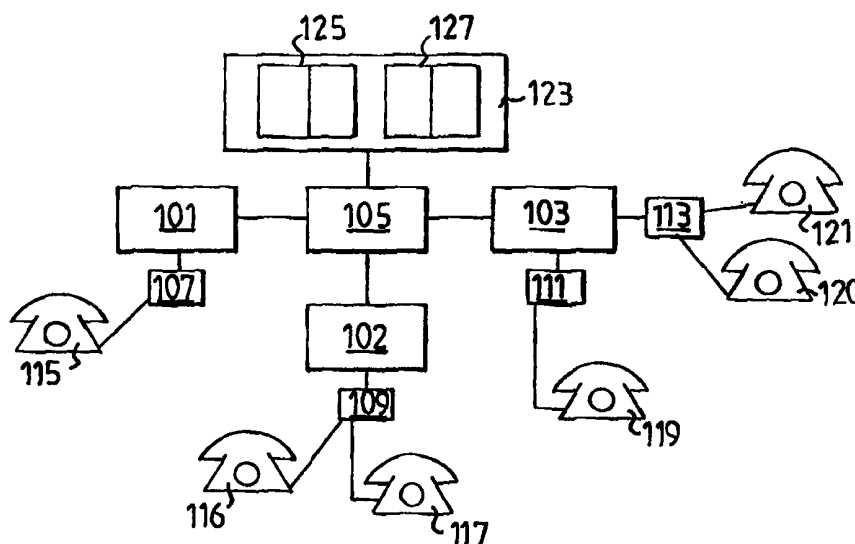




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(54) Title: METHOD AND DEVICE IN TELECOMMUNICATIONS NETWORK



## (57) Abstract

An address registration means (123; 213) used in a telecommunications network in which subscribers are connected to remote subscriber stages (RSS) (107, 109, 111, 113; 205) is disclosed. Said RSSs are connected to local exchanges (101, 102, 103; 201, 203). The address registration means (123, 213) comprises a first table (125) providing information about the RSS to which each subscriber is connected, and a second table (127) providing information about the local exchange to which each RSS is connected. To move an RSS (107, 109, 111, 113; 205), with all subscribers connected to it, from a local exchange to another, the table entry for this RSS in the second table (127) is changed. The address registration means (211) may be comprised in a supervision node (211) monitoring the state of the local exchanges (201, 203) to move an RSS from one local exchange to another automatically when needed.

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## Method and Device in Telecommunications Network

### Technical Field

The present invention relates to telecommunications systems and in particular to  
5 telecommunications systems in which remote subscriber stages are used.

### Background

Often in telecommunications networks remote subscriber stages (RSS) are used to  
move some of the switching and concentration functions closer to the subscribers.  
10 Typically, one RSS can handle approximately 2000 subscribers.

The requirements for number portability in telecommunications networks increases  
as people move more often. Also, it is desirable to be able to move groups of sub-  
scribers fast, to minimize the work and the disturbance in the network. Groups of  
15 subscribers may have to be moved, for example, when a node in the network is be-  
ing replaced. It is also desirable to be able to move groups of subscriber temporarily  
when an exchange or an RSS is out of service.

Solutions currently exist for number portability in networks when the subscribers  
20 are connected to a local exchange, either directly or via a connection node. Co-  
pending US patent application 08/733,390 describes a solution in which a telecom-  
munications network comprises an address table in which the number of each sub-  
scriber is linked to the identity of the exchange to which the subscriber is connected.

25 European patent application EP 0 738 093 A2 describes an address node in a tele-  
communications network linking the logical number of a subscriber to the number  
denoting a physical connection. Thus, when a subscriber moves, only the number to  
the physical connection has to be changed in the table, while the subscriber's logical  
number may be kept.

It is known how to change the numbers of subscribers belonging to the same number series.

None of the above mentioned solutions solve the problem of moving a lot of subscribers connected to an RSS.

### Summary of the Invention

It is an object of the present invention to enable the moving of many subscribers in a telecommunications network to another exchange, irrespective of their telephone number.

It is another object of the invention to enable the efficient handling of subscribers in a remote subscriber stage.

It is another object of the invention to enable the moving of many subscribers in a telecommunications network to another exchange without having to change their telephone numbers.

It is yet another object to enable the moving of many subscribers in a telecommunications network fast and in one operation.

