(54) Title: TWO WAY CORDLESS TELEPHONE COMMUNICATION SYSTEM

(57) Abstract

A system for providing two way telephone communication between a wireless telephone (10) and a telephone (16) hardwired to the public switched telephone network (14) comprises a plurality of teADpoint base stations (12) serviced by a network control center (24) which is coupled to a telephone switch (20). The plurality of teADpoint base stations (12) are further divided into groups of associated base stations (32), the groups (32) determined by the geographic coverage of the base station (12). A wireless telephone (10) can preregister with the base station (12), indicating to the network control center (24) the location of the wireless telephone (10). When a call comes into the system (18) for the wireless telephone (10), the call is coupled to a meet me port (22). The teADpoint station (12) and all other teADpoint stations (12) in the group (32) to which the registered base station (12) belongs, attempt to locate the wireless telephone (10). When the wireless telephone (10) is located, it is coupled to the call at the meet me port (22).
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+ It is not yet known for which States of the former Soviet Union any designation of the Soviet Union has effect.
TWO WAY CORDLESS TELEPHONE COMMUNICATION SYSTEM

Field of the Invention

This invention relates in general to radio communications systems, and in particular to wireless telecommunications.

Background of the Invention

Second generation cordless telephone systems (CT-2) utilize approximately forty radio frequency (RF) channels for communication between cordless telephones or CT-2 handsets and a base station coupled to the public switched telephone network (PSTN). Conventional residential operation allows for two way calling between the handset and all telephones coupled to the PSTN via a home base station. Away from the home base station, the user initiates a telephone call by establishing an RF link between the handset and a telepoint base station coupled to the PSTN. The telepoint base stations provide telecommunications within approximately 150 meter radius of the station depending upon terrain and man-made objects which could interfere with the signalling. To originate a call, the cordless telephone would scan the forty channels to find an available channel and then attempt to access the telepoint station. The telepoint station, likewise, would be scanning the forty available channels for incoming calls from the CT-2 handsets. When the telepoint station detects a call request from a handset, interconnection with the PSTN is provided.

A CT-2 telepoint network control center provides periodic supervision of the telepoint base stations by periodically coupling via the PSTN to each telepoint base station and providing to each station system administrative lists (e.g., a list of stolen handsets to be prevented from operating, and a list of handsets which are to be temporarily put out of operation for not timely paying for
their service). Likewise, each telepoint station periodically (e.g., once a day) interconnects with the network control center via the PSTN to download handset activity for network billing.

Though approximating the convenience of cellular telephones while less expensive than cellular to both the service provider and the consumer, telepoint station operation has been primarily limited to one way telecommunications operation originating with the cordless telephone user. In cellular telephone operation, an RF control channel devoted to locating cellular telephones and substantial infrastructure is required to connect calls received via the PSTN to a cellular telephone.

Proposals have been made to incorporate a selective call receiver such as a pager in the CT-2 handsets. This would allow for reception of a message instructing the user to initiate a telephone call. Yet, addition of the pager would increase the complexity and cost of the CT-2 handset and service and would complicate the cordless telephone design.

It would be desirable to provide a simple, inexpensive method for locating and connecting a call to a cordless telephone.

Summary of the Invention

Accordingly, it is an object of the present invention to provide a system for two way cordless telephone communication which is relatively inexpensive and provides a high probability of establishing communication with a portable radio telephone communications device even if it is not within a coverage area of a private base station to which it is registered.

In carrying out the above and other objects of the invention in one form, there is provided a method for coupling an incoming telephone call to a wireless telephone by retrieving a base station identification associated with the wireless telephone and transmitting information
identifying the wireless telephone to the base station. The base station transmits a predetermined signal requesting a response to the wireless telephone. The wireless telephone is coupled to the incoming telephone call if it responds to the predetermined signal.

Brief Description of the Drawings

FIG. 1 is a diagram of the preferred embodiment of the present invention.

FIG. 2 is a flowchart of the operation of the switch according to the preferred embodiment of the present invention.

FIGS. 3A, 3B, and 3C are a flowchart of the operation of the network control center according to the preferred embodiment of the present invention.

FIGS. 4A, 4B, 4C and 4D are a flowchart of the operation of a telepoint base station according to the preferred embodiment of the present invention.

