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(54) **METHODS AND SYSTEMS FOR COMMUNICATING AND CONTROLLING FACSIMILE INFORMATION**

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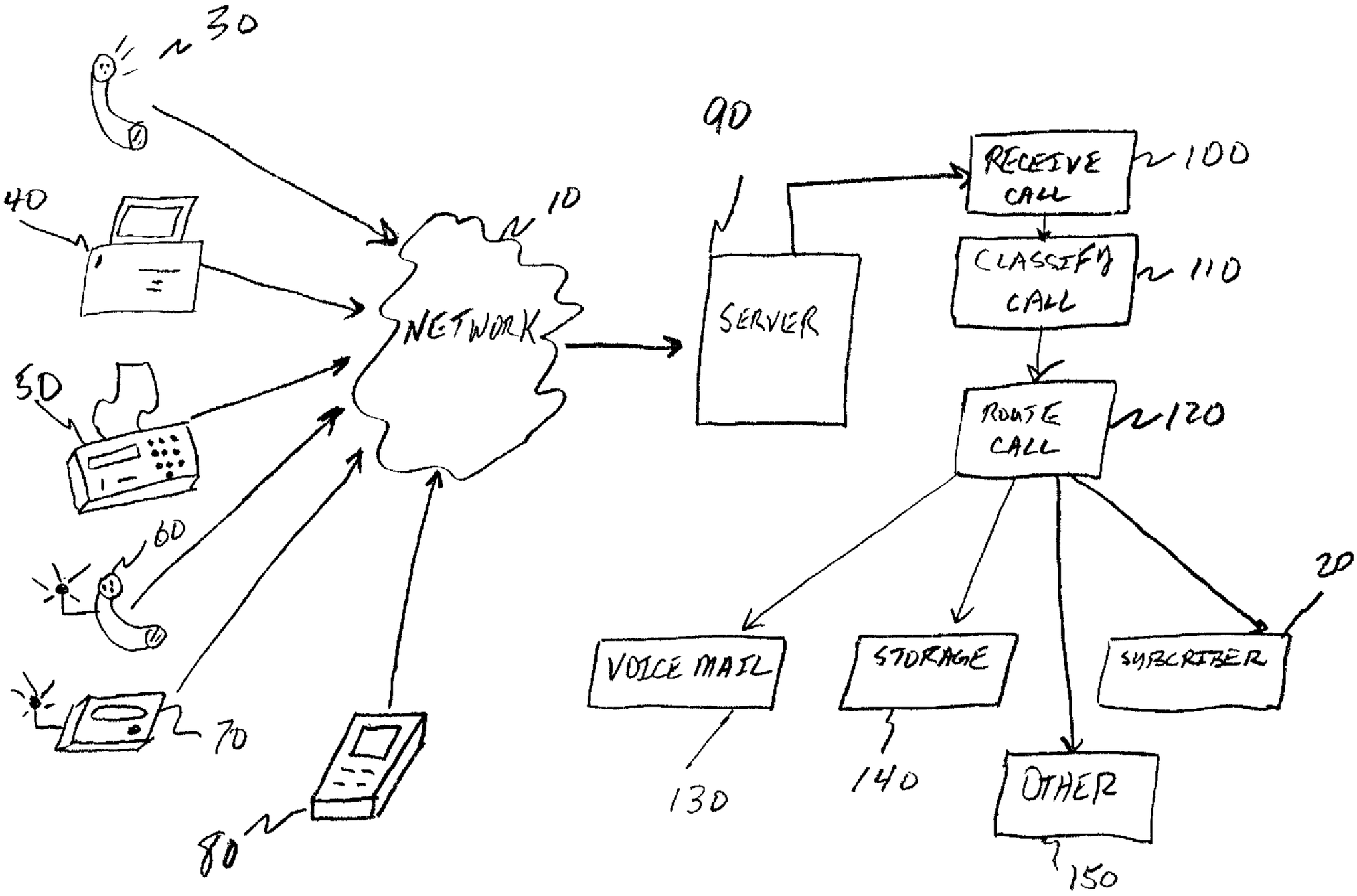
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(57) **ABSTRACT**

Methods for managing and routing multiple telephone calls through a wireless network provide efficient and cost-effective ways in which a subscriber to the network can take advantage of the multiple services being offered. When the subscriber has only one line in the network, or when the subscriber often uses more than one line, multiple telephone calls may attempt transmission to the subscriber and so the subscriber may miss the call. The inventive methods determine what type of incoming call is attempting to contact the subscriber and routes the call to another location, such as the subscriber's voice mail, if the subscriber is otherwise occupying his or her line or lines in the network. The methods are particular useful for storing and forwarding facsimile messages to subscriber.