It is still another object to minimize the disturbances in the network when moving many subscribers in a telecommunications network.

These objects are achieved according to the invention by an address registration means for use in a telecommunications network in which subscribers are connected to remote subscriber stages, said remote subscriber stages being connected to local exchanges, comprising a first table providing information for subscribers connected to an RSS, about the RSS to which each subscriber is connected, and a second table providing information about the local exchange to which each RSS is connected.

An RSS, with all subscribers connected to it, is moved from a local exchange to another local exchange by changing the table entry for this RSS in the second table.

The address registration means may be comprised in a supervision node monitoring the state of all local exchanges connected to it. If one local exchange fails, the supervision node may initiate the move of one or more RSSs connected to this local exchange to another local exchange.

The invention offers the following advantages:

A large number of subscribers connected to an RSS can be moved efficiently by moving the RSS to another local exchange. This may be used, for example, to move subscribers between operators.

With the solution according to the invention, standby exchanges may be used for important subscribers, such as the police to make connections to these subscribers more reliable.

### **Brief Description of the Drawings**

Figure 1 is a block diagram of a prior art telecommunications network.

Figure 2 is a block diagram of a telecommunications network with subscriber stages according to the invention.

Figures 3A and 3B show the address tables according to the invention.

Figure 4 shows a telecommunications network according to one embodiment of the invention.

Figure 5 is a flow chart of the actions performed to set up a call in a system according to the invention.

### **Detailed Description of Embodiments**

Figure 1 shows a telecommunications network as disclosed in the above mentioned co-pending US application 08/733,390.

A first and a second local exchange 1,3 are connected to each other through a transit exchange 5. A number of subscribers 7 are connected to the first local exchange 1,

and a number of subscribers 9 are connected to the second local exchange 3. The transit exchange is connected to an address table 11, comprising two columns 11a, 11b. The first column 11a holds the subscriber numbers; the second column 11b holds information about the exchange at which each subscriber number is found.

5 When a first subscriber 7 calls a second subscriber 9, the local exchange 1 to which the first subscriber 7 is connected first checks if the second subscriber 9 is also connected to the same local exchange. If this is the case, the connection is set up; if not, the call is forwarded to the transit exchange 5, which looks up the number in the address table 11. From the address table 11 information is retrieved about the local exchange 3 to which the second subscriber is connected, and the connection is set up.

Figure 2 shows an example of a telecommunications network comprising remote subscriber stages according to the invention. In this example, a first 101, a second 102 and a third 103 local exchange are connected to each other through a transit exchange 105. A first remote subscriber stage 107 is connected to the first local exchange 101. A second remote subscriber stage 109 is connected to the second local exchange 102. A third 111 and a fourth 113 remote subscriber stage are connected to the third local exchange 103. A number of subscribers 115 are connected to the first subscriber stage 107. A number of subscribers 116, 117 are connected to the second subscriber stage 109. A number of subscribers 119 are connected to the third subscriber stage 111. A number of subscribers 120, 121 are connected to the fourth subscriber stage 113.

In the normal case, for example, the first remote subscriber stage 107 were to be moved to another local exchange, each subscriber would have to be moved individually. According to the invention, an address registration means 123 is introduced comprising two tables 125 and 127. The tables are shown in detail in Figures 3A and 3B. The first table 125 comprises information about what remote subscriber stage each subscriber connected to. The second table 127 comprises information about what local exchange each remote subscriber stage is connected to.

Thus, to move an RSS to another local exchange, only one table entry has to be changed. In addition, of course, the physical connection from the RSS must be moved to the other local exchange, which is a much less time consuming action than moving the subscribers. This is useful when an exchange is to be repaired or replaced, or is temporarily out of service.

5

Figure 3A shows an example of the first table 125, as it would look for the system illustrated in Figure 2. Each subscriber has an entry in the table, stating to which RSS the subscriber is connected. As can be seen from the table, the first subscriber 115 is connected to the first RSS 107, subscribers 116 and 117 are both connected to the second RSS 109, and so on.

10

Figure 3B shows an example of the second table 127 as it would look for the system illustrated in Figure 2. Each RSS has an entry in the table, stating to which local exchange the RSS is connected. As can be seen from the table, the first RSS 107 is connected to the first local exchange 101, the second RSS is connected to the second local exchange 102, and the third and fourth RSSs are connected to the third local exchange 103.