FIG. 5 is a diagram of a first alternate embodiment of the present invention.

FIG. 6 is a diagram of a second alternate embodiment of the present invention.
Detailed Description of the Invention

Referring to FIG. 1, the preferred embodiment of the present invention is a radio communication system designed to interface wireless telephones 10, such as second generation cordless telephones (CT-2), with the public switched telephone network 14 to allow cordless telephone operation. To make a conventional cordless telephone call, a handset 10a establishes a radio frequency link with a telepoint base station 12a. The telepoint base station 12a couples to the PSTN 14 thereby allowing information to be passed from the handset 10a to the PSTN 14 to call a telephone 16a in a conventional manner.

According to the present invention, a telephone call may be made from a conventional telephone 16b to a CT-2 handset 10b by calling a telephone number corresponding to a remote number of the handset 10b. Two forms of system access for incoming calls are possible. Trunk-level access can be implemented by assigning each handset 10 in the system its own unique handset telephone number, just as if the handset 10 were a telephone instrument hard-wired to the PSTN 14. The numbers assigned to the handsets 10 would be routed by the PSTN 14 to incoming ports 18 of a telephone switch 20 of the CT-2 system. The switch 20 can be a devoted CT-2 switch or a telephone switch within a central telephone office. Alternatively, a single access telephone number could be used by the PSTN 14 to route calls to the incoming ports 18 of the switch 20. Telephone lines routing to the ports 18 would belong to a common rotary to allow a next available line to receive the call if a first line is busy. After the switch 20 answers each call, the number of the desired handset 10 is entered using DTMF signalling.

Regardless of how access with the incoming ports 18 is accomplished, the switch 20 couples the incoming port 18 holding the call to one of a plurality of meet me ports 22 to await connection with the handset 10b. Audible ring
back is provided to the caller as the switch 20 then queries the telepoint network control center 24 as to whether the handset 10b has previously provided forward registration information, stored in forward registration memory 26, to the telepoint network control center 24. The switch 20 is coupled to the telepoint network control center 24 by a high-speed two way data link 25.

If the handset 10b has forward registration information stored in the memory 26 indicating that the handset 10b has forward registered at the telepoint base station 12b, the telepoint network control center 24 provides identification of the handset 10b and the meet me port 22 to the telepoint base station 12b via a call port 28 and PSTN 14. The telepoint base station 12b then selects one of the forty radio frequencies assigned to the telepoint base station to contact the handset 10b. When contact is made with the handset 10b, the telepoint base station 12b couples to the PSTN 14, and calls up the identified meet me port 22. This couples the handset 10b to the telephone 16b.

To forward register, a handset 10c establishes an RF link with a telepoint base station 12c and calls a predetermined number. The telepoint base station then forwards information identifying the handset 10c and the telepoint base station 12c to a forward registration port 28 coupled to the telepoint network control center 24. The telepoint network control center 24 stores this information in the forward registration memory 26 for later use.

Deregistration can take place automatically, such as deregistering a handset when it subsequently forward registers in a second location or at a predetermined time (e.g., once a day at midnight) as determined by a real time clock 31. According to the present invention, the subscriber via the handset 10c can indicate a deregistration time when forward registering. For example, if a subscriber is going to be at a restaurant for two hours he can input the time at which he wishes to deregister or a time period after which he wishes to deregister. The network control center 24 compares the
time indicated as a time of deregistration with the time indicated by the real time clock 31 and erases the forward registration information from the memory 26 upon coincidence. Administrative lists are stored in a memory 30 for access by the telepoint network control center 24 in a conventional manner.

To accommodate handsets which are carried within a single geographic area, such as a shopping mall or an airport, yet may enter and leave the range of a single telepoint base station 12b, a plurality of telepoint base stations 12b, 12c, and 12d, together covering the single geographic location 32 are wired together via a data link 34. If the telepoint base station 12b does not locate the handset 10b after polling for a sufficient time, information can be passed via the data link 34 to the telepoint base stations 12c and 12d. Telepoint base stations 12c and 12d can then poll for the handset 10b. Therefore, if handset 10b has moved to the coverage area of telepoint base station 12d (represented in broken line as handset 10b'), the telepoint base station 12d can couple the handset 10b' to meet me port 22 in the manner described above.

