Internet 226 to the data engine 222, together with an address indicating the recipient of the compressed voice data (Step 944). The compressed voice data is stored in the recipient's home directory for subsequent access and playback by the recipient. The recipient can playback the recorded voice message either by calling the voice processor 206 over telephone channels 402, as described above, or by using a computer to access the Internet server system 236 over the Internet 226, as described above in connection with FIGURE 9. Once the voice message has been sent to the data engine 222, the application interface returns to Step 914.

Those skilled in the art will recognize that the method of FIGURE 9 can be modified to allow the user to access via the Internet 226 applications other than voice mail messaging resident in the user's home directory (see FIGURE 10) stored on the Internet server system 236. For example, using the application interface 604 and browser 608, the user can access a calender application or email from the Internet server system 236.

Use of the application interface 604 gives the user full functionality of the user's home directory applications from virtually anywhere in the world, on virtually any computer. Thus, the user need not carry a laptop computer to have access to office or home applications software, but rather can access fully functional applications software from any computer equipped with Internet browser software 608 and a connection to the Internet 226. Furthermore, the application interface software 604 can be downloaded by the user via the Internet 226 into any computer to which the user has access, meaning that the user need not find a computer with the application interface software 604 already loaded. The system of the present invention also allows the user to customize his or her home directory (FIGURE 10) to have virtually any application on board, giving the user flexibility and freedom to include only the applications he or she uses.

Another advantage of the system of the present invention is bandwidth reduction in voice message traffic and fully functional voice mail retrieval and playback features. As described above, conventional voice messaging systems send uncompressed voice messages attached to email. This results in large, bandwidth intensive files being passed over the Internet 226 and that must be stored on the user's computer. Moreover, because the email voice message arrives as a complete file, the user must listen to the entire message and does not have control over playback. With the present invention, the user can have real-time access to voice mail data, indeed to the user's entire voice mailbox, and modify playback on the fly. For example, the system allows the user at will to send commands that fast-forward or reverse the voice message during playback, or to send commands that cause the system to skip to any desired message in the user's voice mailbox.

Also, because the application interface 604 provides a graphical interface displayed on the user's computer, the playback and message selection controls are displayed graphically to the user, making voice message control intuitive and simple. This eliminates the need, inherent in telephone voicemail systems, to memorize which buttons provide various functions or to listen to prompts from a recorded voice giving the user a menu of selections. Instead, all such functions and menus are displayed graphically to the user in a format that is easy to learn and understand.

A number of embodiments of the present invention have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the invention. Accordingly, it is to be understood that the invention is not to be limited by the specific illustrated embodiment, but only by the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A system for processing information that is accessible via a global computer network, comprising:
   a. an audio processor for processing audio information;
   b. a data processor, coupled to the global computer network, for receiving a signal representing audio information from the audio processor, for compressing the audio information signal into a compressed audio signal, and for storing the compressed audio signal; and
   c. a computer, coupled to the global computer network, for receiving the stored compressed audio signal from the data processor via the global computer network, for decompressing the compressed audio signal, and for selecting at least one command that controls delivery of the compressed audio signal as it is being sent to the computer by the data processor via the global computer network.

2. The system of claim 1 wherein commands selected by the computer allow delivery of the compressed audio signal to be stopped, fast-forwarded, and reversed in real-time.

3. The system of claim 1 wherein the data processor is further for storing a plurality of compressed audio signals; and wherein a first command selected by the computer selects any one of the plurality of compressed audio signals for delivery to the computer from the data processor via the global computer network in real-time and a second command selected by the computer stops delivery of the selected compressed audio signals in real-time.

4. The system of claim 3 wherein a third command selected by the computer stops delivery of the selected compressed audio signal and begins delivery of a new selected compressed audio signal in real-time.

5. The system of claim 1 wherein each command controls delivery of the compressed audio signal in real time.

6. The system of claim 1 wherein the data processor is further for storing a plurality signals representing electronic mail and the computer is for receiving the electronic mail signals from the data processor via the global computer network.

7. The system of claim 1, further comprising a plurality of data processors, each coupled to the global computer network, and each for receiving a signal representing audio information from an audio processor, for compressing the audio information signal into a compressed audio signal, and for storing the compressed audio signal;

wherein at least some of the plurality of data processors are located in different telephone area codes from the remaining ones of the plurality of data processors; and

wherein each data processor is for delivering compressed audio signals to at least some of the other data processors via the global computer network and is for providing compressed audio signals to at least one personal computer coupled to the data processor via the global computer network.

8. The system of claim 7 wherein each of the data processors:
   a. corresponds to a plurality of personal computers that are coupled to the data processor by the global computer network;
   b. receives a unique identifier signal corresponding to one of the plurality of data processors together with an audio information signal;
   c. compresses the audio information signal that is received with the unique identifier signal;
   d. stores the compressed audio information signal if the unique identifier signal corresponds to the receiving data processor so that compressed audio information can be accessed by the plurality of personal computers corresponding to the receiving data processor; and
   e. sends the compressed audio information to another data processor corresponding to the unique identifier signal if the unique identifier signal does not correspond to the

receiving data processor so that the compressed audio information can be accessed by the plurality of personal computers corresponding to the other data processor.

9. The system of claim 1 wherein the computer includes a memory for storing a program, the program operating to generate the commands that control delivery of the compressed audio information, the commands being sent by the computer via the global computer network to the data processor.

10. The system of claim 1 wherein the data processor includes a memory for storing a program, the program operating to generate the commands that control delivery of the compressed audio information, the commands being selected by signals sent by the computer via the global computer network to the data processor.

11. A method for processing audio information that is accessible via a global computer network, comprising:

a. sending a signal representing audio information from an audio processor to a data processor;
b. compressing the audio information signal into a compressed audio signal by the data processor;
c. storing the compressed audio signal;
d. receiving the compressed audio signal from the data processor by a computer coupled to the data processor via the global computer network;
e. decompressing the received compressed audio signal by the computer;
f. sending at least one command by the computer to the data processor via the global computer network to control delivery of the compressed audio signal as it is being sent to the computer by the data processor via the global computer network.

12. The method of claim 11, further comprising controlling delivery of the compressed audio signal by the computer by selecting commands to allow delivery of the compressed audio signal to be stopped, fast-forwarded, and reversed in real-time.

13. The method of claim 11, further comprising:
   a. storing a plurality of compressed audio signals by the data processor;
   b. selecting a first command by the computer to choose any one of the plurality of compressed audio signals for delivery to the computer from the data processor via the global computer network in real-time; and
   c. selecting a second command by the computer to stop delivery of the selected compressed audio signals in real-time.

14. The method of claim 13, further comprising selecting a third command by the computer to stop delivery of the selected compressed audio signal and to begin delivery of a new selected compressed audio signal in real-time.

15. The method of claim 11, further comprising real-time controlling by each command delivery of the compressed audio signal .

16. The method of claim 11, further comprising:
   a. for storing a plurality signals by the data processor, each of the plurality of signals representing electronic mail; and
   b. receiving the electronic mail signals by the computer from the data processor via the global computer network.

17. The method of claim 11, further comprising:
   a. coupling a plurality of data processors to the global computer network:
   b. locating at least some of the plurality of data processors in different telephone area codes from the remaining ones of the plurality of data processors:
   c. delivering by each data processor compressed audio signals to at least some of the other data processors via the global computer network; and
   d. providing by each data processor compressed audio signals to at least one personal computer coupled to the data processor via the global computer network.

18. The method of claim 17, further comprising:

a. associating each data processor with a plurality of personal computers that are coupled to the data processor by the global computer network;

b. receiving by one of the plurality of data processors a unique identifier signal corresponding to only one of the plurality of data processors together with an audio information signal;

c. compressing, by the receiving data processor, the audio information signal that is received with the unique identifier signal;

d. storing the compressed audio information signal if the unique identifier signal corresponds to the receiving data processor so that compressed audio information can be accessed by the plurality of personal computers associated with the receiving data processor; and

e. sending the compressed audio information to another data processor corresponding to the unique identifier signal if the unique identifier signal does not correspond to the receiving data processor so that the compressed audio information can be accessed by the plurality of personal computers associated with the other data processor.

19. The method of claim 11, further comprising:

a. storing a program in the computer;

b. generating the commands that control delivery of the compressed audio information by the stored program; and

c. sending the generated commands by the computer via the global computer network to the data processor.

20. The method of claim 11, further comprising:

a. storing a program in the data processor;

b. generating the commands that control delivery of the compressed audio information by the stored program; and

c. selecting the commands by signals sent by the computer via the global computer network to the data processor.

