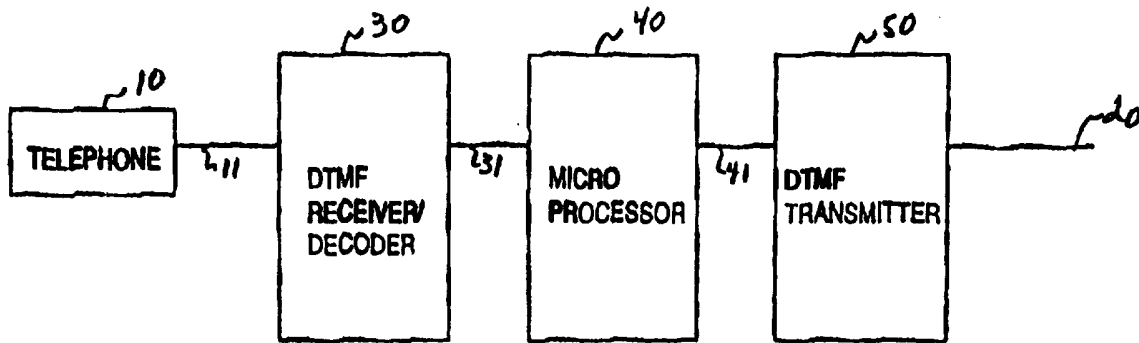




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁶ : H04M 1/26, 1/53</p>	<p>A1</p>	<p>(11) International Publication Number: WO 97/26747 (43) International Publication Date: 24 July 1997 (24.07.97)</p>
<p>(21) International Application Number: PCT/US97/00679 (22) International Filing Date: 16 January 1997 (16.01.97) (30) Priority Data: 08/587,398 17 January 1996 (17.01.96) US (71)(72) Applicants and Inventors: ROBIN, Bruce [US/US]; Suite 5-300, 500 Ala Moana Boulevard, Honolulu, HI 96813 (US). RAUTIO, Jim [US/US]; Suite 5-300, 500 Ala Moana Boulevard, Honolulu, HI 96813 (US). (74) Agents: KARAS, Aaron, B. et al.; Helfgott & Karas, P.C., Empire State Building, 60th floor, New York, NY 10118 (US).</p>		<p>(81) Designated States: AU, CA, IL, JP, MX, NZ, SG, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i></p>

(54) Title: METHOD AND APPARATUS FOR ROUTING A DIALED TELEPHONE NUMBER



(57) Abstract

A method and apparatus are provided for selectively routing a dialed telephone number. The apparatus intercepts a dialed telephone number having a plurality of digits and prevents the number from reaching a telephone address line (2). A comparator (40) compares the digits of the dialed telephone number to a preselected combination of digits and also includes routing means (50) for routing the dialed number along a first route if the compared digits are in agreement but will route the dialed telephone number along a second route if the compared digits are not in agreement with the preselected combination.

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**METHOD AND APPARATUS FOR ROUTING
A DIALED TELEPHONE NUMBER**

BACKGROUND OF INVENTION

The present invention generally relates to a telephone system for facilitating dialing telephone numbers containing a large number of digits. More particularly, the present invention relates to a telephone dialing method and system which can be used between the telephone and the telephone access line for automatically inserting an alternate inter-exchange carrier for long distance and/or international telephone calls.

Since the breakup of the American Telephone and Telegraph company, a plurality of local and long distance carriers have emerged. The consumer has an opportunity to choose a primary long distance telephone carrier. This means that whenever a long distance telephone call is made from a subscriber's telephone, the call is automatically routed to the selected primary long distance carrier.

The long distance telephone business is a highly profitable business, and such profits will increase generally as the number of subscribers utilizing the particular long distance carrier increases. There is fierce competition among the various long distance carriers in an attempt to obtain subscribers.

Because of such competition, different long distance carriers provide different telephone rates depending on the time of call, the area being called, and even the person being called. Therefore, it is possible that a subscriber may choose one primary long distance carrier for most telephone calls. However, for other telephone calls, the subscriber may prefer to utilize a different long distance carrier. As noted above, this might

depend on the time, the duration or the location of the called party.