The user of the handset 10b, therefore, does not have to forward register every time he moves from the coverage area of a telepoint base station 12. By grouping the telepoint base stations in a geographically logical manner, the user forward registers when he travels to a geographic location and does not have to forward register again every time he moves to a coverage of a different base station within the geographic location.

The operation of the preferred embodiment of the present invention is shown in FIGS. 2, 3, and 4. FIG. 2 depicts the operation of the telephone switch 20 (FIG.1). When the switch 20 is energized and operation starts 50, processing remains in an idle loop awaiting reception of a call 52 at one of a plurality of incoming ports 18 (FIG. 1). When a call is received 52 at an input port 18, the call is connected 54 to one of the plurality of meet me
ports 22 (FIG. 1) by interconnecting the input port 18 to the meet me port 22. A "completion failure" timer, which will terminate the call and return an appropriate message to the caller if successful call completion does not occur within a system programmable time limit, is set 56 to the time limit. Audible ring back is provided 57 to the caller in a conventional manner.

The switch 20 then provides 58 handset identification information corresponding to the information received from the caller or the incoming port of the received call, and the assigned meet me port identification information to the telepoint network control center 24 via the dedicated data link 25. The switch 20 receives information back from the telepoint network control center 24 indicating whether the identified handset is registered 60. If the handset is not registered 60, the call is terminated by disconnecting 62 the meet me port 22 and returning the port 22 to an "on-hook" condition. An appropriate message is provided to the caller to inform the caller that the handset cannot be called and the incoming port 18 is disconnected 62 from the PSTN 14 and returned to an "on-hook" condition.

If the handset is registered 60, the switch 20 awaits coupling 64 of the handset to the meet me port 22 via PSTN 14. If the "completion failure" timer times out to zero 66 before coupling of the handset 64 to the meet me port 22, the call is disconnected 62 as described above. When the handset is coupled 64 to the meet me port 22, operation of the switch returns to the idle loop to await reception of another call 52 at an input port 18. Conventionally, when the call is finished and the caller or the handset have hung up, the connection between the meet me port 22 and the input port 18 will be disconnected and the condition of the ports 18 and 22 are returned to "on-hook".

Referring next to FIGS. 3A, 3B, and 3C, operation of the telepoint network control center 24 (FIG. 1) starts 70 upon energization of the control center 24. An administrative timer controlling periodic network administration is initialized 72. If the telepoint network
control center 24 receives an input interrupt 74 from the network administrator, the network control center receives information from the network administrator 76 and utilizes the information to update 78 the administrative lists 30 (FIG. 1). After updating the administrative lists 78, operation returns to determine whether an input has been received.

In the absence of an input interrupt from the network administrator 74, processing determines whether a call has been received 80 on the forward registration/call ports 28 (FIG. 1). If an input interrupt has not been received from the network administrator 74 or a call on the ports 28 has not been received 80, processing determines whether an input interrupt 82 has been received from the switch 20 (FIG. 1). In the absence of an input either from the network administrator 74, at the forward registration/call ports 80 or from the switch 82, the network control center 24 determines from the real time clock 31 (FIG. 1) whether a deregistration time has occurred 83. If deregistration is not indicated 83 by the real time clock 31, the administrative timer is checked to see if it has timed out to zero 84. If time out of the administrative timer has not occurred 84, processing remains in an idle loop until either an input from the network administrator 74, from the forward registration/call ports 80, or from the switch 82 has been received or whether a deregistration time has occurred 83 or timeout of the administrative timer has occurred 84.

Upon timeout of the administrative timer 84, the telepoint base stations 12 (FIG. 1) are called up 86 and provided administrative lists 88 from the memory 30 (FIG. 1) to govern the operation thereof. These administrative lists can, for example, consist of lists of stolen handsets and lists of delinquent or non-paying handsets to allow proper interaction between the telepoint base station and a handset so identified. After provision of the administrative lists to all telepoint base stations 12 within the telepoint network 88, the network control center
24 hangs up 90 from the PSTN 14 (FIG. 1) and processing returns to reinitialize the administrative timer 72.

