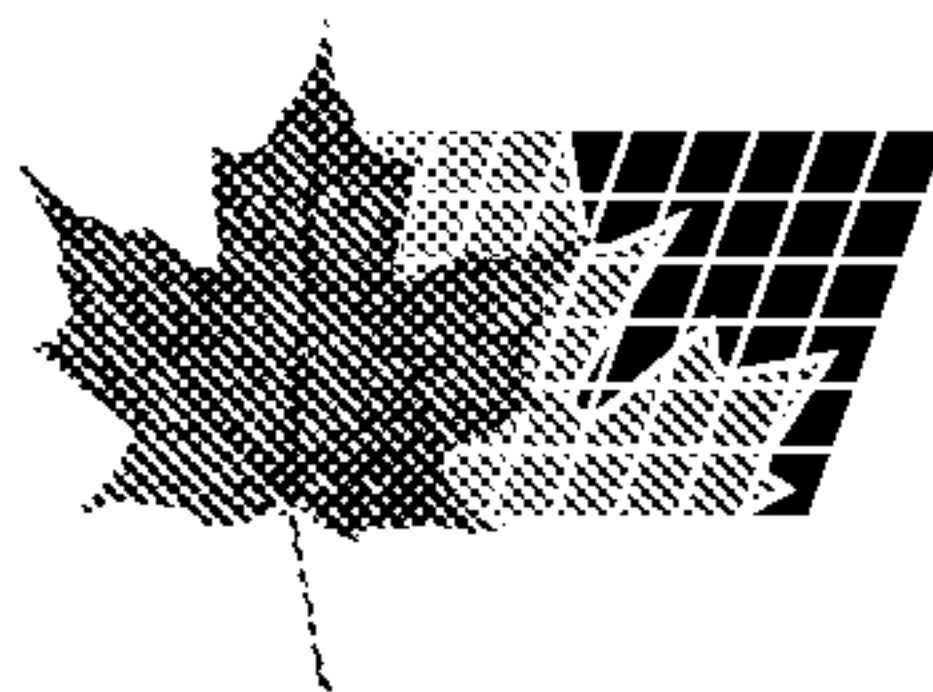




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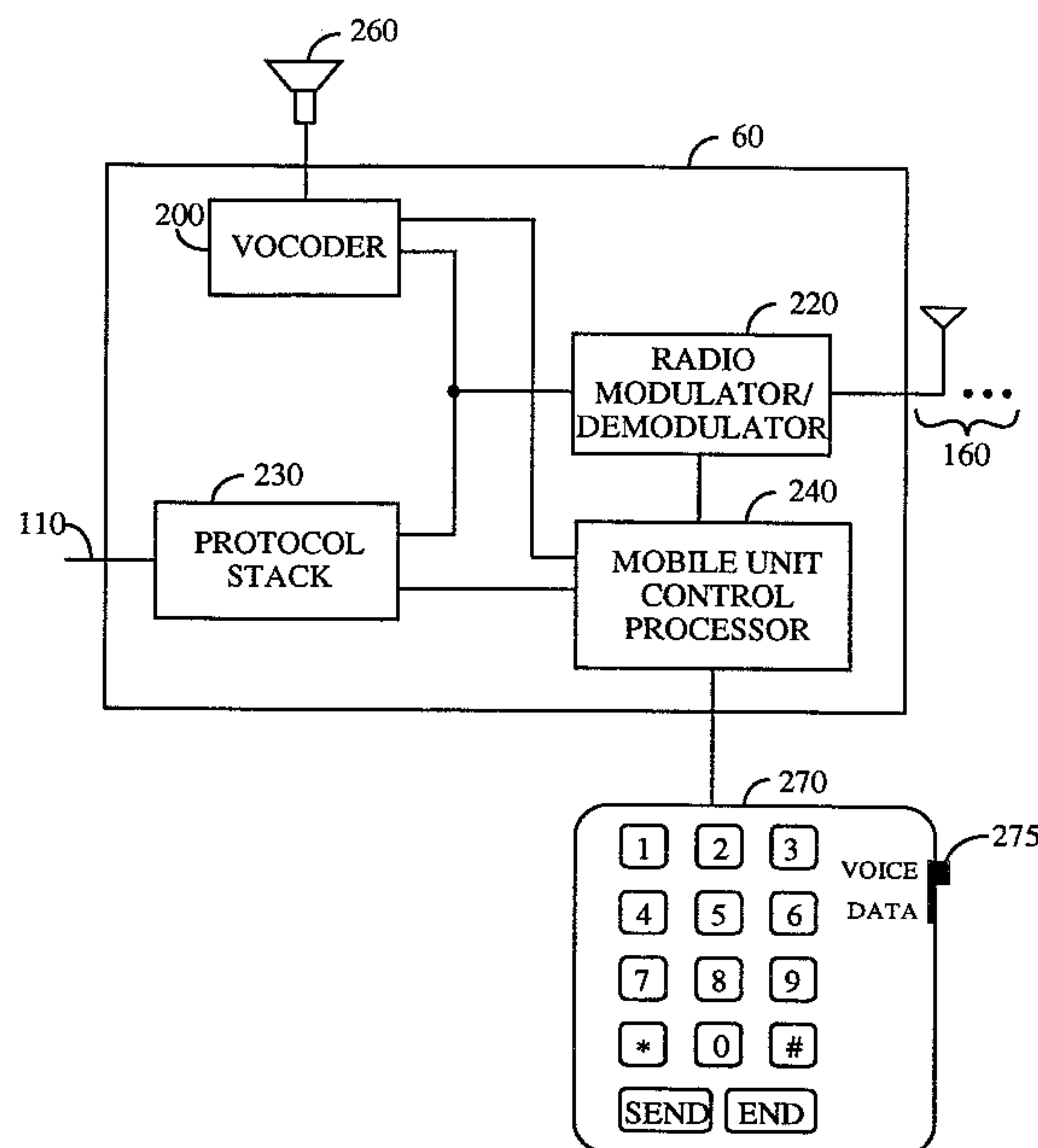
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(54) **PROCEDE D'APPEL OU D'ANNULATION DE SERVICES
VOCAUX OU DE DONNEES A PARTIR D'UNE STATION
MOBILE**

(54) **METHOD OF INVOKING AND CANCELLING VOICE OR DATA
SERVICE FROM A MOBILE UNIT**



(57) Procédé d'appel et d'annulation de services vocaux et de données entre une unité mobile et une station de base. Avec un téléphone classique les liaisons sont les mêmes pour un service vocal et un service de données, mais avec les liaisons numériques sans fil, les connexions vocales et de données diffèrent, ce qui a conduit à créer de nouvelles commandes d'appel qui indiquent le dessein de la connexion. Lesdites commandes peuvent également servir à indiquer le dessein de l'appel sur des unités mobiles capables d'assurer les deux services, mais non simultanément; elles peuvent en outre servir à l'appel simultané des deux types de services.

(57) A method of invoking and cancelling voice and data service between a mobile unit and a base station. Using a standard telephone system, the connection for a voice service and a data service is the same. With the introduction of the digital wireless link, the voice connection and the data connection are different. Therefore new dialing commands which indicate the intent of the connection are created. These commands can also be used to designate the intent of the call from a mobile unit capable of data and voice service but not capable of simultaneous voice and data service. They can also be used to invoke simultaneous voice and data services.