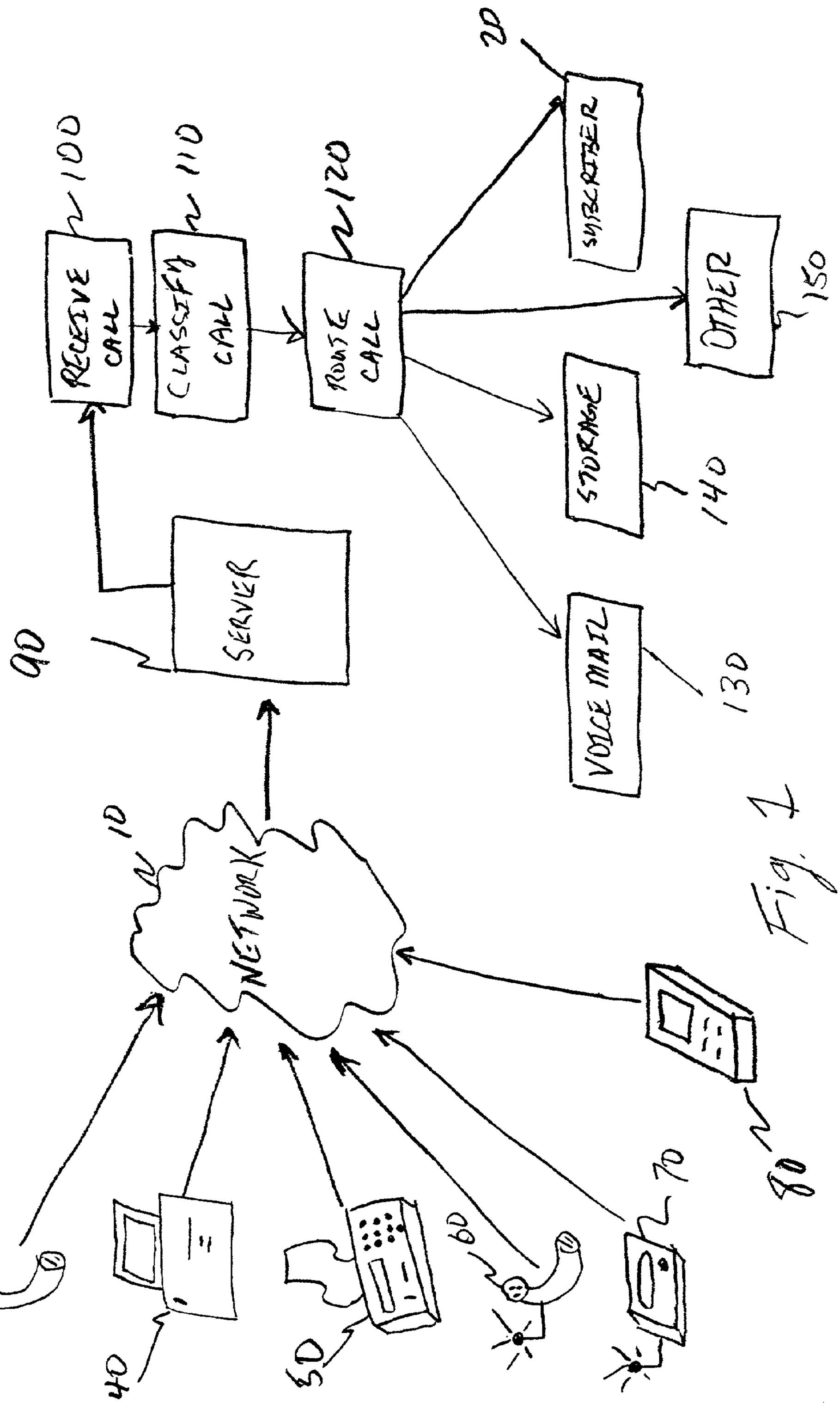

20
RECEIVE CALL
100
CLASSIFY CALL
110
ROUTE CALL
120
SUBSCRIBER
SERVER
30
STORAGE
140
OTHER
150
VOICE MAIL
130
NETWORK
10
20
40
50
60
70
80