When a call has been received from the forward registration/call ports 28 (FIG. 1) 80, the network control center 24 determines from the information received whether handset activity information has been received 92 from a telepoint base station 12. If handset activity information is received 92, such as information identifying which handsets have used air time with the telepoint base station and for how long, the activity information is forwarded 94 in a conventional manner to a billing controller which could be part of the network control center 24 or a separate data processing unit not depicted in FIG. 1. Processing then returns to the idle loop to await an input or a time initiated operation. Likewise, after a call is received 80 on the ports 28, if the information received is not handset activity information 92 or a forward registration request 96, processing returns to the idle loop to await an input or a time initiated operation. If a forward registration request is indicated 96, handset identification information and telepoint base station identification information are received 98 from the telepoint base station 12 and the received information is stored 100 in the forward registration memory 26 (FIG. 1).

If an input interrupt from the switch 82 is indicated, handset identification information and meet me port identification information is received 102 from the switch 20 (FIG. 1) via the dedicated data link 25 (FIG. 1). If the handset 10 identified by the handset identification information is not forward registered 104 as determined from an examination of the forward registration memory 26, the switch 20 is signalled 106 that the handset identified is not registered and processing returns to the idle loop to await the next input or timeout.

If the handset 10 identified is forward registered 104, the switch 20 is signalled 108 that the handset 10 identified is registered, the telepoint base station 12 corresponding to the identified handset 10 as determined
from information stored in the forward registration memory
26 (FIG. 1) is called up 110. After establishing contact
110 with the telepoint base station 12, the handset
identification information and the meet me port
identification information is provided 112 to the telepoint
base station 12. After communicating the information
received from the switch 112, the network control center 24
hangs up 114, disconnecting the coupling between the
network control center 24 and the telepoint base station
12, and processing returns to the idle loop to await an
input or a timeout.

If the real time clock 31 indicates that a
deregistration time has occurred 83, the identified
deregistration takes place by erasing 116 the handset
identification information and the corresponding telepoint
base station identification information from the forward
registration memory 26 (FIG. 1). A deregistration may be
indicated 83 in several manners. For example,
deregistration may be indicated 83 by reception of
deregistration information from a telepoint base station
12. Secondly, upon forward registration 100, time
information may be stored in the forward registration
memory 26 along with the handset identification
information. The stored time information indicates a
subscriber identified deregistration time. Comparison of
the time information in the forward registration memory 26
with the real time clock 31 would indicate deregistration
upon coinidence. Thirdly, system-wide deregistration,
such as is typical in cellular telephone forwarding, may be
made to occur automatically at a preprogrammed time each
day (e.g., midnight). Therefore, coinidence between the
real time clock 31 and the system deregistration time would
indicate deregistration 83.

As described above, reception of handset
identification information for forward registration 98
automatically erases a prior forward registration stored in
the forward registration memory 26 for that handset. A
less preferred alternate method of indicating
deregistration 83 would be to indicate deregistration 83
upon reception of a signal from a telepoint base station 12
indicating that an attempt to contact the handset 10 was
unsuccessful. After erasure 116, processing of the network
control center returns to the idle loop to await a
subsequent input 74, 80 or 82 or a time initiated event 83
or 84.

Referring to FIGS. 4A, 4B, 4C, and 4D, operation of a
telepoint base station 12 according to the present
invention starts 120 upon energization of the telepoint
base station. An administrative timer is initialized 122
and processing enters an idle loop awaiting an input from
the PSTN 124, an RF link with a handset 126, or an
interrupt from another telepoint base station 128 coupled
via data link 34 to the telepoint base station 12. The
idle loop also polls the administrative timer to see if it
has timed out 130. Operation remains in the idle loop
until an input 124, 126, or 128 or timeout 130. Upon
timeout of the administrative timer 130, the network
control center 24 is called up 132 and handset activity
information compiled by the telepoint base station 12 is
forwarded 134 to the network control center 24. In this
manner, periodic transfer of handset activity information
is forwarded to the network control center 24 for periodic
update and/or billing control. In the preferred embodiment
of the present invention, the administrative timer is equal
to 24 hours. After forwarding the activity information 134
to the network control center 124, the telepoint base
station 12 hangs up 136, disconnecting the PSTN 14 routing
between the telepoint base station 12 and the network
control center 24. The administrative timer is
reinitialized 122 and processing returns to the idle loop
to await an input or the next administrative timer timeout.

