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PATENTS ACT 1990

PATENT REQUEST: STANDARD PATENT

I/We, the Applicant(s)/Nominated Person(s) specified below, request I/We be granted a patent for the invention disclosed in the accompanying standard complete specification.

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[54] Invention Title:

Paging System for Establishing Connections Using Stored Wide-Area Telephone Numbers

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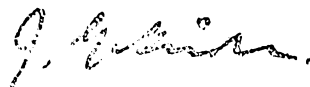
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Basic Applicant(s): NEC Corporation

DATED this TWENTY SIXTH day of OCTOBER 1993

NEC Corporation

By:



Registered Patent Attorney

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NOTICE OF ENTITLEMENT

I, John Gordon Hinde, of Spruson & Ferguson, St Martins Tower, 31 Market Street, Sydney, New South Wales 2000, Australia, being the patent attorney for the Applicant(s)/Nominated Person(s) in respect of Application No 50297/93 state the following:-

The Applicant(s)/Nominated Person(s) has/have entitlement from the actual inventor(s) as follows:-

The Applicant(s)/Nominated Person(s), by virtue of a Contract of Employment between the actual inventor(s) as employee(s) and the Applicant(s)/Nominated Person(s) as employer(s), is a person entitled to have the patent assigned to it if a patent were granted on an application made by the actual inventor(s).

The Applicant(s)/Nominated Person(s) is/are the applicant(s) of the basic application(s) listed on the Patent Request. The basic application(s) listed on the Patent Request is/are the first application(s) made in a Convention Country in respect of the invention.

DATED this TWENTY-SIXTH day of SEPTEMBER 1994

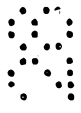
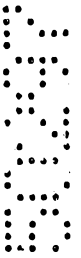
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(54) Title
PAGING SYSTEM FOR ESTABLISHING CONNECTIONS USING STORED WIDE-AREA TELEPHONE NUMBERS

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(56) Prior Art Documents
GB 2174272

(57) Claim

1. A wide-area paging system comprising:

 a plurality of paging terminals connected to a switched telecommunications network, each of said paging terminals covering a home service area and comprising:
 a plurality of transmitters for broadcasting signals in the home service area;
 a home area memory for storing telephone numbers of pagers registered to home area service;

 processor means connected to the network for receiving a page therefrom and further connected to the home area memory for determining whether a destination pager identified by the page is registered to the home area service, reading a telephone number from the home area memory identified by the page if said destination pager is determined to be registered to the home area service, producing, from the read telephone number, a paging signal unique to the home service area, and supplying the paging signal to said transmitters;

 at least one of said paging terminals further comprising:

 a wide area memory for storing telephone numbers of pagers registered to wide area service,

 the processor means of the least one paging terminal is further connected to the wide area memory for additionally determining whether a destination pager identified by the page is further registered to the wide area service, reading a telephone number from the wide area memory identified by the page if said destination pager is

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additionally determined to be registered to the wide area service, producing, from the read telephone number, a paging signal unique to the wide area service, and supplying the paging signal to another paging terminal directly or by way of said network.

3. A wide-area paging system comprising a plurality of paging terminals connected to a switched communication network, each of said paging terminals covering a home service area and comprising first converter means for converting an incoming calling signal received from the network to a paging signal unique to the home service area and means for transmitting the paging signal to a plurality of transmitters located in said home service area,

at least one of said paging terminals comprising:

a memory for storing telephone numbers of pagers registered to wide-area paging service;

means for receiving a copy of the paging signal transmitted to said transmitters from the transmitting means;

second converter means for determining whether a destination pager paged by said transmitted paging signal is registered to the wide-area paging service, reading a telephone number from the memory in accordance with the received copy of the transmitted paging signal if said destination pager is determined to be registered to the wide-area paging service, and deriving an outgoing calling signal from the read telephone number; and

means for transmitting the outgoing calling signal to another paging terminal directly or by way of said network.

