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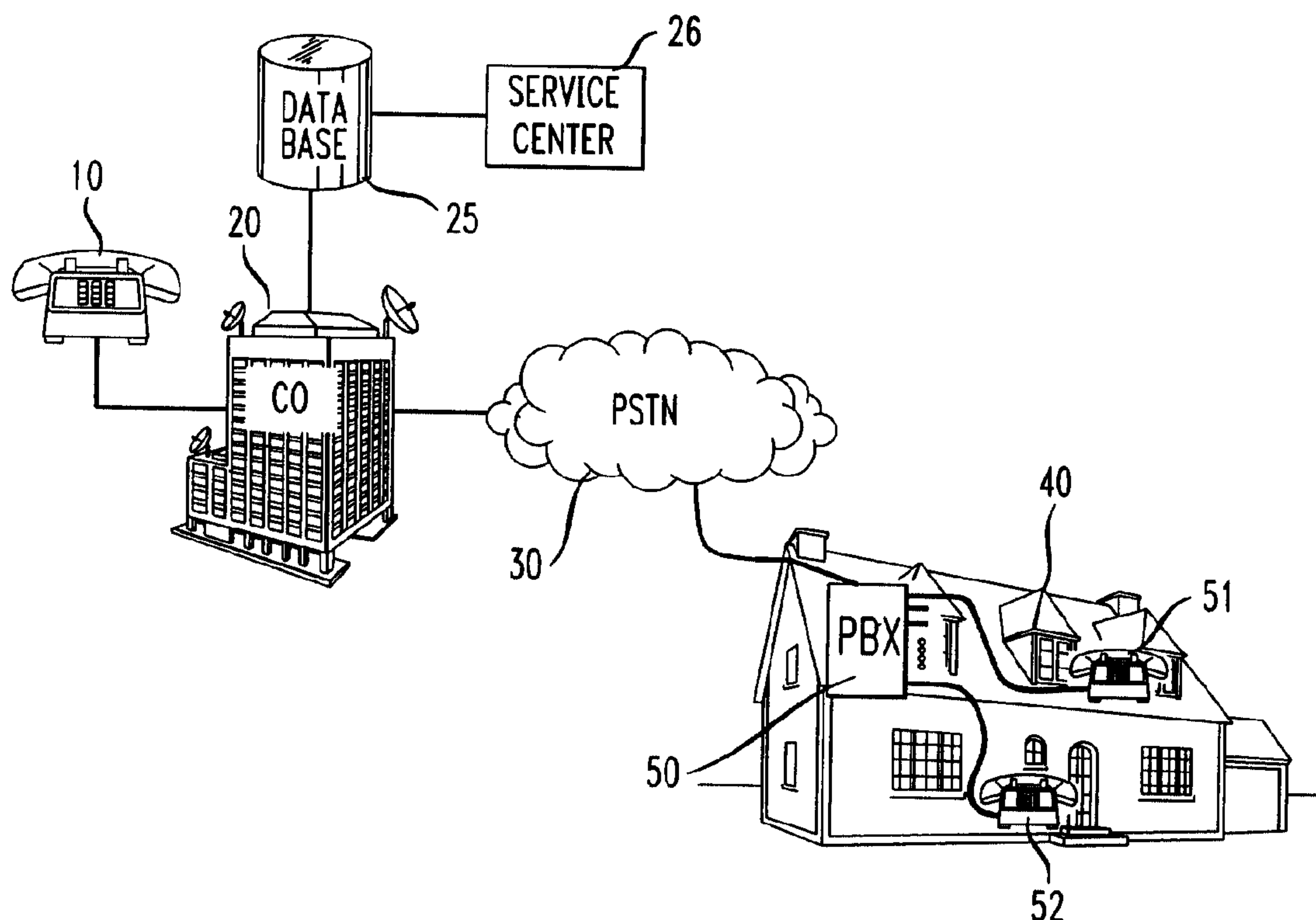
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(54) Title: METHOD FOR PROVIDING REMOTE EMULATION OF THE FUNCTIONALITY OF A PRIVATE EXCHANGE



