

TELECOMMUNICATION NETWORK

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FIELD OF THE INVENTION

This invention relates to the technical field of telecommunication. More precisely the invention relates to a combination comprising a switched telecommunication network, a first branch exchange or subscriber residential equipment connected to the network, a second branch exchange or subscriber residential equipment connected to the network, a portable radio terminal and possibly also a telepoint connected to the switched telecommunication network. The invention also relates to calls in such a combination.

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BACKGROUND OF THE INVENTION

Many public switched telecommunication networks, PSTN, are in use. Recent switched telecommunication networks are based on digital technology and are designed to be able to transmit various kinds of information at various speeds, e.g. speech or data or video.

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Public switched telecommunication networks, PSTN, generally comprise network subscriber stores for storing various information on subscribers to the network, e.g., identification, type, subscribed services, location or routing, etc.

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Public switched telecommunication networks generally also comprise means for connecting subscriber equipment to the network, and means for setting up calls to and from connected subscriber equipment in accordance with information in the network subscriber store. Such

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means may comprise exchanges interconnected by trunks.

When a public switched telecommunication network, PSTN, comprises plural distant local or transit exchanges there may be network subscriber stores at all
5 local exchanges having allocated subscribers.

Some subscribers to a telecommunication network may be residential subscribers having a residential equipment connected by cables to a local exchange of the network.

10 Some residential subscriber equipments comprise a residential base radio station connected to the network by cable and a cordless telephone or portable radio terminal. The residential base radio station then comprises a residential radio transceiver for radio
15 communication with the portable radio terminal or cordless telephone constituting part of the same subscriber residential equipment. This kind of residential subscriber equipment offers a user the freedom of making calls and receiving calls anywhere in
20 his residence if within reach of his residential radio transceiver.

Other subscribers to a switched telecommunication network may be business subscribers. The subscriber equipment may then be a private automatic branch
25 exchange, PABX, connected by cable to the telecommunication network and plural terminals or telephones constituting extensions to the private branch exchange.

Recently private automatic branch exchanges, PABX, comprising means for communication by radio with
30 associated branch extensions have been suggested. The private automatic branch exchange, PABX, may then comprise an exchange switch connected by cable to a telecommunication network, exchange radio transceivers
35 connected by cable to the exchange switch and portable

radio terminals or cordless telephones for radio communication with the exchange radio transceivers. This kind of subscriber equipment may offer staff the freedom of making calls and receiving calls anywhere in a business area of the subscriber if within reach of any
5 of the exchange radio transceivers.

U.S. Patent No. 4,893,335 to Fuller et al describes a remote access telephone control system in which intelligence of a central office is utilized to forward
10 calls to an absent portable radio terminal located near a transceiver other than the transceiver with which it is normally associated. However, the Fuller invention suffers from the drawback that central intelligence is required to forward the call.

15 Many mobile radio communication systems of various kinds have been suggested and are in use for various purposes. Cellular mobile radio communication systems may cover a very large geographical area offering a user with a mobile station a possibility to make calls at the
20 office, in residential areas and in some vehicles. A disadvantage of some mobile communication systems is the high cost, weight and size of mobile stations, the operators' high charge for becoming a subscriber and the high charge for a call compared to corresponding costs
25 for a subscriber using a terminal connected by cable to a fixed telecommunication network.

Another type of subscriber equipment, telepoints, have been suggested as a compromise between the low costs and low freedom of fixed telecommunication
30 equipment and the high costs and freedom of cellular mobile radio communication systems. The telepoint concept offers users the possibility of small light-weight battery-powered portable radio terminals for making calls anywhere via any fixed telepoint radio
35 transceiver. The telepoint radio transceivers may be

located at various places such as railway or underground stations, airports, pedestrian areas, squares, in official buildings etc. They are connected by cable to a switched telecommunication network. The telepoint concept requires comparatively little power consumption at the portable radio terminals whereby frequent change of battery is obviated. Information on UK telepoint standard may be found in "MPT 1375, COMMON AIR INTERFACE SPECIFICATION", DEPARTMENT OF TRADE AND INDUSTRY, LONDON 1989.

One major disadvantage of suggested telepoint systems is that a subscriber in proximity of a telepoint transceiver cannot be called by another subscriber to the telecommunication network to which the telepoint transceiver is connected. Thus a user of a radio terminal for telepoints can make calls but not receive calls.

For those not skilled in the art the following patents may serve as an additional background to the invention: US 3,906,166, US 4,658,416, US 4,748,655, US 4,829,554, GB 2 046 556 and GB 2 216 319.

SUMMARY OF THE INVENTION

One object of the present invention is to provide means and methods enabling a subscriber to a switched telecommunication network with a portable radio terminal constituting part of a residential equipment or constituting an extension to a private branch exchange connected to the telecommunication network to use his portable radio terminal both for making calls and receiving calls at any desired branch exchange or telepoint connected to the telecommunication system.

Another object of the present invention is to provide a means and methods for a roaming function between various kinds of subscriber equipment connected

to a public switched telecommunication network without introducing new procedures or means in the switched telecommunication network.

5 The present invention can redirect calls without using central intelligence features of a PSTN, thus eliminating the need for costly and time consuming modifications of existing PSTN systems which may not have the central intelligence to provide for redirection of calls.

10 Still another object of the present invention is to provide means and methods enabling both way call initiation at telepoints connected to a telecommunication network.

15 According to the invention existing network subscriber stores in a telecommunication network and/or new location stores in private branch exchanges or residential base radio stations and/or call transfer stores may be used for keeping track of portable subscriber radio terminals constituting extensions to the
20 private branch exchanges or part of residential equipment.

According to a first embodiment of the invention, a portable radio terminal of a subscriber residential equipment in a telecommunication combination may
25 comprise means for scanning of radio channels used by the residential radio transceiver or exchange radio transceiver or telepoint radio transceiver, means for receiving radio signals at scanning and determining from the received radio signals information on the identity
30 of the transmitting transceiver, if any, means for choosing as a serving transceiver a transceiver of appropriate received radio signals, if any, and means for calling, via a telepoint transceiver or a branch exchange transceiver, the residential base radio station
35 constituting part of the same subscriber equipment or

the network subscriber store and reporting to the residential location store or the network subscriber store the identity of the serving radio transceiver when the serving radio transceiver is other than the residential radio transceiver constituting part of the same subscriber residential equipment. The reported identity may comprise a network subscriber number unique to the serving transceiver or to the corresponding branch exchange or telepoint transceiver controller or corresponding network information.

According to a second embodiment of the invention a portable radio terminal constituting an extension to a private branch exchange in a telecommunication combination may comprise means for scanning of radio channels used by an exchange radio transceiver or a telepoint radio transceiver, means for receiving radio signals at scanning and determining from the received radio signals information on the identity of the transmitting transceiver, if any, means for choosing as a serving transceiver a transceiver of appropriate received radio signals, if any, and means for calling, via a telepoint transceiver or a branch exchange, the private branch exchange to which the portable radio terminal constitutes an extension or the network call transfer store and reporting to the exchange location store or the network call transfer store the identity of the serving radio transceiver when it is other than one of the exchange radio transceivers constituting part of the same branch exchange. When not all terminals are authorized to use the transceivers of any branch exchange or telepoint etc., the transceivers transmit information on the system or branch exchange or telepoint to which it belongs and the terminal comprises means for determining the system or branch exchange or telepoint identity and checking the right of the

identified unit to access to the system prior to choosing a transmitter as a serving transmitter. The reported identity may comprise a network subscriber number unique to the serving transceiver or to the
5 corresponding branch exchange or telepoint transceiver controller or corresponding network information.

According to the invention the switched telecommunication network sets up a call to a subscriber in accordance with the subscriber information in the
10 network subscriber store or call transfer store and such calls to an absent portable may be redirected back to the network in accordance with information reported to location stores of subscriber equipment.

According to the invention a residential base radio station, receiving a call to the portable radio terminal constituting part of the same subscriber equipment and having reported to the residential location store a
15 serving radio transceiver other than that of the same subscriber equipment, may redirect the call to the branch exchange or telepoint comprising the serving
20 radio transceiver.

According to the invention a branch exchange, receiving a call to a portable radio terminal constituting an extension to the branch exchange and
25 having reported to the exchange location store a serving radio transceiver other than one of the exchange radio transceivers of the same branch exchange, may redirect the call to the telepoint or residential equipment comprising the chosen serving radio transceiver.

30 According to a preferred embodiment of the invention plural telepoint radio transceivers are connected to the switched telecommunication network via a telepoint transceiver controller.

Figure 1 illustrates a public switched telecommunication network and various kinds of subscriber equipment connected to a public switched telecommunication network.

5 Figure 2 illustrates a residential subscriber equipment connected to a public switched telecommunication network.

10 Figure 3 illustrates a private branch exchange with extensions connected to a public switched telecommunication network.

Figure 4 illustrates a telepoint radio station connected to a public switched telecommunication network.

15 Figure 5 illustrates a telepoint transceiver controller connected to a public switched telecommunication network and plural telepoint radio transceivers connected to the telepoint transceiver controller.

Figure 6 illustrates a portable radio terminal.

20 Figure 7 illustrates a telepoint transceiver controller according to another embodiment of the present invention.

25 Figure 8 illustrates another embodiment of a residential radio base station according to the present invention.

Figure 9 illustrates another embodiment of a private automatic branch exchange according to the present invention.

30 Figure 10 illustrates a public switched telecommunication network and various kinds of subscriber equipment connected to a public switched telecommunication network according to another embodiment of the present invention.

35 Figure 11 is a flowchart illustrating a method of setting up a call according to a preferred embodiment of

the present invention.

Figure 12 is a flowchart illustrating a method of handling a call placed to a portable radio terminal according to a preferred embodiment of the present invention.

Figure 13 is a flowchart illustrating a method of maintaining active temporary extension numbers according to a preferred embodiment of the present invention.

Figure 14 illustrates the redirection of a call according to a preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 illustrates a public switched telecommunication network, PSTN, and various kinds of subscriber equipment connected to the network. The network comprises network local exchanges, LNX1 to LNX8, to which subscriber equipment may be connected by cables, network transit exchanges, TNX1 and TNX2, for switching calls, and network trunks, NT, for interconnection of local and transit exchanges.

The local and transit exchanges may comprise multiplexers, demultiplexers, processors, stores as well as other usual network means. In particular the network also comprises at least one network subscriber store for storing information on subscribers to the network. Each local exchange may comprise a network subscriber store, NSS, for information on subscribers allocated to that local exchange, in particular subscribers having subscriber equipment connected to that local exchange by cables. Conventionally the information in network subscriber stores comprise network subscriber numbers.

Exchanges of the network also comprise network information stores, NIS, for storing information on the network, in particular information on trunks to other exchanges, numbering, routing, etc., enabling exchange

processors to set up calls to and from subscribers and disconnect calls. Local exchanges may also comprise means for transferring calls from one subscriber to another subscriber. Such means may use the network subscriber stores or have separate stores.