21. A system for processing information that is accessible via a global computer network, comprising:
    a. audio processing means for processing audio information;
    b. data processing means, coupled to the global computer network, for receiving a signal representing audio information from the audio processor, for compressing the audio information signal into a compressed audio signal, and for storing the compressed audio signal; and
    c. computer means, coupled to the global computer network, for receiving the stored compressed audio signal from the data processor via the global computer network, for decompressing the compressed audio signal, and for selecting at least one command that controls delivery of the compressed audio signal as it is being sent to the computer by the data processor via the global computer network.

22. The system of claim 21 wherein commands selected by the computer means allow delivery of the compressed audio signal to be stopped, fast-forwarded, and reversed in real-time.

23. The system of claim 1 wherein the data processor means is further for storing a plurality of compressed audio signals; and wherein a first command selected by the computer means selects any one of the plurality of compressed audio signals for delivery to the computer means from the data processor means via the global computer network in real-time and a second command selected by the computer means stops delivery of the selected compressed audio signals in real-time.

24. The system of claim 21 wherein each command controls delivery of the compressed audio signal in real time.

25. The system of claim 21, further comprising a plurality of data processing means, each coupled to the global computer network, and each for receiving a signal representing audio information from an audio processing means, for compressing the audio information signal into a compressed audio signal, and for storing the compressed audio signal;

wherein at least some of the plurality of data processor means are located in different telephone area codes from the remaining ones of the plurality of data processor means; and

wherein each data processor means is for delivering compressed audio signals to at least some of the other data processor means via the global computer network and is for providing compressed audio signals to at least one personal computer coupled to the data processor means via the global computer network.

26. A system for processing information that is accessible via a global computer network, comprising:

a. an audio processor for processing audio information;

b. a data processor, coupled to the global computer network, for:

   (1) receiving a signal representing audio information from the audio processor,

   (2) compressing the audio information signal into a compressed audio signal,

   (3) storing the compressed audio signal, and

   (4) storing a plurality of files and a plurality of functional programs; and

c. a computer, coupled to the global computer network, for:

   (1) receiving the stored compressed audio signal from the data processor via the global computer network,

   (2) decompressing the compressed audio signal,

   (3) selecting at least one command that controls delivery of the compressed audio signal as it is being sent to the computer by the data processor via the global computer network, and

   (4) accessing the plurality of files and the plurality of functional programs from the data processor via the global computer network.

27. The system of claim 26 wherein the computer enables a user, via the global computer network, to interface with the plurality of functional programs, to access information associated with the each functional program, and to access the plurality of files.

28. The system of claim 27 wherein the computer includes an application interface program for generating user requests that are sent via the global computer network to the data processor and that enable a user of the computer to access the plurality of files and the plurality of functional programs and to download information for storage by the data processor.

29. The system of claim 28 wherein the data processor includes a server for receiving a selection request generated by the application interface program and sent over the global computer network and for selecting, in response to the selection request, (1) transmission of the compressed audio signal to the computer via the global computer network, (2) receiving a compressed user audio signal from the computer via the global computer network, or (3) providing access by the user to one of the plurality of functional programs or one of the plurality of files.

30. The system of claim 29 wherein the audio processor is further for accessing audio data stored in the data processor via a telephone line.

31. A method for processing information that is accessible via a global computer network, comprising:

a. sending a signal representing audio information from an audio processor to a data processor;

b. compressing the audio information signal into a compressed audio signal by the data processor;

c. storing the compressed audio signal a plurality of files and a plurality of functional programs by the data processor;

d. receiving the stored compressed audio signal by a computer from the data processor via the global computer network;

e. decompressing the compressed audio signal by the computer;

f. selecting at least one command that controls delivery of the compressed audio signal as it is being sent to the computer by the data processor via the global computer network; and

g. accessing the plurality of files and the plurality of functional programs by the computer from the data processor via the global computer network.

32. The method of claim 31, further comprising enabling a user of the computer, via the global computer network, to interface with the plurality of functional programs, to access information associated with the each functional program, and to access the plurality of files.

33. The method of claim 32, further comprising:

a. generating user requests by an application interface program stored on the computer; and

b. sending the user requests via the global computer network to the data processor to enable a user of the computer to access the plurality of files and the plurality of functional programs and to download information for storage by the data processor.

34. The method of claim 33, further comprising:

a. receiving by the data processor a selection request generated by the application interface program and sent over the global computer network; and

c. selecting, by the data processor in response to the selection request:

(1) transmission of the compressed audio signal to the computer via the global computer network,

(2) receiving a compressed user audio signal from the computer via the global computer network, or

(3) providing access by the user to one of the plurality of functional programs or one of the plurality of files.

35. The method of claim 34, further comprising accessing audio data stored in the data processor via a telephone line.

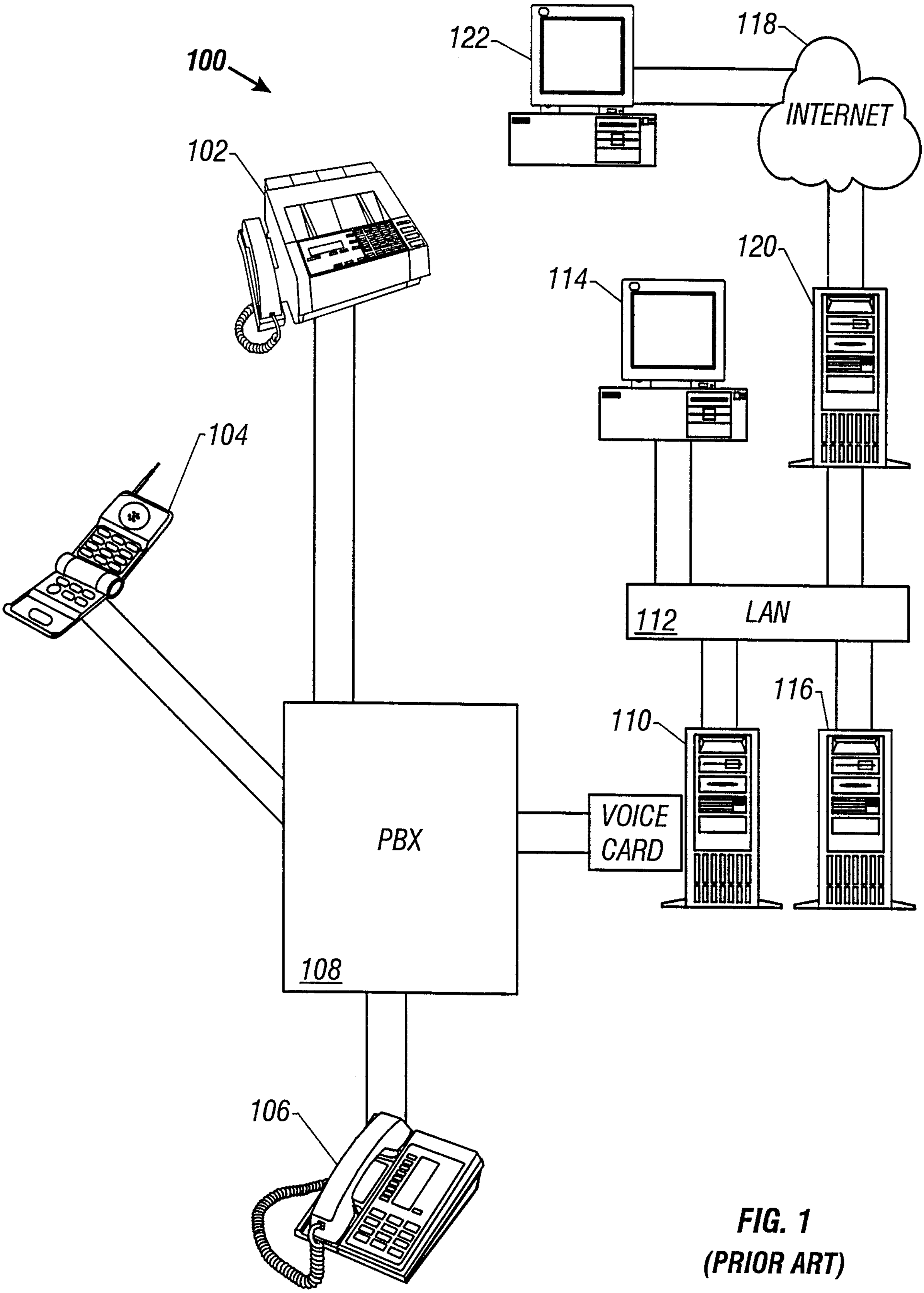

FIG. 1
(PRIOR ART)