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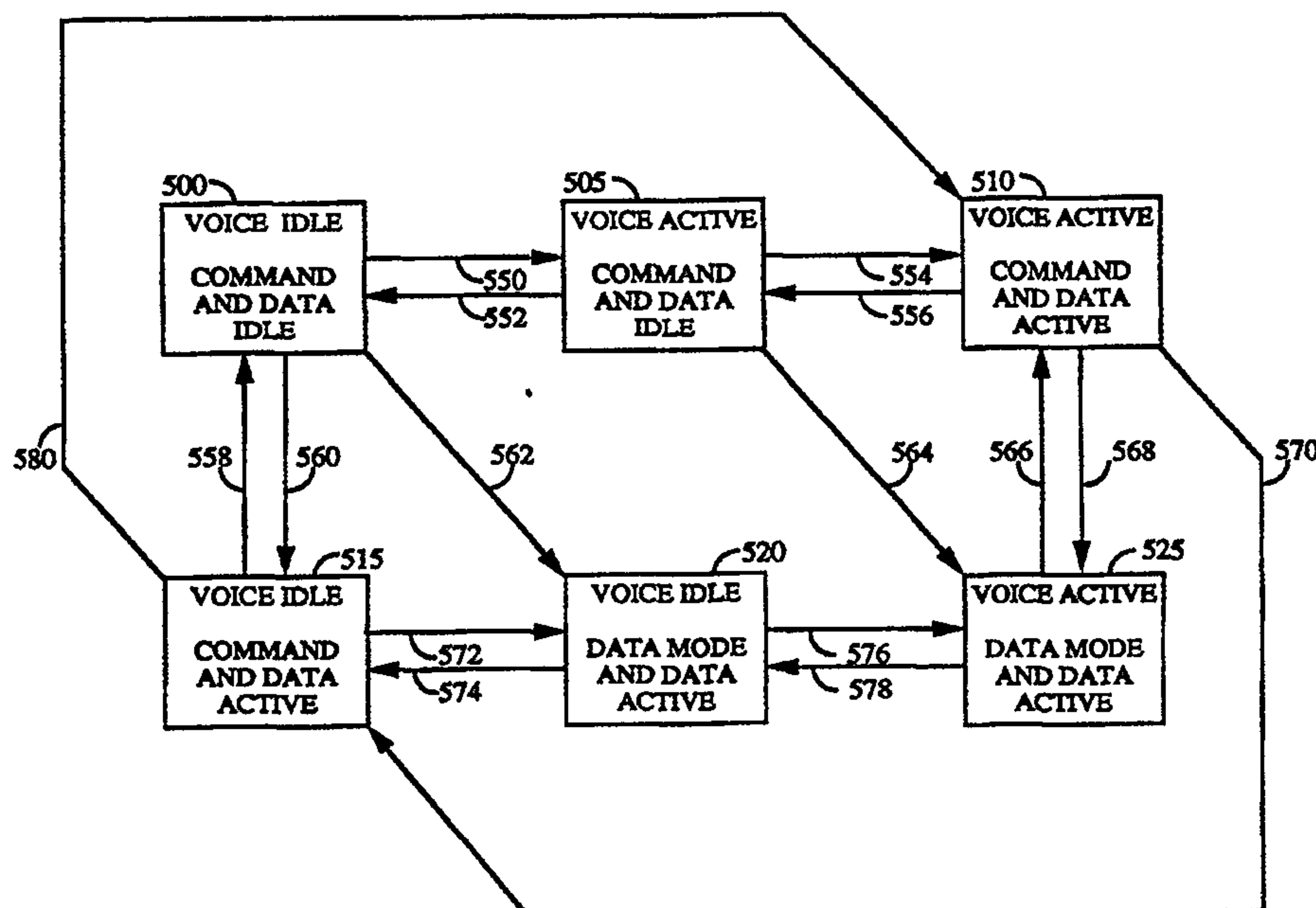
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(54) Title: METHOD OF INVOKING AND CANCELLING VOICE OR DATA SERVICE FROM A MOBILE UNIT



(57) Abstract

A method of invoking and cancelling voice and data service between a mobile unit and a base station. Using a standard telephone system, the connection for a voice service and a data service is the same. With the introduction of the digital wireless link, the voice connection and the data connection are different. Therefore new dialing commands which indicate the intent of the connection are created. These commands can also be used to designate the intent of the call from a mobile unit capable of data and voice service but not capable of simultaneous voice and data service. They can also be used to invoke simultaneous voice and data services.

2 1 7 6 5 9 0 1**METHOD OF INVOKING AND CANCELING VOICE OR DATA
SERVICE FROM A MOBILE UNIT****BACKGROUND OF THE INVENTION**

5

I. Field of the Invention

The present invention relates to communication. More particularly,
the present invention relates to a novel and improved method of invoking
10 and canceling a voice or a data connection.

II. Description of the Related Art

A variety of apparatus exists today that use standard telephone
15 networks to convey data from one terminal to another. One of the most
common terminals which uses a standard telephone network to convey
data is the facsimile (FAX) machine. Like other terminal equipment that
uses standard telephone networks, a FAX machine uses a modem to
translate digital information to audible analog tones for transmission over
20 the telephone network. At the receiving FAX machine, a modem is used to
convert the tones back into an estimate of the original digital information
sent by the transmitting FAX machine.

With the deployment of cellular and personal communications
wireless systems, the end user may wish to connect his terminal equipment
25 to a mobile communication device instead of directly to a land telephone
network. Digital wireless communication equipment typically uses
vocoders to convert incoming voice signals into digital bits for transmission
over the channel and to perform the reverse function. Vocoders are
tailored to sample and compress human voice. Because modem tones differ
30 significantly from human voice, the vocoder can degrade the modem tones.
Also maximizing the capacity of a wireless system in terms of the number of
simultaneous users that can be handled is extremely important. Digitizing
modem tones with a vocoder and sending them over the digital wireless
link is an inefficient use of the radio channel.

35 A more efficient, flexible, and reliable transmission means is to
provide a mechanism to transmit the digital data over the digital wireless
link directly, thus providing a mobile unit that has the capability to receive
and produce both audible voice and digital data. This configuration
presents some unique opportunities to take advantage of the digital link to

provide high quality service. One principal advantage is that a mobile unit capable of both data and voice services may be used simultaneously to provide both services.

It is therefore the object of the present invention to provide a method and apparatus of invoking simultaneous voice and data service with a single mobile unit.

SUMMARY OF THE INVENTION

10 The present invention is a novel method of invoking and canceling voice and data service between a mobile unit and a base station. A mobile unit capable of simultaneous voice and data service must be able to transition between several states. Voice communication has two different states: active and idle. Data communication is made up of two links having three possible states: command mode and data idle, command mode and data active, data mode and data active. The command mode and data mode refer to the status of communication between the modem and the terminal unit. Command mode indicates that the modem itself is receiving commands from the terminal unit. Data mode indicates that the modem is
20 transparently passing data to and from the terminal unit.

Together the two voice states and the three data states combine to create six different states in which a dual capability mobile unit may operate. The key to operation within the dual capability mobile unit is the ability to transition between the six states. Standard modem commands may be incorporated into the present invention. However a set of new commands is necessary for complete functionality.

Using a standard telephone system, the connection

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for a voice service and a data service is the same. With the introduction of the digital wireless link, the voice connection and the data connection are different. For example, the base station must know whether to route an incoming call to a DSP and modem combination or to a vocoder. Therefore new dialing commands which indicate the intent of the connection are created. These commands can also be used to designate the intent of the call from a mobile unit capable of data and voice service but not capable of simultaneous voice and data service.

According to one aspect the invention provides a telephone modem apparatus capable of simultaneously for providing two connection paths to a telephone network, a first path for providing audible communication, and a second path for providing data communication, said telephone modem apparatus comprising: a mobile unit for receiving a stream of standard digital data from a terminal equipment unit and for transmitting an information signal wherein said mobile unit comprises: a protocol stack for receiving a stream of standard digital data, packetizing said stream of standard digital data, and providing a set of data packets for said second path; a vocoder for receiving audible input, for encoding said audible input, and providing encoded output for said first path; a key pad for receiving user input and providing manual user input command wherein said manual user input commands can designate invocation of communication on said first path or said second path; a radio modulator for receiving and modulating said set of data packets, and said encoded output,

said set of data packets for transmission, and for producing said information signal for said first and second paths, a wireless link for conveying said information signal, a base station for receiving said information signal, said base station comprising, a digital signal processor for receiving said set of data packets and providing a corresponding output to said telephone network from said second path, and a vocoder for receiving said encoded output and providing a corresponding output to said telephone network from said first path, said digital signal processor including means for initiating voice communication over said first path in response to a voice request within said set of data packets.

Many different methods are contemplated according to the invention. Among these is a method of invoking and canceling voice service and data service in a communication system comprising a mobile unit supporting simultaneous voice and data communication having a keypad for receiving and providing user data and a speaker, microphone, and vocoder unit for receiving and providing encoded voice signals, and a terminal equipment unit input for receiving and providing digital data, said communication system further comprising a base station having a vocoder portion for receiving and providing said encoded voice signals and said user data and a modem portion for receiving and providing said digital data and said user data wherein a wireless link couples said encoded voice signal, said user data, and said digital data between said mobile unit and said base station, comprising the steps of: receiving at said mobile unit from said terminal

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equipment input a first modem command within said digital data wherein said first modem command designates a directory number and a request to establish a first voice communication between said mobile unit and said base station, and receiving said first modem command at said modem portion of said base station and establishing said first voice communication in response to said first modem command such that said encoded voice signals are passed from said speaker, microphone, and vocoder unit over said wireless link to said vocoder portion of said base station and from said vocoder portion of said base station over said wireless link to said speaker, microphone, and vocoder unit.