(57) Abrégé/Abstract:

A method facilitates providing private exchange functionality to a subscriber that is remote from the private network. In the private network, telephones connected thereto can be accessed via extension dialing. The remote subscriber can dial the extension of a second telephone connected to said private network. A local exchange receives the extension and translates it into a phone number for the second telephone. The local exchange then uses the phone number to establish a connection between the subscriber and the second telephone. The same method can be used to implement remote speed dialing and automatic callback through the private network.



**Method For Providing Remote Emulation Of The
Functionality Of A Private Exchange**

ABSTRACT:

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5 **METHOD FOR PROVIDING REMOTE EMULATION OF
THE FUNCTIONALITY OF A PRIVATE EXCHANGE**

BACKGROUND OF THE INVENTION

10 The present invention is directed to a method for
providing a private exchange functionality to a remote
terminal. More specifically, the invention is
directed to a method which provides remote emulation
of the functionality of a private branch exchange
15 including such features as: extension dialing, speed
dialing, and auto dial back.

 The popularity of the home office and
"telecommuting" in the work force has created new
opportunities for the communication industry.
20 Individuals working from home now demand the same
telecommunication features and options available to
them at the workplace. To service that growing
market, communications companies are now providing the
same office support services found in many of today's
25 larger corporations. For example, ISDN access lines,
video and telephone conferencing, and high speed modem
access are now but a few of the features now available
in the home office.

 At present, if a worker at home wishes to contact
30 a co-worker at the workplace, he must have the actual
telephone number of the worker or must have the main
PBX access number and the extension of the worker to
be able to place a call to the worker at the
workplace. Furthermore, the at-home worker does not

get any of the other benefits of the PBX, namely speed dialing or automatic dial back which are functions which may be available to the worker at their workstation at the workplace. It is desirable to
5 provide a method by which the home worker can have access to PBX functionalities such as extension dialing even when they are remote from the workplace private exchange that provides such functionality.

10 SUMMARY OF THE INVENTION

The present invention provides a method by which a first telephone can access functionality available at a telephone switch remote from the first telephone. For instance, the invention provides that a home
15 worker using a first telephone can have functionality that is also available at a private branch exchange remote from the first telephone. The functionality can include the extension dialing of a second telephone that is coupled to the private branch
20 exchange. In accordance with the present invention, access to such functionality is achieved by providing a database in association with the local exchange to which the homeworker is coupled or connected. That database stores information to translate functionality
25 requests into actual telephone numbers to be dialed. The local office then initiates calls using the actual telephone numbers and establishes connections between the at-home or remote caller and the desired telephone that is coupled to the private branch exchange.

30 In accordance with the present invention, in addition to extension dialing, the remote caller may have access to such functions as speed dialing or automatic call back dialing.

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In accordance with one aspect of the present invention there is provided a method of providing to a first telephone access to functionality available at a telephone switch remote from said
5 first telephone, comprising the steps of: receiving at a local exchange a request for service from the first telephone; in response to said request retrieving a telephone number of a second telephone coupled to said telephone switch; originating a
10 call from said local exchange to the retrieved telephone number; and establishing a communication from said first telephone to said second telephone.

In accordance with another aspect of the present invention there is provided a system for
15 providing functionality available at a telephone switch to a first telephone that is remote from the telephone switch, the system comprising: a local exchange that receives a service request from the first telephone; and a database, coupled to said
20 local exchange and providing a telephone number of a second telephone that is coupled to said telephone switch to said local exchange in response to said service request; wherein said local exchange uses said second telephone number to
25 establish a communication between said first telephone and said second telephone.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a known telecommunications configuration.

FIG. 2 illustrates a telecommunications system in
5 accordance with an embodiment of the present invention.