It is possible for a subscriber to change primary long distance carriers. However, this requires contacting the various carriers and making arrangements for such changes. Quite often, some fees are involved when such changes are made.

In addition to the number of long distance carriers that have been licensed to provide long distance telephone service, there are telephone wholesalers also available for different types of subscribers. The telephone wholesalers may purchase time in large blocks from one or more of the licensed long distance carriers. The wholesaler then resells the time to individual subscribers. Since the reseller can guarantee a large amount of usage of the long distance telephone service, the reseller can generally obtain much better telephone rates than an individual subscriber for making the long distance telephone calls. Thus, the reseller can then pass on some of the savings to individual subscribers.

In order to make use of the resellers equipment, or to use a different long distance carrier from the primary carrier, it is necessary for the telephone caller to first dial an access code into the dialing string. The access code is generally in the form of "101-XXXX". This is also called the "Casual Calling" access code.

As is known, to generally dial a local telephone number, one must dial seven digits. If a long distance telephone call is being made, the subscriber must dial a "1" followed by the area code, followed by the seven digits in the dialing string.

Furthermore, if an international call is being made, the subscriber must generally first dial "011" in order to set up the equipment for the international telephone call. The present invention makes use of these features for selectively routing dialed telephone calls.

SUMMARY OF THE INVENTION

It is accordingly, an object of the present invention to provide a method and apparatus for permitting a telephone subscriber to automatically use different telephone transmission routes, depending on the type of call being made.

It is an object of the present invention to provide a device which is located between a subscriber's telephone and the subscriber's telephone access line. The device will intercept a dialed telephone number and compare at least one of the digits of the dialed telephone number to a preselected combination of digits. The system incorporating the principles of the present invention includes routing means for routing the dialed number along a first route if the compared digits are in agreement with the preselected combination and along a second route if the compared digits are not in agreement with the preselected combination.

The method incorporating the principles of the present invention includes the steps of selectively routing a dialed telephone number. These steps include intercepting a dialed telephone number before the number reaches the telephone access line, and preventing the number from reaching such line. The intercepted number is compared to one or more digits of a

preselected combination of digits. If one or more of the digits of the compared digits are in agreement, an access code for an inter-exchange carrier will automatically be inserted before the dialed telephone number and then the number will be transmitted to the telephone access line.

A further feature of the apparatus incorporating the principles of the present invention is that the apparatus can be operated solely on the electrical power provided by the telephone access line.

Another feature of the present invention is that the telephone inter-exchange carrier company can dial a particular telephone subscriber and when the subscribers answers the "101-XXXX" access code may be automatically reprogrammed.

Still another feature of the present invention is that a single telephone dialing device will permit all of the telephone instruments on a single telephone line to have the benefits of the present invention.

Another feature of the present invention is that the telephone dialing device can be bypassed by simply pressing a selected button on the telephone.

Further features of the system incorporating the principles of the present invention include a receiver and decoding means for intercepting a dialed telephone number from the telephone and developing a number having a plurality of digits corresponding to the dialed number. Comparing means are provided for receiving the developed number and comparing one or more of such digits to a stored preselected combination of digits while preventing the

dialed number from reaching the telephone access line. Finally, transmitting means are provided for dialing a "101-XXXX" access code for an inter-exchange carrier followed by the dialed telephone number and transmitting the entire dialing string to the local telephone line when the compared digits are in agreement but transmitting only the dialed telephone number when the compared digits are not in agreement.

Further features of the present invention include using a dual tone multifrequency receiver and decoder as the receiver and decoding means, a microprocessor as the comparing means and a dual tone multifrequency transmitter as the transmitting means.

These and other objects of the present invention will become apparent to those skilled in the art after reading the following detailed description of a preferred embodiment which is illustrated in the following drawings in which:

IN THE DRAWING

Figure 1 is a block diagram showing an embodiment of the present invention; and

Figure 2 is a flow diagram showing the various steps practiced by the apparatus incorporating the principles of the present invention.