TITLE OF THE INVENTION

"Paging System for Establishing Connections Using Stored Wide-Area Telephone Numbers"

BACKGROUND OF THE INVENTION

5

Field of the Invention

The present invention relates generally to radio paging systems, and more specifically to a wide-area radio paging system.

Description of the Related Art

10 In wide-area paging services provided by a common carrier which owns a public switched telephone network, a local calling signal from a network subscriber station to a wide-area pager is translated into telephone numbers of the remote toll areas to which the pager is entitled to receive paging signals. While satisfactory for such common carriers, the translation of telephone number from local to wide-area service is impossible for new common carriers since the up-to-date telephone directory numbers
15 of all network and pager subscribers are not available. Current wide-area paging services provided by new common carriers require manual intervention for establishing wide-area paging connections when a request is received from a network subscriber.

SUMMARY OF THE INVENTION

20 It is therefore an object of the present invention to provide a wide-area paging system which enables a paging terminal to establish wide-area paging connections using stored telephone numbers.

The invention discloses a wide-area paging system comprising:
a plurality of paging terminals connected to a switched telecommunications network, each of said paging terminals covering a home service area and comprising:
25 a plurality of transmitters for broadcasting signals in the home service area;
a home area memory for storing telephone numbers of pagers registered to home area service;

processor means connected to the network for receiving a page therefrom and further connected to the home area memory for determining whether a destination pager
30 identified by the page is registered to the home area service, reading a telephone number from the home area memory identified by the page if said destination pager is determined to be registered to the home area service, producing, from the read telephone number, a paging signal unique to the home service area, and supplying the paging signal to said transmitters;

35 at least one of said paging terminals further comprising:
a wide area memory for storing telephone numbers of pagers registered to wide area service,



the processor means of the least one paging terminal is further connected to the wide area memory for additionally determining whether a destination pager identified by the page is further registered to the wide area service, reading a telephone number from the wide area memory identified by the page if said destination pager is additionally determined to be registered to the wide area service, producing, from the read telephone number, a paging signal unique to the wide area service, and supplying the paging signal to another paging terminal directly or by way of said network.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be described in further detail with reference to the accompanying drawings, in which:

Fig. 1 is a block diagram of a wide-area paging system according to a first embodiment of the present invention;

Fig. 2 is a block diagram of a wide-area paging system according to a second embodiment of the present invention;

Fig. 3 is a block diagram of a wide-area paging system according to a third embodiment of the present invention; and

Fig. 4 is a block diagram of a wide-area paging system according to a fourth embodiment of the present invention.

DETAILED DESCRIPTION

Referring now to Fig. 1, a wide-area radio paging system according to one embodiment of the present invention is shown. The wide-area radio paging system comprises a plurality of paging terminals 2-1, 2-2, ..., 2-N connected to the public switched telephone network 1. Groups of radio transmitters 3-1, 3-2, ..., 3-N are connected to the paging terminals 2-1, 2-2, ..., 2-N, respectively, for transmitting coded paging signals to pagers, not shown, registered in their respective home service areas.

At least one of the paging terminals 2-1 through 2-N, or paging



1 terminal 2-1 includes an incoming interface unit 20 for receiving from the
2 network 1 an incoming calling signal, which is usually seven- or eight-digit
3 telephone number addressing a destination pager. A processor 21 is
4 connected to receive the incoming calling signal from the interface unit 20
5 and determines whether the addressed pager belongs to the home
6 service area by reading data from a home-area memory 22. If it is
7 determined as belonging to the home service area, processor 21 reads a
8 corresponding binary paging signal from the home-area memory 22,
9 containing a pager's identification code which is unique to the home area.
10 The paging signal is then applied to an output interface unit 23 where it is
11 encoded into a specified code format such as BCH (Bose-Chandhuri-
12 Hocquenghem) code for error detection and correction and transmitted to
13 the radio transmitters 3-1. Paging terminal 2-1 further includes a wide-
14 area memory 24 which stores telephone numbers (including toll and local
15 area codes) of those pagers registered to wide-area paging service. An
16 outgoing interface unit 25 is connected to the processor 21 to receive
17 telephone numbers read from the wide-area memory 24 to transmit an
18 outgoing calling signal to the network 1.