2/13

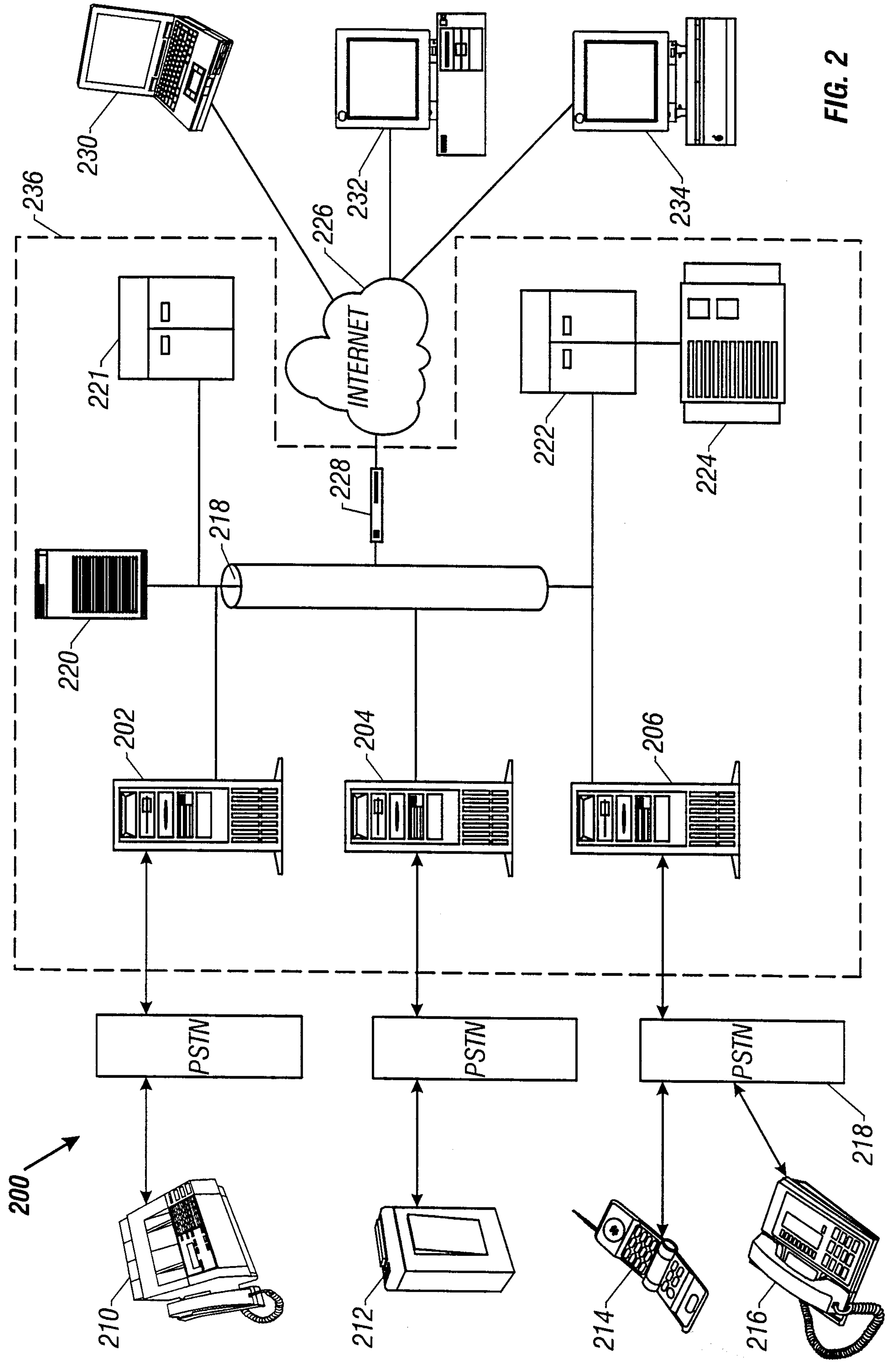
200
202
204
206
210
212
214
216
218
220
221
222
224
226
228
230
232
234
236
INTERNET
PSTN
PSTN
PSTN

FIG. 2

3/13

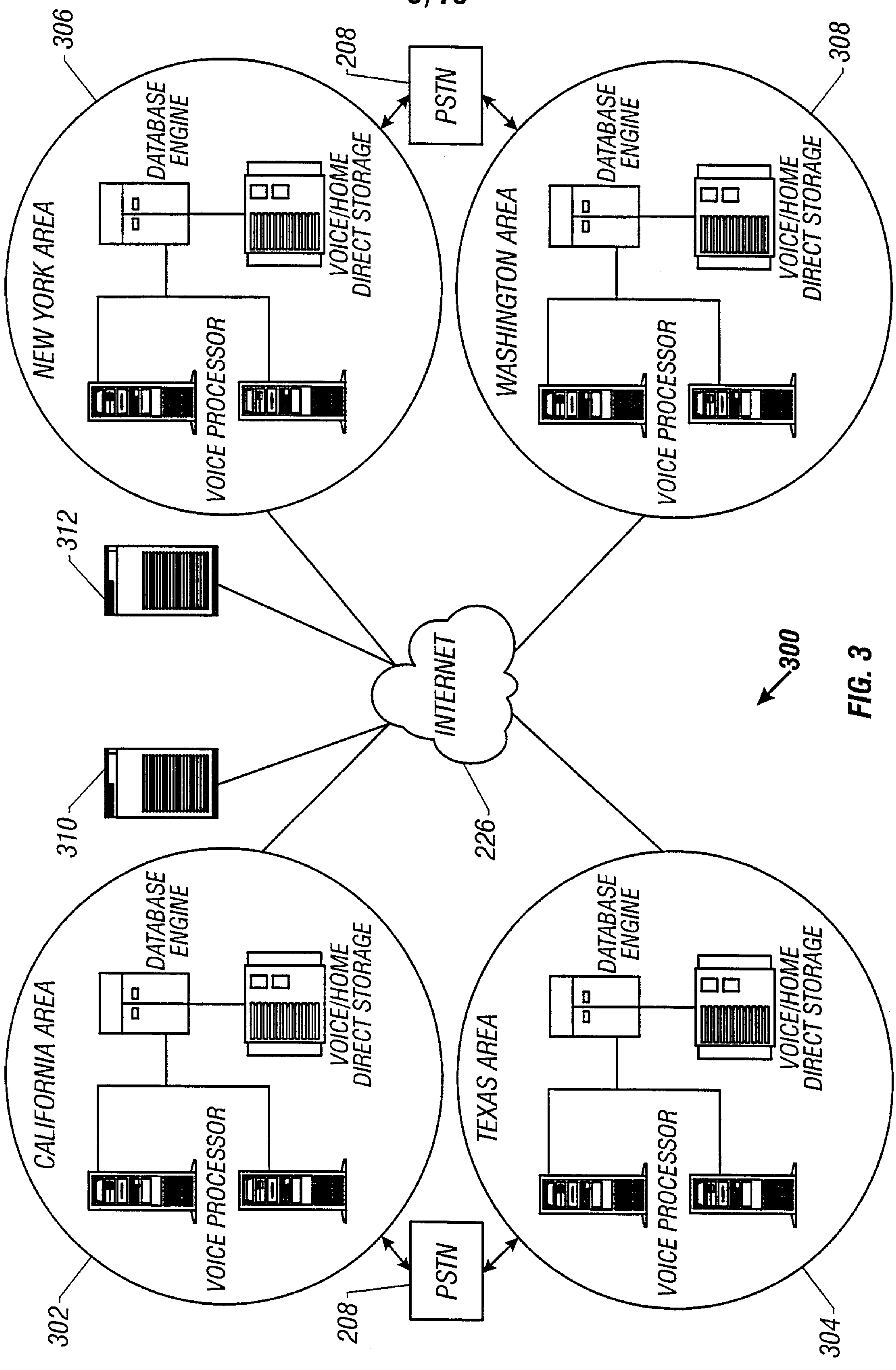
306
208
PSTN
308
NEW YORK AREA
DATABASE ENGINE
VOICE/HOME DIRECT STORAGE
VOICE PROCESSOR
WASHINGTON AREA
DATABASE ENGINE
VOICE/HOME DIRECT STORAGE
VOICE PROCESSOR
312
INTERNET
300
310
226
CALIFORNIA AREA
DATABASE ENGINE
VOICE/HOME DIRECT STORAGE
VOICE PROCESSOR
TEXAS AREA
DATABASE ENGINE
VOICE/HOME DIRECT STORAGE
VOICE PROCESSOR
PSTN
302
208
304