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BRIEF DESCRIPTION OF THE DRAWINGS

The features, objects, and advantages of the present invention will become more apparent from the detailed description set forth below when
5 taken in conjunction with the drawings in which like reference characters identify correspondingly throughout and wherein:

Figure 1 is an apparatus that uses standard telephone networks to convey data from one terminal to another;

Figure 2 is an apparatus that uses standard telephone networks and a
10 digital wireless link to convey data from one terminal to another and to convey voice from one telephone to another;

Figure 3 is a detailed representation of an exemplary configuration of a mobile unit used to connect terminal equipment to a telephone network; and

15 Figures 4 illustrates the six possible mobile unit states and the possible transfers from one state to another.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

20

Several methods exist today that use standard telephone networks to convey data from one terminal to another. Terminals that connect by telephone networks can be FAX machines, personal computers, credit card verification machines, and telemetry devices. The standard connection of
25 these types of devices is shown in Figure 1. For example assume terminal equipment 10 is transmitting information to terminal equipment 50. Terminal equipment 10 produces digital data 110 representative of the information. Modem 20 converts digital data 110 to analog signal 120. Analog signal 120 is of a proper bandwidth and power level to be
30 transferable over standard telephone network 30. Telephone network 30 conveys analog signal 120 to its destination. The telephone network may introduce noise such that output audible signal 130 is an estimate of analog signal 120. Modem 40 converts audible signal 130 to digital data 140 which is an estimate of digital data 110. Terminal equipment 50 receives digital
35 data 140 and can act on the estimate of the information sent by terminal equipment 10. Most such links are bi-directional with the reverse functions working in the same manner as the forward.

Figure 1 is a highly simplified diagram. Actual implementations of these connections can take on a variety of forms. For example in some

equipment, such as a standard FAX machine, the terminal equipment and the modem reside in the same housing. Also telephone network 30 may use any of a variety of methods well known in the art to convey analog signal 120 to its destination. Such methods may include digitizing the signal and transmitting the signal via satellite to a remote location where audible signal 130 is created.

A wireless link is introduced into the configuration of Figure 1 when a user would like to connect his terminal equipment but does not have access to a land telephone network. The user may instead have a digital mobile communications device. Figure 2 is an exemplary embodiment of such a configuration. In Figure 2, modem 20 has been replaced with mobile unit 60, wireless link 160, and digital signal processor (DSP) and modem 70. DSP and modem 70 resides in base station 80 which is also capable of handling digital voice communications. Figure 2 assumes that just one wireless link has been introduced. The description that follows applies equally if communication is achieved with two wireless links.

Referring to Figure 2, assume again that terminal equipment 10 is transmitting information to terminal equipment 50. Terminal equipment 10 produces digital data 110 representative of the information. Mobile unit 60 modulates digital data 110 and provides output over wireless link 160. The signal from wireless link 160 is received by base station 80 and DSP and modem 70 through switch 90. DSP and modem 70 converts the digital signal to analog signal 120 which is the same signal output by modem 20 in Figure 1. DSP and modem 70 outputs analog signal 120 through switch 95. Telephone network 30 conveys analog signal 120 to its destination. The telephone network may introduce noise such that output audible signal 130 is an estimate of analog signal 120. Modem 40 converts audible signal 130 to digital data 140 which is an estimate of digital data 110. Terminal equipment 50 receives digital data 140 and can act on the estimate of the information sent by terminal equipment 10. This link is bi-directional with the reverse functions working in the same manner as the forward.

In Figure 2, base station 80 is also capable of handling voice communications. If mobile unit 60 and base station 80 are involved in voice communication, the voice signal from mobile unit 60 is transmitted over wireless link 160 and received by base station 80. The voice signal is received by vocoder 75 through switch 90. Audible signal 125 is routed to Telephone network 30 through switch 95. Telephone network 30 produces

audible signal 135 for telephone 55. This link is bi-directional with the reverse functions working in the same manner as the forward.

One of the great advantages of the digital link is the great flexibility available at the mobile unit. With a standard FM analog link, a separate connection is needed for each type of service. For example, a user cannot place a telephone call while sending a FAX. However, due to the use of a vocoder which comprises an efficient compression mechanism, a digital link can send standard voice at a rate less than full rate. Thus a mobile unit may send data communication in the time slots where no voice is sent. This mechanism allows a mobile unit to provide simultaneous bi-directional voice and data capabilities.

Figure 3 provides a more detailed representation of an exemplary configuration of mobile unit 60. In Figure 3, mobile unit 60 provides both voice and data capabilities. In Figure 3, digital data 110 is connected to protocol stack 230 within mobile unit 60. Protocol stack 230 is capable of bi-directional communication with terminal equipment 10, mobile unit control processor 240 and radio modulator/demodulator 220. When protocol stack 230 receives digital data 110 for transmission over wireless link 160, it provides any required encoding and passes the encoded information to radio modulator/demodulator 220 under the control of mobile unit control processor 240. Radio modulator/demodulator 220 modulates the encoded information and provides the signal for transmission to wireless link 160. Inversely when a signal containing information for terminal equipment 10 arrives, radio modulator/demodulator 220 demodulates the signal and provides it to protocol stack 230.

Likewise when vocoder 200 receives audible input from speaker/microphone 260 for transmission over wireless link 160, it encodes the information and passes the encoded information to radio modulator/demodulator 220 under the control of mobile unit control processor 240. Radio modulator/demodulator 220 modulates the encoded information and provides the signal for transmission to wireless link 160. When a signal containing information for output on speaker/microphone 260 arrives on wireless link 160, modulator/demodulator 220 demodulates the signal and provides it to vocoder 200. Vocoder 200 decodes the signal and provides audible output to speaker/microphone 260.

Mobile unit control processor 240 provides control over the functions of mobile unit 60. Mobile unit control processor 240 also is capable of

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bi-directional communication with keypad 270, protocol stack 230, vocoder 200, and radio modulator/demodulator 220. Keypad provides a user interface to mobile unit control processor 240. In addition, information intended for mobile unit control processor 240 might come over wireless link 160 or from digital data 110.

Protocol stack 230 provides the main control center for data communication with terminal equipment 10 over wireless link 160. Protocol stack 230 may need to provide flow control. For example, digital data 110 may have a data rate that is higher than that of which wireless link 160 is capable. In this case protocol stack 230 may store the excess data and recall data at a rate appropriate for output on the link. Also protocol stack 230 must packetize digital data 110 provided by terminal equipment 10 into frames for radio modulator/demodulator 220 and unpacketize frames from radio modulator/demodulator 220 for digital data 110.

Protocol stack 230 must also recognize an array of special commands. Referring again to Figures 1 and 2, terminal equipment 10 can produce several categories of output. Terminal equipment 10 can produce information for transfer to terminal equipment 50. Terminal equipment 10 can produce commands for modem 20 which are not to be transferred to terminal equipment 50. Because in Figure 2, modem 20 of Figure 1 has been replaced with mobile unit 60, wireless link 160, and DSP and modem 70, if terminal equipment 10 sends a message intended for the local modem the message must be sent over wireless link 160.

In Figure 2, when a link is established between terminal equipment 10 and terminal equipment 50, the system is said to be in data active mode. When such a link does not exist, the system is said to be in data idle mode. In data mode and data active, mobile unit 60 and DSP and modem 70, provide analog signal 120 in response to digital data 110.

In Figure 2, when terminal equipment 10 sends a message intended solely for mobile unit 60 and DSP and modem 70, the system is said to be in command mode. In this mode, terminal equipment 10 may send command instructions or set parameters directly with mobile unit 60 and DSP and modem 70. The commands sent are not transferred into analog signal 120. In response to messages in command mode, mobile unit 60 and DSP and modem 70 may provide result codes indicating the successful or defective execution of a command. Command mode can be invoked independent of an established data connection. Therefore three possible data states exist: command mode and data idle, command mode and data active, data mode and data active.