FIG. 3 illustrates a call processing flow in accordance with an embodiment of the present invention.

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DETAILED DESCRIPTION

FIG. 1 illustrates a known communication arrangement for providing communication service to a telecommuting worker. The worker, at home, has access
15 to telephone station 10. That telephone station is coupled to a central office 20. The worker's workplace is designated as element 40 which is remote from the worker and remote from telephone station 10. The central office 10 and the workplace 40 are coupled
20 via the Public Switched Telephone Network (PSTN) 30. Please note that central office 20 would be considered part of the public switched telephone network PSTN but is shown separately for purposes of providing an indication of what the home worker telephone is most
25 directly coupled to and to aid in the description of the invention that follows with respect to FIG. 2. A private branch exchange (PBX) provides telecommunication service within the work environment. The PBX provides switching between various telephone
30 stations, for example 51 and 52, within the workplace. The PBX can provide such functionality as extension dialing, speed dialing, and auto dial back.

In extension dialing, a user at telephone station 51 need only dial an extension number for telephone

station 52 and the PBX will establish a connection between the two stations. Speed dialing, which is also known, operates by permitting the user of a telephone station, for example 51, to input a reduced
5 number of keypad entries to execute the dialing of a desired party. As one example, the telephone station may have a single key set aside for speed dialing which permits the user to program the key and then when the key is pressed then the desired number is
10 used to establish a connection to the desired party. In the auto dial back function, the PBX keeps track of the number of the calling party who last attempted to contact a given station. When that given called station so desires, it can request an automatic
15 callback to the party that previously called. The PBX uses the stored calling party information to establish a communications path to the previous calling party.

In the known telecommunications arrangement, the worker, when she is remote from the PBX, that is when
20 she is telecommuting or at home, does not have access to these features of PBX 50.

In accordance with an embodiment of the present invention, the worker using telephone station 10 obtains access to the functionality which they would
25 be able to have if they were instead located in the workplace environment connected to the PBX. With reference to FIG. 2, like elements in FIGS. 1 and 2 bear like reference numerals. One new element illustrated in FIG. 2 is database 25. Furthermore, a
30 connection between the central office 20 and the database 25 is added. This database allows the central office to provide functionality to the worker to emulate being at the location of the PBX. In particular, the database 25 can store real telephone

numbers for establishing connections to parties at the PBX 50 in accordance with a functionality that may be desired.

For example, if the home worker desires to have
5 extension dialing capabilities, that is she wishes
merely to dial the extension of a co-worker, for
example a worker at station 52, then the following
operations may be performed in connection with the
database 25. First, the home worker would need to
10 provide programming information to the database. Such
information would include the desire to implement
extension dialing, extension numbers and corresponding
real telephone numbers, the desire to implement speed
dialing, a speed dialing code or identifier and a
15 corresponding real telephone number, and an automatic
dial back functionality. This data can be provided to
the database during a registration call via the CO or
it may be entered into the database by a service
center 26 in response to the customer providing all of
20 the necessary data to the service center in a separate
call or data transmission (for example, a completed
application form or other data message such as by
facsimile or Internet access). If the information is
provided to the database during a direct call from the
25 home worker, it is also possible that the process can
be controlled by an integrated voice response (IVR)
system. In such a system the caller may be provided
with voice prompts and/or voice menu options. The
caller can then enter data either using the keypad or
30 with a voice response.

Regardless of how the data is entered into the
database, the data essentially constitutes a table of
information associated with the home worker
correlating actual telephone numbers for contacting

parties coupled to PBX 50, and dialing commands or reduced length telephone numbers (e.g., extensions) usable at the workplace to contact such parties.