FIG. 3

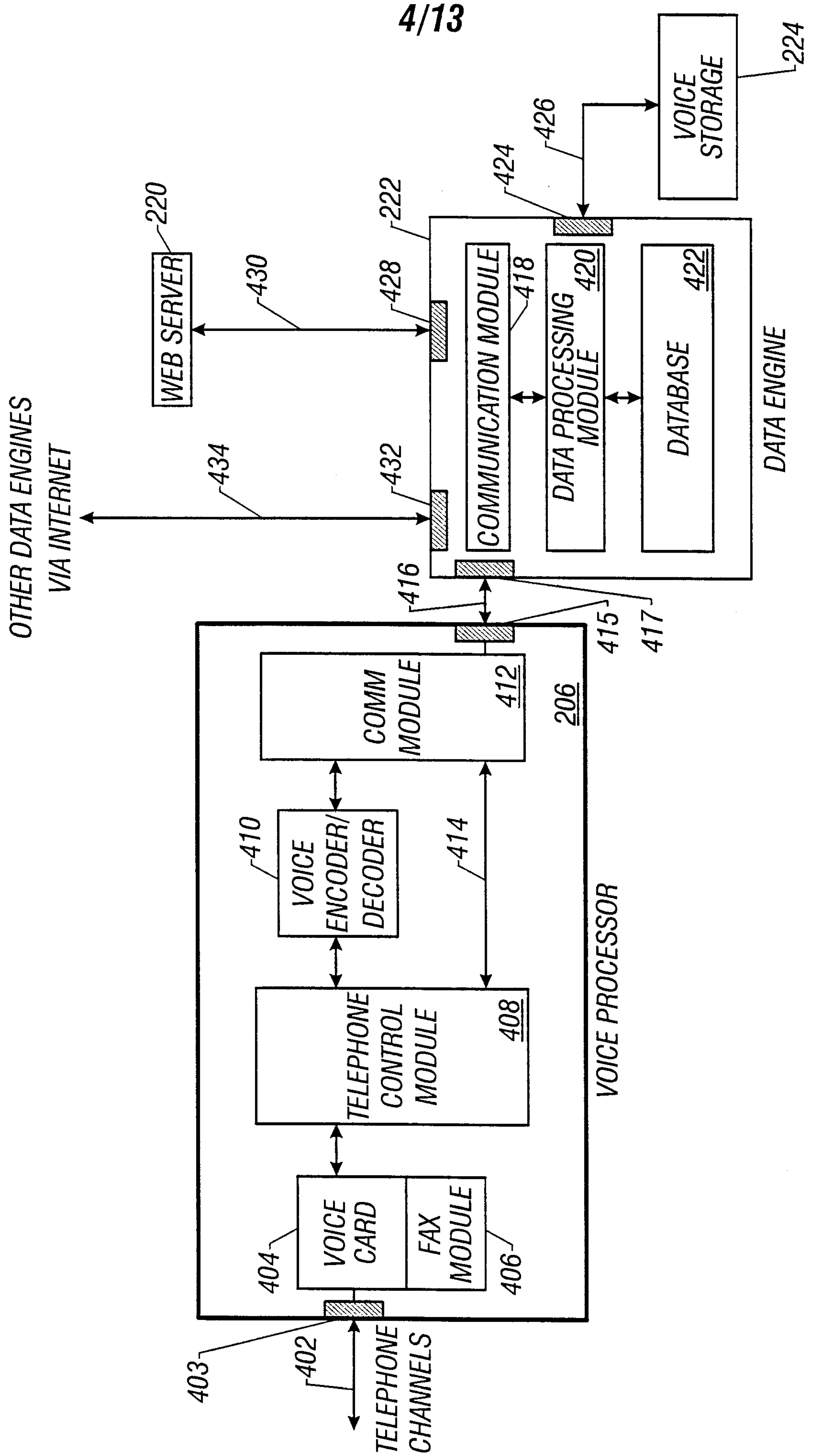
VOICE STORAGE
224
426
424
222
220
WEB SERVER
430
428
COMMUNICATION MODULE
418
DATA PROCESSING MODULE
420
DATABASE
422
DATA ENGINE
OTHER DATA ENGINES VIA INTERNET
434
432
416
415
417
COMM MODULE
412
206
VOICE ENCODER/ DECODER
410
414
TELEPHONE CONTROL MODULE
408
VOICE PROCESSOR
VOICE CARD
FAX MODULE
404
406
403
402
TELEPHONE CHANNELS

FIG. 4

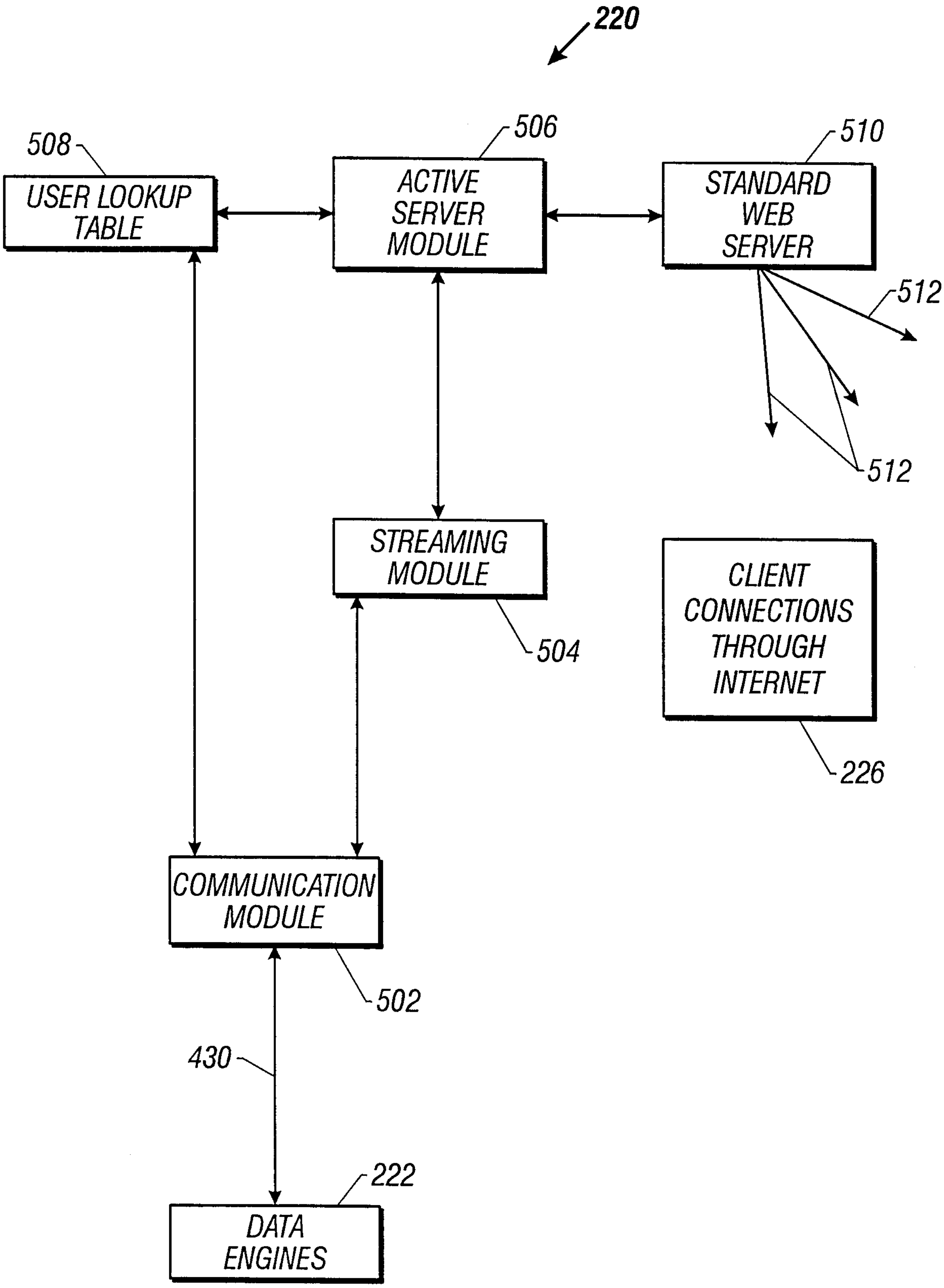
220
508
USER LOOKUP TABLE
506
ACTIVE SERVER MODULE
510
STANDARD WEB SERVER
512
512
STREAMING MODULE
504
CLIENT CONNECTIONS THROUGH INTERNET
226
COMMUNICATION MODULE
502
430
222
DATA ENGINES