Referring to the drawings, in Figure 1 the telephone 10 generally has a handset which is removed for dialing a telephone number. It is recognized that some telephones are cordless telephones and there are also cellular telephones. Accordingly, as used in this application, a telephone goes "off-hook" when the

telephone 10 is operated to receive a dial tone from a telephone access line 20.

Arranged between the telephone 10 and the telephone access line 20 is a dual tone multifrequency (DTMF) receiver and decoder 30; a microprocessor 40 and a DTMF transmitter 50.

The dialed telephone number from the telephone 10 is applied to the DTMF receiver/decoder 30 via an electrical conductor 11. The DTMF receiver/decoder 30 will transform the received telephone number into a plurality of digits if the dialed telephone number is not already in digital form. The digital number, equivalent to the dialed telephone number from the telephone 10 is applied along an electrical conductor 31 to the microprocessor 40.

The microprocessor 40 will compare the dialed telephone number in digital form to a preselected stored combination of digits in the microprocessor. The operation of the microprocessor 40 will subsequently be described with respect to the flowchart of Figure 2.

The stored dialed telephone number, which has been prevented from reaching the telephone access line 20, after being compared to the preselected combination of digits in the microprocessor 40 is then applied via an electrical conductor 41 to the DTMF transmitter 50. The DTMF transmitter 50 will then transmit the number received from the microprocessor 40 in the form of a dialing string of numbers and will apply the same to the telephone line 20.

The dialed string of numbers will follow one of at least two routes. The first route will be to an alternate inter-exchange

carrier (IXC). In this arrangement, the microprocessor 40 will have inserted the access code "101-XXXX" before the dialed telephone number. Thus, the number that is applied to the telephone access line 20 from the DTMF transmitter 50 will then be automatically transmitted to the alternate inter-exchange carrier without being transmitted to the primary long distance carrier of the telephone subscriber.

That is, the telephone 10 and the access line 20 will normally have a preselected primary long distance carrier. In the event the telephone subscriber chooses not to use the primary long distance telephone carrier, the subscriber will utilize the telephone dialing device illustrated in Figure 1 and incorporating the principles of the present invention. The dialed access code 101-XXXX will be inserted in the dialing string of numbers before the dialed telephone number to instruct the equipment on the telephone access line to send the number along the first route which includes the alternate inter-exchange carrier. This will occur, as will be explained with respect to the flowchart of Figure 2, when the combination of digits compared in the microprocessor 40 are in agreement.

In the event the digits compared in the microprocessor 40 do not agree, no access code number will be inserted into the dialing string and the number transmitted from the DTMF transmitter 50 will be the actual number dialed at the telephone 10. This will provide the second route for the dialed telephone number which is applied by the telephone access line to the local telephone exchange.

The DTMF receive/decoder 30, the microprocessor 40 and the DTMF transmitter 50 are all conventional telephone equipment readily available and their actual circuits need not be included at this time in order to avoid unnecessarily complicating the drawings.

Referring now to the flowchart of Figure 2, in the first step, the telephone 10 goes into off-hook operation. This occurs when the handset is removed from the telephone or otherwise connected to receive the dial tone from the telephone access line 20. When the phone goes off-hook as indicated by the box 60, the circuits 61 are initialized to receive the dialed telephone number. The dialed telephone number is then subjected to the decoding and storing step 62. The telephone number is prevented from reaching the telephone access line 20 at this time.

In the next step 63, the first number of the dialed number is compared to the preselected combination of digits in the microprocessor 40. If the first number of the dialed telephone number is a "1", this information is utilized to perform the next step 64. Step 64 dials a pre-programmed access code 101-XXXX and inserts it in front of the dialed stored telephone number. In the next step 65, the new dialing string which includes the 101-XXXX access code, is transmitted via the DTMF transmitter 50 to the telephone access line 20.

Since in this case the pre-programmed 101-XXXX access code has been inserted in front of the dialed telephone number, the telephone access line will send the number along a first route to the alternate inter-exchange carrier.

In addition to transmitting the dialed string of numbers at the step 65, the DTMF transmitter 50 will thereafter emit a signal to perform the step 66 which resets the circuit and prepares it for the next dialed number.