Once the database associated with the central
5 office has been established, the operation or call process flow is rather straightforward. In particular, once the home worker at telephone station
10 desires to extension dial a co-worker at PBX 50, the home worker goes off-hook and receives a dial tone
10 from central office 20. The worker then can enter a short sequence of numbers and/or symbols to indicate that an extension number is to be dialed. Then the home worker enters the extension number and some terminating symbols such as the * or # key. The
15 central office detects the dialed extension and initiates a query to a database 25. The database could be operated by the local exchange carrier that operates the central office. Alternatively the database could be operated by another party (such as
20 an inter exchange carrier) that sells, for example, enhanced network services. The query does two things. First, it verifies the calling subscriber. This can be done using the automatic number identification (ANI) associated with the subscriber telephone
25 station. Then, once the subscriber has been verified the received extension number, for example 825, is used to conduct a look up or translation function using the subscriber database. The extension number is compared to the list of extension numbers for which
30 the subscriber has provided real telephone number information. When a match is found, the real telephone number which may correspond to a Direct Inward Dial number for station 52 is returned from the database to the local exchange carrier central office.

The central office then dials the real telephone number for telephone station 52 and establishes a communications path between telephone station 10 and station 52 which path passes through PBX 50. In this manner, the home worker has a virtual attachment to the PBX for purposes of obtaining certain functionality. While the functionality is in fact provided by the database and central office operating together, the functionality emulates the functionality that would be available to the worker if they were at the workplace rather than at home.

The above described processing operation is illustrated in a flow diagram in FIG. 3. In accordance with the process, a local office receives the extension plus some code designated that extension dialing is desired in step 300. The local office sends a query to the database including the extension in step 301. The database sends the real telephone number corresponding to the extension back to the local office in step 302 and the local office establishes a path from the caller to the extension in step 303.

The call processing could be modified depending on whether the caller actually seeks to implement a different functionality. For example, the caller may desire to implement the speed dialing functionality. In this circumstance, the caller may have programmed in the subscriber database a particular speed dial code which will access a particular telephone number for dialing. For instance, after the subscriber goes off-hook they may enter a code such as *XX that indicates a speed dial selection is to follow. The user can then enter a single digit identifying one of possible ten speed dial numbers. If the user

activates speed dial "1" for example, then the local office sends a query to the database looking for the actual telephone number associated with that speed dial code. Once the number is retrieved from the database then the local exchange can establish a path from the caller to the party corresponding to the speed dial number.

In the embodiments described above with reference to FIG. 2, the telephone 10 is shown coupled to central office 20. That coupling can be via a typical land-line connection. Alternatively, the subscriber's telephone may constitute a wireless communication unit. Such a unit could make use of a database coupled to the central office by the routing of calls from the wireless network to the CO which, as described above, is part of the PSTN. In a further variation the database 25 and service center may be provided in the wireless network to service a wireless subscriber.

The present invention provides a remote subscriber with functionality that emulates the functionality available at a private exchange. As a consequence, a worker at home can have access to functionality they would have if they were in fact in the workplace and using a telephone station connected to the private branch exchange at the workplace. The database coupled to the central office provides tremendous flexibility in terms of designating real telephone numbers that are of interest to the subscriber and can be accessed with special codes which are shorter in length than having to dial the entire telephone number. Thus, the combined operation of the central office and the database provide an

emulation of PBX functionality to the remote subscriber who is working at home.

WHAT IS CLAIMED IS:

1. A method of providing to a first telephone access
5 to functionality available at a telephone switch
remote from said first telephone, comprising the steps
of:
 receiving at a local exchange a request for
service from the first telephone;
10 in response to said request retrieving a
telephone number of a second telephone coupled to said
telephone switch;
 originating a call from said local exchange to
the retrieved telephone number; and
15 establishing a communication from said first
telephone to said second telephone.
2. The method of claim 1 wherein said request for
service includes an extension associated with said
20 second telephone.
3. The method of claim 1 wherein said request
comprises a code requesting speed dialing of the
telephone number of said second telephone.
- 25 4. The method of claim 1 wherein prior to receiving
said request said local exchange received a phone call
from said second telephone number and said request
comprises a code requesting an automatic dial back to
30 said second telephone number.
5. The method of claim 1 wherein said retrieved
telephone number comprises a direct inward dial
number.