A preferred embodiment of the present invention will now be described. It is understood that the invention may be implemented in a network with two or more of any of the various subscriber equipments described. Eleven residential subscriber equipments, RSQ1 to RSQ11, are connected by cables to the local exchanges LNX1 to LNX5 and LNX8 of the network. Five private automatic branch exchanges, PABX1 to PABX5, are connected by cables to the local exchanges LNX2 and LNX5 to LNX8 of the network. Five telepoint radio stations, TSN1 to TSN5, are connected by cables to the local exchanges LNX4 and LNX5 and LNX7 of the network. Three telepoint transceiver controllers, TTC1 to TTC3, are connected by cables to the local exchanges LNX3 and LNX6 and LNX8 of the network. At least in some aspects the RSQ, the PABX, the TSN and the TTC may all be considered as various kinds of subscriber equipment connected to the PSTN. The local exchanges' network subscriber stores NSS comprise information on the subscribers having the equipment connected to them. In particular the stores may comprise information on the type of subscription, e.g., residential or business or telepoint, the type of equipment connected, e.g., RSQ or PABX or TSN or TTC, and the number of lines or bandwidth connected to the network, e.g., single analogue line, 64 kbit digital line, 1 Mbit digital line etc.

For the purpose of implementation of the invention only information normally included in a conventional NSS is necessary because the network need not know whether a terminal is connected to the network via wires or radio

link and thus the same type of network subscriber numbers may be used in both cases.

Figure 2 illustrates a kind of residential subscriber equipment of particular interest to this invention connected to a PSTN. The residential equipment, RSQ, comprises a residential base radio station, RBS, connected to the PSTN by cable, and a residential portable radio terminal, PRT. The residential base radio station comprises a residential location store, RLS, for storing information on the portable radio terminal and a residential radio transceiver, RTR, for radio communication with the portable radio terminal. When a subscriber uses his residential portable radio terminal in his residence the portable radio terminal and the residential radio transceiver may cooperate in a well known way transmitting radio signals when setting up a call, during an ongoing call and when terminating a call. To the user, the portable radio terminal and the residential radio transceiver may then appear to operate substantially in accordance with known residential cordless telephones. When a subscriber uses or has used his portable radio terminal distant from his residence but in proximity to another radio transceiver, the portable radio terminal and the residential radio transceiver may however operate somewhat differently to be described later on.

Figure 3 illustrates a private automatic branch exchange, PABX, of particular interest to this invention connected to a PSTN by cable and portable exchange radio terminals, PRT, constituting extensions to the PABX. Although not illustrated, the PABX may of course also have conventional fixed terminals, WT, connected by wires. For the purpose of direct dialling all branch exchange extensions may have their own complete network

subscriber numbers of the same kind. The PABX comprises an exchange switch, XSW, an exchange location store, XLS, for storing information on portable radio terminals as well as fixed terminals constituting extensions to the PABX, an exchange processor, XCP, and exchange radio transceivers, XTR, connected to the exchange switch by cables. The exchange radio transceivers are preferably plural channel transceivers. The exchange radio transceivers are located at various sites in the business area of the PABX subscriber for radio communication with the portable radio terminals constituting extensions. When setting up a call to or from a proximate portable radio terminal, during an ongoing call involving a proximate portable radio terminal, and when terminating such a call, an exchange radio transceiver transmits radio signals to the portable radio terminal and receives radio signals from the portable radio terminal in a way similar to what is known in connection with cellular mobile radio systems. The PABX and the portable radio terminals cooperate to enable portable radio terminal roaming and handoff within the area covered by the exchange radio transceivers. The radio communication between the exchange portables and the exchange transceivers may incorporate known dynamic channel allocation procedures and known roaming and handoff procedures appropriate in connection with dynamic channel allocation, in which procedures regarding the decision on choice of serving transceiver and channel and handoff is taken by the portable terminal. The PSTN is not at all involved in channel selection, roaming or handoff for a portable radio terminal served by an exchange radio transceiver of the PABX.

Figure 4 illustrates a telepoint radio station, TSN, connected by cable to a PSTN. The telepoint radio

station comprises a telepoint-network interface, TNI, a telepoint store, TS, a telepoint processor, TPC, and a multi channel telepoint radio transceiver, TTR. The telepoint radio transceiver may be similar to an exchange radio transceiver. When setting up or terminating a call from a proximate portable radio terminal, the telepoint radio transceiver and the rest of the telepoint radio station may cooperate with each other and the PSTN in accordance with well known telepoint procedures. The telepoint radio transceiver and the rest of the telepoint radio station may however also cooperate with the PSTN in setting up a call from the PSTN to a proximate portable radio terminal in a way to be described later on. For the purpose of network routing the PSTN considers the TSN as equivalent to any single line subscriber equipment or any plural line PABX.

Figure 5 illustrates a telepoint transceiver controller, TTC, connected to a PSTN by cable and controlling plural telepoint radio transceivers, TTR, connected to the telepoint transceiver controller by cables. The telepoint transceiver controller comprises a network-controller interface, TNI, a telepoint controller store, TCS, and a telepoint processor, TPC. Each telepoint radio transceiver connected to the transceiver may be similar to the radio transceiver of the telepoint station according to figure 4. When setting up or terminating a call from a portable radio terminal, in proximity of one of the telepoint radio transceivers connected to the transceiver controller, the portable radio terminal, the telepoint transceiver and the controller may cooperate with the PSTN in accordance with well known telepoint procedures. The telepoint transceiver controller, the telepoint radio transceivers and the portable radio terminals cooperate

to enable portable radio terminal roaming and handoff when within the area covered by radio transceivers connected by cables to the same transceiver controller. The procedures may include dynamic channel allocation and the decision on a serving radio transceiver and channel made at the portable radio terminal are identical with or similar to corresponding procedures at the PABX according to figure 3. The PSTN is not at all involved in radio channel selection, roaming or handoff for a portable radio terminal served by a radio transceiver connected by cable to the TTC. The transceiver controller and its connected radio transceivers may however also cooperate with the PSTN and a portable radio terminal in setting up a call from the PSTN to a portable terminal served by one of the radio transceivers connected to the transceiver controller in a way to be described later on. For the purpose of network routing the PSTN considers the TTC as equivalent to a PABX, with direct dial-in facilities.

Figure 6 illustrates a portable radio terminal PRT which may be part of a residential subscriber equipment according to figure 2 or may constitute an extension to a PABX according to figure 3. The portable radio terminal comprises input/output means, I/O, comprising at least one of keypad or microphone or display or loudspeaker or printer. The portable radio terminal also comprises a portable terminal store, PTS, a portable terminal computer, PTC, and a portable radio terminal transceiver, PTR. The portable terminal computer, the portable terminal store, the input/output means and the portable transceiver together constitute means for performing certain steps and procedures in connection with communication to be described later.

The portable radio terminal is intended to be able to be used not only at subscribers' residences, if

constituting part of residential equipment, or in subscribers' business areas, if constituting an extension to a PABX, but also proximate to a telepoint radio transceiver. Each residential radio transceiver and exchange radio transceiver and telepoint radio transceiver frequently scans, and preferably also frequently transmits, radio signals on at least one of a predetermined group of radio channels. The radio signals from such a transceiver comprises information on transmitter identity and in appropriate cases PABX identity or TSN identity or TTC identity. The radio signals may also comprise information on channels available at the transmitter and the order in which the transceiver scans radio channels for receiving signals from portable radio terminals. An exchange radio transmitter or a telepoint radio transmitter may page a portable radio terminal by transmitting radio signals comprising the identity of the paged terminal on at least one of the radio channels.

20 A portable radio terminal frequently scans one or more or all of the radio channels of the predetermined group for receiving radio signals from proximate residential or exchange or telepoint radio transceivers, if any. Sometimes there are no radio signals or all or some of the radio signals are too weak or disturbed by noise or interfering signals. When receiving appropriate radio signals, the portable radio terminal determines from the received radio signals the identity of the transmitting radio transceiver and possibly other information on channels available, etc. The information is stored in the portable terminal store separately for all present or recent active transmitters and is updated with more recent corresponding information obtained at subsequent scanning. Based on the strength and/or quality of the radio signals received and/or other

information on the transceiver in the portable terminal store and possibly also predetermined rules, the portable terminal computer chooses as a serving transceiver a transceiver which has transmitted the appropriate radio signals which were in turn received by the portable terminal. When there is more than one possible choice, the rules may give priority to the strongest transceiver of the same subscriber equipment.

According to a first embodiment of the present invention, a portable radio terminal chooses as a serving transmitter a transmitter of a telepoint radio station or a transmitter connected to a telepoint transceiver controller and tries to inform a subscriber location store on the chosen transceiver. This may be done automatically by the portable radio terminal or only after manual actuation of a pushbutton by the terminal user. If the radio terminal is part of a subscriber residential equipment the portable radio terminal tries to set up a call to the corresponding residential base radio station. The call is set up using the telepoint radio station or transceiver controller of the serving radio transceiver and the PSTN. The call set up procedure may be in accordance with well known telepoint call set up procedures. When the residential base radio station answers the call the portable radio terminal initiates transmission of a coded message comprising information on the identity of the calling portable radio terminal and network subscriber number of the telepoint station or controller of the chosen serving radio transceiver. The residential base radio station stores at least the information on the network subscriber number of the telepoint station or controller of the serving radio transceiver in the residential location store. Whenever thereafter receiving a call for the portable radio

terminal, the residential base radio station redirects the call to the network as a call for the telepoint radio station or the telepoint transceiver controller of the serving radio transceiver in accordance with the
5 information in the residential location store.

Figure 14 illustrates an exemplary combination according to the present invention whereby a residential base radio station, PABX, or telepoint radio station can redirect the call without the use of central
10 intelligence in the PSTN system. In figure 14, subscriber unit A attempts to call on a first external PSTN line 10, a subscriber whose portable unit C is typically serviced by the subscriber equipment B1. B1 is preferably a residential base radio station, a PABX
15 or a telepoint radio station. If the portable unit C is not currently located in the servicing area of subscriber equipment B1, the call is redirected back to the network as a call to the subscriber equipment B2 which is currently serving the portable unit C that
20 subscriber A is attempting to contact.

According to an exemplary embodiment of the invention, this redirection can be accomplished by calling the unit B2 on a second external PSTN line 12, and connecting the two lines 10 and 12 in the subscriber
25 equipment B1. The system can include functionality provided, for example, by first and second telecommunication lines 10 and 12, for receiving a call from the telecommunication network across the first line 10 and automatically setting up and directing the call
30 back across the second line 12 to the telecommunication network as a call to the serving radio transceiver. Thus, the system provides call redirection and a roaming function between various kinds of subscriber equipment connected to a PSTN without introducing new procedures
35 in the PSTN or requiring central intelligence in the

PSTN.