19 The other paging terminals 2-2 through 2-N are of identical
20 construction which differs from the paging terminal 2-1 in that they are not
21 provided with the wide-area memory 24 and interface unit 25 of paging
22 terminal 2-1.

23 If an incoming calling signal received from the network is
24 determined by the processor 21 that the addressed pager is registered to
25 the home service area, processor 21 reads a corresponding paging signal
26 from memory 22 and applies it to the interface 23 for coding and
27 transmission to the transmitters 3-1 in a manner just described. Processor
28 21 proceeds to check to see if the addressed pager is registered to the
29 wide-area paging service. If this is the case, processor 21 reads one or
30 more telephone numbers of the registered pager from the wide-area



1 memory 24 and supplies them to the interface 25 where they are
2 converted to outgoing calling signals and transmitted in sequence to the
3 network 1. If the addressed pager is registered to two remote toll areas,
4 for example, two outgoing calling signals are transmitted in sequence from
5 interface unit 25. If the paging terminal 2-2 is one of such remote toll
6 areas, the transmitted outgoing calling signal is received at the interface 20
7 of this terminal as an incoming calling signal and converted to a
8 corresponding paging signal unique to the home area of paging terminal
9 2-2 and transmitted in coded format to transmitters 3-2.

10 The arrangement of Fig. 1 is advantageous for incorporating the
11 present invention into a system which is to be newly installed. A modified
12 embodiment shown in Fig. 2 is advantageous if the present invention is to
13 be incorporated into an existing radio paging system. In this modification,
14 the paging terminal 2A-1 includes an input interface unit 26 which is
15 connected to receive a copy of the transmitted paging signal from the
16 output interface 23 for conversion from the coded format to a binary
17 paging signal for coupling to a second processor 27 to which the wide-
18 area memory 28, identical to memory 24 of Fig. 1, is connected. On
19 receiving the binary paging signal from interface 26, processor 27
20 determines whether the pager addressed by the paging signal is
21 registered to wide-area paging service by reading data from memory 28.
22 If the addressed pager is registered to wide-area paging service,
23 processor 27 reads the telephone numbers of the registered pager from
24 wide-area memory 28. An outgoing interface unit 29 is connected to the
25 processor 27 to produce and transmit outgoing calling signals in sequence
26 to the network 1 in response to the telephone numbers read from the
27 memory 28.

28 In the previous embodiments, the outgoing calling signal is
29 transmitted to the public switched telephone network 1. If a paging
30 system is provided by a common carrier which does not own the network

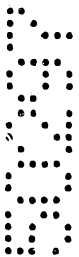


1 1 and wide-area paging service is to be extended only to an adjacent
2 paging area, embodiments shown in Figs. 3 and 4 can be used to
3 advantage.

4 In the embodiment of Fig. 3, only two adjacent paging terminals
5 are shown and parts corresponding to those in Fig. 1 are marked with the
6 same numerals. An outgoing calling signal which is to be sent from
7 paging terminal 2B-1 to adjacent terminal 2-2 is derived in the same
8 manner as in the embodiment of Fig. 1 using information stored in wide-
9 area memory 24. This calling signal is directly transmitted from interface
10 25 to interface 20 of adjacent paging terminal 2-2 through a transmission
11 line 26. This signal is treated by the processor 21 of terminal 2-2 in the
12 same manner as it treats the incoming calling signal from the network 1.
13 As a result, the copy of the paging signal from terminal 2-2 is converted to
14 a unique paging signal for transmission to transmitters 3-2.

15 Additionally, a copy of a paging signal transmitted from paging
16 terminal 2-2 to transmitters 3-2 is received through a transmission line 27
17 by an input interface unit 28 of paging terminal 2B-1 and applied to the
18 processor 21. On receiving it, processor 21 of terminal 2B-1 converts the
19 received paging signal to a signal which is unique to the home area of
20 paging terminal 2B-1 using information stored in the home-area memory
21 22, and applies it to interface 23 for transmission to transmitters 3-1.