In reviewing the above operation it should be noted that when a telephone subscriber make a long distance call, the first digit dialed is a "1". Then the area code is dialed and the seven digit dialed number follows. It is known that the digit "1" is required to set up the long distance circuit. Accordingly, with this arrangement, once the system incorporating the principles of the present invention recognizes that a long distance number is to be transmitted, the system operates to insert the alternate inter-exchange carrier access code.

Returning now to the flowchart of Figure 2, in the event the first number of the dialed telephone number is not a "1", the next step is step 67, which now compares the first three numbers to the first three numbers of the stored combination of digits in the microprocessor 40. In the event the first three digits of the dialed number equal 011, this indicates an international call.

When the international call is to be placed, the agreement of the first three numbers of the dialed telephone number with the preselected stored combination of digits in the microprocessor 40 will again result in the step 64. Thus the 101-XXXX access code which has been pre-programmed in the microprocessor 40 will be inserted before the dialed telephone number to alert the equipment attached to the telephone access line 20 that an international call is to be placed. The DTMF

transmitter 50 will then operate the step 65 to dial all of the stored digits and transmit them to the telephone access line 20. The circuits will again be reset by the step 66.

Thus it can be seen that the telephone dialing system incorporating the principles of the present invention can save the telephone subscriber substantial time. Once the telephone subscriber decides to use an alternate inter-exchange carrier and has pre-programmed the telephone dialing device incorporating the principles of the present invention with the alternate inter-exchange carrier selected, the device will thereafter automatically insert the appropriate access code into any long distance or international call to be made.

This saves the necessity of the telephone subscriber remembering the access code whenever the alternate carrier is to be used. The telephone subscriber merely dials the long distance number in the same manner as usual and the telephone dialing device incorporating the principles of the present invention will automatically take care of routing the call to the appropriate inter-exchange carrier. As noted above, the telephone dialing device incorporating the principles of the present invention may have its preprogrammed access code changed automatically by the desired inter-exchange carrier. This is carried out by the carrier dialing the telephone subscriber having the device. When the call is answered, a secret code is transmitted from the carrier and the device is automatically set to the desired access code. This permits the carrier to change the selected code if needed.

Returning to the flow chart diagram of Figure 2, if the three numbers compared in step 67 are not in agreement with the stored combination of digits in the microprocessor 40, the microprocessor 40 will then perform the step 68, which transmits along the electrical conductor 41 information to the DTMF transmitter 50 to transmit simply the dialed number that has been stored in the microprocessor 40. Thus, there will be no insertion of any access codes, the telephone access line 20 will send the dialed telephone number along the second route to the local telephone company exchange.

In other words, the failure of the comparison with the first three digits to agree with the preselected combination of digits stored in the microprocessor 40, will indicate that the call is a local telephone call and that no long distance carrier or international call need be placed.

At the end of the step 68, the circuits are again reset in the step 69 in a manner similar to that of step 66.

It can be seen that no separate electrical power connections are provided in the apparatus illustrated in Figure 1. The telephone access line 20 generally brings to the subscriber and the telephone 10 electrical power for operating the telephone system in the usual manner. By having the telephone dialing device inserted between the telephone 10 and the telephone access line 20, the electrical power is available for powering the apparatus of the telephone dialing system which includes the DTMF receiver/decoder 30, the microprocessor 40, and the DTMF transmitter 50. Thus, no alternate power source is required. Of

course, if such alternate power source is desired, it can readily be utilized.

Furthermore, many telephone subscribers have a plurality of telephones operating on a single telephone access line 20. With the telephone dialing device incorporating the principles of the present invention, only a single device is needed for the access line 20. Any one of the telephones connected to the access line 20 may be used and still have the advantages of using the device.

The present invention has been described to provide two separate routes for the dialed telephone number to follow. In the event an alternate inter-exchange carrier is to be used, the required access code is automatically inserted and the telephone subscriber need only dial the long distance number without concern as to the access code. The same is true with respect to making an international call utilizing the alternate inter-exchange carrier.

