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(56) Documents Cited
EP 0498593 A2 WO 97/50234 A2 WO 97/26748 A1
US 5592541 A US 5206901 A

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(54) Abstract Title
Call forwarding to multiple extensions in an exchange

(57) A PBX system is described that can forward an incoming call destined to one extension to a plurality of other extensions either sequentially or concurrently. A called terminal number is received with an incoming call. If a call forwarding function is set for the called terminal, a ring signal is sent to a plurality of destination extensions registered for the called extension. If the call is answered from one of the destination terminals to which the ring signal has been sent, a speech path is formed between the received call and the destination extension from which the call was answered.

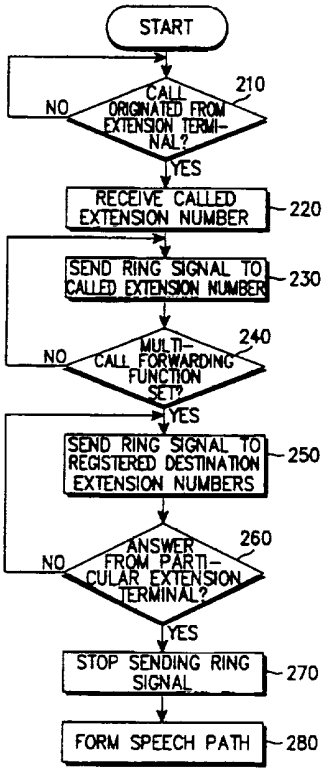

FIG. 2

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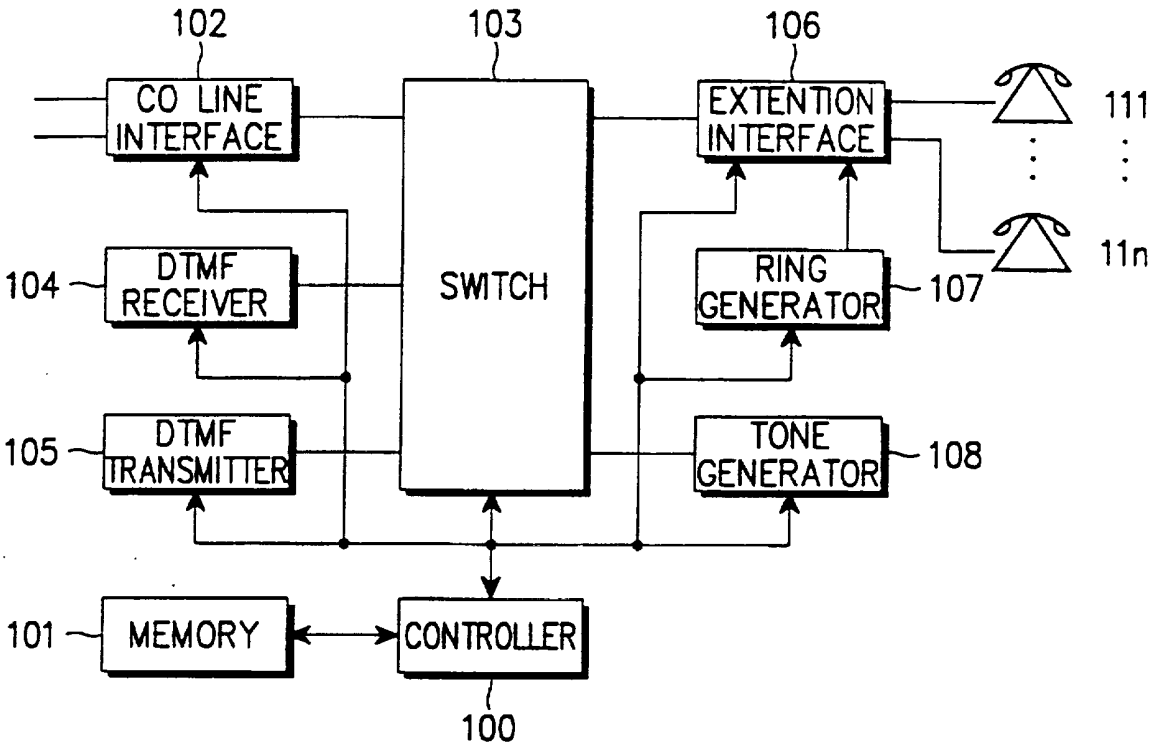
102
103
106
CO LINE INTERFACE
SWITCH
EXTENTION INTERFACE
111
11n
104
DTMF RECEIVER
RING GENERATOR
107
105
DTMF TRANSMITTER
TONE GENERATOR
108
101
MEMORY
CONTROLLER
100