22 In the embodiment of Fig. 4, the wide area service of the present
23 invention is advantageously incorporated as add-on units to existing
24 paging terminals. Two paging terminals 2C-1 and 2-2 are connected to
25 the PSTN 1. Each of the paging terminals 2C-1 and 2-2 includes an
26 incoming interface unit 40 for receiving from the network 1 an incoming
27 calling signal. A processor 41 receives the incoming calling signal via
28 interface 40 and determines if the addressed pager belongs to the home
29 service area by reading data from a home-area memory 42. If it is,
30 processor 41 reads a corresponding unique binary paging signal from the



1 home-area memory 42. The paging signal is then applied to an output
2 interface unit 43 where it is encoded into the BCH code format and
3 transmitted to the transmitters 3-1.

4 Paging terminal 2C-1 further includes an input interface unit 44
5 connected to receive a copy of the transmitted paging signal from the
6 output interface 43 of paging terminal 2C-1 for conversion from the coded
7 format to a binary paging signal. Interface 44 is further connected by a
8 transmission line 60 to the interface unit 43 of paging terminal 2-2 for
9 conversion to a binary paging signal. A paging signal converted by
10 interface unit 44 is coupled to a second processor 45 to which the wide-
11 area memory 46, identical to memory 24 of Fig. 1, is connected. On
12 receiving the binary paging signal from interface 44, processor 45
13 determines whether a destination pager is registered to wide-area paging
14 service. If it is, processor 45 reads the telephone numbers of the
15 registered pager from memory 46. A first outgoing interface unit 47 is
16 connected between processor 45 and the interface 40 of paging terminal
17 2C-1. Interface 47 applies the outgoing calling signals which were
18 converted from the paging signal from adjacent paging terminal 2-2 to
19 interface 40 of terminal 2C-1. A second outgoing interface unit 48 is
20 provided having its input connected to processor 45 and its output
21 connected via a transmission line 61 to the interface 40 of terminal 2-2 for
22 transmitting the outgoing calling signals derived from the paging signal
23 supplied from the interface 43 of terminal 2C-1 to the interface 40 of
24 adjacent paging terminal 2-2.

25 On receiving a calling signal from adjacent paging terminal at the
26 interface unit 40 of each paging terminal, each processor 41 treats it as if it
27 were an incoming signal from the network 1 by converting it to a unique
28 binary paging signal for coupling to the corresponding interface unit 43.

The claims defining the invention are as follows:

1. A wide-area paging system comprising:

a plurality of paging terminals connected to a switched telecommunications network, each of said paging terminals covering a home service area and comprising:
5 a plurality of transmitters for broadcasting signals in the home service area;
a home area memory for storing telephone numbers of pagers registered to home area service;

processor means connected to the network for receiving a page therefrom and further connected to the home area memory for determining whether a destination pager
10 identified by the page is registered to the home area service, reading a telephone number from the home area memory identified by the page if said destination pager is determined to be registered to the home area service, producing, from the read telephone number, a paging signal unique to the home service area, and supplying the paging signal to said transmitters;

15 at least one of said paging terminals further comprising:

a wide area memory for storing telephone numbers of pagers registered to wide area service,

the processor means of the least one paging terminal is further connected to the wide area memory for additionally determining whether a destination pager identified
20 by the page is further registered to the wide area service, reading a telephone number from the wide area memory identified by the page if said destination pager is additionally determined to be registered to the wide area service, producing, from the read telephone number, a paging signal unique to the wide area service, and supplying the paging signal to another paging terminal directly or by way of said network.

25 2. A wide-area paging system as claimed in claim 1, wherein said at least one paging terminal includes receives a copy of a paging signal from another paging terminal, and wherein said processor means of said at least one paging terminal

converts the received copy of the paging signal to a paging signal unique to the home service area of said at least one paging terminal and applying the converted paging
30 signal to the transmitters.