FIG. 5

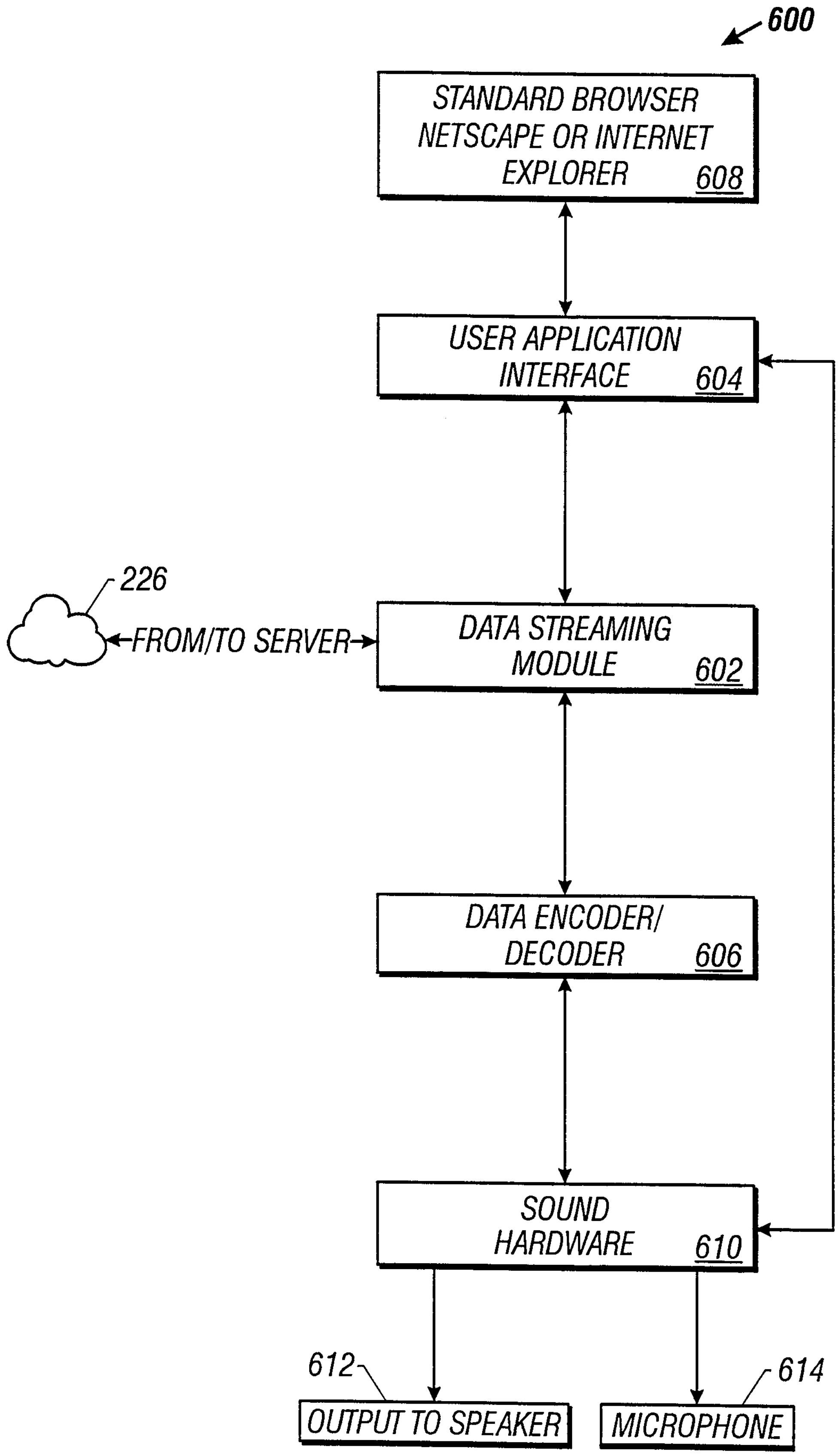
600
STANDARD BROWSER
NETSCAPE OR INTERNET
EXPLORER 608
USER APPLICATION
INTERFACE 604
226
FROM/TO SERVER
DATA STREAMING
MODULE 602
DATA ENCODER/
DECODER 606
SOUND
HARDWARE 610
612
OUTPUT TO SPEAKER
614
MICROPHONE

FIG. 6

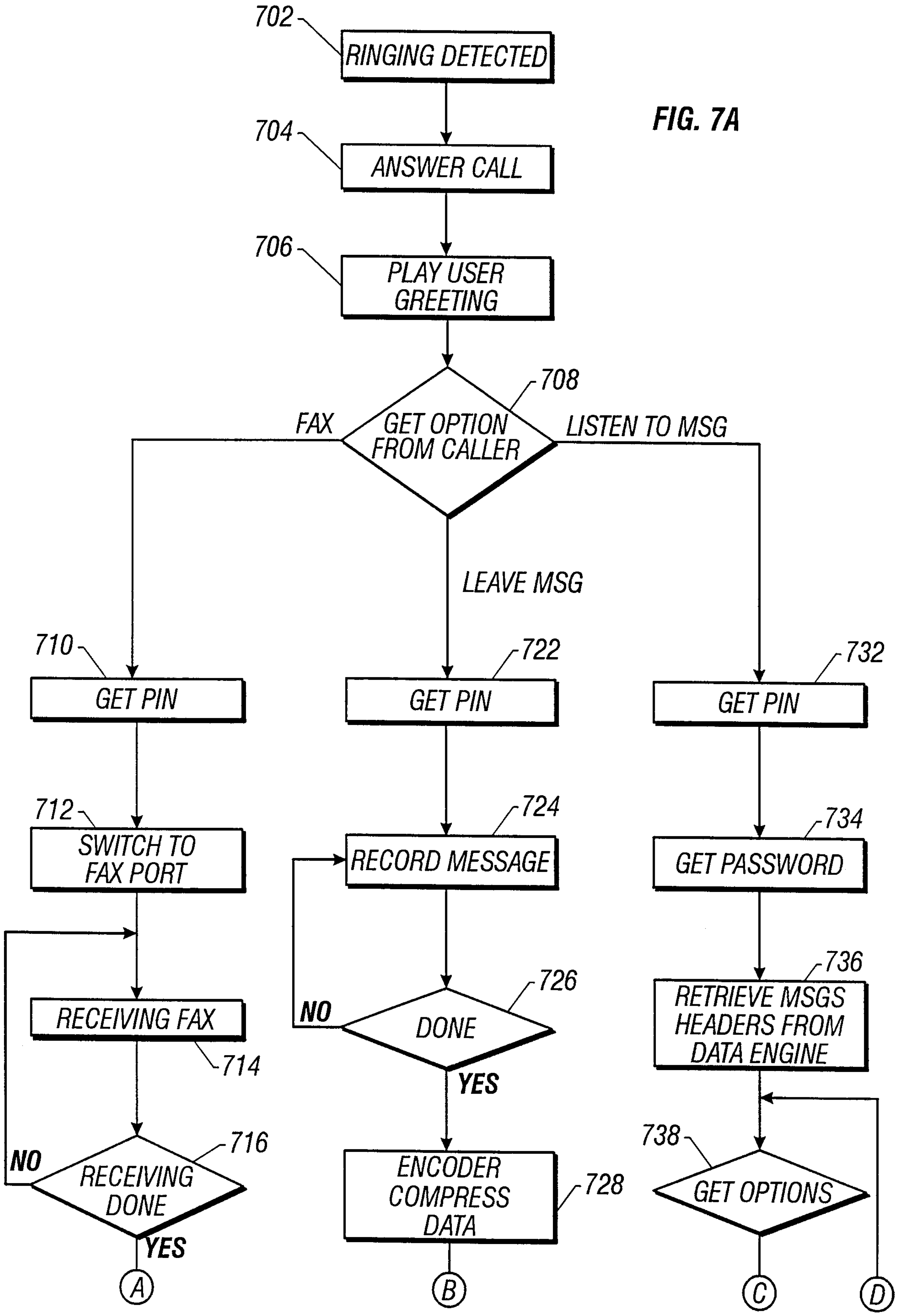
702
RINGING DETECTED
704
ANSWER CALL
706
PLAY USER GREETING
708
GET OPTION FROM CALLER
FAX
LISTEN TO MSG
LEAVE MSG
710
GET PIN
712
SWITCH TO FAX PORT
RECEIVING FAX
714
716
RECEIVING DONE
NO
YES
A
722
GET PIN
724
RECORD MESSAGE
726
DONE
NO
YES
728
ENCODER COMPRESS DATA
B
732
GET PIN
734
GET PASSWORD
736
RETRIEVE MSGS HEADERS FROM DATA ENGINE
738
GET OPTIONS
C
D