6. The method of claim 2 wherein said step of
retrieving comprises the substep of accessing a memory
location associated with the first telephone number to
5 read a telephone number associated with said
extension.

7. The method of claim 6 wherein said retrieved
telephone number comprises a direct inward dial
10 number.

8. A method for enabling a first telecommunications
terminal to access a second telecommunications
terminal associated with first switching equipment
15 that provides access via extension dialing comprising
the steps of:

at a local exchange, receiving an extension
number of the second telecommunications terminal from
the first telecommunications terminal;

20 translating said extension number into a
telephone number for accessing said second
telecommunications terminal; and

establishing a communications path between said
first telecommunications terminal and said second
25 telecommunications terminal via said local exchange
using said telephone number for accessing obtained in
said translating step.

9. The method of claim 8 wherein said step of
30 translating comprises the substep of reading a
telephone number corresponding to the extension number
from a memory location associated with said first
telecommunications terminal in a database coupled to
the local exchange.

10. The method of claim 8 wherein said retrieved telephone number comprises a direct inward dial number.

5

11. The method of claim 8 wherein said step of establishing comprises the substeps of originating a call to said second telecommunications terminal from said local exchange with said telephone number for
10 accessing;

and connecting said first telecommunications terminal to a communications path that services said call said second telecommunications terminal.

15

12. The method of claim 9 wherein said step of establishing comprises the substeps of originating a call to said second telecommunications terminal from said local exchange with said telephone number for
accessing;

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and connecting said first telecommunications terminal to a communications path that services said call said second telecommunications terminal.

13. A method for emulating establishment of coupling
25 of two stations on a private exchange such that a remote station can be coupled to a station associated with the private exchange, the method comprising the steps of:

at a local exchange, receiving from the remote
30 station an extension number corresponding to a station at the private exchange;

translating said extension number into a telephone number for accessing said station at the private exchange; and

using said telephone number to establish a communication path between said remote station and said station at the private exchange via said local exchange and said private exchange.

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14. The method of claim 13 wherein said step of translating comprises the substep of reading a telephone number corresponding to the extension number from a memory location associated with said first
10 telecommunications terminal in a database coupled to the local exchange.

15. The method of claim 13 wherein said retrieved telephone number comprises a direct inward dial
15 number.

16. The method of claim 13 wherein said step of establishing comprises the substeps of originating a call to said second telecommunications terminal from
20 said local exchange with said telephone number for accessing;

and connecting said first telecommunications terminal to a communications path that services said call said second telecommunications terminal.

25

17. The method of claim 14 wherein said step of establishing comprises the substeps of originating a call to said second telecommunications terminal from said local exchange with said telephone number for
30 accessing;

and connecting said first telecommunications terminal to a communications path that services said call said second telecommunications terminal.

18. A system for providing functionality available at a telephone switch to a first telephone that is remote from the telephone switch, the system comprising:

5 a local exchange that receives a service request from the first telephone; and

a database, coupled to said local exchange and providing a telephone number of a second telephone that is coupled to said telephone switch to said local exchange in response to said service request;

10 wherein said local exchange uses said second telephone number to establish a communication between said first telephone and said second telephone.

19. A system for enabling a first telecommunications terminal to access a second telecommunications terminal associated with first switching equipment that provides access via extension dialing, the system comprising:

15 a local exchange receiving an extension number of the second telecommunications terminal from the first telecommunications terminal; and

20 a number translator coupled to said local exchange, that translates said extension number into a telephone number for accessing said second telecommunications terminal;

25 wherein, using said telephone number said local exchange establishes a communications path between said first telecommunications terminal and said second telecommunications terminal.