FIG. 1

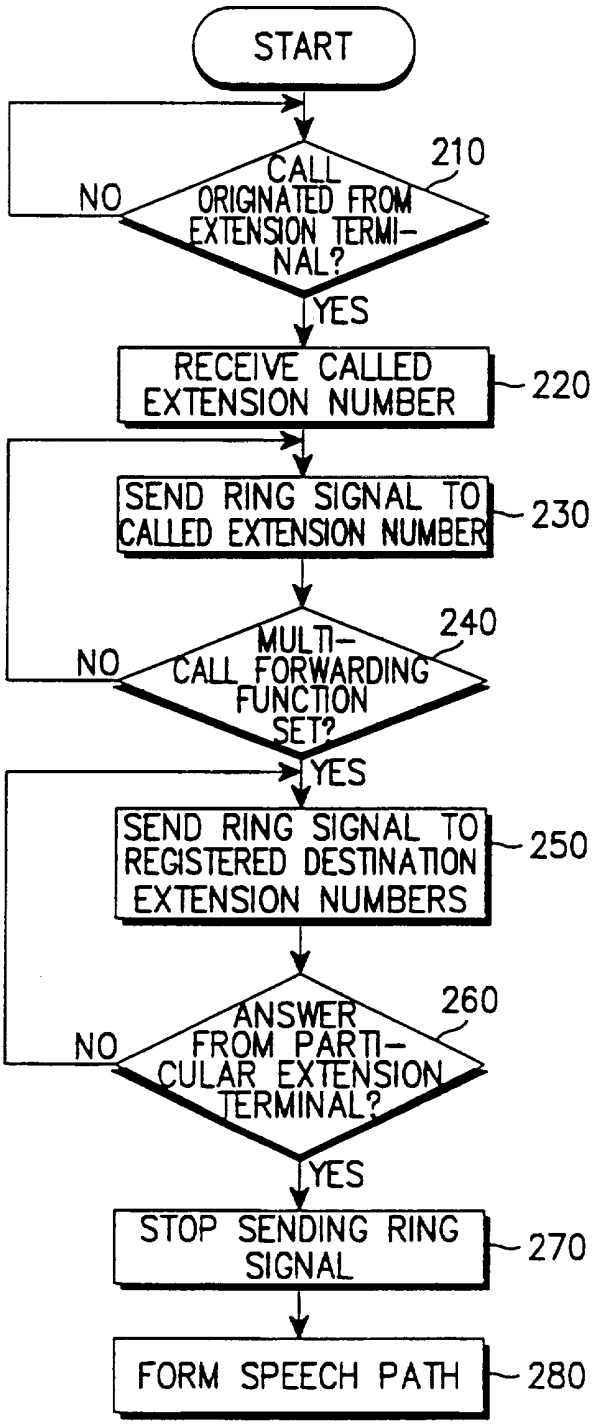
START
CALL ORIGINATED FROM EXTENSION TERMINAL?
210
NO
YES
RECEIVE CALLED EXTENSION NUMBER
220
SEND RING SIGNAL TO CALLED EXTENSION NUMBER
230
MULTI-CALL FORWARDING FUNCTION SET?
240
NO
YES
SEND RING SIGNAL TO REGISTERED DESTINATION EXTENSION NUMBERS
250
ANSWER FROM PARTICULAR EXTENSION TERMINAL?
260
NO
YES
STOP SENDING RING SIGNAL
270
FORM SPEECH PATH
280