Fig. 1

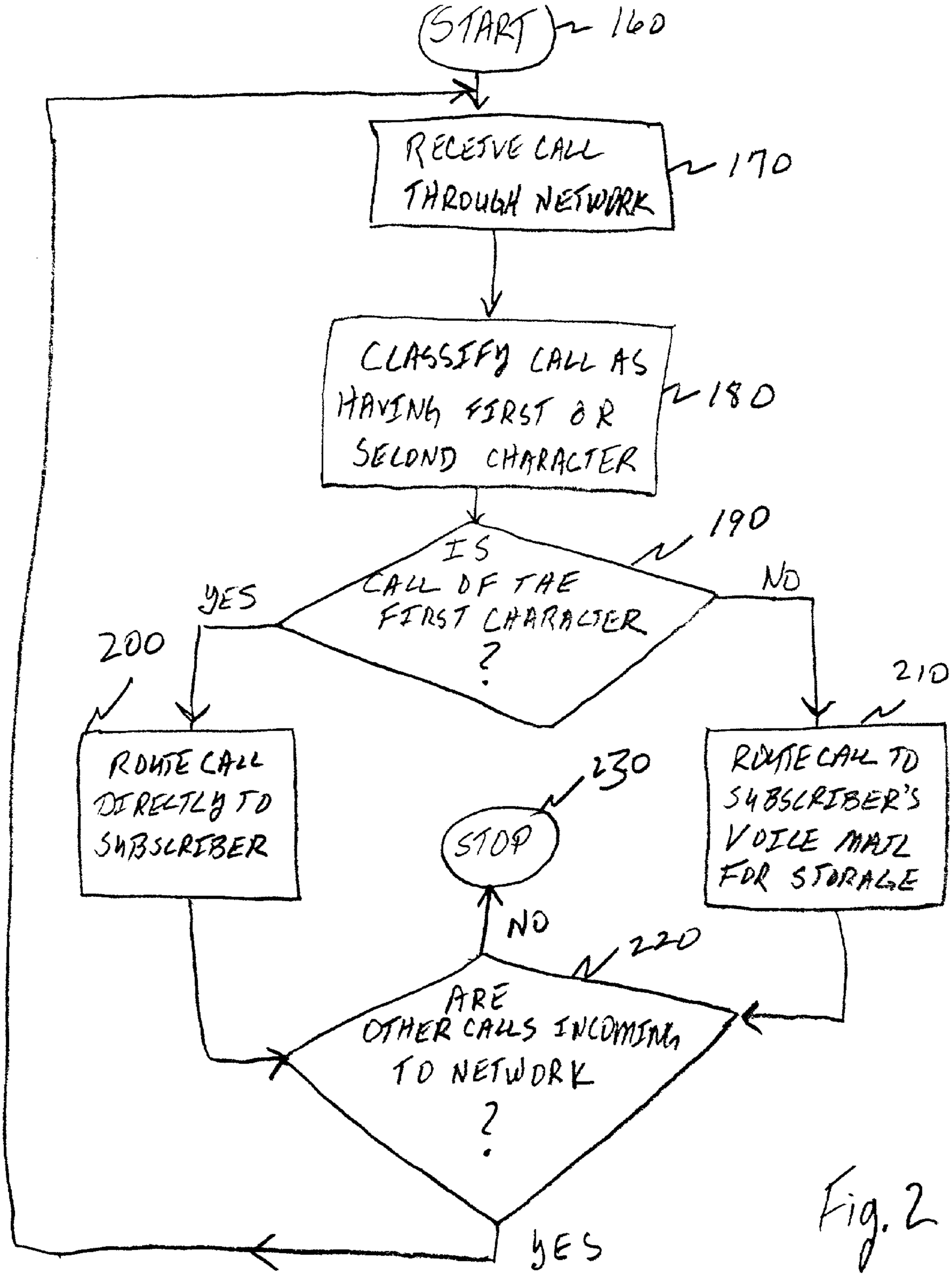

START
160
RECEIVE CALL THROUGH NETWORK
170
CLASSIFY CALL AS HAVING FIRST OR SECOND CHARACTER
180
IS CALL OF THE FIRST CHARACTER ?
190
YES
NO
200
ROUTE CALL DIRECTLY TO SUBSCRIBER
210
ROUTE CALL TO SUBSCRIBER'S VOICE MAIL FOR STORAGE
230
STOP
NO
220
ARE OTHER CALLS INCOMING TO NETWORK ?
YES

Fig. 2

METHODS AND SYSTEMS FOR COMMUNICATING AND CONTROLLING FACSIMILE INFORMATION

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] This invention relates generally to methods and systems for communicating and controlling data in a network. More specifically, the invention relates to managing and controlling incoming telephone calls to a network when subscribers to the network do not have multiple telephone lines in the network.

[0003] 2. Description of the Related Art

[0004] With the current explosion of wireless technologies and the implementation of sophisticated wireless networks, new wireless services are constantly being offered to wireless subscribers that allow the subscribers to take full advantage of advanced communications over the network. Many of these services require that a telephone call be placed to the subscriber so that the subscriber can access the service through the network. There has thus developed an acute need in the art for ways to manage these incoming telephone calls and ensure that the subscriber receives all of the services that he or she has subscribed to and that are provided by the network.

[0005] Typically, a subscriber to a wireless network that is receiving services therefrom only has one line or telephone number through which it can access the network and receive services. However, it will be recognized that at any one time, more than one telephone call, including voice calls, may be attempting to contact the subscriber through the network. Additionally, as service offerings proliferate in wireless networks, it is envisioned that more than one service may attempt to access the subscriber at any one time.

[0006] For example, the FAX machine has become a ubiquitous piece of equipment in the office environment. Most businesses and many home users employ FAX machines so that they can stay in communication with business associates, relatives and other people. In fact, FAX services have become an integral part of the plethora of Internet and wireless services that are now available. In fact FAX services in the wireless environment are already readily available to subscribers and so the aforementioned problems have arisen.