3. A wide-area paging system comprising a plurality of paging terminals connected to a switched communication network, each of said paging terminals covering a home service area and comprising first converter means for converting an
35 incoming calling signal received from the network to a paging signal unique to the home service area and means for transmitting the paging signal to a plurality of transmitters located in said home service area,

at least one of said paging terminals comprising:



a memory for storing telephone numbers of pagers registered to wide-area paging service;

means for receiving a copy of the paging signal transmitted to said transmitters from the transmitting means;

5 second converter means for determining whether a destination pager paged by said transmitted paging signal is registered to the wide-area paging service, reading a telephone number from the memory in accordance with the received copy of the transmitted paging signal if said destination pager is determined to be registered to the wide-area paging service, and deriving an outgoing calling signal from the read
10 telephone number; and

means for transmitting the outgoing calling signal to another paging terminal directly or by way of said network.

4. A wide-area paging system as claimed in claim 3, wherein said first converter means includes means for determining whether a pager addressed by the
15 received incoming calling signal belongs to the home service area of the paging terminal and converting the calling signal to said paging signal if said pager is determined as belonging to the home service area.

5. A wide-area paging system comprising first and second paging terminals connected to a switched communication network, each of said paging
20 terminals covering a home service area and comprising:

first interface means for receiving an incoming calling signal from the network;

first converter means for converting the incoming calling signal received by the first interface means to a paging signal unique to the home service area;

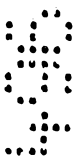
25 second interface means for transmitting the paging signal to a plurality of transmitters located in said home service area,

the first paging terminal including:

a memory for storing telephone numbers of pagers registered to wide-area paging service;

30 third interface means for receiving a copy of the paging signal from the second interface means of the first paging terminal;

second converter means for determining whether a destination pager paged by the paging signal transmitted from the first paging terminal is registered to the wide-area paging service, reading a telephone number from the memory in accordance with a
35 copy of the paging signal from the third interface means if said destination pager is determined to be registered to the wide-area paging service, and deriving an outgoing calling signal from the read telephone number if said destination pager is located in the home area of the first paging terminal; and



fourth interface means for transmitting the outgoing calling signal to said first interface means of the second paging terminal.

6. A wide-area paging system as claimed in claim 5, wherein said third interface means further receives a copy of the paging signal from the second interface means of the second paging terminal, and said second converter means further derives a second outgoing calling signal from the read telephone number if said destination pager is located in the home area of the second paging terminal, and wherein said fourth interface means includes means for transmitting the second outgoing calling signal to said first interface means of the first paging terminal.

7. A wide-area paging system as claimed in claim 5, wherein said first converter means includes means for determining whether a pager addressed by the received incoming calling signal belongs to the home service area of the paging terminal and converting the calling signal to said paging signal if said pager is determined as belonging to the home service area.

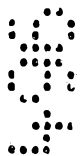
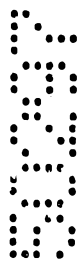
8. A wide-area paging system substantially as herein described and as shown in any one of Figs. 1, 2, 3 or 4.

DATED this First Day of April 1996

NEC Corporation

Patent Attorneys for the Applicant

SPRUSON & FERGUSON



Paging System for Establishing Connections
Using Stored Wide-Area Telephone Numbers