15

As will be obvious to the skilled person, the networks shown in Figures 1 and 2 may comprise different types and any number of exchanges. More than one exchange may be connected to the address table and able to look up addresses directly. The address registration means need not be a separate node; it may be implemented as part of another node, for example a service control point or an intelligent periphery in an intelligent network.

25

The moving of an RSS from a first to a second local exchange may be performed according to a predetermined scheme. A time may be set for the moving of the subscribers, for example by adding a third table to the address registration means 123.

30

This table would comprise, for each RSS, information about the time of the switch to be made and the time to switch back to the first local exchange. The physical

connections may also be changed automatically by configuring the network in such a way that the connection from the RSS to the local exchange could be changed.

This can be done in several ways: the simplest solution would be to use a common switch or selector to select one of two cables. A more complex solution would be to  
5 connect the RSSs via another exchange, for example, an Asynchronous Transfer Mode (ATM) exchange.

If important subscribers such as the police or the parliament are connected through RSSs, the connections may be made more reliable by automatically moving the RSS  
10 to another exchange if the exchange to which they are connected fails for some reason.

One way to implement this is shown in Figure 4. A first 201 and a second 203 local exchange are connected to each other. Other exchanges may be present in the network but are not shown. An RSS 205 is connected to a selecting means 207 which  
15 may be used to connect the RSS to of the two local exchanges 201, 203. A number of subscribers 209 are connected to the RSS 205. A supervision node 211 monitors all local exchanges having such important subscribers connected to them, for example, by registering signals transmitted from the exchanges to confirm that they  
20 are OK. An address table 213 similar to the one 123 in Figure 2, is preferably located in the supervision node 211. If the exchange 201 fails to transmit such an "OK" signal, the RSS 205 is automatically moved to the other exchange 203 if this exchange is still OK. The command to move the RSS 205 is executed automatically, and the physical connections are switched automatically by means of the selecting  
25 means 207.

In this application, as well as the previous one, the physical connection might be changed manually or automatically. If it is changed manually, the selecting means 207 is not needed. If manual work is to be done, an alarm may be needed to inform  
30 the maintenance personnel that a connection needs to be changed.



Either way, of course the event will have to be registered in the way common in the art. The RSS may be moved back to the first exchange automatically when this exchange is again functioning, or the connection to the second exchange may be kept until it is manually changed.

5

Calls are set up in the network shown in Figure 2 according to the following, with reference to Figure 5:

Step S51: The first subscriber 115 dials the desired number, in this case to the second subscriber 116.

10 Step S52: The RSS 107 checks if the dialled number is found in the same RSS. As this is not the case, the call is forwarded to the local exchange 101 to which the RSS 107 is connected.

Step S53: The local exchange 101 checks if the dialled number is found in the same local exchange or in any other RSS connected to it. As this is not  
15 the case, the call is forwarded to the transit exchange 105.

Step S54: The transit exchange looks up the subscriber number in the first table 125 and finds the RSS 109 to which the subscriber 116 is connected.

Step S55: The transit exchange looks up the RSS 109 in the second table 127 and finds the local exchange 102 to which the RSS 109 is connected.

20 Step S56: The call is set up, in a way common in the art, between the first subscriber 115 and the second subscriber through the local exchange and the RSS identified in steps S44 and S45.

## Claims

1. An address registration means (123; 213) for use in a telecommunications network in which subscribers are connected to remote subscriber stages (107, 109, 111, 113), said remote subscriber stages being connected to local exchanges, characterized in that it comprises
- a first table (125) providing information for subscribers connected to an RSS, about the RSS (107, 109, 111, 113) to which each subscriber is connected,
  - a second table (127) providing information about the local exchange to which each RSS is connected.
2. A supervision node (211) in a telecommunications network to which at least one local exchange (201, 203) is connected, at least one of the local exchanges (201, 203) connected to said supervision node (211) having at least one RSS (205) connected to it, said supervision node (211) receiving information from each local exchange (201, 203) connected to it about the state of the local exchange (201, 203), characterized in that it comprises
- an address registration means (123; 213), comprising
- a first table (125) providing information for subscribers connected to an RSS, about the RSS (107, 109, 111, 113) to which each subscriber is connected,
  - a second table (127) providing information about the local exchange to which each RSS is connected,
- and that it is adapted to,
- if a local exchange (201) to which at least one RSS (207) is connected fails, move said RSS (207) from the failed local exchange (201) to another local exchange (203).
3. A supervision node (211) in a telecommunications network to which at least one local exchange (201) is connected, at least one of the local exchanges (201) connected to said supervision node (211) having at least one RSS (205) connected to it,