A portable radio terminal constituting an extension to a PABX according to figure 3 tries to call the PABX after choosing as a serving radio transceiver a
5 transceiver other than one of the radio transceivers of the PABX. This is normally done automatically but may be initiated by the terminal user by actuating a pushbutton or other device on the terminal. The call is set up using the PSTN and serving transceiver and
10 associated radio station or controller. The call set up procedure may be in accordance with well known telepoint or PABX or residential call set up procedures. When the called PABX answers the call, the portable radio terminal initiates transmission of a coded message
15 comprising at least information on the identity of the portable radio terminal and network subscriber number of the residential or telepoint station or controller of the chosen serving radio transceiver. The PABX stores at least information on the identity of the portable
20 radio terminal and network subscriber number in the exchange location store. Whenever thereafter receiving a call for the portable radio terminal the PABX redirects the call to the network as a call for the telepoint radio station or the telepoint transceiver
25 controller or the residential base radio station of the serving radio transceiver in accordance with the information in the exchange location store.

As in the previous example, the call can be redirected as shown in figure 14 by calling the unit B2
30 on a second external PSTN line 12, and connecting the two lines 10 and 12 in the subscriber equipment B1.

A call for a portable radio terminal redirected by a residential base station or a PABX to the network as a call for a telepoint radio station or telepoint
35 transceiver controller is directed by the PSTN in the

same way irrespective of which portable radio terminal is intended to be the final call receiver. The call is answered by the telepoint station or transceiver controller as any call. When the telepoint radio station or transceiver controller has answered the call, the residential base station or PABX having redirected the call, transmits information on the identity of the portable radio terminal intended to be the final receiver of the call. This information on identity may be the network subscriber number or the branch extension number of the portable radio terminal. To establish contact with the portable terminal, the portable radio terminal must be paged by the serving telepoint radio transceiver. If the portable radio terminal is served by a radio transceiver of a telepoint station having only one transceiver, paging is done from this transceiver only. If the portable radio terminal is served by a radio transceiver of a transceiver controller and has reported to the location store the network subscriber number of the controller, there is more than one possible radio transceiver. The transceiver controller then initiates broadcast paging of the portable from all radio transceivers connected to the transceiver controller.

The portable radio terminal receiving the paging signals sends a response to its chosen serving radio transceiver. The response is directed by the radio transceiver to the transceiver controller. The transceiver controller then directs the call to the serving radio transceiver for radio communication with the portable radio terminal. The call is then established all the way to the portable radio terminal intended.

A residential portable radio terminal may be served by an exchange radio transceiver and be called there in

a similar way if reporting to its residential location store a network subscriber number of the PABX in a similar way. Furthermore a portable radio terminal constituting an extension to one PABX may be served by
5 an exchange radio transceiver of another PABX. For this purpose there may be a couple of vacant extension numbers at each or some PABX for use by visiting residential or exchange portable radio terminals. For the purpose of direct dialling such vacant extension
10 numbers may be complete network subscriber numbers. When served by an exchange radio terminal a visiting portable radio terminal may be allotted one of these vacant extension numbers. The visiting portable radio terminal then reports this allotted extension number to
15 its residential location store. A call can then be redirected from the home residential equipment transceiver to the temporary extension number assigned to the portable terminal in accordance with the information stored in the home residential location
20 store. In this way, the identity of the portable terminal intended as the final receiver of the call is identified to the serving transceiver by the temporary extension number which has been called.

As described above with reference to figure 14, the
25 call can be redirected by calling the unit B2 on a second external PSTN line 12, and connecting the two lines 10 and 12 in the subscriber equipment B1.

A portable radio terminal having reported to its residential or exchange location store, a serving radio
30 transceiver other than its residential or exchange transceiver, may thereafter leave the area covered by this transceiver and return to the area covered by its residential transceiver or one of the exchange radio transceivers of its PABX. When returning and receiving
35 appropriate radio signals from its residential radio

transceiver or one of the exchange radio transceivers of its PABX, the portable radio terminal chooses this transceiver as the serving transceiver and transmits a radio signal comprising a particular reentry message.

5 The reentry message comprises information at least on the identity of the portable radio terminal and preferably also information on the previous serving transceiver. When receiving this information from its transceiver, the residential radio base station or the
10 PABX changes the information on the portable radio terminal concerned in its location store accordingly.

A PABX having a couple of vacant extension numbers for temporary use by visiting portable terminals may have appropriate means for temporarily withdrawing from
15 use such a vacant extension number previously allotted to a visiting portable terminal when the portable terminal is no longer served by an exchange transceiver of the PABX. Such means may comprise means for paging of assumed still visiting terminals with allotted
20 extension numbers in order to check whether the visiting terminal with allotted extension number is still in proximity of one of the exchange transceivers of the PABX. An assumed visiting portable terminal not responding to such a paging may have its allotted
25 extension number withdrawn from use. In order to be able to later allocate the withdrawn extension number to another visiting portable terminal, the PABX may call the residential base radio station or PABX of the visiting portable terminal and inform its location store
30 on the withdrawal of the use of the extension number by the portable terminal. The PABX does not allocate the withdrawn extension number to another visiting portable terminal until the called residential base radio station or PABX has answered the call regarding withdrawal of
35 allotted extension number or after a long timeout,

whereby two portable terminals using same extension number is avoided.

A telepoint radio station or a telepoint transceiver controller may also store the identity of served portable radio terminals and frequently page
5 assumed served portable radio terminals for checking their presence in a similar way. The telepoint waits for answers to such paging of assumed served portable radio terminals. When not receiving a response to a
10 paging of a portable terminal the telepoint sets up a call for reporting to the appropriate location store the identity of the assumed served portable terminal not answering to such paging. The information in the location store may be changed accordingly.

15 Some PSTN comprise means for transferring calls from a called subscriber to another subscriber. Such call transfer means may be used by a subscriber visiting another subscriber and wishing to receive his calls at the visiting subscriber. A PSTN comprising call
20 transfer means may comprise a separate call transfer store for receiving from subscribers information on other subscribers where they want their calls or use other stores including network subscriber stores for this purpose. For the purpose of call transfer a
25 subscriber normally transmits to his local station a message comprising information on the network subscriber number(s) of the subscriber where he want his calls. After receiving such information the PSTN does not direct a call to a subscriber in accordance with the
30 normal information in the network subscriber store but directs any call to the subscriber in accordance with received information stored in the call transfer store.

Call transfer means in a PSTN may be used simultaneously with or instead of location stores in
35 residential base station or PABX for transferring calls

from a subscriber site to another subscriber site, e.g. a telepoint station or controller. When using network call transfer means instead of such location stores the portable radio station is programmed to call a network number dedicated to a call transfer means instead of its own network subscriber number for reporting allotted extension number or subscriber number of serving radio transceivers. Neither when the call transfer means of the PSTN is used together with the location store nor when the call transfer means of the PSTN is used instead of the location stores are any amendments of the PSTN required in order to be able to call a portable radio terminal served by a telepoint radio transceiver, provided an identity or number with conventional subscriber number format is reported.

The invention is neither restricted to described embodiments of PRT or RBS or TSN or TTR or TTC or XTR or PABX nor to the particular PSTN described but may be implemented in somewhat different ways.

According to another embodiment of the invention as shown in figure 7, a telepoint transceiver controller with connected telepoint radio transceivers is very similar to a PABX of the type previously described. According to this embodiment a telepoint radio station is also similar to a PABX of the type previously described but having only one radio transceiver. According to this embodiment a telepoint transceiver controller or telepoint radio station has a couple of extension numbers for use by visiting residential or exchange portable radio terminals. When served by such a telepoint, a visiting portable radio terminal may be allotted one of these extension numbers. The visiting portable terminal then reports this allotted extension number to its residential location store or exchange location store or the appropriate call transfer store of

the PSTN just as a temporary allotted extension number of a PABX. When receiving a call addressed to a portable radio terminal, its residential base station, private exchange or the network then uses this allotted
5 extension number for directing or redirecting the call to the portable radio terminal in the same way as an extension number of a branch exchange.

As previously described with reference to figure 14, if the call is serviced by the subscriber
10 equipment B1, it can be redirected by calling the unit B2 on a second external PSTN line 12, and connecting the two lines 10 and 12 in the subscriber equipment B1.

According to another embodiment of the invention, the portable radio terminals served by radio
15 transceivers other than those of their own residential base radio station or own branch exchange do not themselves call their appropriate location stores and report their temporary extension number or identity of serving radio transceiver or telepoint or exchange.
20 Instead the terminals merely initiate this calling of and reporting to appropriate location or call transfer store. The initiation can be done either automatically after selection of the serving radio transceiver by transmitting radio signals comprising information on
25 portable identity or subscriber number or by transmitting radio signals after the portable radio station user has actuated a pushbutton or other terminal input device. The actual calling and reporting is done by the telepoint or branch exchange comprising the
30 serving radio transceiver.

Some residential radio base stations having a 2A+B ISDN access to the public switched telecommunication network may easily be designed to redirect incoming calls to a PABX or telepoint using the reported
35 subscriber number of the telepoint or PABX or the

temporary extension number of the portable radio terminal. Some residential radio base stations merely having one ordinary analogue telephone access to the public switched telecommunication network may, however, have some difficulties in conveniently redirecting an incoming call to a reported subscriber or extension number. Then the residential radio base station may comprise an answering machine giving a calling party information on reported number, as shown in figure 8. A PABX may also comprise one or more answering machines giving a calling party information on reported number from the location store, as shown in figure 9. The answering machine or machines may be part of the location store, as shown in figure 9, or be connected to one or more extensions in the PABX.

A combination according to another embodiment of the present invention may of course always comprise a switched telecommunication network but need not comprise both a residential equipment and a telepoint and an exchange. It is conceivable that a combination according to the invention comprises at least two separate branch exchanges but no telepoints. Figure 10 illustrates an embodiment wherein a PSTN of the type shown in figure 1, has residential subscriber equipment units RSQ1...RSQ7 and private automatic branch exchanges PABX1...PABX7. Of course, the number of connections is used for purposes of illustration only and any number of connections and any combination of subscriber equipment is possible.

The following discussion refers to figures 11-13 to describe the methods according to the present invention which are described generally above.

Figure 11 is a flowchart illustrating a preferred embodiment of a method according to the present invention by which a portable radio terminal can

register at subscriber equipment of his choice. For purposes of this discussion, subscriber equipment can refer to residential subscriber equipment, private automatic branch exchanges or telepoints. In step 100, a portable radio terminal listens to radio signals being transmitted by transceivers in the subscriber equipment in the network. In step 105, the portable radio terminal chooses as its serving transceiver a transceiver from which the portable has received appropriate radio signals, by sending its identification number to the chosen serving transceiver. In other words, any given portable will only be compatible with certain transceivers. Steps 100 and 105 cause the portable to determine with which of the transceivers in the network he is compatible and to select one of the compatible transceivers as the serving transceiver.