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Combining, the two different voice modes and the three possible data modes, mobile unit 60 can be in one of six different states as shown in Figure 4. New commands not presently used in standard modem configurations are required to transfer from one state to another. For example, if both an active data connection and an active voice connection are established, a user may wish to terminate the voice connection and retain the data connection. The command sent to the base station must designate which connection is to be canceled.

Similar new commands are needed to establish connections. Using a standard telephone system, the connection for voice service and data service is the same. As illustrated in Figures 2 and 3, with the introduction of the digital wireless link, the voice connection and the data connection are different. For example in Figure 2, base station 80 must know whether to route an incoming call to DSP and modem 70 or to vocoder 75.

At first glance, one might think to designate all connections invoked from keypad 270 as voice connections and all connections invoked through digital data 110 as data connections. However situations exist where terminal equipment 10 initiates a voice connection. One such situation is when a repertory dialer sets up a voice connection. A repertory dialer installed on a personal computer is typically a software package that allows a user store telephone numbers. The stored numbers can be automatically dialed for the user and output from the personal computer as digital data 110. The connection desired by the user in such a case is a voice connection. Therefore a new command to initiate a voice connection from the terminal equipment is created. For example, the new command may be designated as "AT+CDV" meaning establish a voice connection.

Also, a user may wish to establish a data connection through use of the keypad. An example of such a use is when the terminal equipment is incapable of dialing the quantity of numbers necessary to place a call such as when a user is attempting to establish an overseas data connection using a call card access code. Referring again to Figure 3, switch 275 designates the connection as either voice or data. Many other implementations may be used to designate the type of connection such as a menu selection, a special key, a voice command, or a prefix or suffix attached to the dialed number. An active data connection established by the keypad may be either in command mode or data mode. The ability to cancel a data connection may also be issued from the keypad.

Note that ability to establish a voice connection from a terminal unit and the ability to establish a data connection from the keypad is desirable in

those case where simultaneous voice and data connections are not possible. For example, if a user has a mobile unit which does not support simultaneous voice and data connections, he may still wish to use his repertory dialer to establish a voice connection.

5 Figure 4 represents the six states and defines transitions between the states. Block 500 represents voice idle, command mode and data idle. Thus block 500 represents the case where no voice connection nor terminal equipment to terminal equipment connection is established. In this state, terminal equipment 10 may send commands to mobile unit 60 and DSP and
10 modem 70.

From block 500, mobile unit 60 may establish a voice connection moving into block 505 as represented by arrow 550. Block 505 represents voice active, command mode and data idle. Arrow 550 may represent at least two possible commands. The first command is a numeric entry on
15 keypad 270 followed by "SEND". Typically this sequence is entered by the user from keypad 270. The second type of command may be issued by terminal equipment 10 or keypad 270. For example, the new command may be designated as "AT+CDV" meaning establish a voice connection.

From block 505, mobile unit 60 may terminate the voice connection
20 moving into block 500 as represented by arrow 552. Arrow 552 may represent at least two possible commands. The first command is "END" which is typically entered by the user from keypad 270. A second command is a command issued from terminal equipment 10 or from keypad 270 to hang up the voice connection. For example, the command may be
25 designated as "AT+CHV" meaning terminate the voice connection. This is also a new command. The command would not terminate an active data connection.

From block 505, mobile unit 60 may establish a data connection for data transfer while retaining the voice connection thus moving into
30 block 525 as represented by arrow 564. Arrow 564 represents a command to DSP and modem 70 to establish a data connection. A standard command designation for such a function is "ATDT#" meaning establish the data connection ready for data transfer to the number indicated. Such a command may be issued from terminal equipment 10 or keypad 270.

35 From block 505, mobile unit 60 may establish a data connection while retaining the voice connection and remaining in command mode thus moving into block 510 as represented by arrow 554. Arrow 554 represents a command to DSP and modem 70 to establish a data connection but after establishing the connection to remain ready to receive commands from

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terminal equipment 10. A standard command designation for such a function is "ATDT#;". Such a command may be issued from terminal equipment 10 or keypad 270.

5 From block 510, mobile unit 60 may terminate the active voice connection while remaining in command mode and retaining the active data connection thus moving into block 515 as represented by arrow 570. Arrow 570 may represent same command as arrow 552. As such, arrow 570 may indicate the receipt of "END" or "AT+CHV".

10 From block 510, mobile unit 60 may terminate the active data connection while retaining the active voice connection thus moving into block 505 as represented by arrow 556. Arrow 556 represents a command to DSP and modem 70 to terminate the data connection while maintaining the voice connection through vocoder 75. A standard command designation for such a function is "ATH" meaning hang up the data connection. Such a
15 command may be issued from terminal equipment 10 or keypad 270.

From block 510, mobile unit 60 may enter data mode on the active data connection while retaining the active voice connection thus moving into block 525 as represented by arrow 568. Arrow 568 may represent at least two alternative commands. The first command, standardly referred to as
20 "ATO", is issued by terminal equipment 10 and indicates that DSP and modem 70 should enter data mode to pass data to terminal equipment 50. Another alternative is send "ATDT#". The alternative means of connection would be used for systems which require two stage dialing. For example, a main telephone number was originally sent and that connection
25 established. Now to connect to terminal equipment 50, a telephone extension must be entered. Each of these commands may be issued from terminal equipment 10 or keypad 270.

From block 525, mobile unit 60 may enter command mode while maintaining the active data connection and retaining the active voice
30 connection thus moving into block 510 as represented by arrow 566. Arrow 566 may represent a standard "Escape" sequence.

Also from block 525, mobile unit 60 may maintain the active data connection while terminating the active voice connection thus moving into block 520 as represented by arrow 578. Arrow 578 may represent an
35 "END" which is typically entered by the user from keypad 270. Note that a command sent from terminal equipment 10 would not terminate the voice connection because the system is presently in a data transfer mode. If terminal equipment sent a command in this state the command would be

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directly transferred to terminal equipment 50 and thus not cause the desired disconnection.

From block 520, mobile unit 60 may establish an active voice connection while maintaining the active data connection thus moving into
5 block 525 as represented by arrow 576. Arrow 576 may represent a numeric entry on keypad 270 followed by "SEND". Typically this sequence is entered by the user from keypad 270. Again, a command sent from terminal equipment 10 would not establish a voice connection due to the state of the system being data transfer mode.

10 From block 520, mobile unit 60 may enter command mode while maintaining the active data connection thus moving into block 515 as represented by arrow 574. Arrow 574 may represent a standard "Escape" sequence.

From block 515, mobile unit 60 may enter data mode on the active
15 data connection thus moving into block 520 as represented by arrow 572. Arrow 572 may represent the same commands as arrow 568: "ATO" or "ATDT#" as required by two stage dialing systems.

From block 515, mobile unit 60 may enter voice active mode thus moving into block 510 as represented by arrow 580. Arrow 580 may
20 represent the same commands as arrow 550: a numeric entry on keypad 270 on mobile unit 60 followed by "SEND" or "AT+CDV#" from terminal equipment 10 or keypad 270.

From block 515, mobile unit 60 may terminate the active data connection thus moving into block 500 as represented by arrow 558.
25 Arrow 558 represents a command to DSP and modem 70 to terminate the data connection designated as "ATH". Such a command may be issued from terminal equipment 10 or keypad 270.

From block 500, mobile unit 60 may establish a data connection in command mode thus moving into block 515 as represented by arrow 560.
30 Arrow 560 represents the standard command designated "ATDT#;". Such a command may be issued from terminal equipment 10 or keypad 270.

From block 500, mobile unit 60 may establish a data connection for data transfer thus moving into block 520 as represented by arrow 562.
Arrow 562 the standard command designated "ATDT#". Such a command
35 may be issued from terminal equipment 10 or keypad 270.

The previous description of the preferred embodiments is provided to enable any person skilled in the art to make or use the present invention. The various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be

applied to other embodiments without the use of the inventive faculty. Thus, the present invention is not intended to be limited to the embodiments shown herein but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.