If an incoming call is received 124 from the PSTN 14,
the telepoint base station 12 determines whether the input
is administrative list update material 138 or a call
forward request 142 from the network control center 24. If
administrative list update material is received 138, the
revised administrative lists received from the network
control center 24 are stored 140 and processing returns to
the idle loop to await the next input or timer timeout. If
the information received is not a call forward request 142
or administrative list update material 138, processing also
returns to the idle loop.

Upon reception of a call forward request 142, the
telepoint base station 12 receives 144 the handset
identification information and the meet me port
identification information. In an alternate embodiment,
this information can be immediately forwarded via the data
link 34 to the other telepoint base stations within the
group to perform a "shotgun" handset polling. For example,
all the telepoint base stations 12b, 12c, or 12d within the
group 32 will poll for the identified handset 10b
simultaneously.

In the preferred embodiment of the present invention,
the handset 12 polls for the identified handset 10. To
poll for the identified handset, a polling timer is
initialized 146 and the identified handset is polled for
148. As standardized by the "Common Air Interface
Specification to be Used for the Interworking Between
Cordless Telephone Apparatus Including Public Access
Services MPT 1375, published by the Great Britain
Department of Trade and Industry, the polling timer is
initialized 146 to 2.8 seconds. The telepoint base station
12b polls for the handset 10b identified 148 by
transmitting a predetermined signal on one of the base
station frequencies for 1.4 seconds, then transmitting the
predetermined signal on a second one of the base station
frequencies for an additional 1.4 seconds. The base
station 12b scans the frequencies for a signal from the
handset identified 10b. Upon reception of a reply from the
identified handset 10b, an RF link is established therewith
158.

If an RF link with the identified handset is not
established 158, and the polling timer does not equal zero
160, polling for the handset continues 148. Upon timeout
of the polling timer 160, in the preferred embodiment of
the present invention, the handset identification
information and meet me port identification information is
forwarded to the other telepoint base stations 12c, 12d in
the group 162 for subsequent polling by the telepoint base
stations in the group. In this manner, the telepoint base
station 12b identified in the forward registration memory
polls first for the handset 106. If the subscriber
remains stationary, such as eating at a restaurant, there
is a greater likelihood that he would be within the
coverage area serviced by the identified telepoint base
station 12b. Only upon failure to locate the handset 106
by the identified telepoint base station is the information
transferred to the other telepoint base stations 12c, 12d
within the group 32 thereby conserving communication time
utilized by the telepoint base stations for polling for a
handset. After transfer of the handset identification
information and the meet me port identification information
to the telepoint base stations 162, processing returns to
the idle loop.

If an RF link with the identified handset 106 is
established 158, the telepoint base station calls up 164
the meet me port identified 22 via the PSTN 14 and the
linked handset 106 is coupled 166 to the meet me port
identified 22, thereby coupling the handset 106 to the
caller who initiated the contact at telephone 16b.
Processing of the telepoint base station returns to the
idle loop. In a conventional manner, when the telephone
conversation is complete and the caller hangs up and the
subscriber using the handset 106 hangs up, the coupling
between the telepoint base station 12b and the PSTN 14,
between the PSTN 14 and the meet me port 22, and between
the incoming port 18 and the PSTN 14 will be disconnected
and returned to the "on-hook" condition by central office
equipment governing operation of the PSTN 14.