The identification number of the portable can either be its ISDN number (usually 7 digits plus area code, where the 7 digits includes an extension number) or it can be the ISDN number plus a separate extension. Of course, any other suitable unique identification number can be used.

At step 110, it is determined whether the portable is at its home transceiver, that is, it is determined whether the serving transceiver is the transceiver with which the portable is normally associated. This can occur either in the subscriber equipment of the serving transceiver or in the portable. If at step 110, it is determined that the portable is at home, that information is registered, that is, the home transceiver location store is told that the portable is home (step 115), and the routine ends.

If the serving transceiver is not the home location of the portable, the portable registers at the serving transceiver. Thus, the portable is connected to the

subscriber equipment of the serving transceiver and sends its portable identification number thereto (step 120). If the serving transceiver is part of a branch exchange or telepoint, a temporary extension number is then allocated to the served portable radio terminal (step 125). A residential subscriber equipment may also allocate a temporary extension number if it is connected to ISDN facilities, with plural extensions. The serving transceiver then places a call to the home subscriber equipment to report the temporary extension number (step 130). If an answering machine is connected to the home location of the served portable, the temporary extension number is reported to the answering machine. Otherwise, the number is reported to the location store of the home subscriber equipment. In an alternative embodiment, the network subscriber store may be called to receive this information. The routine then ends.

Figure 12 is a flowchart illustrating a routine that is performed when a call is made to a portable radio terminal using the portable terminal's identification number. At step 140, it is determined whether there is an answering machine at the home subscriber equipment and whether the answering machine has the reported temporary extension number. If yes, the call is answered with the answering machine, at step 145, and the caller is informed of the redirection number, that is the temporary extension number. If there is no answering machine, the call is automatically redirected to the subscriber equipment having the reported temporary extension number at step 150. The temporary extension number is retrieved either from the home location store or from the network subscriber store, depending upon the embodiment. If the temporary extension number is retrieved from the home location store, the call can be redirected using a second PSTN

external line 12, as shown in Figure 14. The routine then ends.

Figure 13 is a flowchart illustrating a preferred embodiment of the invention according to which the temporary extension numbers are maintained so that the portables assigned thereto are active. In other words, periodically, or when it is discovered that the number of remaining unassigned temporary extension numbers is low, this routine is executed.

At step 160, all visiting portable are paged by the subscriber equipment, preferably a branch exchange or telepoint, but possibly a residential subscriber equipment with multiple lines. At step 165, it is determined whether each assigned terminal has responded at the expiration of a waiting period. For each assigned temporary extension number for which no response is received at step 165, the allocated extension number is withdrawn (step 170). This is reported to the location store where the temporary extension number is canceled (step 175). The cancellation is made at the home location store or network subscriber store, as appropriate.

It is understood that the connections between different network components, subscriber equipments, and radio transceivers can be made by radio links, optical fibers, or other telecommunications connections, instead of cables. An example of this is a mobile telepoint radio station on board a train or a bus connected to a cellular telephone network.

The foregoing description of the specific embodiments will so fully reveal the general nature of the invention that others can, by applying current knowledge, readily modify and/or adapt for various applications such specific embodiments without departing from the generic concept, and, therefore, such

adaptations and modifications should and are intended to be comprehended within the meaning and range of equivalents of the disclosed embodiments. It is to be understood that the phraseology of terminology employed

5 herein is for the purpose of description and not of limitation.

CLAIMS:

1. In combination, a public switched telecommunication network, at least two subscriber equipments connected to the telecommunication network and at least one portable radio terminal associated with one of the at least two subscriber equipments;
the telecommunication network comprising
means for connecting the at least two subscriber equipments to the network, and
means for setting up calls to and from connected subscriber equipments;
each of the at least two subscriber equipments comprising
a radio transceiver for radio communication with at least one portable radio terminal, and wherein said one of the subscriber equipments comprise a location store for storing information on the at least one portable radio terminal associated with said one of the subscriber equipments;
the at least one portable radio terminal comprising
means for transmitting radio signals to be received by the radio transceiver,
means for receiving radio signals transmitted by the radio transceiver,
means for determining from received radio signals information on the identity of a transmitting transceiver, if any, and
means for choosing as a serving transceiver a transceiver of appropriate received radio signals, if any;
the combination comprising
means for calling via the network the subscriber equipment with which the at least one portable radio terminal is associated and reporting to the location store the identity of the chosen serving



transceiver when the chosen serving transceiver is a transceiver other than the transceiver of the subscriber equipment with which the at least one portable radio terminal is associated; and

5 means including first and second telecommunication lines provided in said one of the subscriber equipments responsive to receiving a call from the telecommunication network across said first line to a portable radio terminal having been reported
10 to the location store of said one subscriber equipment as being served by a radio transceiver other than the radio transceiver of the subscriber equipment with which the portable radio terminal is associated, for
15 automatically setting up and directing the call back across said second line to the telecommunication network as a call to the subscriber equipment comprising the serving radio transceiver, the call comprising information on the identity of the portable radio terminal.

20

2. The combination of claim 1, wherein the telecommunication network further comprises

a network subscriber store for storing information on network subscribers including network
25 subscriber numbers of the at least two subscriber equipments, and wherein a call to a portable radio terminal associated with subscriber equipment in the combination is set up by the telecommunication network to the associated subscriber equipment in accordance
30 with information on the portable radio terminal stored in the network subscriber store.

3. The combination of claim 1, wherein the means for calling is provided in the at least one portable
35 terminal.



4. The combination of claim 1, wherein the means for calling is provided in each of the at least two subscriber equipments.

5 5. The combination of claim 1, wherein at least one of said at least two subscriber equipments comprises subscriber residential equipment including a residential base radio station connected to the network.

10 6. The combination of claim 1, wherein at least one of said at least two subscriber equipments comprises a private automatic branch exchange including an exchange switch connected to the network.

15 7. The combination of claim 1, wherein at least one of said at least two subscriber equipments comprises a branch exchange having plural extension numbers for temporary use by at least one visiting portable radio terminal not normally associated with the
20 subscriber equipment,

the subscriber equipment allotting a vacant extension number to the at least one visiting portable radio terminal to be served by a transceiver of the subscriber equipment; and

25 the location store of the subscriber equipment with which the at least one visiting terminal is associated being informed on the identity of the chosen transceiver indirectly by reporting the allotted extension number.

30 8. A combination according to claim 7, wherein the at least two subscriber equipments further comprise means for paging visiting portable radio terminals having allotted extension numbers;

means for withdrawing from use allotted extension
35 numbers of visiting portable radio terminals not



responding to paging; and

means for setting up a call through the network for canceling the information on the allotted extension number of the visiting portable radio terminal not responding to paging.

9. The combination of claim 1, further comprising telepoint system connected to said telecommunication network comprising a telepoint radio station comprising
10 a telepoint radio transceiver for radio communication with portable radio terminals,
means for receiving an access request from and directing a call from a served portable radio terminal to the telecommunication network,
15 means for paging a served portable radio terminal called by the telecommunication network, and
means for directing a call from the telecommunication network to a paged and responding served portable radio terminal.

20

10. The combination of claim 9, wherein said telepoint radio station further comprises
means for storing identities of served portable radio terminals,
25 means for paging served portable radio terminals in order to check the presence of served portable radio terminals,
means for waiting for answers to its paging from paged served portable radio terminals, and
30 means for setting up a call through the network for informing the location store of a non answering previously served portable radio terminal that the portable radio terminal is no longer served by the telepoint radio station.

35



11. The combination of claim 1, further comprising a telepoint system connected to said telecommunication network comprising a telepoint transceiver controller comprising

5 means for receiving a call from the telecommunication network to a portable terminal and initiating a broadcast paging of the portable terminal from all telepoint radio transceivers connected to the telepoint transceiver controller,

10 means for receiving a response to a paging via one of a telepoint radio transceiver and a portable radio terminal access request via a telepoint radio transceiver,

15 means for directing a call from a portable radio terminal via a connected serving telepoint radio transceiver to the telecommunication network, and

20 means for directing a call from the telecommunication network via a connected serving telepoint radio transceiver to a portable radio terminal.

12. The combination of claim 11, wherein said telepoint radio transceiver comprises

means for paging of a portable radio terminal upon request by the telepoint transceiver controller,

25 means for receiving and directing to the telepoint transceiver controller responses to paging,

and means for receiving access requests from portable radio terminals and directing them to the telepoint transceiver controller.

30

13. The combination of claim 11, wherein said telepoint transceiver controller further comprises

means for storing identities of served portable radio terminals,

35 means for initiating broadcast paging of



served portable radio terminals in order to check the accessibility of served portable radio terminals,

means for waiting for answers to the broadcast paging from paged served portable radio terminals, and

5 means setting up a call through the switched network for informing the location store of a non answering previously served portable radio terminal that the portable radio terminal is no longer served by the telepoint transceiver controller.

10

14. In combination, a public switched telecommunication network, at least two subscriber equipments connected to the telecommunication network, and at least one portable radio terminal associated with one of the at least two subscriber equipments, the at least two subscriber equipments selected from an automatic branch exchange, a subscriber residential equipment, and at least one telepoint system, the at least one telepoint system selected from a telepoint radio station and a telepoint transceiver controlled with telepoint radio transceivers;

20

the telecommunication network comprising

means for connecting the at least two subscriber equipments to the network, and

25 means for setting up calls to and from connected subscriber equipment;

each of the at least two subscriber equipments comprising

30

a radio transceiver for radio communication with the at least one portable radio terminal, and wherein said one of the at least two subscriber equipments comprise a location store for storing information on the at least one portable radio terminal constituting part of said one subscriber equipment;

35

the at least one portable radio terminal comprising



means for transmitting radio signals to be received by at least one transceiver of the at least two subscriber equipments in the combination,

means for receiving radio signals transmitted
5 by at least one transceiver of the at least two subscriber equipments in the combination,

means for determining from received radio signals information on the identity of one of a transmitting transceiver, and a subscriber equipment of
10 a transmitting transceiver, if any, and

means for choosing as a serving transceiver a transceiver of appropriate received radio signals, if any;

the combination further comprising

15 means for calling via the network the subscriber equipment with which the portable radio terminal is associated and reporting to the location store one of the identity of the serving transceiver and the identity of the subscriber equipment of the serving
20 transceiver when the serving transceiver is a transceiver other than the transceiver of the subscriber equipment with which the portable radio terminal is associated; and

means including first and second telecommunication
25 lines provided in said one of the subscriber equipments responsive to receiving a call from the telecommunication network across said first line to a portable radio terminal having been reported to the location store of said one subscriber equipment as being
30 served by a radio transceiver other than the radio transceiver of the subscriber equipment with which the portable radio terminal is associated, for automatically setting up and directing the call back across said second line to the telecommunication network as a call
35 to the subscriber equipment comprising the serving radio



transceiver, the call comprising information on the identity of the portable radio terminal.