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WE CLAIM:

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A method of invoking and canceling data or voice service in a communication system comprised of a mobile unit having a data port for receiving and providing a terminal element signal, a voice port and vocoder for receiving and providing encoded voice signals, a wireless port for receiving and providing data signals and said encoded voice signals over a wireless link, and a keypad port for receiving and providing a manual user signal, said system further comprising a base station having a vocoder for receiving and providing said encoded voice signals, a modem for receiving and providing said data signals, and a wireless link port for receiving and providing said data signals and said encoded voice signals over said wireless link, wherein said communication system supports the simultaneous transfer of said encoded voice signals between said voice port and vocoder of said mobile unit and said vocoder of said base station on a voice connection and said data signals between said data port of said mobile unit and said modem of said base station on a data connection, wherein initially said communication system is in an initial state wherein said voice connection and said data connection are in an idle state, comprising the steps of:
 - receiving at said mobile unit a first message on said manual user signal wherein in said initial state said communication system is in a command mode such that said mobile unit interprets and acts upon said first message;
 - entering by said communication system a fifth state in response to said first message and establishing said data connection wherein in said fifth state said communication system is in a data mode, said data connection is in an active state and said voice connection is in said idle state and wherein when said communication system is in said data mode said mobile unit passes said terminal equipment signal over said data connection as said digital signals;
 - receiving at said mobile station when said communication system is in said second state a second message on said terminal equipment signal;
 - entering by said communication system a fourth state in response to said second message, and establishing said voice connection, wherein in said fourth state said communication system is in said data mode, said data connection is in said active state and said voice connection is in an active state;

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34 receiving at said mobile station when said communication system is in
said third state a third message on said terminal equipment signal;

36 entering by said communication system a fourth state in response to
said third message and changing said communication system mode to a data
38 mode wherein in said fourth state said communication system is in said data
mode, said data connection and said voice connection are in said active state
40 and wherein when said communication system is in said data mode said
mobile unit passes said terminal equipment signal over said data connection
42 as said data signals;

receiving at said mobile station when said communication system is in
44 said fourth state a fourth message on said manual user signal;

entering by said communication system a fifth state in response to said
46 fourth message and disconnecting said voice connection wherein in said fifth
state said communication system is in said data mode, said data connection is
48 in said active state and said voice connection is in said idle state;

receiving at said mobile station when said communication system is in
50 said fifth state an escape sequence on said terminal equipment signal;

entering by said communication system a sixth state in response to said
52 escape sequence and changing said communication system mode to said
command mode wherein in said sixth state said communication system is in
54 said command mode, said data connection is in said active state and said
voice connection is in said idle state;

56 receiving at said mobile station when said communication system is in
said sixth state a fifth message on said manual user signal; and

58 entering by said communication system said initial state in response to
said fifth message and disconnecting said data connection.

2. A method of invoking and canceling data or voice service in a
2 communication system comprised of a mobile unit having a data port for
receiving and providing a terminal element signal, a voice port and vocoder
4 for receiving and providing encoded voice signals, a wireless port for
receiving and providing data signals and said encoded voice signals over a
6 wireless link, and a keypad port for receiving and providing a manual user
signal, said system further comprising a base station having a vocoder for

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8 receiving and providing said encoded voice signals, a modem for receiving
and providing said data signals, and a wireless link port for receiving and
10 providing said data signals and said encoded voice signals over said wireless
link, wherein said communication system supports the simultaneous
12 transfer of said encoded voice signals between said voice port and vocoder of
said mobile unit and said vocoder of said base station on a voice connection
14 and said data signals between said data port of said mobile unit and said
modem of said base station on a data connection, wherein initially said
16 communication system is in an initial state wherein said voice connection
and said data connection are in an idle state, comprising the steps of:

18 receiving at said mobile unit when said communication system is in
said initial state a first message on said terminal equipment signal wherein in
20 said initial state said communication system is in a command mode such that
said mobile unit interprets and acts upon said first message;

22 entering by said communication system a second state in response to
said first message and establishing said voice connection over said wireless
24 link wherein in said second state said communication system is in said
command mode, said data connection is in said idle state, and said voice
26 connection is in an active state;

receiving at said mobile station when said communication system is in
28 said second state a second message on said manual user signal;

entering by said communication system a fourth state in response to
30 said second message, establishing said data connection, and changing said
communication system mode to a data mode wherein in said fourth state said
32 communication system is in said data mode, said data connection is in an
active state, and said voice connection is in said active state and wherein
34 when said communication system is in said data mode said mobile unit
passes said terminal equipment signal over said data connection as said data
36 signals;

receiving at said mobile station when said communication system is in
38 said fourth state a third message on said manual user signal;

entering by said communication system a fifth state in response to said
40 third message and disconnecting said voice connection wherein in said fifth

state said communication system is in said data mode, said data connection is
 42 in said active state and said voice connection is in said idle state;
 receiving at said mobile station when said communication system is in
 44 said fifth state an escape sequence on said terminal equipment signal;
 entering by said communication system a sixth state in response to said
 46 escape sequence and changing said communication system mode to said
 command mode wherein in said sixth state said communication system is in
 48 said command mode, said data connection is in said active state and said
 voice connection is in said idle state;
 50 receiving at said mobile station when said communication system is in
 said sixth state a fifth message on said manual user signal; and
 52 entering by said communication system said initial state in response to
 said fifth message and disconnecting said data connection.

3. A method of invoking and canceling data or voice service in a
 2 communication system comprised of a mobile unit having a data port for
 receiving and providing a terminal element signal, a voice port and vocoder
 4 for receiving and providing encoded voice signals, a wireless port for
 receiving and providing data signals and said encoded voice signals over a
 6 wireless link, and a keypad port for receiving and providing a manual user
 signal, said system further comprising a base station having a vocoder for
 8 receiving and providing said encoded voice signals, a modem for receiving
 and providing said data signals, and a wireless link port for receiving and
 10 providing said data signals and said encoded voice signals over said wireless
 link, wherein said communication system supports the simultaneous
 12 transfer of said encoded voice signals between said voice port and vocoder of
 said mobile unit and said vocoder of said base station on a voice connection
 14 and said data signals between said data port of said mobile unit and said
 modem of said base station on a data connection, wherein initially said
 16 communication system is in an initial state wherein said voice connection
 and said data connection are in an idle state, comprising the steps of:
 18 receiving at said mobile unit a first message on said terminal
 equipment signal wherein in said initial state said communication system is

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20 in a command mode such that said mobile unit interprets and acts upon said first message;

22 entering by said communication system a second state in response to said first message and establishing said voice connection over said wireless
24 link wherein in said second state said communication system is in said command mode, said data connection is in said idle state, and said voice
26 connection is in an active state;

receiving at said mobile station when said communication system is in
28 said second state a second message on said terminal equipment signal;

entering by said communication system a fourth state in response to
30 said second message, establishing said data connection, and changing said communication system mode to a data mode wherein in said fourth state said
32 communication system is in said data mode, said data connection is in an active state and said voice connection is in said active state and wherein
34 when said communication system is in said data mode said mobile unit passes said terminal equipment signal over said data connection as said data
36 signals;

receiving at said mobile station when said communication system is in
38 said fourth state a third message on said manual user signal;

entering by said communication system a fifth state in response to said
40 third message and disconnecting said voice connection wherein in said fifth state said communication system is in data mode, said data connection is in
42 said active state and said voice connection is in said idle state;

receiving at said mobile station when said communication system is in
44 said fifth state an escape sequence on said terminal equipment signal;

entering by said communication system a sixth state in response to said
46 escape sequence and changing said communication system mode to said command mode wherein in said sixth state said communication system is in
48 said command mode, said data connection is in said active state and said voice connection is in said idle state;

50 receiving at said mobile station when said communication system is in said sixth state a fourth message on said manual user signal; and

52 entering by said communication system said initial state in response to said fourth message and disconnecting said data connection.