ABSTRACT

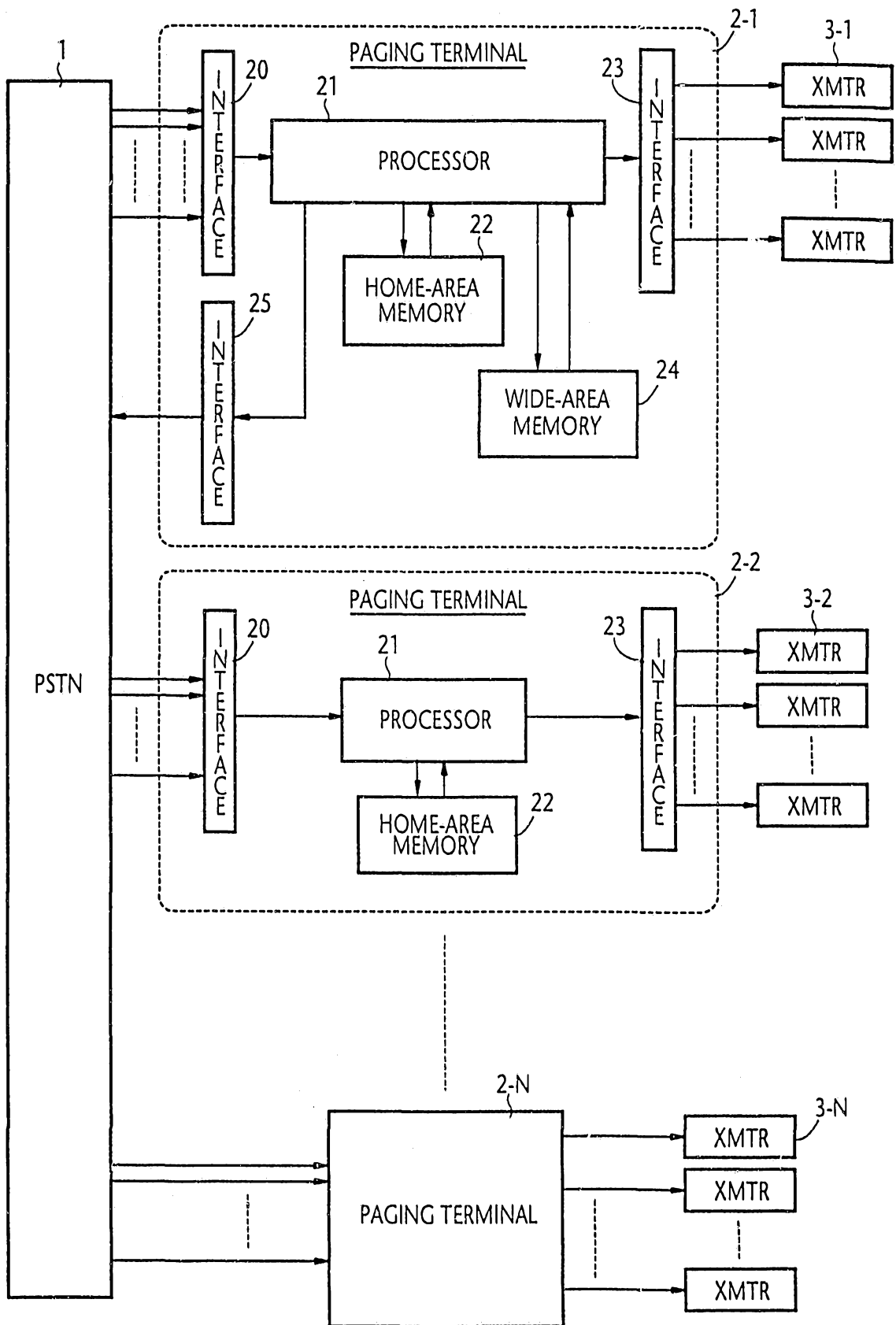
In a wide-area paging system, each of paging terminals (2-N) connected to
5 a switched communication network (1) covers a home service area and
provides a conversion an incoming calling signal received from the
network (1) to a paging signal unique to the home service area and
transmits the paging signal to radio transmitters (3-N) located in the
home service area. One of the paging terminals (2A-1) includes a memory
10 (24) for storing telephone numbers of pagers registered to wide-area
paging service, and determines whether a destination pager paged by the
transmitted paging signal is registered to the wide-area paging service,
and reads a telephone number from the memory (28) in accordance with the
incoming calling signal from the network (1) if the pager is entitled to
15 the wide-area paging service. An outgoing calling signal is derived from
the read telephone number and transmitted to another paging terminal
(2-N) directly or by way of the network.

Figure 1.