15. The combination of claim 14, wherein
- 5 each branch exchange comprises
- an exchange switch,
- an exchange radio transceiver connected to the switch for radio communication with portable radio terminals, and
- 10 an extension location store for storing information on portable radio terminals constituting extension terminals to the branch exchange;
- each subscriber residential equipment comprises
- a residential base radio station connected to
- 15 the network and
- a portable radio terminal,
- the residential base radio station comprising a residential radio transceiver for radio communication with the portable radio terminal and a residential
- 20 location store for storing information on the portable radio terminal constituting part of the same subscriber residential equipment;
- each telepoint radio station comprises
- a telepoint radio transceiver for radio
- 25 communication with portable radio terminals,
- means for receiving an access request from and directing a call from a served portable radio terminal to the telecommunication network,
- means for paging a served radio terminal
- 30 called by the telecommunication network, and
- means for directing a call from the telecommunication network to a paged and responding served portable radio terminal;
- each telepoint radio transceiver comprises
- 35 means for paging of a portable radio terminal



upon request by the telepoint transceiver controller,
means for receiving and directing to the
telepoint transceiver controller responses to paging,
and means for receiving access requests from
5 portable radio terminals and directing them to the
telepoint transceiver controller; and
each telepoint transceiver controller comprises
means for receiving a call from the
telecommunication network to a portable terminal and
10 initiating a broadcast paging of the portable terminal
from all telepoint radio transceivers connected to the
telepoint transceiver controller,
means for receiving a response to a paging via
one of a telepoint radio transceiver access request and
15 portable radio terminal access request via a telepoint
radio transceiver,
means for directing a call from a portable
radio terminal via a connected serving telepoint radio
transceiver to the telecommunication network, and
20 means for directing a call from the
telecommunication network via a connected serving
telepoint radio transceiver to a portable radio
terminal.

25 16. The combination of claim 14, wherein the
telecommunication network further comprises
a network subscriber store for storing
information on network subscribers including network
subscriber numbers of the at least two subscriber
30 equipments, and wherein a call to a portable radio
terminal associated with subscriber equipment in the
combination is set up by the telecommunication network
to the associated subscriber equipment in accordance
with information on the portable radio terminal stored
35 in the network subscriber store.



17. The combination of claim 14, wherein the means for calling is provided in the at least one portable terminal.

5 18. The combination of claim 14, wherein the means for calling is provided in each of the at least two subscriber equipments.

10 19. The combination of claim 15, comprising at least one unit selected from the branch exchange, telepoint radio station, and telepoint transceiver controller in the combination having plural extension numbers for temporary use by visiting portable radio terminals not normally constituting extensions to the
15 unit,

the at least one unit allotting a vacant extension number to a visiting portable radio terminal to be served by a transceiver of the unit; and

20 the location stores of the visiting terminals being informed on the identity of the chosen transceiver indirectly by reporting the allotted extension number.

20. The combination of claim 19, wherein the at least one unit comprises

25 means for paging visiting portable radio terminals having allotted extension numbers of the unit;

means for withdrawing from use allotted extension numbers of visiting portable radio terminals not responding to paging; and

30 means for setting up a call through the switched network to the location stores of the visiting portable terminal for canceling the information on the allotted extension number of the visiting portable radio terminal not responding to paging.



21. The combination of claim 15, wherein the telepoint radio station further comprises means for storing identities of served portable radio terminals,

5 means for paging served portable radio terminals in order to check the presence of served portable radio terminals,

means for waiting for answers to its paging from paged served portable radio terminals, and

10 means for setting up a call through the network for informing the location store of a non answering previously served portable radio terminal that the portable radio terminal is no longer served by the telepoint.

15

22. The combination of claim 15, wherein the telepoint transceiver controller further comprises means for storing identities of served portable radio terminals,

20 means for initiating broadcast paging of served portable radio terminals in order to check the accessibility of served portable radio terminals,

25 means for waiting for answers to the broadcast paging from paged served portable radio terminals, and

means setting up a call through the network for informing the location store of a non answering previously served portable radio terminal that the portable radio terminal is no longer served by the telepoint.

30

23. A method of setting up a call to a portable terminal in a combination of a public switched telecommunication network, at least two subscriber equipments connected to the telecommunication network,

35



- and at least one portable radio terminal associated with one of the at least two subscriber equipments, said one of the at least two subscriber equipments comprising a location store for storing information on the portable radio terminal, wherein the at least two subscriber equipments are selected from an automatic branch exchange, a subscriber residential equipment, and at least one telepoint connected to the telecommunication network;
- 10 the method comprising the steps of:
- receiving radio signals at a portable radio terminal and determining from received radio signals information on the identity of one of a transmitting transceiver and the subscriber equipment of a
- 15 transmitting transceiver, if any;
- choosing at a portable radio terminal as a serving transceiver, a transceiver of appropriate radio signals, if any;
- transmitting information on the identity of the
- 20 portable radio terminal with radio signals from the portable radio terminal to a serving transceiver when the serving transceiver is a transceiver other than the transceiver of the subscriber equipment with which the portable radio terminal is associated;
- 25 storing information corresponding to the identity of served portable radio terminals received with radio signals at the subscriber equipment of which the serving transceiver is a part when the serving transceiver is a transceiver of a subscriber equipment other than the
- 30 subscriber equipment with which the portable radio terminal is associated;
- allotting, at the subscriber equipment of the serving transceiver, a temporary extension number to served portable radio terminals with reported identity;
- 35 setting up a call from the subscriber equipment of



the serving transceiver through the network to the subscriber equipment with which the portable radio terminal is associated and reporting to the location store the allotted temporary extension number of the portable when the serving transceiver is a transceiver
5 other than the transceiver of the subscriber equipment with which the portable radio terminal is associated; and

when receiving, at a transceiver of the at least
10 one subscriber equipment, a call via the network on a first telecommunication line to a portable radio terminal having been reported to the location store as being served by another radio transceiver, redirecting, on a second telecommunication line connected to the
15 first telecommunication line in said one of the at least two subscriber equipments, the call through the network as a call to the subscriber equipment comprising the reported temporary extension number.

20 24. The method of claim 23, further comprising the steps of:

paging from at least one subscriber equipment selected from a branch exchange and a telepoint system, visiting portable radio terminals having been allotted
25 temporary extension numbers;

withdrawing from use allotted extension numbers of visiting portable radio terminals not responding to the paging; and

setting up a call through the network for canceling
30 the temporary extension number in the location store of the subscriber equipment of the visiting portable radio terminal not responding to paging.

25. A method of setting up a call to a portable
35 terminal in a combination of a public switched



telecommunication network, at least two subscriber equipments connected to the telecommunication network, and at least one portable radio terminal associated with one of the at least two subscriber equipments, the at
5 least two subscriber equipments selected from an automatic branch exchange, a subscriber residential equipment, and at least one telepoint, the telecommunication network comprising a network subscriber store for storing information on network
10 subscribers and call transfer means including a call transfer store for receiving from subscribers information on other network subscriber numbers to which to transfer the subscribers' calls;

the method comprising the steps of:

15 receiving at a portable radio terminal radio signals from a transceiver and determining from received radio signals information on the identity of one of a transmitting transceiver and the subscriber equipment of a transmitting transceiver, if any;

20 choosing at a portable radio terminal as a serving transceiver, a transceiver of appropriate radio signals, if any;

transmitting the information on the identity of the portable radio terminal with radio signals from the
25 portable radio terminal to the serving transceiver when the serving transceiver is a transceiver other than the transceiver of the subscriber equipment with which the portable radio terminal is associated;

allotting a temporary extension number at the
30 subscriber equipment of the serving transceiver to a served portable terminal having reported information on its identity;

setting up a call from the subscriber equipment of the serving transceiver through the network to the call
35 transfer means and reporting to the call transfer store



the allotted temporary extension number of the served portable radio terminal when the serving radio transceiver is a transceiver other than the transceiver of the subscriber equipment with which the portable
5 radio terminal is associated;

setting up a call to a portable radio terminal associated with at least one subscriber equipment through the telecommunication network to the subscriber equipment in accordance with information on the portable
10 radio terminal in the network subscriber store if no temporary extension number is reported to the call transfer store; and

when receiving a call to a portable radio terminal having been allotted a temporary extension number reported to the call transfer store of the switched
15 network, then directing the call through the network to the subscriber having a network subscriber number corresponding to the reported temporary extension number.

20

26. The method of claim 25, further comprising the steps of:

paging, from at least one of the at least two
25 subscriber equipments, visiting portable radio terminals having been allotted temporary extension numbers;

withdrawing from use allotted extension numbers of visiting portable radio terminals not responding to the paging; and

30 setting up of a call through the network to the call transfer means of the network for canceling in the call transfer store the temporary extension number of the visiting portable radio terminal not responding to paging.

35



27. A method of communication in a combination of a public switched telecommunication network, at least two subscriber equipments connected to the telecommunication network, at least one answering machine connected to at least one of the at least two subscriber equipments, and at least one portable radio terminal associated with one of the at least two subscriber equipments, said one of the at least two subscriber equipments comprising a location store for storing information on the at least one portable radio terminals associated with the one subscriber equipment, the at least two subscriber equipments selected from an automatic branch exchange, a subscriber residential equipment, and at least one telepoint;
- 15 the method comprising the steps of:
- receiving at a portable radio terminal radio signals from a radio transceiver, if any, and determining from received radio signals information on the identity of one of a transmitting transceiver and the subscriber equipment with which the transmitting transceiver is associated, if any;
- choosing at a portable radio terminal as a serving transceiver a transceiver, of appropriate received radio signals, if any;
- 25 transmitting information on the identity of the portable radio terminal with radio signals from the portable radio terminal to the serving transceiver when the serving transceiver is a transceiver other than the transceiver of the subscriber equipment with which the portable radio terminal is associated;
- 30 allotting a temporary extension number at the subscriber equipment of the serving transceiver to the served portable radio terminal having reported information on identities;
- 35 setting up a call from the subscriber equipment of