4. A method of invoking and canceling data or voice service in a communication system comprised of a mobile unit having a data port for receiving and providing a terminal element signal, a voice port and vocoder for receiving and providing encoded voice signals, a wireless port for receiving and providing data signals and said encoded voice signals over a wireless link, and a keypad port for receiving and providing a manual user signal, said system further comprising a base station having a vocoder for receiving and providing said encoded voice signals, a modem for receiving and providing said data signals, and a wireless link port for receiving and providing said data signals and said encoded voice signals over said wireless link, wherein said communication system supports the simultaneous transfer of said encoded voice signals between said voice port and vocoder of said mobile unit and said vocoder of said base station on a voice connection and said data signals between said data port of said mobile unit and said modem of said base station on a data connection, wherein initially said communication system is in an initial state wherein said voice connection and said data connection are in an idle state, comprising the steps of:

receiving at said mobile unit when said communication system is in said initial state a first message on said terminal equipment signal wherein in said initial state said communication system is in a command mode such that said mobile unit interprets and acts upon said first message;

entering by said communication system a second state in response to said first message and establishing said voice connection over said wireless link wherein in said second state said communication system is in said command mode, said data connection is in said idle state, and said voice connection is in an active state;

receiving at said mobile station when said communication system is in said second state a second message on said manual user signal;

entering by said communication system a third state in response to said second message and establishing said data connection wherein in said third state said communication system is in said command mode, said data connection is in an active state, and said voice connection is in said active state;

34 receiving at said mobile station when said communication system is in
said fourth state an escape sequence on said terminal equipment signal;

36 entering by said communication system a third state in response to said
escape sequence and changing said communication system mode to said
38 command mode wherein in said third state said communication system is in
said command mode, said data connection is in said active state, and said
40 voice connection is in said active state;

receiving at said mobile station when said communication system is in
42 said third state a third message on said terminal equipment signal;

entering by said communication system a sixth state in response to said
44 third message and disconnecting said voice connection wherein in said sixth
state said communication system is in said command mode, said data
46 connection is in said active state and said voice connection is in said idle state;

receiving at said mobile station when said communication system is in
48 said sixth state a fourth message on said manual user signal; and

entering by said communication system in response to said fourth said
50 initial state and disconnecting said data connection.

5. A method of invoking and canceling data or voice service in a
2 communication system comprised of a mobile unit having a data port for
receiving and providing a terminal element signal, a voice port and vocoder
4 for receiving and providing encoded voice signals, a wireless port for
receiving and providing data signals and said encoded voice signals over a
6 wireless link, and a keypad port for receiving and providing a manual user
signal, said system further comprising a base station having a vocoder for
8 receiving and providing said encoded voice signals, a modem for receiving
and providing said data signals, and a wireless link port for receiving and
10 providing said data signals and said encoded voice signals over said wireless
link, wherein said communication system supports the simultaneous
12 transfer of said encoded voice signals between said voice port and vocoder of
said mobile unit and said vocoder of said base station on a voice connection
14 and said data signals between said data port of said mobile unit and said
modem of said base station on a data connection, wherein initially said

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16 communication system is in an initial state wherein said voice connection
and said data connection are in an idle state, comprising the steps of:

18 receiving at said mobile unit when said communication system is in
said initial state a first message on said terminal equipment signal wherein in
20 said initial state said communication system is in a command mode such that
said mobile unit interprets and acts upon said first message;

22 entering by said communication system a sixth state in response to said
first message and establishing said data connection wherein in said sixth state
24 said communication system is in said command mode, said data connection
is in an active state and said voice connection is in said idle state;

26 receiving at said mobile station when said communication system is in
said second state a second message on said terminal equipment signal;

28 entering by said communication system a third state in response to said
second message and establishing said voice connection wherein in said third
30 state said communication system is in said command mode, said data
connection is in said active state, and said voice connection is in an active
32 state;

receiving at said mobile station when said communication system is in
34 said third state a third message on said terminal equipment signal;

entering by said communication system a fourth state in response to
36 said third message and changing said communication system mode to a data
mode wherein in said fourth state said communication system is in said data
38 mode, said data connection and said voice connection are in said active state
and wherein when said communication system is in said data mode said
40 mobile unit passes said terminal equipment signal over said data connection
as said data signals;

42 receiving at said mobile station when said communication system is in
said fourth state an escape sequence on said terminal equipment signal;

44 entering by said communication system said third state in response to
said escape sequence and changing said communication system mode to said
46 command mode;

receiving at said mobile unit when said communication system is in
48 said third state a fourth message on said manual user signal;

entering by said communication system a second state in response to
50 said fourth message and disconnecting said data connection over said wireless
link wherein in said second state said communication system is in said
52 command mode, said data connection is in said idle state, and said voice
connection is in said active state;

54 receiving at said mobile station when said communication system is in
said second state a fourth message on said terminal equipment signal; and

56 entering by said communication system in response to said fourth said
initial state and disconnecting said voice connection.

6. A method of invoking and canceling voice service and data service in a
2 communication system comprising a mobile unit supporting simultaneous
voice and data communication having a keypad for receiving and providing
4 user data and a speaker, microphone, and vocoder unit for receiving and
providing encoded voice signals, and a terminal equipment unit input for
6 receiving and providing digital data, said communication system further
comprising a base station having a vocoder portion for receiving and
8 providing said encoded voice signals and said user data and a modem portion
for receiving and providing said digital data and said user data wherein a
10 wireless link couples said encoded voice signal, said user data, and said digital
data between said mobile unit and said base station, comprising the steps of:

12 receiving at said mobile unit from said terminal equipment input a
first modem command within said digital data wherein said first modem
14 command designates a directory number and a request to establish a first
voice communication between said mobile unit and said base station; and

16 receiving said first modem command at said modem portion of
said base station and establishing said first voice communication in response
18 to said first modem command such that said encoded voice signals are passed
from said speaker, microphone, and vocoder unit over said wireless link to
20 said vocoder portion of said base station and from said vocoder portion of
said base station over said wireless link to said speaker, microphone, and
22 vocoder unit.

7. The method of invoking and canceling voice service and data service
2 in the communication system of claim 1 , further comprising the steps of:

receiving at said mobile unit from said keypad a user command
4 wherein said user command designates a directory number and a request to
establish a first data communication between said mobile unit and said base
6 station; and

establishing said first data communication to be active
8 contemporaneously with said first voice communication, said first data
communication being established such that said digital data is passed from
10 said terminal equipment unit input of said mobile unit to said modem
portion of said base station and from said modem portion of said base station
12 to said terminal equipment unit input of said mobile unit over said wireless
link.

8. The method of invoking and canceling voice service and data
2 service in the communication system of claim 6 , wherein said first modem
command comprises a standard modem attention message, a logical
4 connector, and a character string designating dialing of said voice
communication having the form "AT+CDV".

9. The method of invoking and canceling voice service and data
2 service in the communication system of claim 6 , further comprising the
steps of:

receiving at said mobile unit from said terminal equipment a second
4 modem command wherein said second modem command designates a hang
up of said first voice communication; and
6

disconnecting said first voice communication.

10. The method of invoking and canceling voice service and data
2 service in the communication system of claim 9 , wherein said second
modem command comprises a standard modem attention message, a logical
4 connector, and a character string designating hang up of said voice
communication having the form "AT+CHV".

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11. A method of invoking and canceling voice service and data service in a
2 communication system comprising a mobile unit supporting simultaneous
voice and data communication having a keypad for receiving and providing
4 user data and a speaker, microphone, and vocoder unit for receiving and
providing encoded voice signals, and a terminal equipment unit input for
6 receiving and providing digital data, said communication system further
comprising a base station having a vocoder portion for receiving and
8 providing said encoded voice signals and said user data and a modem portion
for receiving and providing said digital data and said user data wherein a
10 wireless link couples said encoded voice signal, said user data, and said digital
data between said mobile unit and said base station, comprising the steps of:

12 receiving at said mobile unit from said keypad a first modem
command within said user data wherein said first modem command
14 designates a directory number and a request to establish a first data
communication between said mobile unit and base station, said keypad also
16 being capable of providing a request to establish a first voice communication
between said mobile unit and said vocoder portion of said base station; and

18 establishing said first data communication in response to said
first modem command such that said digital data is passed from said terminal
20 equipment unit input of said mobile unit to said modem portion of said base
station and from said modem portion of said base station to said terminal
22 equipment unit input of said mobile unit over said wireless link.

12. The method of invoking and canceling voice service and data
2 service of claim 11, further comprising the steps of:

receiving at said mobile unit from said keypad a second modem
4 command wherein said second modem command requests a termination of
said first data communication; and

6 disconnecting said first data communication.