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FIG. 1



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FIG. 2

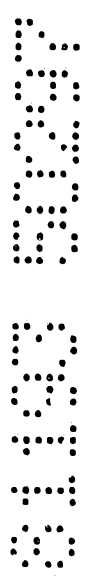
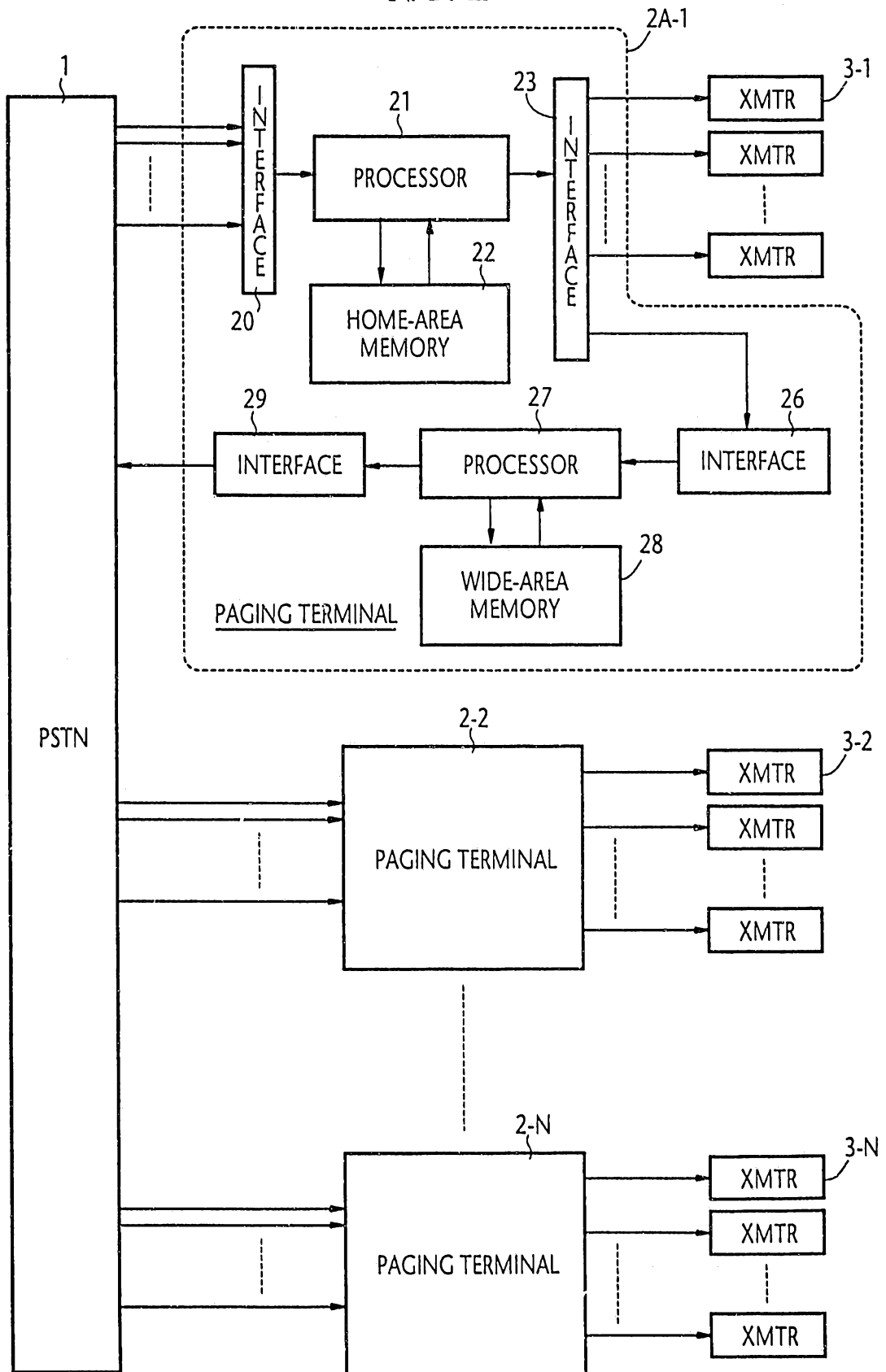