FIG. 1

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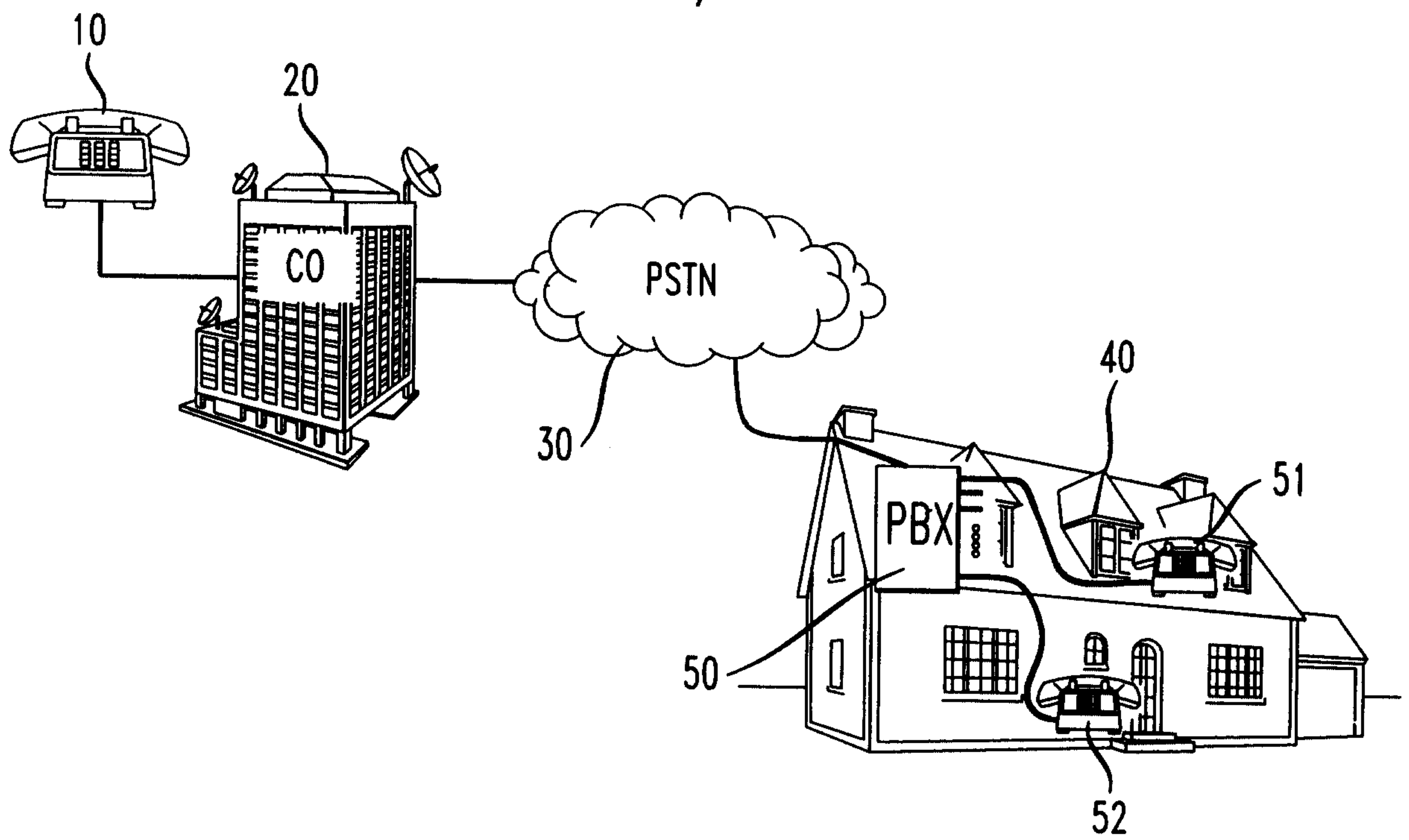