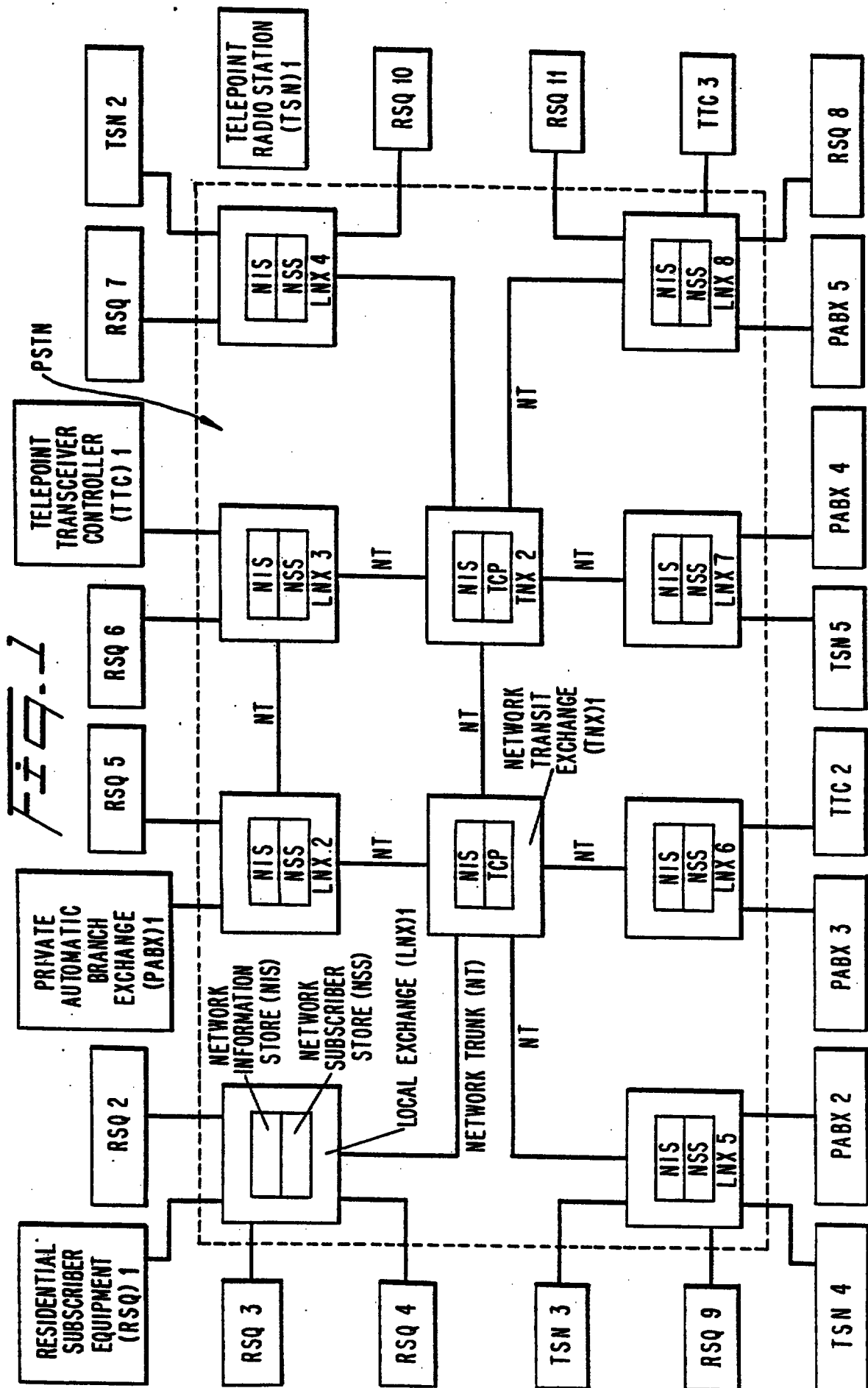
the serving transceiver through the network to the subscriber equipment with which the portable radio terminal is associated and reporting to one of the at least one answering machine and the location store the
5 allotted temporary extension number of the served portable radio terminal when the serving transceiver is a transceiver other than the transceiver of the subscriber equipment with which the portable radio terminal is associated; and

10 when receiving at a subscriber equipment a call through the network to a portable radio terminal constituting part of the subscriber equipment and having been allotted a temporary extension number reported to the answering machine, answering the call with the
15 answering machine of the subscriber equipment and giving the reported allotted temporary number to the calling party with the answering machine; and

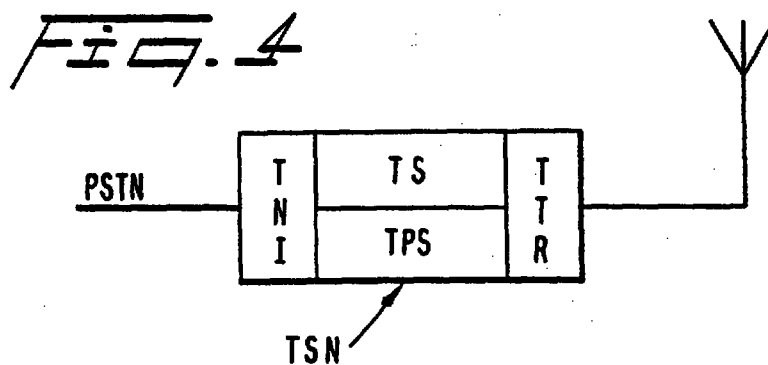
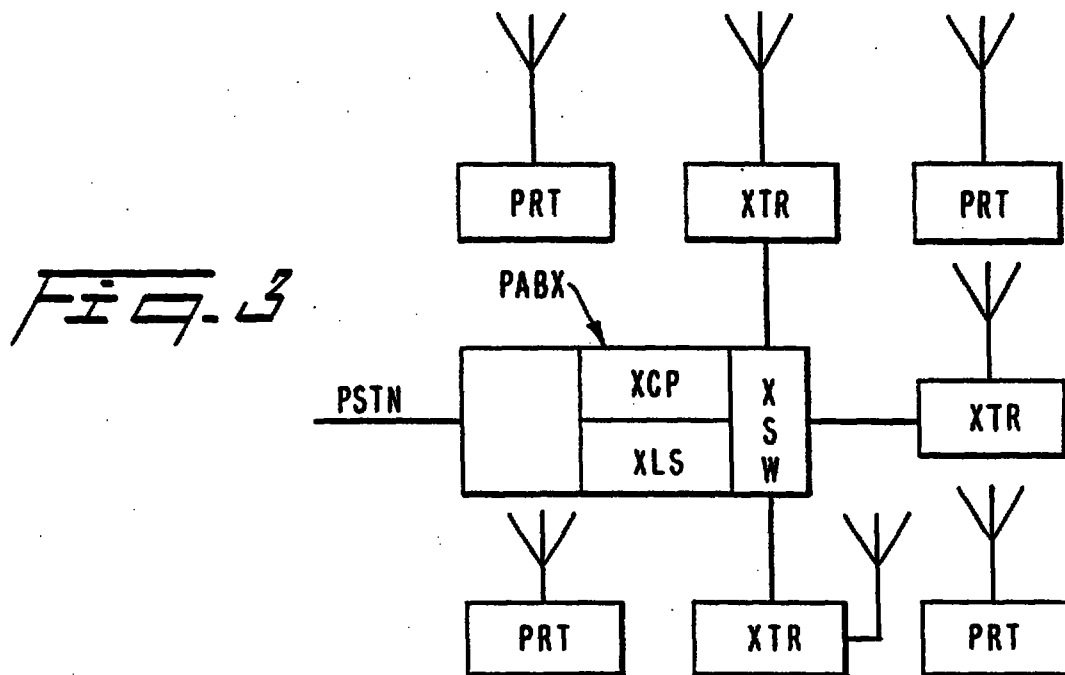
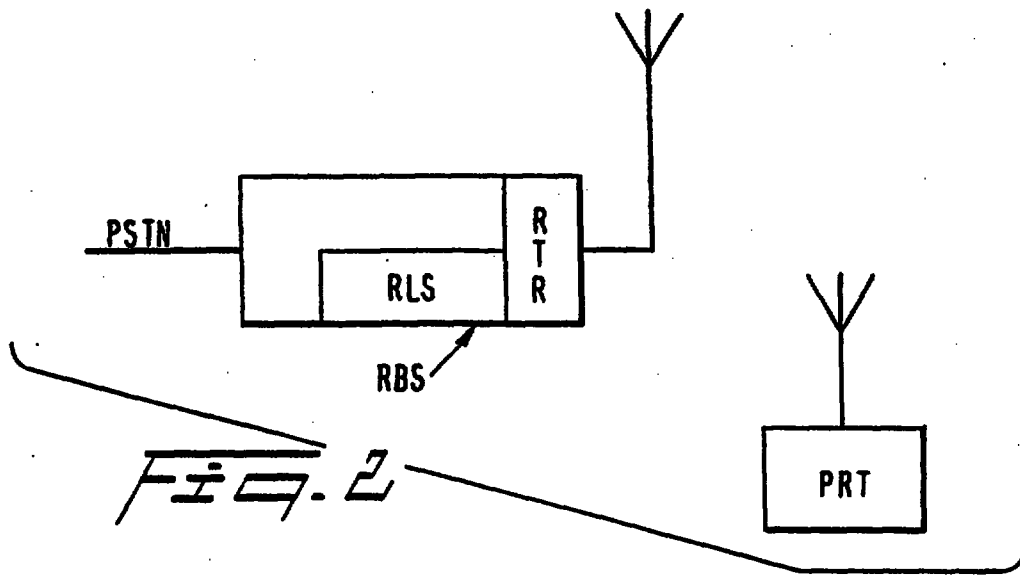
when receiving at a subscriber equipment a call through the network on a first telecommunication line to
20 a portable radio terminal associated with the subscriber equipment and having been allotted a temporary extension number reported to the location store, redirecting the call on a second telecommunication line connected to the first telecommunication line in said one of the at least
25 two subscriber equipments back to the telecommunication network as a call to the subscriber having a network subscriber number corresponding to the reported temporary extension number.