If an input is received 126 by the telepoint base
station 12 from a handset 10, the base station 12 checks
its administrative list to see if the handset 10 is on the
stolen handset list 168. If the handset 10 is on such a list, in a manner well known to those skilled in the art, a predetermined code is transmitted 170 to the handset 10 that has established an RF link with the base station 12. The code transmitted places the handset 10 in a permanently out-of-service condition. Likewise, the base station 12 checks the administrative list to see if the handset 10 establishing a link with the base station 12 is on the delinquent handset list 172. Entry on the delinquent handset list causes an out-of-service message to be transmitted 174 to the linked handset 10 and disconnection or noncompletion of a call by the base station 12. Thus, all calls received from a handset 10 are screened by comparison with the administrative list to only allow authorized use of the CT-2 communication system. If the handset 10 does not request forward registration, or as described above, deregistration 176, the handset 10 is coupled to the PSTN 14 and operation therefrom is well known to those skilled in the art. If a forward registration request is received 176, telepoint base station identification information is attached 180 to the handset identification information indicated by the linked handset 10 and deregistration information received from the handset 10. The telepoint base station 12 calls up 182 the network control center 24. Upon contact being established with the network control center 24, the telepoint base station identification information, the handset identification information, and the deregistration information is provided 184 to the network control center 24 after which the telepoint base station 12 hangs up 186. After hang up 186, processing returns to the idle loop to await the next input interrupt 124, 126, or 128, or timeout of the administrative timer 130.

Upon reception of an input interrupt from another telepoint base station 12 within the group 128, the handset identification information and the meet-me port identification information are received 188 and the polling
timer is initialized 190. The handset identified 10 is polled for 192 in the manner described above. If no link is established 194 with the identified handset 10 and the polling timer has not timed out 196, processing determines whether an input has been received 197 from another base station 12 in the group 32 indicating that the handset 10 has been located. If the handset located message is not received 197, polling for the identified handset 10 continues 192. If the polling timer times out 196 before an RF link is established 194 with the identified handset 10 or if the handset located message is received 197, processing will return to the idle loop. In the less preferred alternative embodiment described above, before returning to the idle loop, information is transmitted to the telepoint network control center 24 via the PSTN 14 indicating that polling for the handset 10 failed and deregistering the handset 10 in response thereto.

If an RF link is established with the identified handset 10, the identified meet me port is called up 198 and the RF link with the handset identified is coupled to the meet me port identified 200 to allow communication therebetween. A message indicating that the handset 10b has been located is broadcast 201 to the other base stations within the group to indicate that the other base stations can cease polling for the handset 10. Processing of the telepoint base station returns to await a next input or timeout of the administrative timer.

In some situations, a hardwired data link 34 may be too costly. Referring to FIG. 5, an alternative embodiment would allow installation of a local group paging system 203 to provide communication to all base stations 12b', 12c', and 12d' within the group 32 via pagers 202a, 202b, and 202c. In the alternate embodiment, when the telepoint network control center 24 receives a call for the forward registered handset 106 identified as being registered with a telepoint base station 12b' within group 32, a message is provided to the local group paging system 200 to provide a selective call message to pager 202a. To provide
simultaneous polling for a handset 10 by the telepoint base stations 12b', 12c', and 12d' of the group 32, a local group paging system 200 can simultaneously provide a message to pagers 202a, 202b, and 202c indicating the handset 106 to be polled for.

Referring next to FIG. 6, a further alternative embodiment would provide installation of a pager 202 within each telepoint base station 12' and a wide area paging system 210 for providing messages to the pagers 202. The wide area paging system 210 could be a system devoted to the communication with telepoint base stations or a wide area system of which the pagers 202 would be subscribers as would individual pagers operating independently from the present invention.

By now it should be appreciated that there has been provided a system for two way cordless telephone communication which is relatively inexpensive and provides increased probability of establishing communication with a portable radio telephone communications device even if it is not within the coverage area of the telepoint base station indicated as forward registered to.
CLAIMS

1. A method for coupling an incoming telephone call to a wireless telephone comprising the steps of:
   receiving an incoming telephone call for a wireless telephone from a telephone;
   retrieving first information identifying one of a plurality of base stations if the wireless telephone is forward registered;
   transmitting second information comprising identification of the wireless telephone to said one of said plurality of base stations;
   said one of said plurality of base stations transmitting a predetermined signal to said wireless telephone requesting a response therefrom;
   coupling said wireless telephone to said telephone if a response is received from the wireless telephone; and
   transmitting said second information to predetermined ones of said plurality of base stations if a response is not received from the wireless telephone.

2. The method according to Claim 1 further comprising the steps of:
   said predetermined ones of said plurality of base stations transmitting said predetermined signal to said wireless telephone requesting a response therefrom; and
   coupling said wireless telephone to said telephone if a response is received from the wireless telephone.

3. The method according to Claim 1 wherein the step of transmitting said second information comprises the step of transmitting phone line identification information.