13. A method of invoking and canceling data or voice service in a
2 communication system comprised of a mobile unit having a data port for
receiving and providing a terminal element signal, a voice port and vocoder
4 for receiving and providing encoded voice signals, a wireless port for

receiving and providing data signals and said encoded voice signals over a
6 wireless link, and a keypad port for receiving and providing a manual user
signal, said system further comprising a base station having a vocoder for
8 receiving and providing said encoded voice signals, a modem for receiving
and providing said data signals, and a wireless link port for receiving and
10 providing said data signals and said encoded voice signals over said wireless
link, wherein said communication system supports the simultaneous
12 transfer of said encoded voice signals between said voice port and vocoder of
said mobile unit and said vocoder of said base station on a voice connection
14 and said data signals between said data port of said mobile unit and said
modem of said base station on a data connection, wherein initially said
16 communication system is in an initial state wherein said voice connection
and said data connection are in an idle state, comprising the steps of:

18 receiving at said mobile unit when said communication system is in
said initial state a first message on said terminal equipment signal wherein in
20 said initial state said communication system is in a command mode such that
said mobile unit interprets and acts upon said first message;

22 entering by said communication system a second state in response to
said first message and establishing said voice connection over said wireless
24 link wherein in said second state said communication system is in said
command mode, said data connection is in said idle state, and said voice
26 connection is in an active state;

receiving at said mobile station when said communication system is in
28 said second state a second message on said terminal equipment signal;

entering by said communication system a third state in response to said
30 second message and establishing said data connection wherein in said third
state said communication system is in said command mode, said data
32 connection is in an active state, and said voice connection is in said active
state;

34 receiving at said mobile station when said communication system is in
said third state a third message on said terminal equipment signal;

36 entering by said communication system a fourth state in response to
said third message and changing said communication system mode to a data
38 mode wherein in said fourth state said communication system is in said data

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mode, said data connection and said voice connection are in said active state
40 and wherein when said communication system is in said data mode said
mobile unit passes said terminal equipment signal over said data connection
42 as said data signals;

receiving at said mobile station when said communication system is in
44 said fourth state a fourth message on said manual user signal;

entering by said communication system a fifth state in response to said
46 fourth message and disconnecting said voice connection wherein in said fifth
state said communication system is in said data mode, said data connection is
48 in said active state and said voice connection is in said idle state;

receiving at said mobile station when said communication system is in
50 said fifth state an escape sequence on said terminal equipment signal;

entering by said communication system a sixth state in response to said
52 escape sequence and changing said communication system mode to said
command mode wherein in said sixth state said communication system is in
54 said command mode, said data connection is in said active state and said
voice connection is in said idle state;

receiving at said mobile station when said communication system is in
56 said sixth state a fifth message on said terminal equipment signal ; and

58 entering by said communication system said initial state in response to
said fifth message and disconnecting said data connection.

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14. A telephone modem apparatus capable of simultaneously for
 2 providing two connection paths to a telephone network, a first path for
 providing audible communication, and a second path for providing data
 4 communication, said telephone modem apparatus comprising:

a mobile unit for receiving a stream of standard digital data from a
 6 terminal equipment unit and for transmitting an information signal wherein
 said mobile unit comprises:

8 a protocol stack for receiving a stream of standard digital data,
 packetizing said stream of standard digital data, and providing a set of data
 10 packets for said second path;

a vocoder for receiving audible input, for encoding said audible input,
 12 and providing encoded output for said first path;

a key pad for receiving user input and providing manual user input
 14 command wherein said manual user input commands can designate
 invocation of communication on said first path or said second path;

16 a radio modulator for receiving and modulating said set of data
 packets, and said encoded output, said set of data packets for transmission,
 18 and for producing said information signal for said first and second paths;

a wireless link for conveying said information signal;

20 a base station for receiving said information signal, said base station
 comprising;

22 a digital signal processor for receiving said set of data packets and
 providing a corresponding output to said telephone network from said
 24 second path; and

a vocoder for receiving said encoded output and providing a
 26 corresponding output to said telephone network from said first path, said
 digital signal processor including means for initiating voice communication
 28 over said first path in response to a voice request within said set of data
 packets.

15. A method of invoking and canceling voice service and data
 2 service in a communication system comprising a mobile unit supporting
 simultaneous voice and data communication having a keypad for receiving
 4 and providing user data and a vocoder unit for providing an encoded voice
 signal in response to an input voice signal, and a terminal equipment unit
 6 input for receiving and providing digital data, said communication system

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8 further comprising a base station having a vocoder portion for receiving and
providing said encoded voice signals and said user data and a modem portion
for receiving and providing said digital data and said user data wherein a
10 wireless link couples said encoded voice signal, said user data, and said digital
data between said mobile unit and said base station, comprising the steps of:
12 receiving at said mobile unit from said terminal equipment input a
first modem command within said digital data wherein said first modem
14 command includes a request to establish a first voice communication
between said mobile unit and said base station, said mobile unit entering a
16 voice active mode in response to receipt of said first modem command; and
receiving said first modem command at said modem portion of said
18 base station and establishing said first voice communication using said
vocoder portion of said base station such that said encoded voice signal is
20 passed from said vocoder unit over said wireless link to said vocoder portion
of said base station and from said vocoder portion of said base station over
22 said wireless link to said vocoder unit.

16. The method of claim 15 further including the step of receiving at
2 said mobile unit from said terminal equipment input a second modem
command within said digital data wherein said second modem command
4 includes information used for configuration of said base station, said mobile
unit entering a command active mode in response to receipt of said second
6 modem command.

17. The method of claim 16 further including the step of receiving at
2 said mobile unit from said keypad a third modem command wherein said
third modem command includes a request to establish a first data
4 communication between said mobile unit and said base station, said mobile
unit entering a data active mode in response to receipt of said third modem
6 command.