said RSS (205) being connectable, to at least a first (201) and a second (203) local exchange through a selector (207), and said supervision node (211) receiving information from each local exchange (201, 203) connected to it about the state of the local exchange (201, 203), characterized in that it comprises

5 an address registration means (123; 213), comprising

- a first table (125) providing information for subscribers connected to an RSS, about the RSS (107, 109, 111, 113) to which each subscriber is connected,
- a second table (127) providing information about the local exchange to which each RSS is connected,

10 and that it is adapted to perform the following steps if the first local exchange (201) to which at least one RSS (205) is connected, fails:

- moving said RSS (205) from the failed local exchange (201) to the second local exchange (203).
- instructing the selector (207) to change the physical connection of the RSS

15 (205) to said second local exchange (203).

4. A method in a telecommunications network in which subscribers are connected to RSSs (107, 109, 111, 113), said RSSs in turn connected to local exchanges, of moving an RSS connected to a first local exchange to another local exchange,

20 characterized by the steps of

- providing a first table (125) holding information for subscribers connected to an RSS, about the RSS (107, 109, 111, 113) to which each subscriber is connected,
- providing a second table (127) holding information about the local exchange to which each RSS (107, 109, 111, 113) is connected,

25 - when an RSS is to be moved, changing a table entry in one of the tables (125, 127).

5. A method according to claim 4, characterized by the step of changing the entry of the local exchange in the second table (127) for the RSS (107, 109, 111, 113) to be moved.

30

6. A method according to claim 4 or 5, characterized in that the table entry is changed automatically at a predetermined time.

5 7. A method according to claim 4, 5 or 6 characterized by

- providing a supervision node in the network, supervising the state of at least one local exchange in the network,
- changing the table entry for an RSS automatically if the local exchange to which the RSS is connected fails.

10

8. A method for setting up a connection in a telecommunications network in which subscribers are connected to RSSs (107, 109, 111, 113), said RSSs in turn being connected to local exchanges,

characterized by the steps of

15 - providing a first table (125) holding information for subscribers connected to an RSS, about the RSS (107, 109, 111, 113) to which each subscriber is connected,

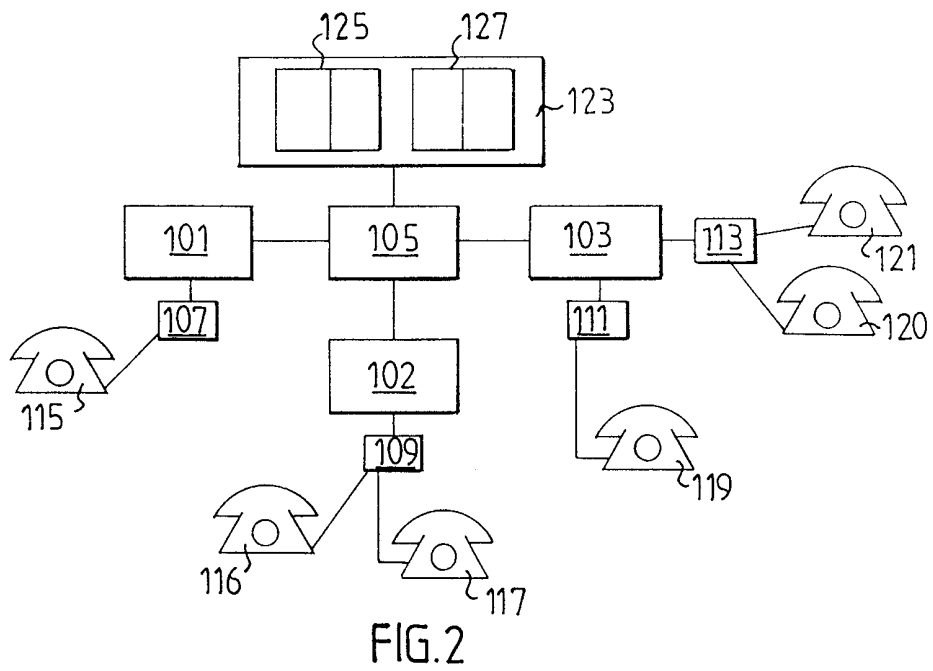
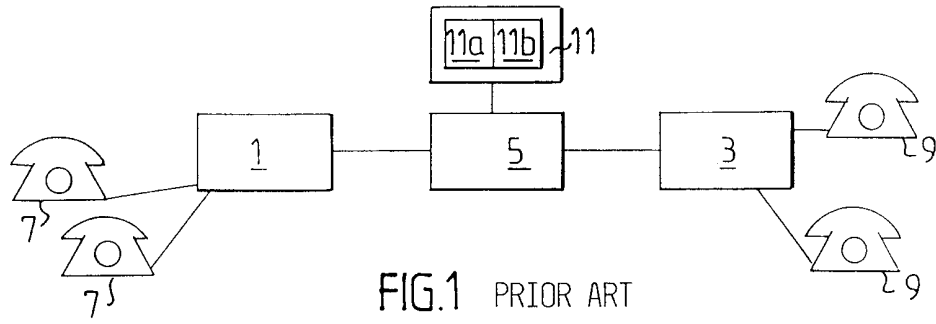
- providing a second table (127) holding information about the local exchange to which each RSS (107, 109, 111, 113) is connected,