[0007] Prior approaches to solving these problems have been proposed. For example, separate telephone lines apart from voice telephone lines may be provided to a subscriber that wishes wireless access to FAX machines. However, this is an expensive solution especially when the network over which the FAX signals will be sent is a wireless network. Therefore, it may be desirable to allow FAX and voice signals to be sent over a single channel with one telephone number. In order to accomplish this goal, it will be appreciated that if the user is not available at the telephone, the FAX call may be missed, or if the user is using the phone for voice communications, the FAX call will not go through. A method for overcoming these problems should therefore be devised.

[0008] Other prior art approaches to address these issues have relied on detecting a FAX versus a voice call and alerting the user when a FAX call is coming in. The alert may be in the form of a web page sent to the user. In the area of cordless phones which have base units, when the base units include FAX machines the base units may be provided with functionality to differentiate the FAX call from the voice call without interrupting or otherwise alerting the user of the cordless phone. Voice and text storage systems also exist in the art wherein text, such as a FAX, may be stored in a user's mailbox in the system.

[0009] None of the aforementioned solutions adequately provide methods and systems for FAX communications continuously to subscribers with only one telephone number for FAX and voice calls. Nor do these solutions automatically store and forward FAX transmissions to a subscriber over a single telephone line when the subscriber is occupying the line with a voice phone call. Moreover, the prior methods and systems for sending FAX signals over a single telephone line do not adequately identify FAX transmissions or alert the subscriber that a FAX has been or will be sent.

[0010] There thus exists a long-felt need for methods which store and forward incoming telephone calls when only a single telephone line is available for multiple incoming telephone calls. The methods and systems should identify whether the call is a voice call or some other type of call and notify the user that another type of call FAX has been received. Additionally, it would be desirable if the methods and systems automatically and continuously accepted incoming telephone calls even when the subscriber is using the single line for a voice call. These needs have not heretofore been achieved in the art.