FIG. 7A

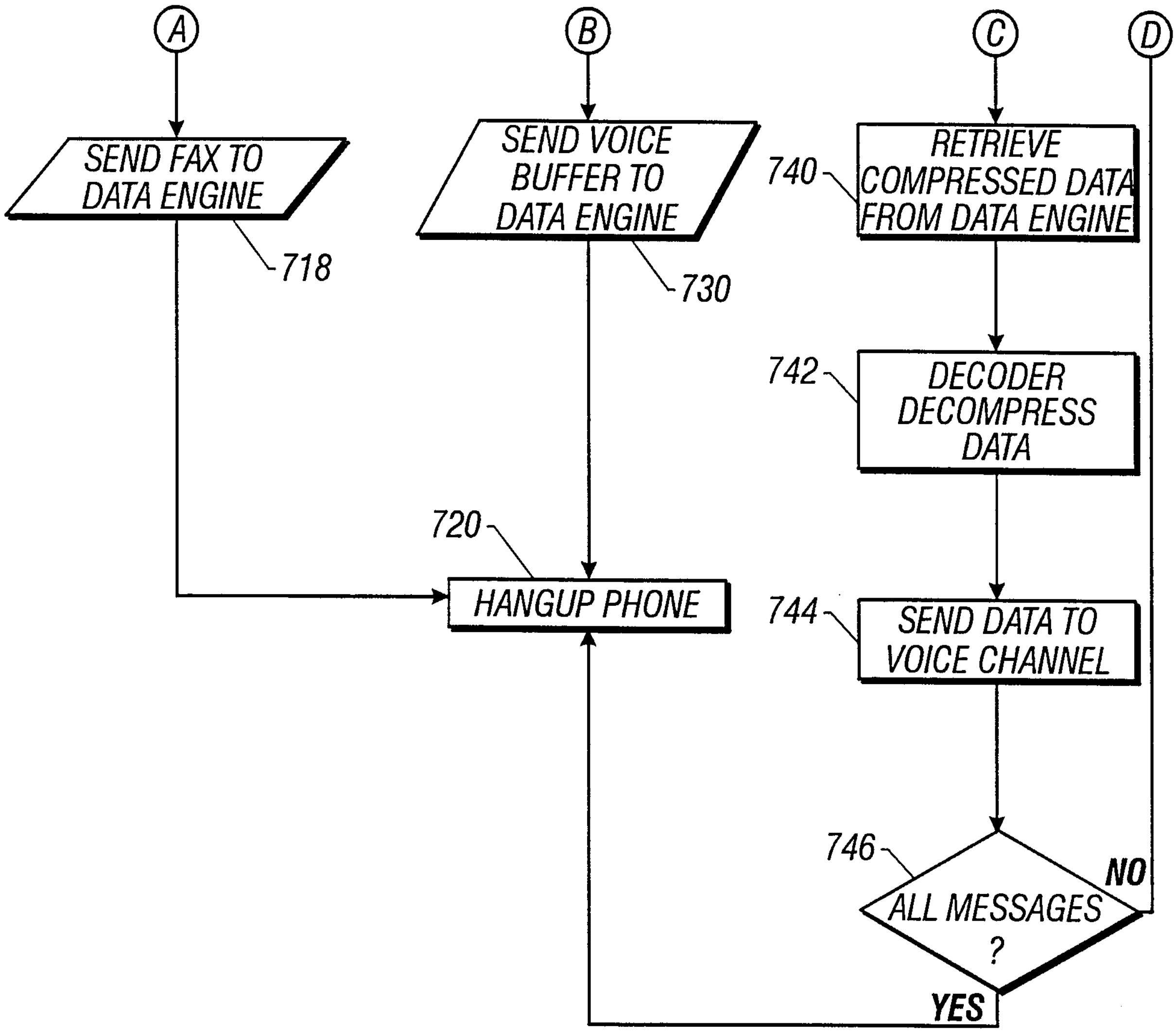
A
B
C
D
SEND FAX TO DATA ENGINE
718
SEND VOICE BUFFER TO DATA ENGINE
730
740
RETRIEVE COMPRESSED DATA FROM DATA ENGINE
742
DECODER DECOMPRESS DATA
720
HANGUP PHONE
744
SEND DATA TO VOICE CHANNEL
746
ALL MESSAGES ?
NO
YES

FIG. 7B

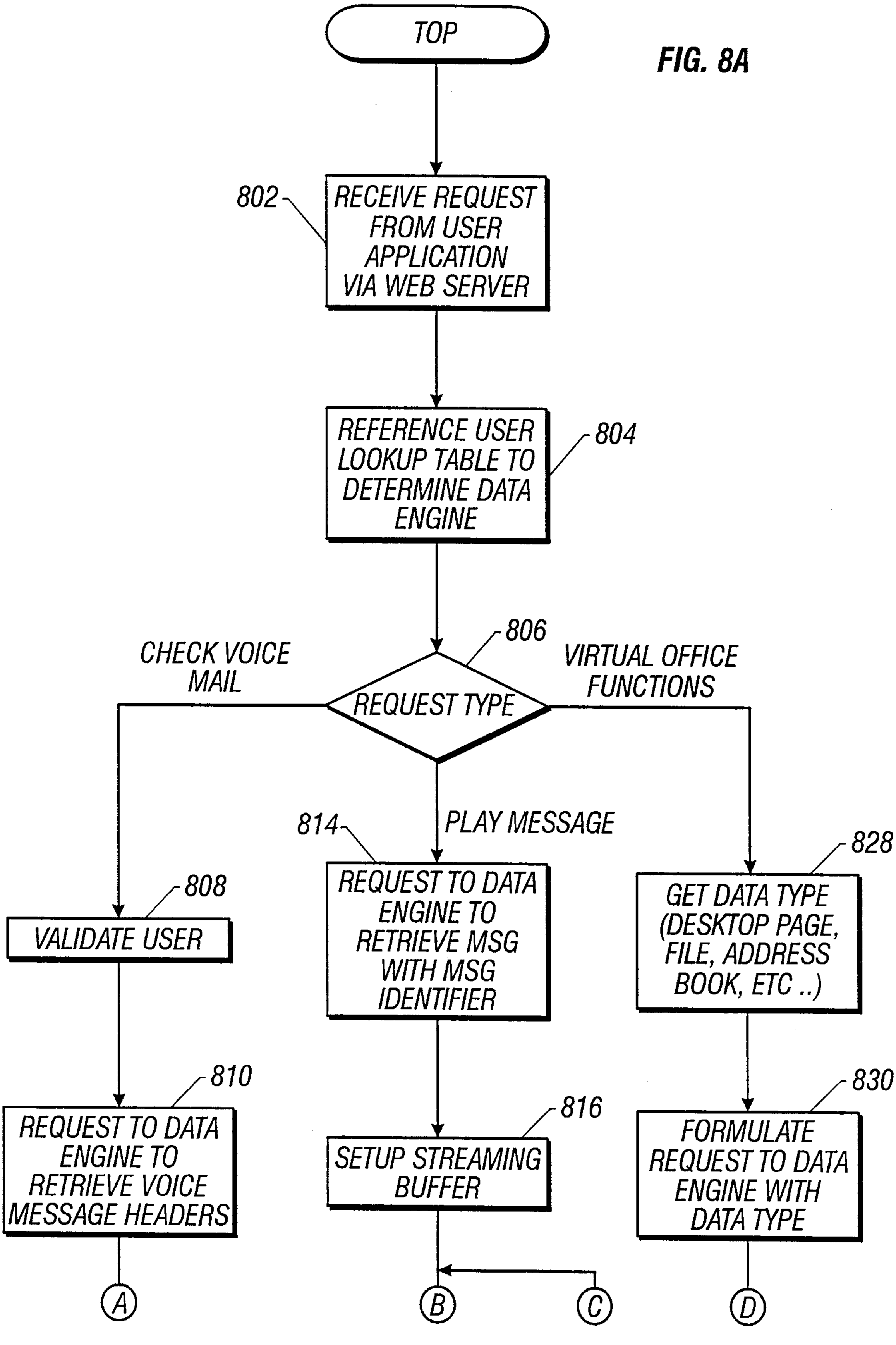
TOP
802
RECEIVE REQUEST FROM USER APPLICATION VIA WEB SERVER
REFERENCE USER LOOKUP TABLE TO DETERMINE DATA ENGINE
804
806
CHECK VOICE MAIL
REQUEST TYPE
VIRTUAL OFFICE FUNCTIONS
814
PLAY MESSAGE
828
808
VALIDATE USER
REQUEST TO DATA ENGINE TO RETRIEVE MSG WITH MSG IDENTIFIER
GET DATA TYPE (DESKTOP PAGE, FILE, ADDRESS BOOK, ETC ..)
810
816
830
REQUEST TO DATA ENGINE TO RETRIEVE VOICE MESSAGE HEADERS
SETUP STREAMING BUFFER
FORMULATE REQUEST TO DATA ENGINE WITH DATA TYPE
A
B
C
D