20 - when a calling subscriber in the network dials a number located in an RSS to make a call:

- looking up the number in the first table (125) to find the RSS to which the call should be directed,

- finding the local exchange to which the RSS is connected in the second table (127),

25 - setting up the call between said calling subscriber and the called number through the local exchange and the RSS thus identified.



Subscriber	RSS
115	107
116	109
117	109
119	111
120	113
121	113

FIG.3A

RSS	Local Exch.
107	101
109	102
111	103
113	103

FIG.3B

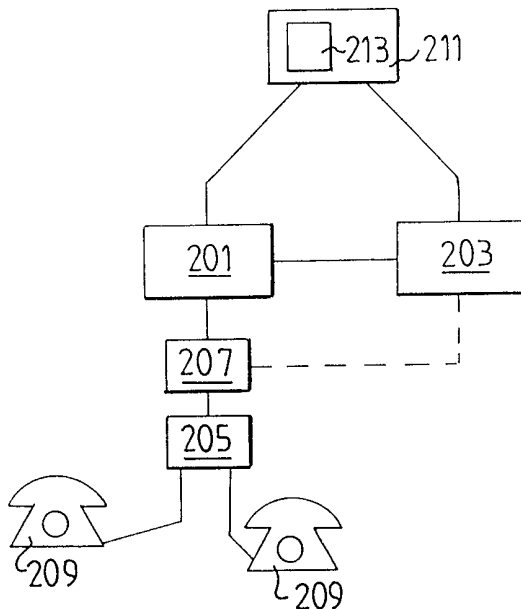


FIG.4

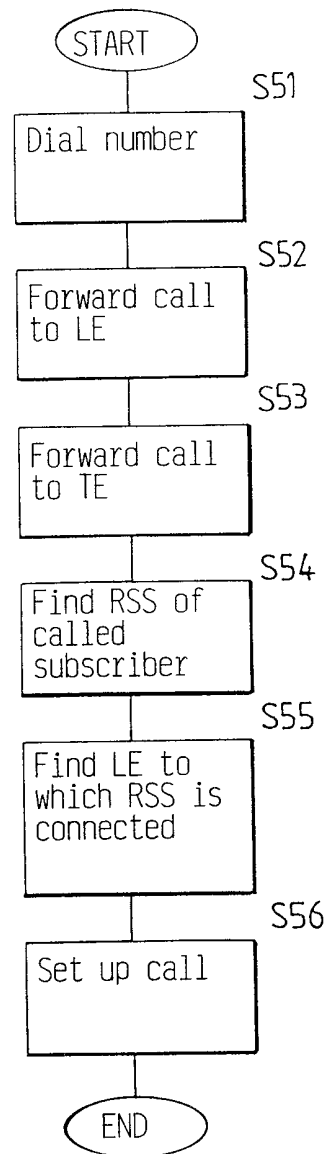


FIG.5