In the event a local telephone call is to be made, the subscriber merely dials the local telephone number and the telephone dialing device, after making its quick comparisons, will not interfere with such local dialed telephone number and will apply such number to the telephone access line 20 to follow the second route to the local telephone exchange.

Suppose the telephone subscriber would like to use the primary long distance carrier which has been previously chosen. In this event, the system will respond to the operation of one of the alternate buttons available on the telephone handset. These buttons are known as the "*" and "#" button. Either one of these buttons or a combination thereof can be utilized and operated

prior to dialing the telephone number to automatically bypass the telephone dialing device incorporating the principles of the present invention.

Accordingly, the telephone subscriber has several choices. For a local dialed telephone number, the subscriber merely dials the telephone number. To use the primary long distance carrier, the telephone subscriber operates the "*" or "#" button in the proper combination to bypass the device. In the event the telephone subscriber wants to utilize the alternate inter-exchange carrier because the rates are better or for any other reason, the subscriber need merely dial the long distance or the international telephone calling dialed number. At this point, the telephone dialing system incorporating the principles of the present invention will automatically arrange for the alternate inter-exchange long distance carrier to be used.

As noted above, a further advantage of the system incorporating the principles of the present invention is that the telephone subscriber has the option of utilizing the primary long distance carrier or the alternate long distance carrier without having to correspond with either of the long distance carrier companies to arrange for an exchange of carriers and without having to dial any special access code before dialing the telephone number.

It is possible to have more than one alternate inter-exchange access code automatically inserted if the subscriber desires to use more than the primary long distance carrier and one alternate inter-exchange carrier. This will require that the microprocessor 40 be programmed with more than one access code

and means be provided on the device for choosing which alternate inter-exchange carrier is to be used prior to dialing the telephone number. Once this is selected, the proper access code will be inserted automatically without additional operation required by the telephone subscriber.

Various modifications will become possible for those skilled in the art after having the benefit of the present disclosure without departing from the scope thereof and the invention is meant to include such modifications as recited in the following claims.

WHAT IS CLAIMED IS:

1. A method for selectively routing a dialed telephone number comprising the steps of:

intercepting a dialed telephone number having a plurality of digits before said number reaches a telephone access line;

comparing at least one of the digits of said intercepted number to a preselected combination of digits;

routing said dialed number along a first route if said compared digits are in agreement with said preselected combination; and

routing said dialed number along a second route if said compared digits are not in agreement with said preselected combination.

2. A method as claimed in claim 1 wherein said step of comparing comprises comparing the first digit of said dialed number to the first digit of said preselected combination and said first route includes an inter-exchange carrier.

3. A method as claimed in claim 1 wherein said step of comparing comprises comparing the first three digits of said dialed number to the first three digits of said preselected combination and said first route includes an international telephone exchange and an inter-exchange carrier.

4. A method as claimed in claim 1 wherein said second route includes a local telephone exchange.

5. A method as claimed in claim 1 wherein said telephone access line includes access to a primary long distance company and said first route includes an alternate inter-exchange carrier.

6. A method as claimed in claim 6 wherein said first route excludes said primary long distance company carrier.

7. A method as claimed in claim 1 wherein a 101-XXXX access code for an inter-exchange carrier is automatically inserted before said dialed number for transmission along said first route when said compared digits are in agreement.

8. A telephone dialing device adapted to operate between a telephone and a telephone access line, said device comprising:

means for intercepting a dialed telephone number having a plurality of digits output from said telephone before said dialed number reaches said telephone access line;

comparator means for comparing at least one of said digits of said dialed number to a preselected combination of digits;

routing means for routing said dialed number along a first route if said compared digits are in agreement with said preselected combination and along a second route if said compared digits are not in agreement with said preselected combination.

9. A device as claimed in claim 8 wherein said comparator compares the first digit of said dialed number to the first digit of said preselected combination and said first route includes an inter-exchange carrier.

10. A device as claimed in claim 8 wherein said comparator compares the first three digits of said dialed number to the first three digits of said preselected combination and said first route includes an international exchange and an inter-exchange carrier.