FIG. 2

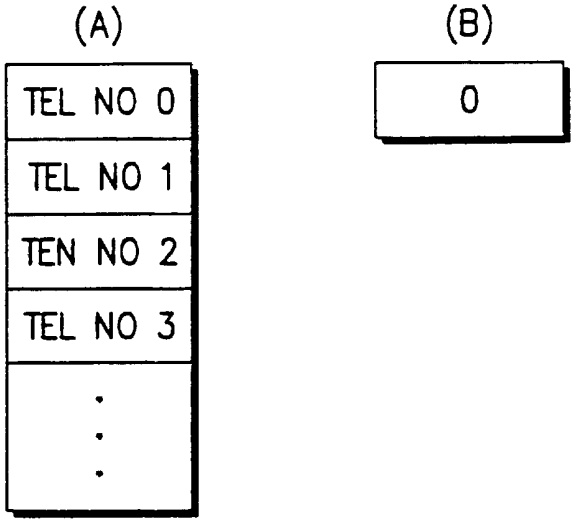

FIG. 3

MULTI-CALL FORWARDING METHOD IN AN EXCHANGE

BACKGROUND TO THE INVENTION

The present invention relates to a call forwarding method in an exchange, such as a PBX system.

Call forwarding in a PBX system involves forwarding an incoming call to a predetermined external subscriber or extension subscriber conventional call forwarding is useful only if the subscriber concerned moves to a predetermined location. If he frequently moves to various locations, call forwarding must always be reset to the destination telephone numbers of his changed locations, at great inconvenience.

SUMMARY OF THE INVENTION

Therefore, an object of the present invention is to provide an improved call forwarding method.

To achieve this object, there is provided an exchange system adapted to operate as follows upon receipt of a call:

to receive a called terminal number;

if a call forwarding function is set for the called terminal, to send a ring signal to a plurality of destination terminals registered for the called terminal; and

if the call is answered from one of the destination terminals to which the ring signal has been sent, forming a speech path between the received call and the destination extension from which the call was answered.

The present invention also provides a method of operating an exchange system upon receipt of a call comprising:

receiving a called terminal number;

determining that a call forwarding function is set for the called terminal and as a consequence of that determination, sending a ring signal to a plurality of destination terminals registered for the called terminal; and

when the call is answered from one of the destination terminals to which the ring signal has been sent, forming a speech path between the received call and the destination extension from which the call was answered.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 is a schematic block diagram of a PBX system to which the present invention is applied;

FIG. 2 is a flowchart for the process forwarding a call to a plurality of destination telephone numbers; and

FIGs. 3A and 3B illustrate a ring queue and an index for call-forwarded subscribers.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 is a schematic block diagram of a PBX system to which the present invention is applied. The PBX system includes a controller 100, a memory 101, a central office line interface (CO line interface) 102, a switch 103, a

DTMF (Dual Tone Multi-Frequency) receiver 104, a DTMF transmitter 105, an extension interface 106, a ring generator 107, a tone generator 108 and a plurality of extension terminals 111 to 11n.

Referring to FIG. 1, the operation of the PBX system will now be described. The controller 100 provides overall control to the PBX system. The memory 101 stores a control program that operates the controller 100 in the way shown in FIG. 2 and a plurality of destination telephone numbers to which a call is forwarded for each extension terminal. The central office line interface 102 transmits a signal received from an exchange through a central office line to the switch 103 under the control of the controller 100. The switch 103 switches a speech path under the control of the controller 100. The DTMF receiver 104 receives DTMF signal from the central office line interface 102 under the control of the controller 100. The DTMF transmitter 105 sends DTMF signal to the switch 103 under the control of the controller 100.

The extension interface 106 transmits a signal received from the switch 103 to a corresponding extension terminal and a signal received from an extension terminal to the switch 103, under the control of the controller 100. The ring generator 107 sends ring signals to a called extension terminal upon a call request being reviewed from the central office line interface 102 or a specific extension terminal through the extension interface 106. The tone generator 108 generates tone signals and feeds the tone signals to the switch 103 under the control of

the controller 100. The extension terminals 111 to 11n can accommodate a multi-call forwarding function and store their destination telephone numbers in their internal memories. Thus, by setting the multi-call forwarding function of the present invention, a plurality of destination telephone numbers can be registered for each extension terminal.