SUMMARY OF THE INVENTION

[0011] The aforementioned problems are solved, and long-felt needs met, by methods of managing multiple telephone calls in a network. In a preferred embodiment, the methods receive an incoming call having a first character for a subscriber to the network. It is then determined whether the incoming telephone call has the first character or a second character in order to classify the incoming telephone call. The call is then routed to a location depending upon its classification as a telephone call of the first or second character.

[0012] Methods of routing telephone calls in a network also satisfy the aforementioned long-felt needs. Preferably, an incoming telephone call to the network is received that is intended for a subscriber to the network. The incoming call is classified as either a voice call or another type of call. If the call is classified as a voice call, it is routed to the subscriber. However, if the call is classified as another type of call, it is routed to another location. It may then be stored at the other location and forwarded to the subscriber at some future time.

[0013] The inventive methods are particularly useful for storing and forwarding of FAX and other incoming telephone calls to subscribers, especially when the subscriber has only a single line in the network. Advantageously, the methods allow automatic and continuous receipt of FAX messages even when the subscriber is using the single line for voice calls. This greatly reduces the costs to the subscriber for receiving FAX transmissions and allows the subscriber great versatility in using the network. Such results have not heretofore been achieved in the art.

[0014] These and other features of the present invention will become apparent from the following detailed description considered in conjunction with the accompanying drawings. It is to be understood, however, that the drawings are designed solely for purposes of illustration and not as a definition of the limits of the invention, for which reference should be made to the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] In the drawings wherein like reference numerals refer to like elements throughout the several views thereof:

[0016] **FIG. 1** is a block diagram of a network which implements the inventive methods described herein; and

[0017] **FIG. 2** is a flow chart of a preferred embodiment of the methods provided in accordance with the present invention which can be implemented in software.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] Referring now to **FIG. 1, a** network **10** is depicted wherein incoming telephone calls can be managed and routed to a desired location depending on the nature and character of the calls as determined and classified by the inventive methods. The network **10** may be any type of computer network such as the Internet, the known switched telephone network, a wireless network, a local area network (LAN), a wide area network (WAN) or other networks through which analog and/or digital communications may take place. For ease of description throughout, network **10** will be described as a wireless network.

[0019] A subscriber **20** to wireless network **10** will communicate with the network **10** through a standard wireless device such as a mobile telephone, a personal or laptop computer, a personal digital assistant (PDA) a beeper, a FAX machine, or any other device which is configured to transmit and receive wireless communications. This communication can be received by any communications device as will be described in more detail. Typically, subscriber **20** will only have one wireless telephone line to network **10**, but subscriber **20** may subscribe to more than one wireless line. Whether subscriber **20** has access to one or more lines to network **10**, there will doubtless be times when all of the subscriber **20**'s lines are being occupied, or are otherwise in use such that an incoming call to the subscriber **20** through network **10** will not be able to be completed.

[0020] This scenario will occur since many other parties and devices may try to contact subscriber **20** at the same time. For example, but not intending to limit the invention in any way, a standard landline telephone **20**, a personal or laptop computer **40**, a FAX machine **50**, a wireless telephone **60**, a beeper **70**, a PDA (wireless or landline-based) **80**, or other devices may be used by others to try and contact subscriber **20** through network **10**. Conventionally, a server **90** is associated with network **10** and provides the required functionality to run data and voice communications through network **10**. There are many servers that are commercially available on the market today which are used to drive networks, for example, the PROLIANT server sold by Compaq Computer Corp. (Houston, Tex.) may be employed. Other servers are known to those skilled in the art which may also be used to run network **10**.

[0021] As will be appreciated by those skilled in the art, the inventive methods may be implemented as a software program or programs, or in modules associated with a larger software program such as an operating system for network **10**. The software may be written in any appropriate software language such as C++, VISUALBASIC, or others, and may be implemented in any operating system environment such as UNIX, WINDOWS or other operating systems. In a preferred embodiment, server **90** runs the software to perform the inventive methods.