4. The method according to Claim 1 wherein the step of transmitting second information comprises the step of transmitting said second information via the public switched telephone network.
5. The method according to Claim 1 wherein the step of transmitting second information comprises the step of transmitting said second information from a paging network to one of a plurality of pagers, said plurality of base stations each coupled to one of said plurality of pagers.

6. The method according to Claim 1 wherein a group of base stations comprises said one of said plurality of said base stations and the step of transmitting second information comprises the step of transmitting said second information to said group of base stations.

7. The method according to Claim 1 further comprising the step of deleting said first information if said predetermined ones of said plurality of base stations do not receive a response from the wireless telephone.

8. The method according to Claim 6 wherein each of said base stations belonging to said group cover at least a portion of a geographical location.

9. In a wireless telephone communications system a method of polling a wireless telephone from one of a plurality of base stations, the method comprising the step of polling for said wireless telephone until a predetermined signal is received from another of said plurality of base stations, said predetermined signal indicating that said another of said plurality of base stations has located said wireless telephone.
10. A method in a wireless telephone communications system comprising the steps of:

receiving information from one of a plurality of wireless telephones, said information comprising

identification information of said one of said plurality of wireless telephones, identification information of one of a plurality of base stations, and selectable time information;

storing said information;

receiving an incoming call for said one of said plurality of wireless telephones;

transmitting a predetermined signal to said one of said plurality of base stations if said information is stored, said one of said plurality of base stations polling for said one of said plurality of wireless telephones in response to said predetermined signal; and

deleting said information at a time determined by said selectable time information.

11. A wireless telephone communications system for coupling an incoming telephone call to a wireless telephone at remote locations comprising:

switching means coupled to the public switched telephone network for receiving the incoming telephone call;

base stations at said remote locations for RF linking to the wireless telephone and coupling the wireless telephone to said switching means; and

a network control center comprising:

memory means for storing information indicating said remote location;

means for receiving information from said switching means indicating reception of said incoming telephone call; and

means for providing an indication to said at least one base station that said incoming telephone call has been received.
12. The wireless telephone communication system of Claim 11 wherein said at least one base station comprises a plurality of base stations, each of said plurality of base stations covering a portion of a geographical location.
FIG. 1
START

CALL RECEIVED AT INPUT PORT?

CONNECT CALL TO A MEET ME PORT

SET TIMER TO MAXIMUM VALUE

PROVIDE AUDIBLE RING BACK TO THE CALLER

PROVIDE THE HANDSET IDENTIFICATION INFORMATION AND THE MEET ME PORT IDENTIFICATION INFORMATION TO THE TELEPOINT NETWORK CONTROL CENTER

HANDSET REGISTERED?

HANDSET COUPLED TO THE MEET ME PORT VIA THE PSTN?

TIMER = ZERO?

DISCONNECT CALL FROM INPUT PORT AND MEET ME PORT

FIG. 2
START

72 INITIALIZE THE TIMER

74 INPUT INTERRUPT FROM NETWORK ADMINISTRATOR?

76 RECEIVE INFORMATION FROM THE NETWORK ADMINISTRATOR

78 UPDATE THE ADMINISTRATIVE LISTS

80 CALL RECEIVED ON FORWARD REGISTRATION/CALL PORT?

82 INPUT INTERRUPT FROM SWITCH?

83 Deregistration Time Indicated?

84 Timer = Zero?

86 Call Up Telepoint Base Stations

88 Provide Administrative Lists to Telepoint Base Stations

90 Hang Up

D

FIG. 3A
FIG. 3B
FIG. 3C
START

INITIALIZE THE TIMER

INCOMING CALL RECEIVED FROM PSTN?

NO

RF LINK CALL RECEIVED FROM A HANDSET?

NO

INPUT INTERRUPT FROM GROUP?

NO

TIMER = ZERO?

YES

HANG UP

FORWARD ACTIVITY INFORMATION TO THE NETWORK CONTROL CENTER

CALL UP THE NETWORK CONTROL CENTER

FIG. 4A
A

ADMINISTRATIVE LIST UPDATE?

CALL FORWARD?