FIG. 2 is a flowchart of the process of forwarding an incoming call to an extension terminal for which a multi-call forwarding function is registered. FIGs. 3A and 3B show a queue for storing extension numbers to which a call has been forwarded and an index indicating the queue.

Referring to FIGs. 1 to 3B, the multi-call forwarding operation in the PBX system according to the embodiment of the present invention will be described. In step 210, the controller 100 determines whether an extension terminal originates a call through the extension interface 106. Upon such call origination, the controller 100 receives a called telephone number from the extension terminal, in step 220. Then, the controller 100 controls the ring generator 107 to send a ring signal to the received telephone number through the central office line interface 102 or the extension interface 106, in step 230.

In step 240, the controller 100 determines whether a multi-call forwarding function is set for the called extension terminal to which the ring signal is sent. If

it is, the controller 100 sends the ring signal to a destination extension number registered when the multi-call forwarding function was set, in step 250. Here, the controller 100 sequentially sends the ring signal to a plurality of registered destination extension numbers by controlling the ring generator 107. Then, the controller 100 sequentially stores the extension numbers to which the ring signal has been sent in a queue and increments an index whenever the ring signal is sent to the next extension number. Alternatively, the controller 100 may send the ring signal to the destination extension numbers simultaneously.

In step 260, the controller 100 determines whether the call is answered by one of the extension terminals to which the call has been. If it is, the controller 100 stops sending the ring signal to the destination extension numbers, in step 270. In step 280, the controller 100 establishes a speech path between the calling extension terminal and the extension terminal which answered the call by controlling the switch 103.

In accordance with the present invention as described above, a ring signal can be sent to a plurality of destination telephone numbers when forwarding an incoming call originally for an extension terminal for which a multi-call forwarding function is set. Therefore, an incoming call can be forwarded to a plurality of destination telephone numbers at the locations which a called subscriber frequents.

CLAIMS

1. An exchange system adapted to operate as follows upon receipt of a call:

to receive a called terminal number;

if a call forwarding function is set for the called terminal, to send a ring signal to a plurality of destination terminals registered for the called terminal; and

if the call is answered from one of the destination terminals to which the ring signal has been sent, forming a speech path between the received call and the destination extension from which the call was answered.

2. A system according to claim 1 which is a private branch exchange (PBX) system.

3. A PBX system according to claim 2 in which the said terminals are extension terminals of the PBX.

4. A PBX system according to claim 2 or claim 3 in which the incoming call is from an extension terminal of the PBX.

5. An exchange system according to any preceding claim, adapted to send the ring signal to the plurality of destination telephone numbers according predetermined call forwarding priorities.

6. An exchange system according to any one of claims 1-4, adapted to send the ring signal to the plurality of

destination telephone concurrently.

7. A method of operating an exchange system upon receipt of a call comprising:

receiving a called terminal number;

determining that a call forwarding function is set for the called terminal and as a consequence of that determination, sending a ring signal to a plurality of destination terminals registered for the called terminal; and

when the call is answered from one of the destination terminals to which the ring signal has been sent, forming a speech path between the received call and the destination extension from which the call was answered.

8. An exchange system substantially as described herein with reference to and/or as illustrated in the accompanying drawings.

9. A method of operating an exchange system substantially as described herein with reference to and/or as illustrated in FIGs. 2 and 3 of the accompanying drawings.

The Patent Office

INVESTOR IN PEOPLE

Application No: GB 9924873.4 **Examiner:** Mark Bell
Claims searched: 1 to 9 **Date of search:** 10 December 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H4K (KF54)

Int Cl (Ed.6): H04M 3/54, 3/46

Other: ONLINE: WPI, PAJ, EPODOC

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	EP 0498593 A2	A T & T CO.	1 to 4, 6 and 7
X	WO 97/50234 A2	A T & T CORP. (See page 10 lines 1 and 2)	1 to 5
X	WO 97/26748 A1	PILGRIM TELEPHONE INC. (see page 2 lines 14 to 20)	1 to 5
X	US 5592541	FLEISHER, III et al.	1 to 4, 6 and 7
X	US 5206901	HARLOW et al.	1 to 5 and 7

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.