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SUBSTITUTE SHEET



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Fig. 5

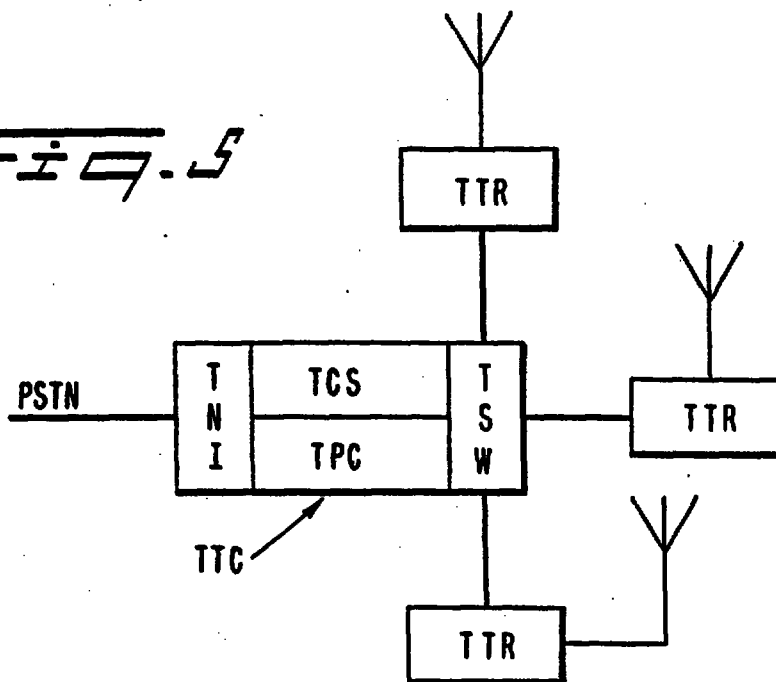


Fig. 6

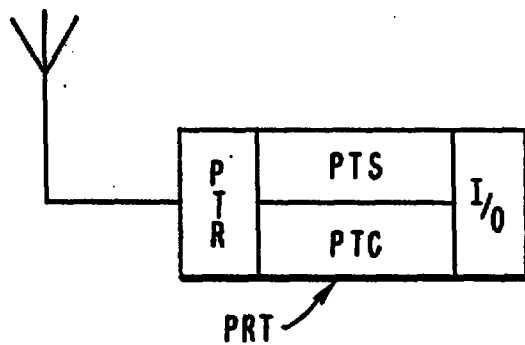
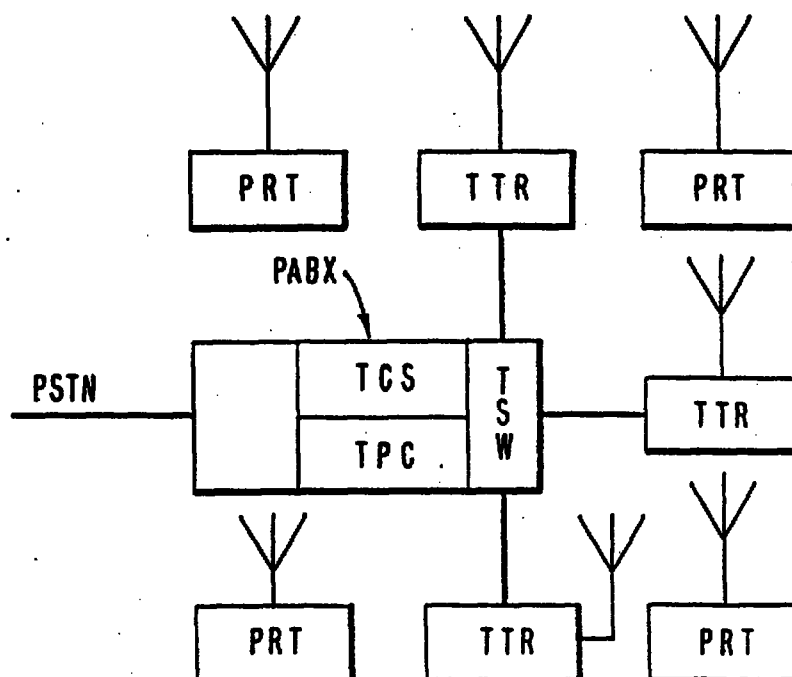


Fig. 7



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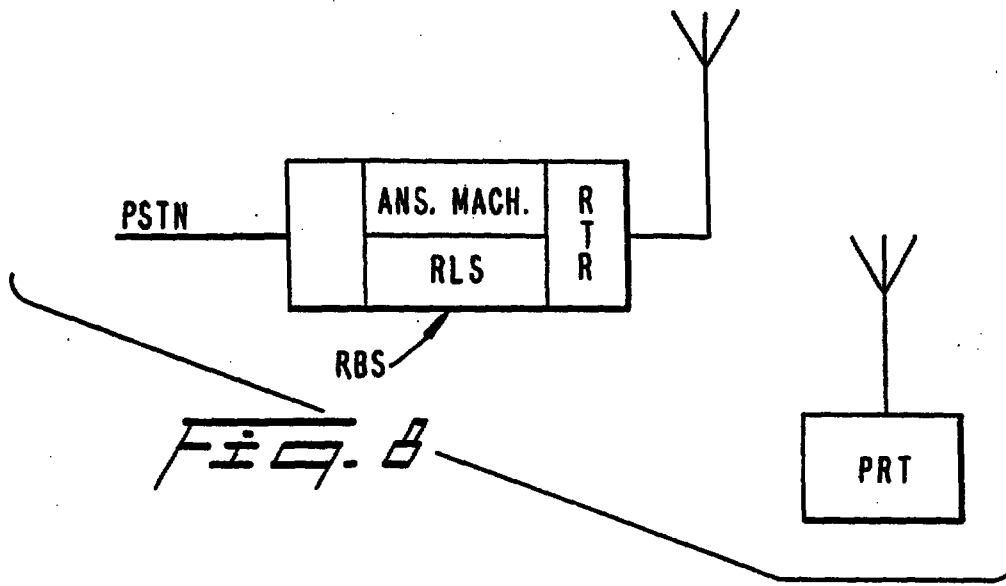