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PATENT AGENTS

FIG. 1

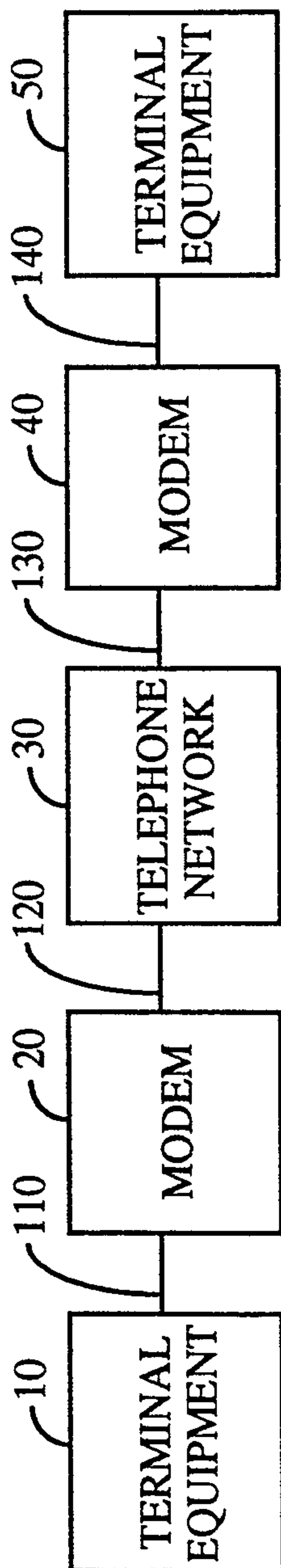


FIG. 2

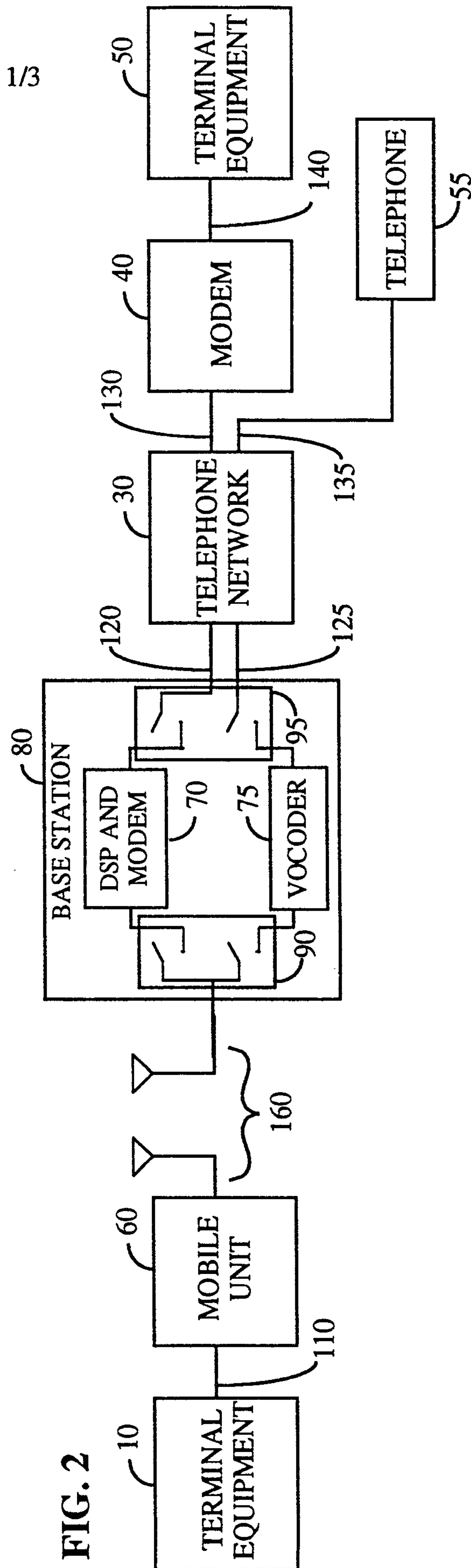
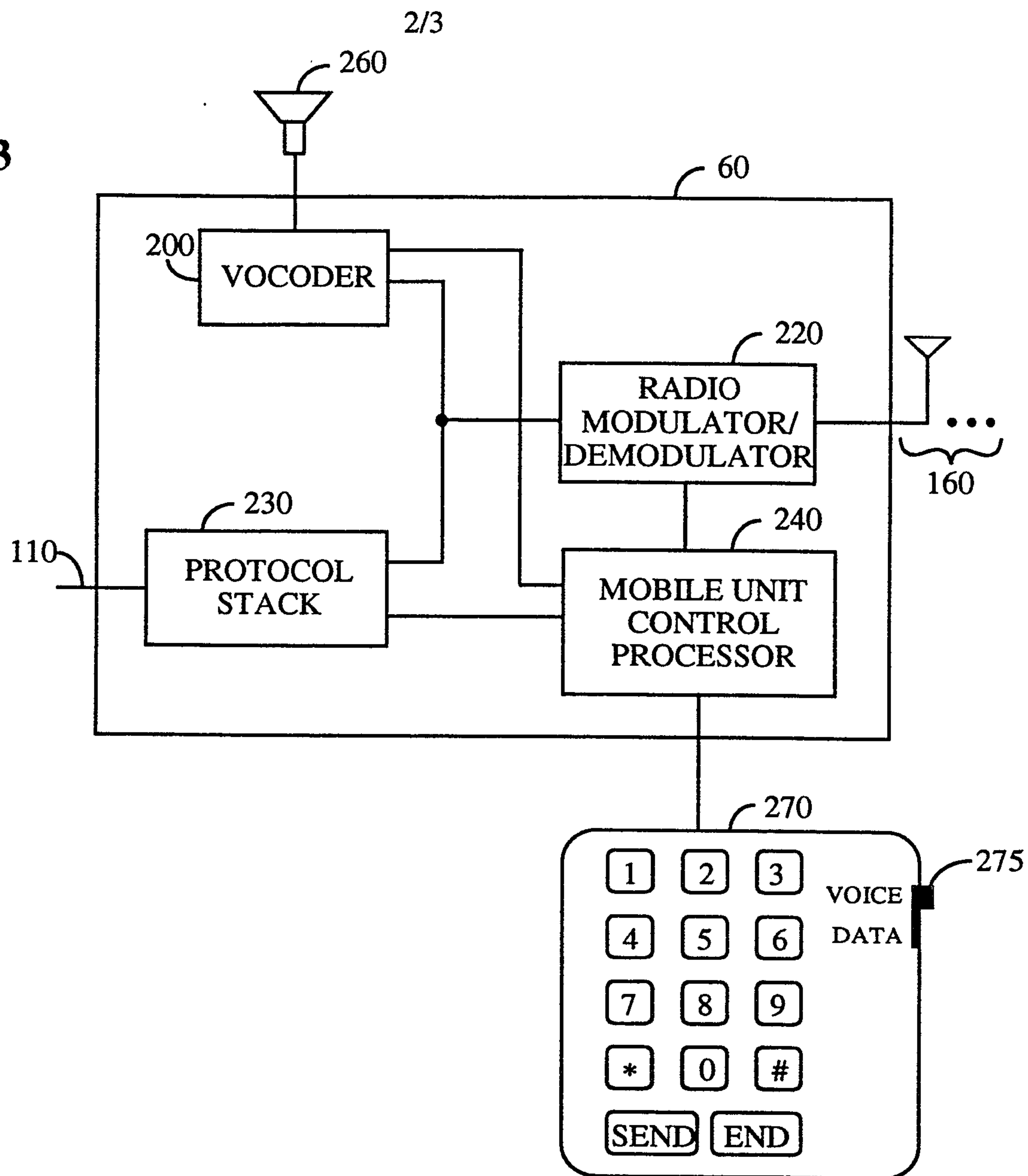


FIG. 3



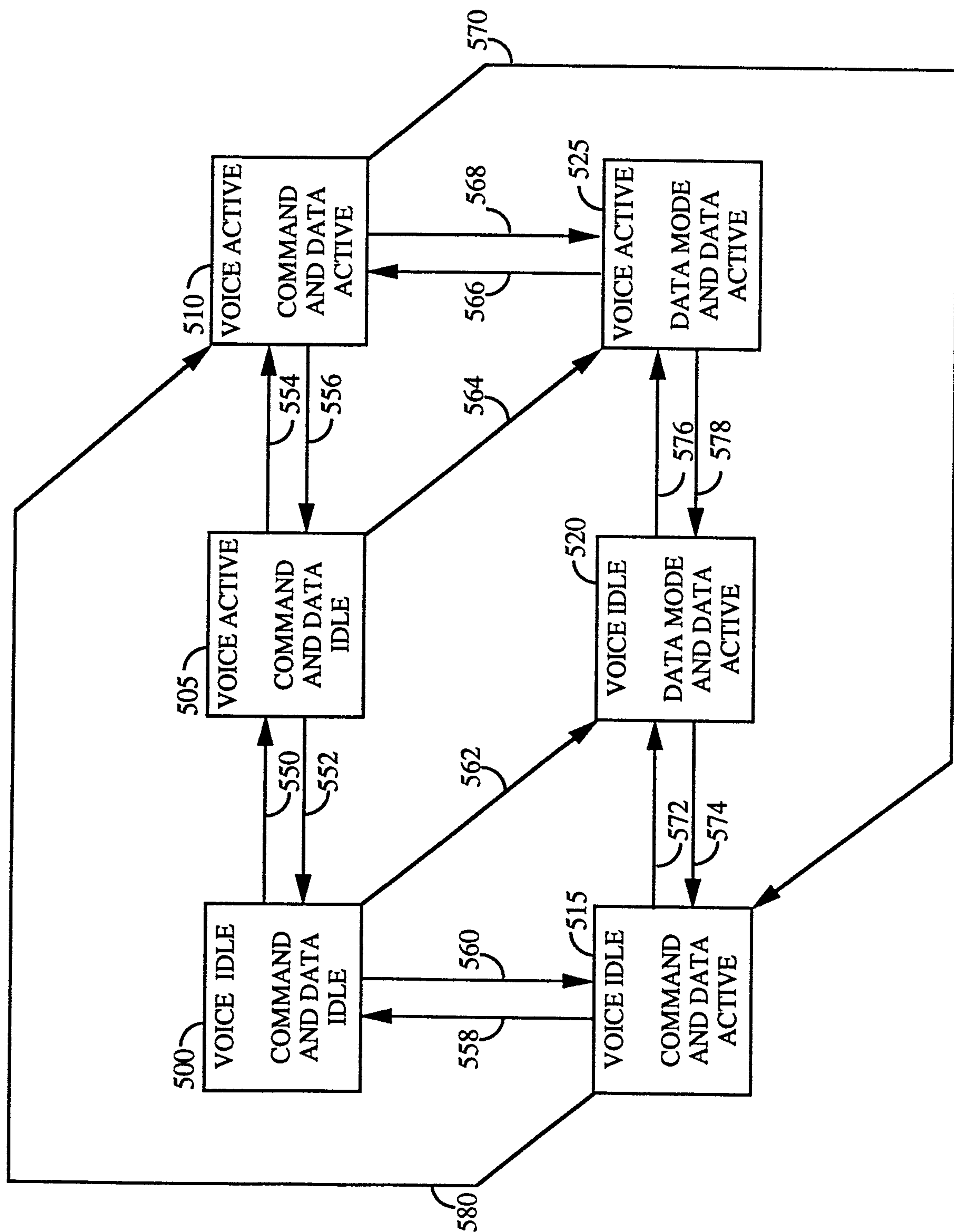


FIG. 4