RECEIVE THE HANDSET IDENTIFICATION INFORMATION AND THE MEET ME PORT IDENTIFICATION INFORMATION

INITIALIZE POLLING TIMER

POLL FOR HANDSET IDENTIFIED

LINK WITH IDENTIFIED HANDSET ESTABLISHED?

STORE ADMINISTRATIVE LISTS FROM THE NETWORK CONTROL CENTER

CALL UP THE MEET ME PORT IDENTIFIED

COUPLE LINKED HANDSET TO THE MEET ME PORT IDENTIFIED

POLLING TIMER = ZERO?

TRANSFER THE HANDSET IDENTIFICATION INFORMATION AND THE MEET ME PORT IDENTIFICATION INFORMATION TO THE GROUP TELEPOINT BASE STATIONS

FIG. 4B
HAN DSET ON STOLEN HANDSET LIST?

NO

HAN DSET ON DELINQUENT HANDSET LIST?

NO

FORWARD REGISTRATION REQUEST?

NO

COUPLE HANDSET LINK TO PSTN

YES

TRANSMIT PREDETERMINED CODE TO THE LINKED HANDSET TO PLACE HANDSET OUT OF SERVICE

TRANSMIT AN OUT OF SERVICE MESSAGE TO THE LINKED HANDSET

ATTACH TELEPOINT BASE STATION IDENTIFICATION INFORMATION TO HANDSET IDENTIFICATION INFORMATION AND Deregistration INFORMATION

CALL UP THE NETWORK CONTROL CENTER

PROVIDE TELEPOINT BASE STATION IDENTIFICATION INFORMATION, HANDSET IDENTIFICATION INFORMATION, AND DeregISTRATION INFORMATION TO THE NETWORK CONTROL CENTER

HANG UP

FIG. 4C
RECEIVE THE HANDSET IDENTIFICATION INFORMATION AND THE MEET ME PORT IDENTIFICATION INFORMATION

INITIALIZE POLLING TIMER

POLL FOR HANDSET IDENTIFIED

LINK WITH IDENTIFIED HANDSET ESTABLISHED?

YES

CALL UP THE MEET ME PORT IDENTIFIED

COUPLE LINKED HANDSET TO THE MEET ME PORT IDENTIFIED

BROADCAST HANDSET LOCATED MESSAGE TO GROUP BASE STATIONS

NO

POLLING TIMER = ZERO?

YES

HANDSET LOCATED MESSAGE RECEIVED FROM BASE STATION IN GROUP?

NO

FIG. 4D
FIG. 6
INTERNATIONAL SEARCH REPORT
International Application No.
PCT/US91/05430

I. CLASSIFICATION OF SUBJECT MATTER

According to International Patent Classification (IPC) or to both National Classification and IPC
IPC (5): H04M 11/00

II. FIELDS SEARCHED

Classification System
Classification Symbols
U.S. 379/58, 60-63

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched

III. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of Document with indication where appropriate, of the relevant passages Relevant to Claim No. |
|----------|-------------------------------------------------------------------------------------------------|--------------------------------------------------|
| X        | US, A, 4,456,793 (BAKER ET AL.) 26 June 1984  
See column 14, lines 25 to column 15, line 5; column 2, lines 62 to column 3, line 4. | 1-3, 6, 8, 9, 4, 7, 9 |
| Y        | X        | US, A, 4,748,655 (THOWER ET AL.) 31 May 1988  
See figure 1 (items 5, 7); column 3, lines 8-23. | 11, 12 |
| X        | US, A, 4,833,702 (SHITARA ET AL.) 23 May 1989  
See figure 1; column 2, lines 54-63; column 3, lines 44-49, column 4, lines 39-45, line 64 to column 5, line 4. | 10 |
| Y        | X        | US, A, 4,980,907 (RAITH ET AL.) 25 December 1990  
See column 2, line 42 to column 3, line 54. | 4, 7 |

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  "A" document defining the general state of the art which is not considered to be of particular relevance
  "E" earlier document but published on or after the international filing date
  "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  "O" document referring to an oral disclosure, use, exhibition or other means
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  "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
  "A" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search
23 September 1991

Date of Mailing of this International Search Report
11 OCT 1991

International Searching Authority
ISA/US

Signature of Authorized Officer
Dwayne Bost