FIG. 8A

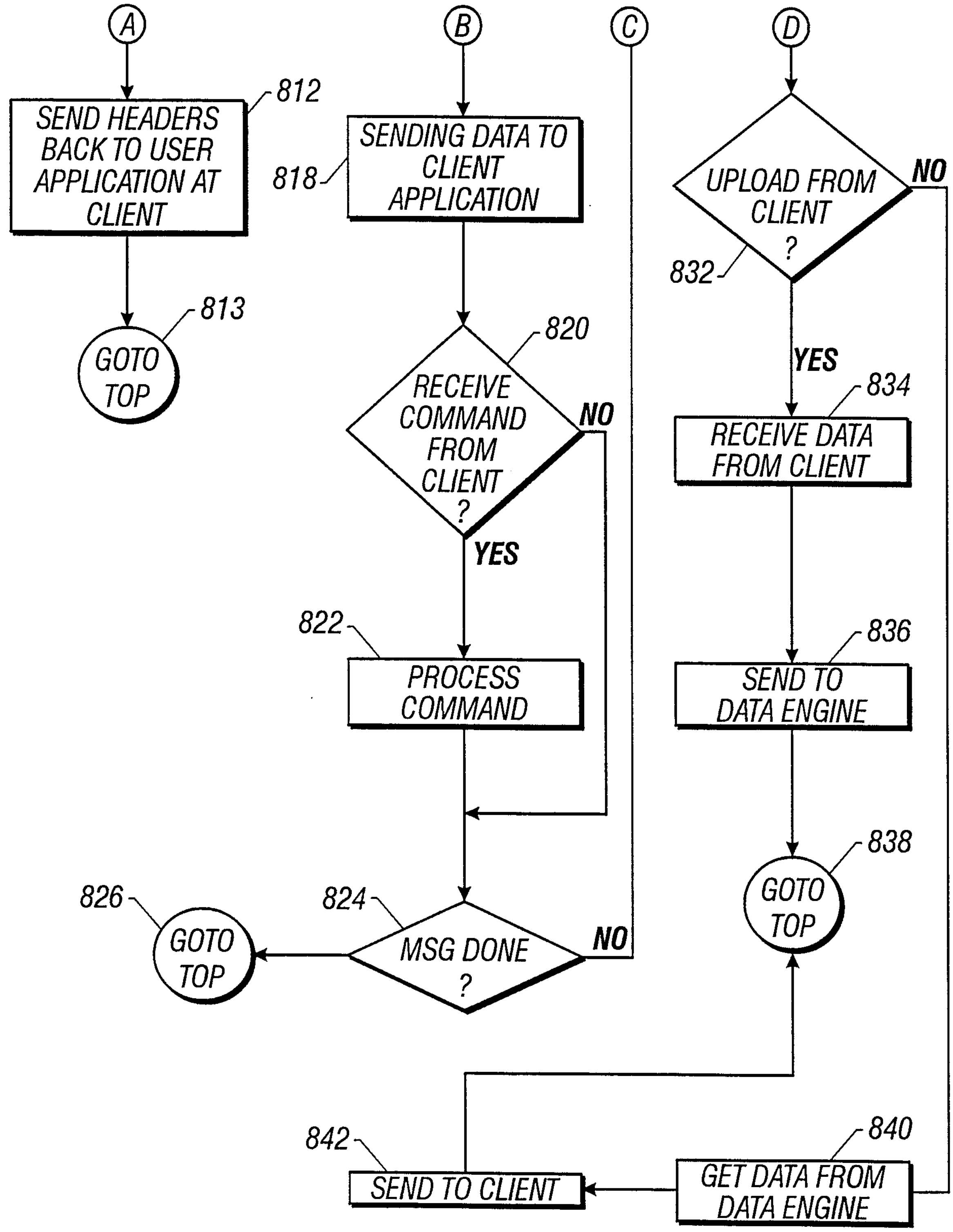
A
SEND HEADERS BACK TO USER APPLICATION AT CLIENT
812
GOTO TOP
813
B
SENDING DATA TO CLIENT APPLICATION
818
RECEIVE COMMAND FROM CLIENT ?
820
NO
YES
PROCESS COMMAND
822
MSG DONE ?
824
NO
GOTO TOP
826
C
D
UPLOAD FROM CLIENT ?
832
NO
YES
RECEIVE DATA FROM CLIENT
834
SEND TO DATA ENGINE
836
GOTO TOP
838
GET DATA FROM DATA ENGINE
840
SEND TO CLIENT
842

FIG. 8B

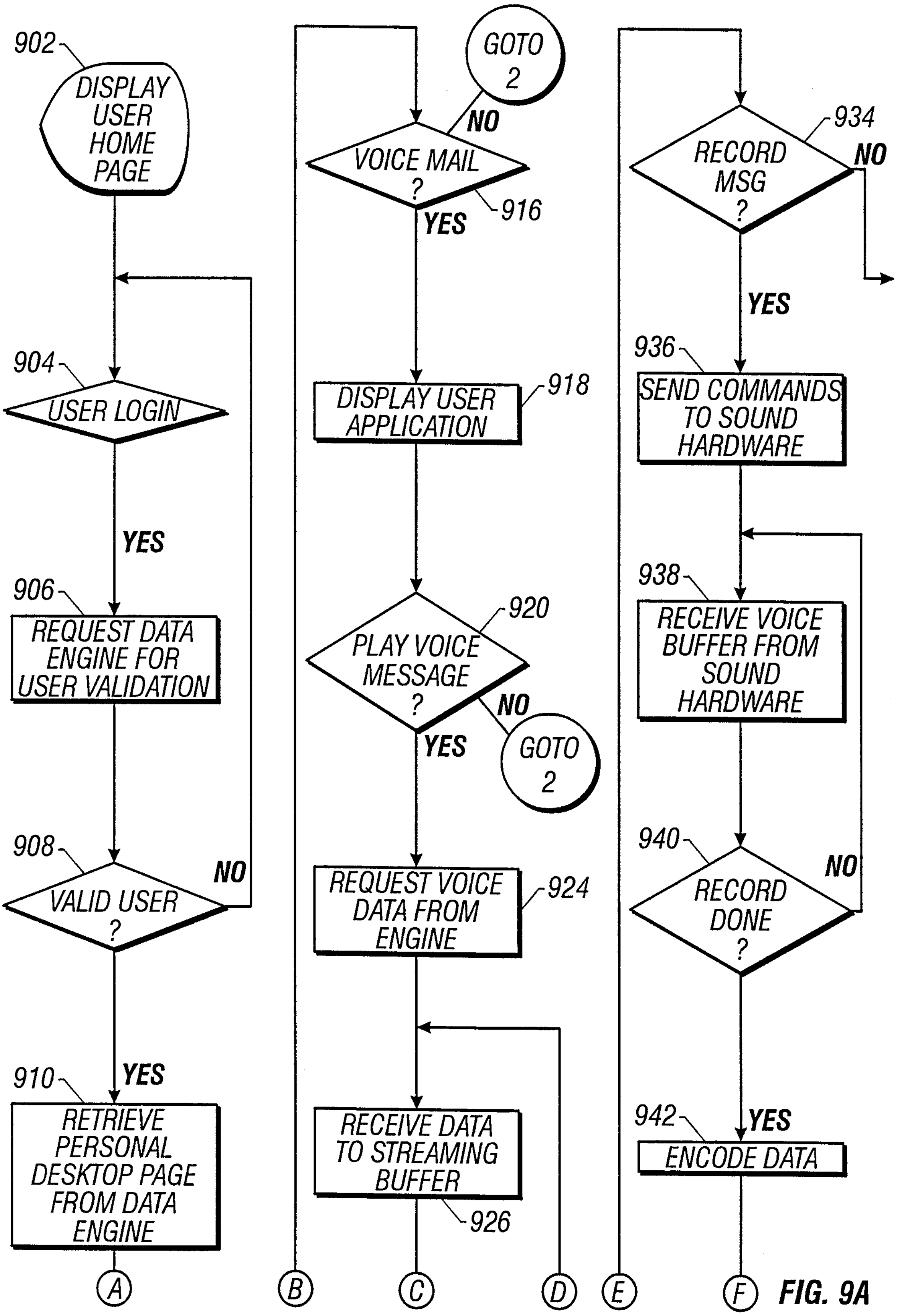
902
DISPLAY USER HOME PAGE
904
USER LOGIN
YES
906
REQUEST DATA ENGINE FOR USER VALIDATION
908
VALID USER ?
NO
YES
910
RETRIEVE PERSONAL DESKTOP PAGE FROM DATA ENGINE
A
B
GOTO 2
NO
VOICE MAIL ?
916
YES
DISPLAY USER APPLICATION
918
PLAY VOICE MESSAGE ?
920
NO
GOTO 2
YES
REQUEST VOICE DATA FROM ENGINE
924
RECEIVE DATA TO STREAMING BUFFER
926
C
D
E
RECORD MSG ?
934
NO
YES
936
SEND COMMANDS TO SOUND HARDWARE
938
RECEIVE VOICE BUFFER FROM SOUND HARDWARE
940
RECORD DONE ?
NO
942
YES
ENCODE DATA
F