Fig. 9

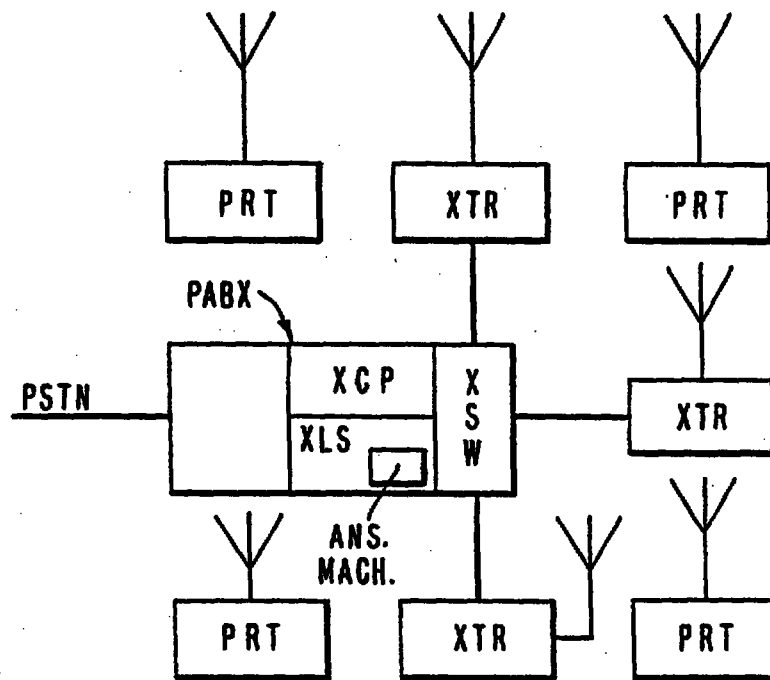
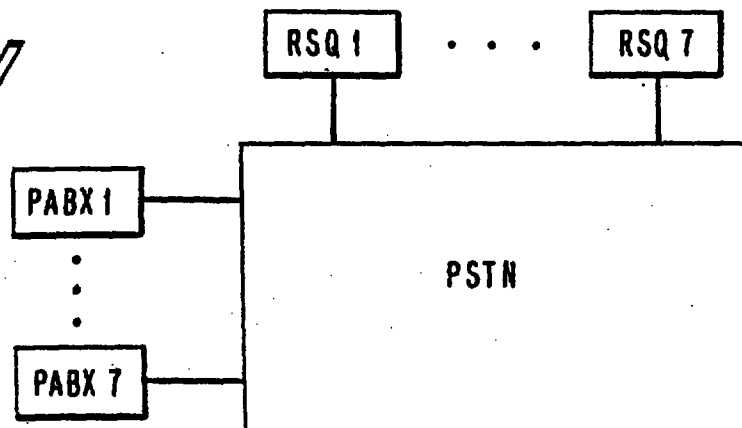
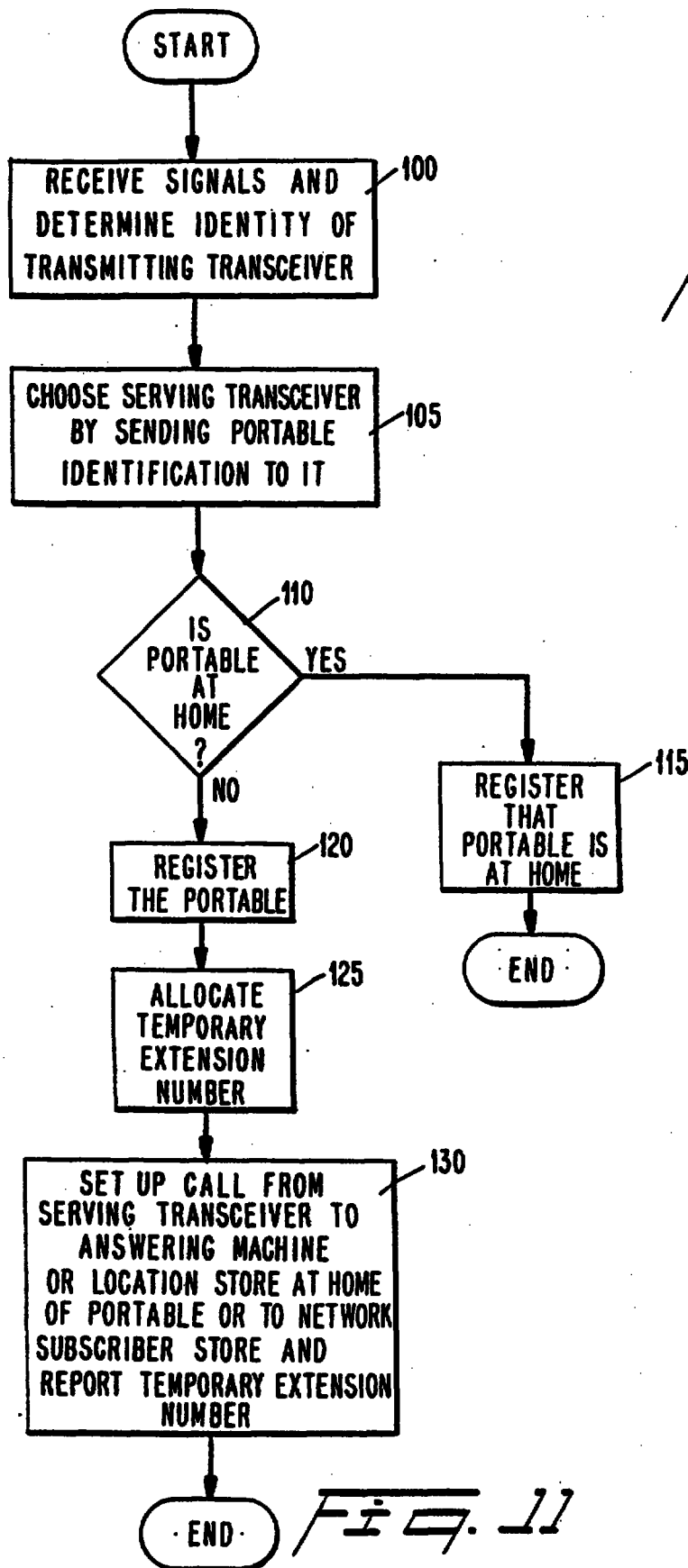
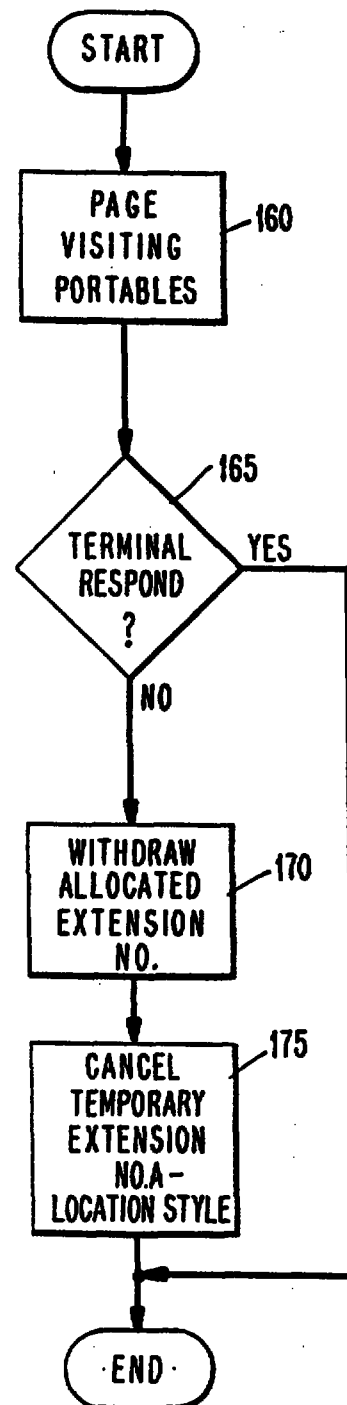
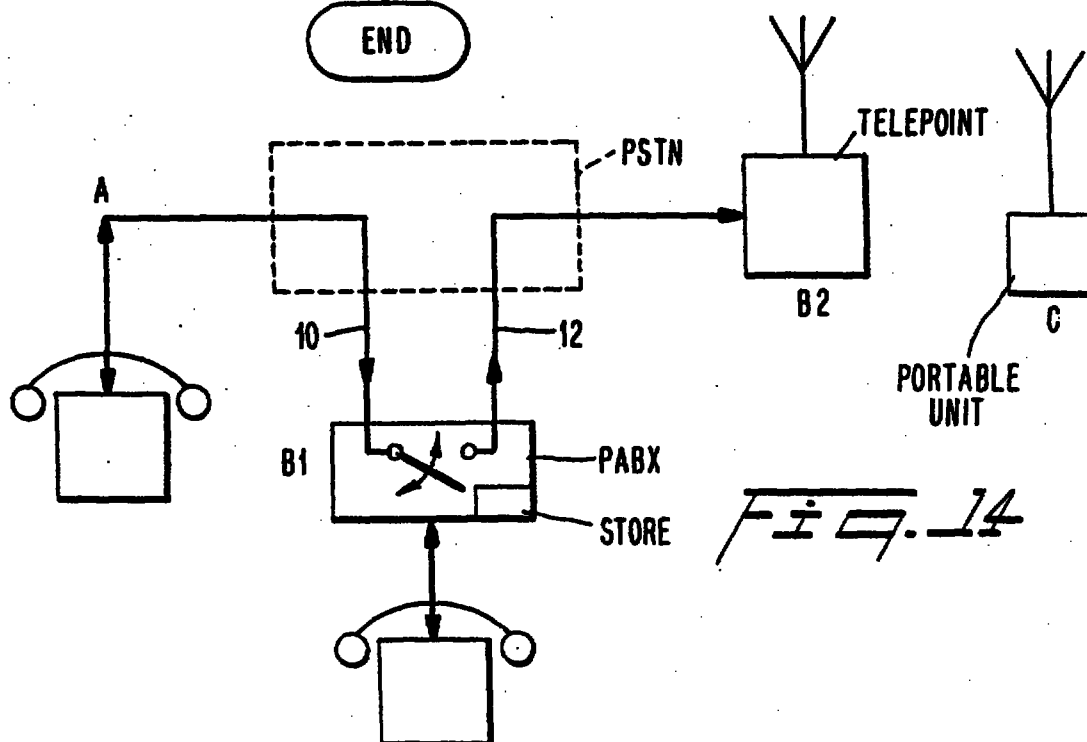
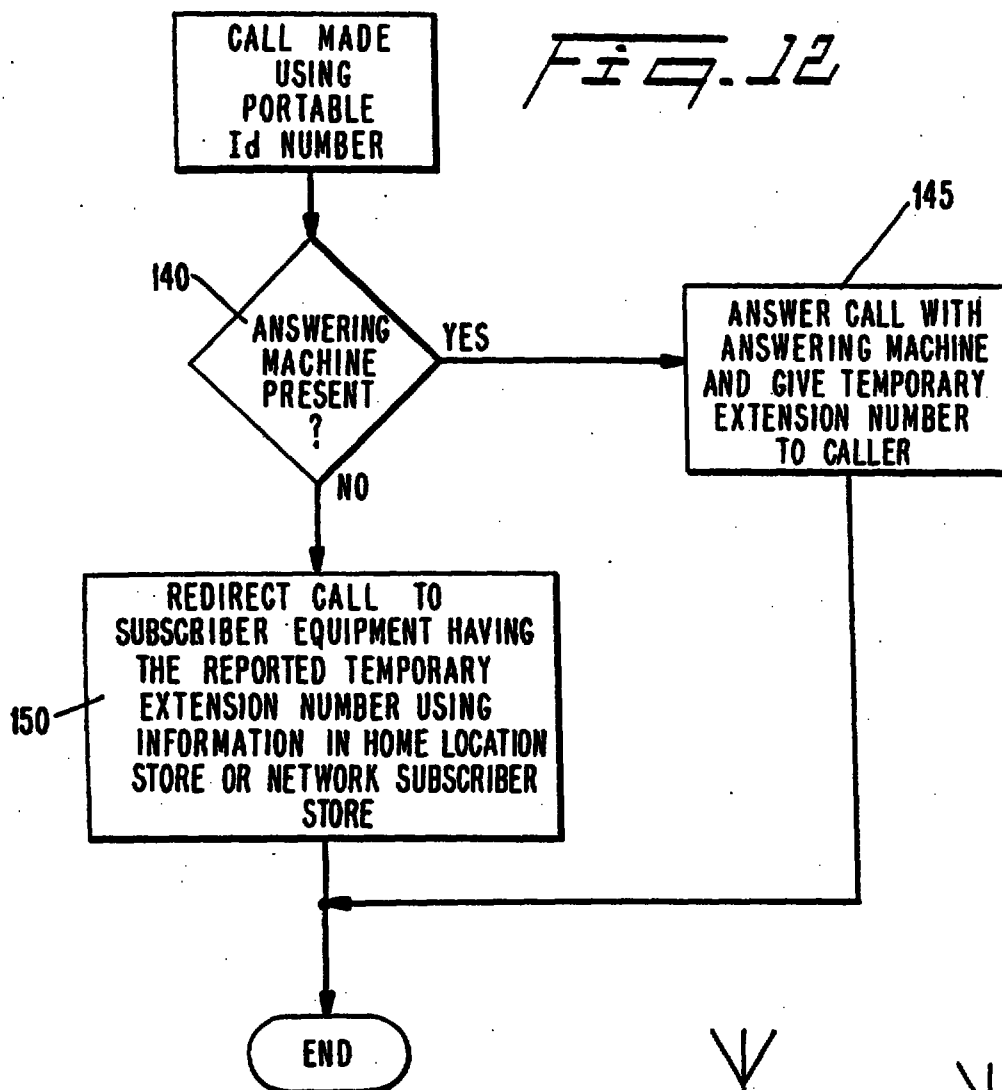


Fig. 10



**FIG. 13**

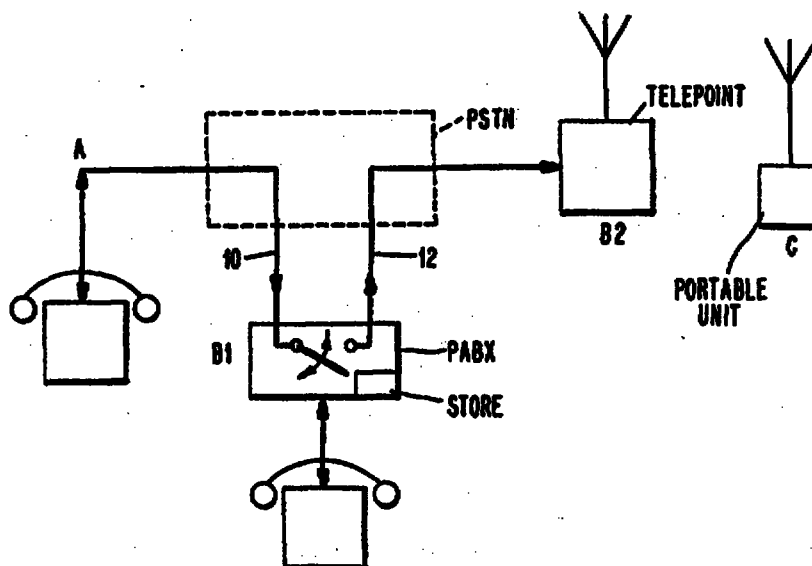




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(21) International Application Number: PCT/SE95/01330 (22) International Filing Date: 9 November 1995 (09.11.95) (30) Priority Data: 08/348,916 25 November 1994 (25.11.94) US (71) Applicant: TELEFONAKTIEBOLAGET LM ERICSSON [SE/SE]; S-126 25 Stockholm (SE). (72) Inventors: RAITH, Alex, Krister; 805A5 Park Ridge Road, Durham, NC 27713 (US). PERSSON, Bengt, Yngve; P.O. Box 42, S-182 05 Djursholm (SE). ÅKERBERG, Dag, E:Son; Ekhammarsvägen 23, S-196 31 Kungsängen (SE). (74) Agents: BOHLIN, Björn et al.; Telefonaktiebolaget LM Ericsson, Patent Dept., S-126 25 Stockholm (SE).	(81) Designated States: AL, AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, LS, MW, SD, SZ, UG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> 56 9701710-7	

(54) Title: TELECOMMUNICATION NETWORK



(57) Abstract

The invention relates to a communication method and a combination of a switched telecommunication network and connected to the network, a first automatic branch exchange or residential equipment for a subscriber, a second automatic branch exchange or residential equipment for a subscriber, possibly also a telepoint, and a portable radio terminal constituting part of a residential equipment or an extension to an automatic branch exchange, the portable radio terminal when served by a radio transceiver other than its residential or exchange radio transceiver uses the branch exchange or telepoint and the network for calling its residential base radio station or branch exchange and reporting serving branch exchange or telepoint or a temporary number to a location store, calls to the portable radio terminal thereafter being transferred by the residential equipment or branch exchange through the network to the branch exchange or telepoint in accordance with information in the location store, whereby the portable radio terminal may call and be called through the network and proximate branch exchange or telepoint.