[0022] After an incoming call is received by the network **10** and the server **90** is notified thereof, it is desired to process the received call with a processing block for the received call which receives and processes data information associated with the received call. Then, the call is classified by a classification block **110** to determine the nature and character of the call so that it can be routed to the appropriate location. Once classification has taken place, routing module **120** routes the call to the appropriate location either in the network **10**, to the subscriber **20**, or to some other location outside the network **10**.

[0023] The classified call can be routed to virtually any location desired, in or out of the network. For example, the call may be directly and immediately routed to subscriber **20**. Further, the call may be routed to the subscriber's voice mail **130**, to a storage area or device **140** or to any other appropriate location **150** which may later be contacted by the subscriber or others for retrieval or for other actions depending on the nature and/or character of the incoming call.

[0024] As has been mentioned above, the inventive methods may be implemented in software in the appropriate software language. **FIG. 2** depicts a flow diagram of a preferred embodiment of a method provided in accordance with the present invention. The method begins at step **160** and at step **170** an incoming call is received through the network. The call is classified at step **180** as having a first or second character. As used herein, the terms "nature" or "character" with respect to the incoming call means the type of call that is incoming to the network. For example, a first character may be a standard voice call. A second character may be a call from a FAX machine, beeper or other device as described in relation to **FIG. 1** above. Of course, there may second, third or fourth, etc. character incoming calls which can be classified by the inventive methods and ultimately routed to a location in the network. The invention is not limited to the number or incoming call characters, and the description of **FIG. 2** with respect to incoming calls having one of two characters is simply exemplary for illustrative purposes. It will be further appreciated by those skilled in the art that the call characters are programmed in the software and may be added, deleted or modified at any time by the server **90** managers to accommodate the desired architecture of the network **10**.

[0025] It is then preferably determined at step **190** whether the incoming call is of the first character. If so, then at step **200** the call is routed directly to the subscriber. If not, then at step **210** the call is routed to the subscriber's voice mail on the network for storage or other action. In this scenario, the call has a second character, for example it is determined to be a FAX machine call, and the first character is a voice

mail call. However, it will be further appreciated that these calls may have different characters and may therefore be routed to other locations.

[0026] In any event, the method then proceeds to step **220** where it is determined whether there are other incoming calls to the network that must be routed and classified in accordance with the present invention. If so, then the method proceeds back to step **170** for further processing. If not, then the method stops at step **230**.

[0027] Classification of the character of the incoming call and/or determination of the type of call can occur in several ways. For example, it is known that each of the subscribers to the network are assigned a mobile identification number (MIN) when the network is a wireless network. When an incoming call is received at the network, the network then determines whether the subscriber identified by the MIN has the feature activated that is associated with the character to be determined. For example, if the subscriber desires that FAX transmissions be routed to his or her voice mail, then this option is activated and the system will route FAX transmissions to voice mail after the FAX character of the incoming call has been determined. The determination that the incoming call is a FAX call may be determined by detecting whether or not there are any tones associated with the FAX transmission in the incoming call. If these tones exist, then the call is determined to be a FAX transmission which is preferably automatically routed to voice mail. If no tones are present, the call may be assumed to be a voice call which is directly routed to the subscriber.

[0028] Even more preferably, after the FAX call is routed to voice mail, the system notifies the subscriber that a FAX has been received. This may be accomplished a number of ways. For example, the network may send a wireless communication to the subscriber that a FAX communication is in voice mail, or the network may institute a web page communication to the user that the FAX has been placed in voice mail. Moreover, the inventive methods may determine more than one characteristic about the incoming call, for example, how long the communication is, how many FAX pages are associated with the communication, the time and date of the communication, and other characteristics that may be of interest to the subscriber, the network or others. Additional features may also be added, for example, the inventive methods may be modified to allow the subscriber to dial into his or her voice mail to select and forward the communication to another location such as another FAX machine in or out of the network for printing.

[0029] Thus, the inventive methods store and forward FAX and other incoming telephone calls to subscribers of a network, especially when the subscriber has only a single line in the network. This provides automatic and continuous receipt of FAX and other messages even when the subscriber is using the single line for voice calls. The inventive methods thereby greatly reduce the costs to the subscriber for receiving FAX transmissions and other message and allow the subscriber great versatility in using the network. These results have not heretofore been achieved in the art.