11. A device as claimed in claim 8 wherein said second route includes a local telephone exchange.

12. A device as claimed in claim 8 wherein said telephone access line includes access to a primary long distance company and said first route includes an alternate inter-exchange carrier.

13. A device as claimed in claim 12 wherein said first route excludes said primary long distance carrier.

14. A device as claimed in claim 8 wherein said routing means includes a 101-XXXX access code for an alternate inter-exchange carrier which is automatically inserted before said dialed number for transmission along said first route.

15. A device as claimed in claim 8 wherein said telephone access line includes electrical power for operating said telephone and said device includes means for utilizing said power for operation.

16. A device as claimed in claim 14 wherein said device includes means for bypassing said intercepting means and said routing means for accessing said telephone access line.

17. A telephone dialing system adapted to operate between a telephone and a telephone access line, said system comprising:

a receiver and decoding means for intercepting a dialed telephone number output from said telephone and developing a number having a plurality of digits corresponding to said dialed number;

comparing means for receiving said developed number and comparing at least one of said digits of said developed number to a stored preselected combination of digits while preventing said dialed number from reaching said telephone access line; and

transmitting means for transmitting only said dialed telephone number when said compared digits are not in agreement and for dialing a 101-XXXX access code for an inter-exchange carrier followed by said dialed telephone number to form a dialing string and transmitting said dialing string to said telephone access line when said compared digits are in agreement.

18. A system as claimed in claim 17 wherein said receiver and decoding means includes a dual tone multifrequency receiver

and decoder, said comparing means includes a microprocessor and said transmitting means includes a dual tone multifrequency transmitter.

19. A telephone dialing device as claimed in claim 8 wherein a plurality of telephones are operatively connected to said telephone access line and any one of said telephones may be used in conjunction with said device.

20. A telephone dialing device as claimed in claim 14 wherein said access code may be remotely and automatically reprogrammed by said inter-exchange carrier when desired.