FIG. 3

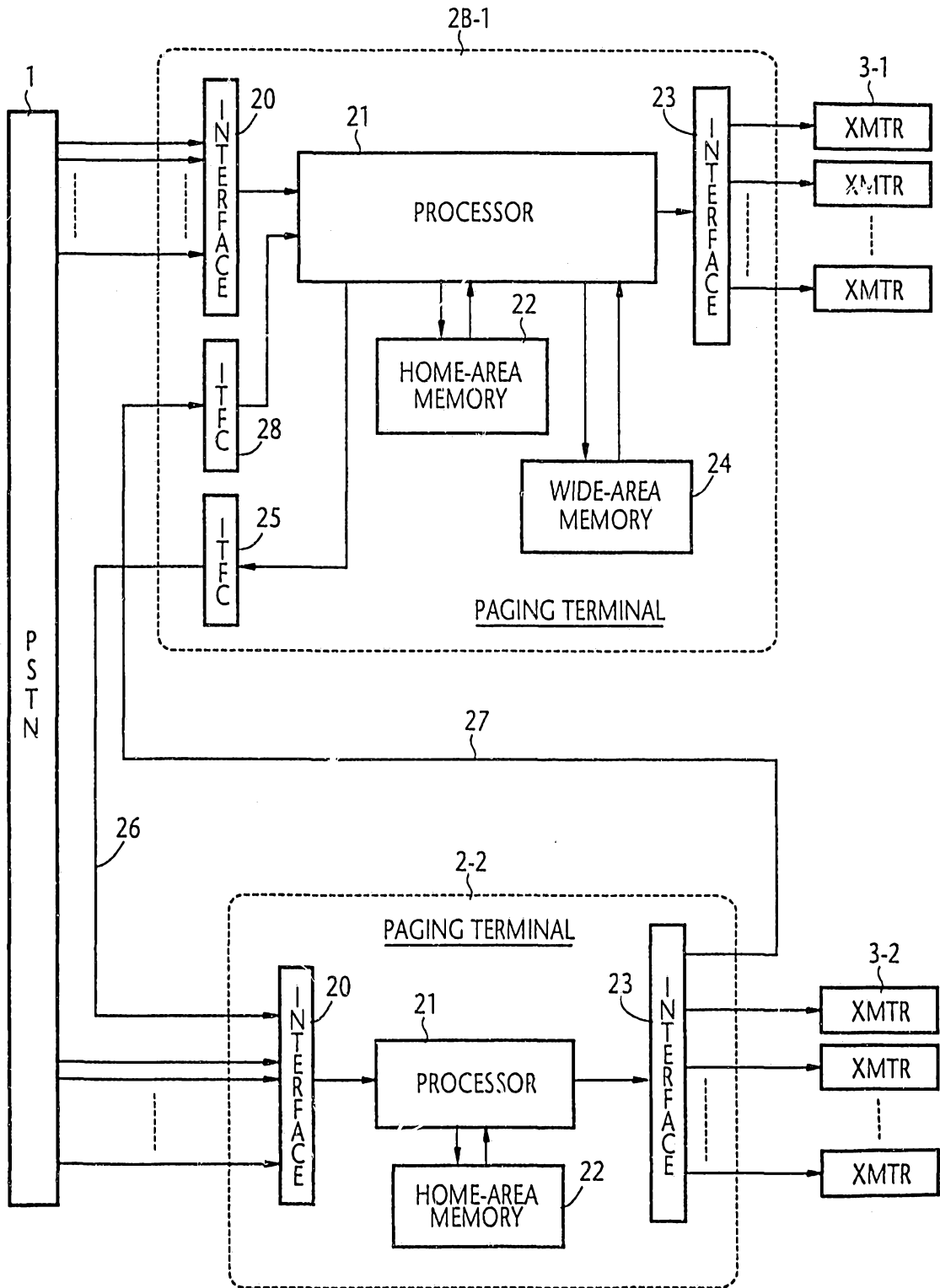


FIG. 4