[0030] While there have been shown and described and pointed out certain novel features of the present invention as applied to preferred embodiments thereof, it will be understood by those skilled in the art that various omissions and substitutions and changes in the methods and apparatus described herein, and in their operation, may be made by those skilled in the art without departing from the spirit and scope of the invention. It is expressly intended that all combinations of those elements and/or method steps which perform substantially the same function in substantially the same way to achieve the same results are within the scope of the invention. Substitutions of method steps and elements from one described embodiment to another are also fully intended and contemplated. It is the intention, therefore, to be limited only as indicated by the scope of the claims appended hereto.

What is claimed is:

1. A method of managing multiple telephone calls in a network, comprising the steps of:

receiving an incoming telephone call having a first character for a subscriber to the network;

determining whether the incoming telephone call has one of the first character and a second character in order to classify the incoming telephone call; and

routing the incoming telephone call to a location depending upon its classification as a telephone call of the first or second character.

2. The method recited in claim 1, wherein the determining step comprises the step of reading an identification number associated with the subscriber to determine whether the subscriber has activated a feature associated with the incoming call indicative of the first or second character.

3. The method recited in claim 2, wherein the determining step comprises the step of detecting at least one tone associated with the incoming telephone call wherein the first or second character can be determined from the tone.

4. The method recited in claim 3, wherein the second character indicates that the incoming call comprises a facsimile transmission.

5. The method recited in claim 4 wherein the first character indicates that the incoming call comprises a voice call.

6. The method recited in claim 5, further comprising the step of notifying the subscriber that a facsimile transmission has been received by the network.

7. The method recited in claim 6, wherein the routing step comprises the step of sending the facsimile transmission to a voice mail location for the subscriber.

8. The method recited in claim 7, wherein the notifying step comprises the step of sending a web page to the subscriber to tell the subscriber that a facsimile transmission has been received and forwarded to voice mail.

9. A method of routing telephone calls in a network, comprising the steps of:

receiving an incoming telephone call to the network that is intended for a subscriber to the network;

classifying the incoming call as one of a voice call and another type of call;

routing the incoming all to the subscriber to the network if the incoming call is classified as a voice call; and

routing the incoming call to another location if the incoming call is classified as another type of call.

10. The method recited in claim 9, further comprising the step of notifying the subscriber that an incoming call of the other type has been received by the network.

11. The method recited in claim 10, wherein the incoming call of the other type comprises a facsimile call.

12. The method recited in claim 11, the step of routing the facsimile call comprises the storing the facsimile call in a voice mail location associated with the subscriber of the network.

13. The method recited in claim 12, wherein the facsimile call has associated with it a series of tones which indicate to the network that the incoming call is a facsimile call.

14. The method recited in claim 9, further comprising the step of identifying a mobile identification number associated with a subscriber so that the network can determine whether the subscriber has activated a feature associated with the incoming call so that it can be determined whether the incoming call is the voice call or the call of the other type.

15. A system for managing multiple telephone calls in a network, comprising:

a receiving module for receiving an incoming telephone call having a first character for a subscriber to the network;

a classifying module for classifying the incoming telephone call as a call having one of the first character and a second character; and

a routing module for routing the incoming telephone call to a location depending upon its classification as a telephone call of the first or second character.

16. The system recited in claim 15, wherein the classifying module comprises a reading module for reading a mobile identification number associated with the subscriber to determine whether the subscriber has activated a feature associated with the incoming call so that the first or second character can be determined.

17. The system recited in claim 16, wherein the classifying module is operable for detecting at least one tone associated with the incoming telephone call wherein the first or second character can be determined from the tone.

18. The system recited in claim 17, wherein the second character indicates that the incoming call comprises a facsimile transmission.

19. The system recited in claim 18 wherein the first character indicates that the incoming call comprises a voice call.

20. The system recited in claim 19, further comprising a notifying module for notifying the subscriber that a facsimile transmission has been received by the network.

21. The system recited in claim 20, wherein the routing module is operable for sending the facsimile transmission to a voice mail location for the subscriber.

22. The method recited in claim 21, wherein the notifying module is operable for sending a web page to the subscriber to tell the subscriber that a facsimile transmission has been received and forwarded to voice mail.

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