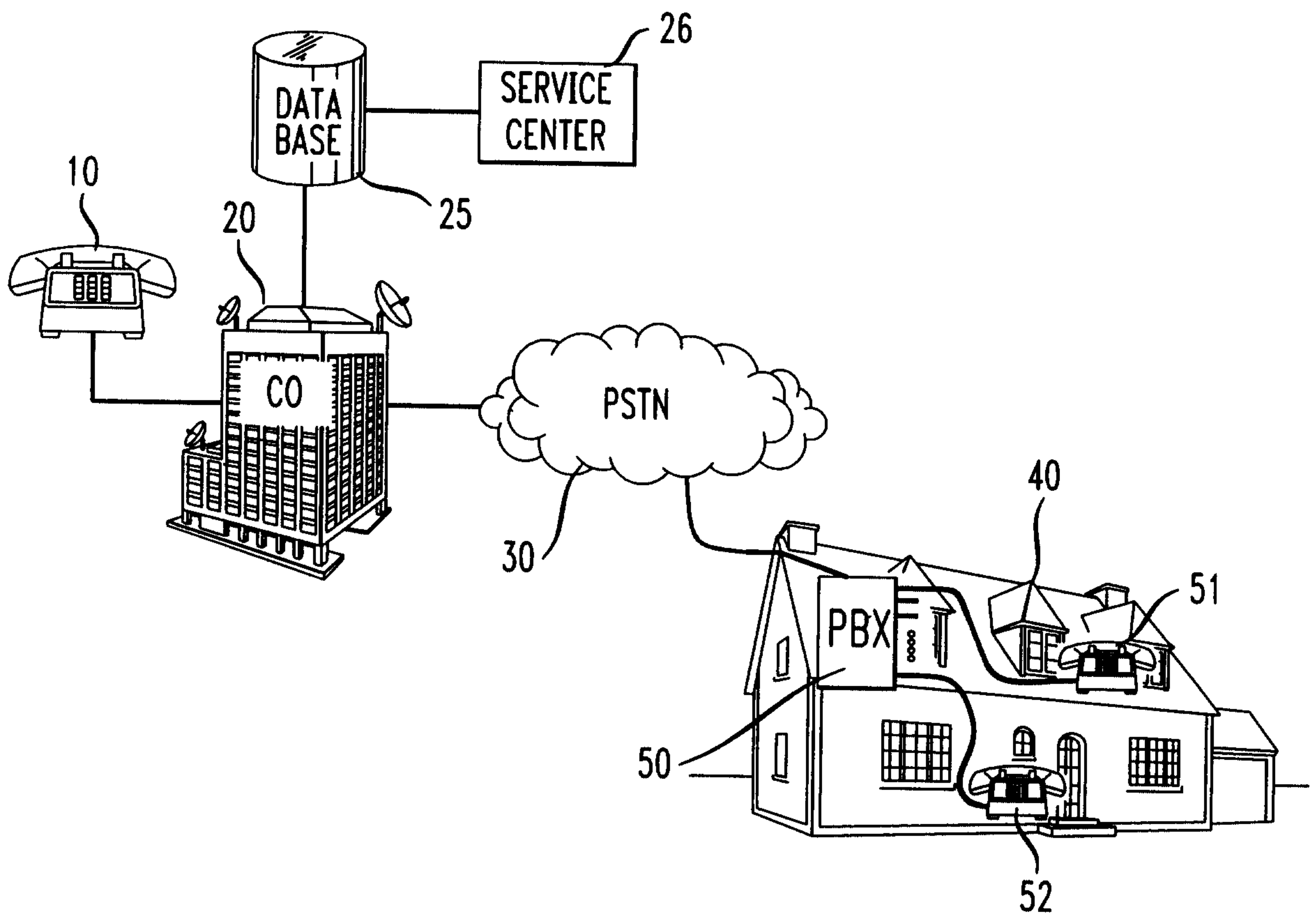


FIG. 2



2/2

FIG. 3