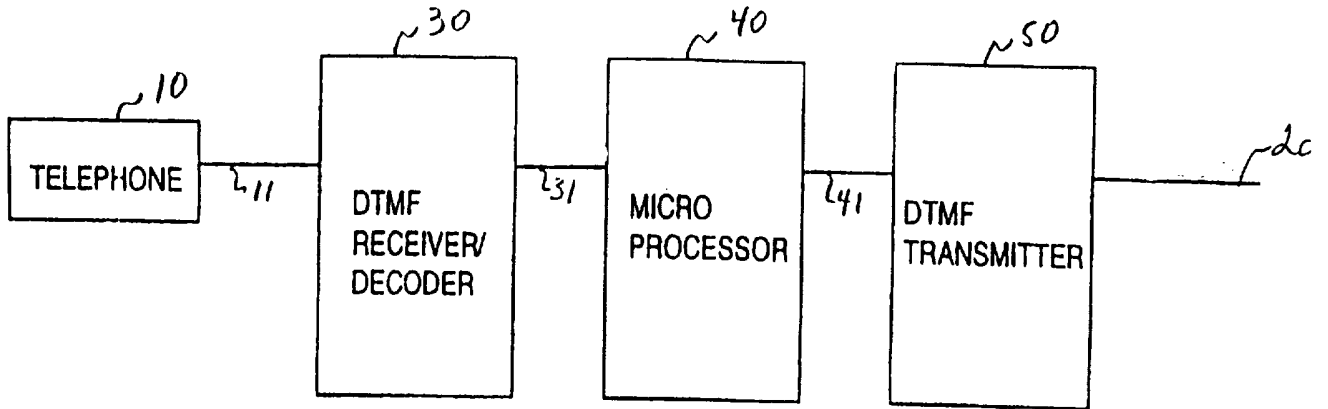


FIGURE 1

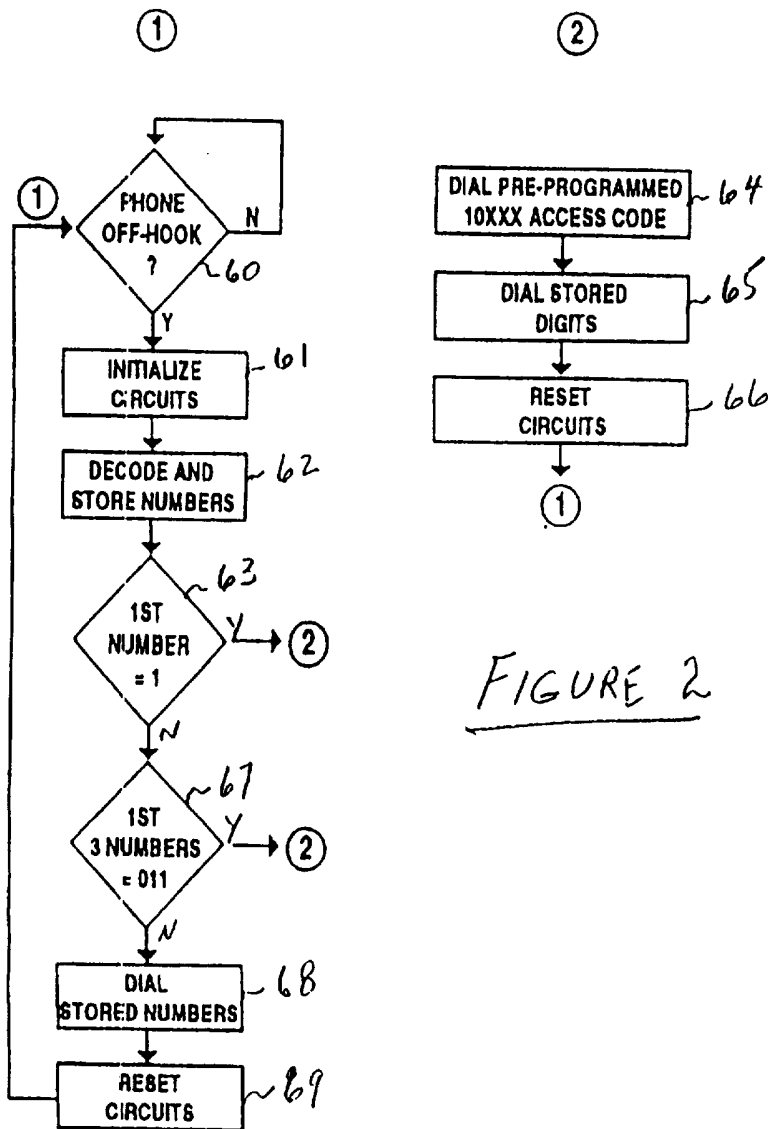


FIGURE 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/00679

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :HO4M 1/26, 1/53
US CL :379/220, 221, 355

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 379/220, 221, 355, 112, 113, 114, 130, 133, 140, 199, 200, 356

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.
X --- Y	US 5,425,085 A (Weinberger et al.) 13 June 1995, figures 2, 4, 5 and 7; col 6 lines 20-30, col 4 lines 24-34.	1, 3, 4, 5, 6, 8, 10, 11- 15, 17, 18-20 ----- 16
X	US 5,400,396 A (Berenato) 21 March 1995, figure 1 and 4, col 4 lines 44-59	1, 2, 4-6, 8, 9, 11-13
Y	US 5,200,995 A (Gaukel et al.) 06 April 1993, abstract, col 4 lines 34-54, col 19 lines 34-49.	16
A	US 4,751,728 A (TREAT) 14 June 1988	1-20
A	US 4,947,422 A (Smith et al.) 07 August 1990	1-20

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

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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Date of the actual completion of the international search

05 MARCH 1997

Date of mailing of the international search report

26 MAR 1997

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/00679

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4,964,159 A (Son) 16 October 1990	1-20
A	US 5,341,415 A (Baran) 23 August 1994	1-20
A	US 5,473,630 A (Penzias et al.) 05 December 1995	1-20
X,P	US 5,550,915 A (Partridge III) 27 August 1996	1, 2, 4-9, 11-14, 17, 18, 20