FIG. 9A

FIG. 9A

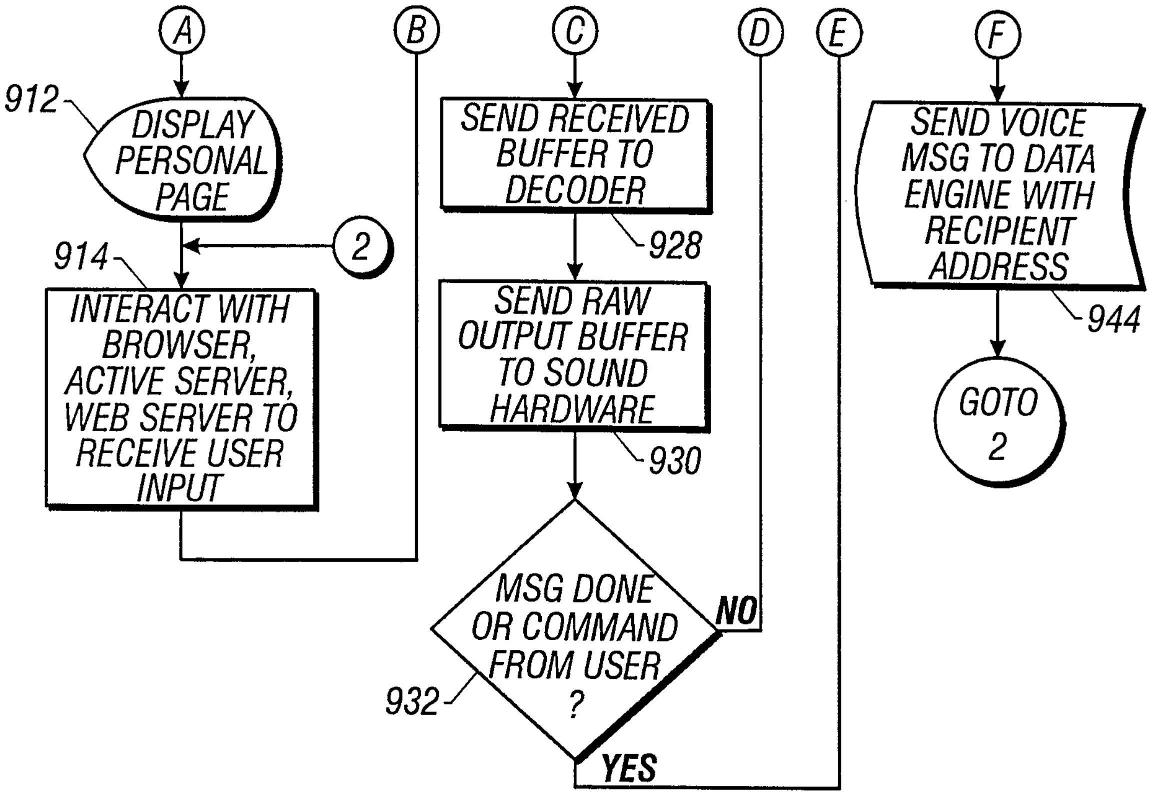
A
B
C
D
E
F
912
DISPLAY PERSONAL PAGE
2
914
INTERACT WITH BROWSER, ACTIVE SERVER, WEB SERVER TO RECEIVE USER INPUT
SEND RECEIVED BUFFER TO DECODER
928
SEND RAW OUTPUT BUFFER TO SOUND HARDWARE
930
MSG DONE OR COMMAND FROM USER ?
932
NO
YES
SEND VOICE MSG TO DATA ENGINE WITH RECIPIENT ADDRESS
944
GOTO 2

FIG. 9B

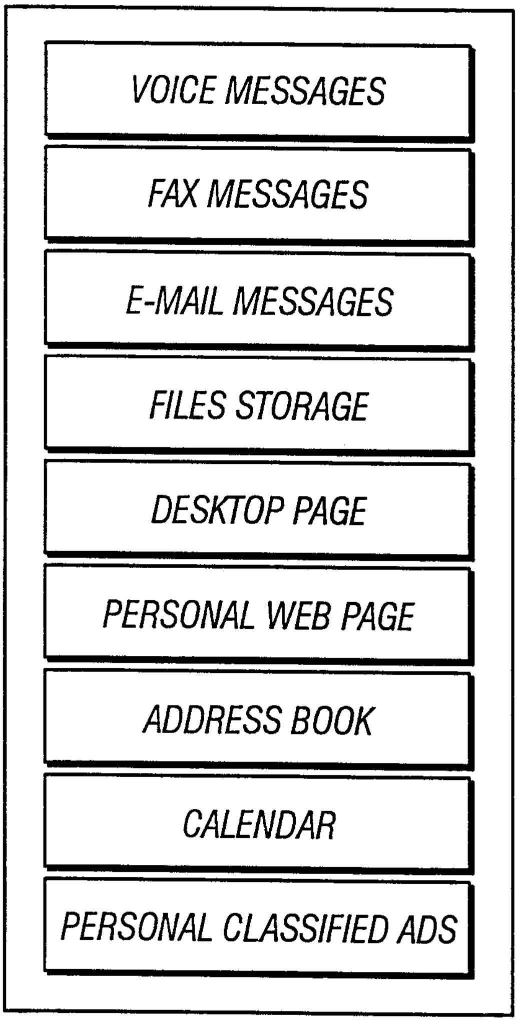
VOICE MESSAGES
FAX MESSAGES
E-MAIL MESSAGES
FILES STORAGE
DESKTOP PAGE
PERSONAL WEB PAGE
ADDRESS BOOK
CALENDAR
PERSONAL CLASSIFIED ADS

FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/29529

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :G06F 15/00; H04J 3/20; H04L 12/66
US CL : 370/401;84/622;463/41;246/187
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. : 370/401;84/622;463/41;246/187;379/212,211;709/239, 234;395/182.16;

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 practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,764,639 A (STAPLES et al) 09 JUNE 1998, see entire document	1-35
Y,P	US 5,999,612 A (DUNN et al) 07 DECEMBER 1999, see entire document	1-35
Y,P	US 5,898,833 A (KIDDER) 27 APRIL 1999, see entire document	1-35
Y,P	US 5,918,002 A (KLEMETS et al) 29 JUNE 1999 see entire document	1-35
Y,P	US 5,940,598 A (STRAUSS et al) 17 AUGUST 1999, see entire document	1-35
A	US 5,734,835 A (SELKER) 31 MARCH 1998, see entire document	1-35

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

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"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
08 FEBRUARY 2000	04 APR 2000

Name and mailing address of the ISA/US	Authorized officer
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,838,682 A (DEKELBAUM et al) 17 NOVEMBER 1998, see entire document	1-35