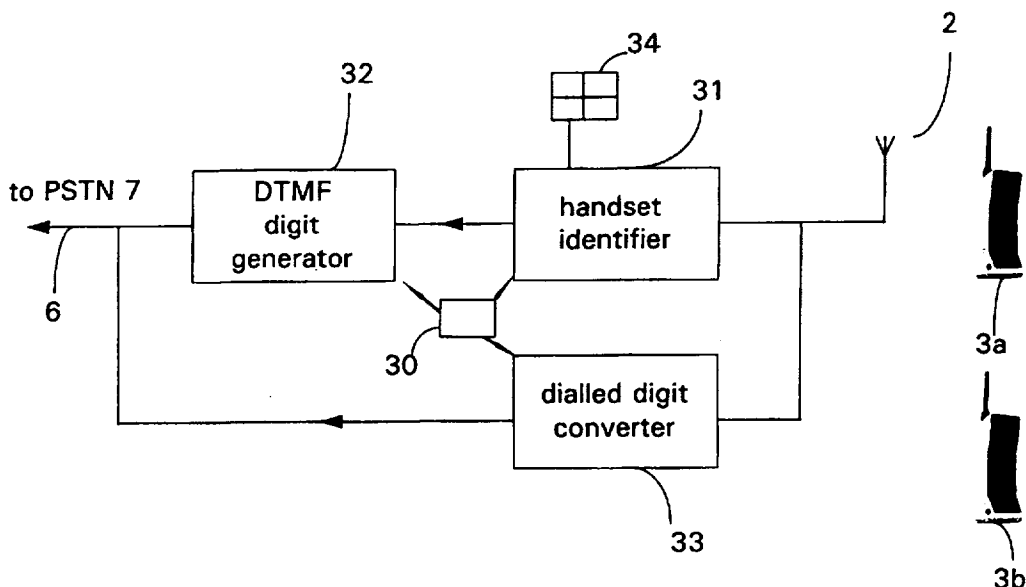




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(21) International Application Number: PCT/GB97/01849 (22) International Filing Date: 7 July 1997 (07.07.97) (30) Priority Data: 96305127.1 11 July 1996 (11.07.96) EP (34) Countries for which the regional or international application was filed: GB et al. (71) Applicant (for all designated States except US): BRITISH TELECOMMUNICATIONS PUBLIC LIMITED COMPANY [GB/GB]; 81 Newgate Street, London EC1A 7AJ (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): WARBURTON, Robert, John [GB/GB]; 20 The Green, Earsham, Bungay, Suffolk NR35 2SX (GB). BUTTERY, Stephen, John [GB/GB]; 47 Remercie Road, Mistley, Manningtree, Essex CO11 1NF (GB). MERRETT, Robert, Peter [GB/GB]; 18 Bury Hill, Woodbridge, Suffolk IP12 1LF (GB). (74) Agent: LIDBETTER, Timothy, Guy, Edwin; BT Group Legal Services, Intellectual Property Dept., 8th floor, 120 Holborn, London EC1N 2TE (GB).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, 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). Published <i>With international search report.</i>

(54) Title: TELEPHONE APPARATUS**(57) Abstract**

A telephone apparatus, for connection to an exchange line (6) and a plurality of handsets (3a, 3b) is arranged such that the handsets may each initiate an outward call over the exchange line (6) by transmission of dialled digits, and the apparatus includes means (31) for identifying the handset initiating a call, and means (32) for generating additional dialling digits indicative of the handset (3a, 3b) which initiated the call. This allows the maker of the call to be identified, allowing services such as individual billing, call blocking, etc., to operate without any special input by the users.

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TELEPHONE APPARATUS

This invention relates to telephone apparatus, in particular for use in a situation in which several people share the use of a single telephone exchange line, for example in a household. When several people use the same telephone
5 exchange line it can be necessary to identify which user made each call, for example so that call charges can be attributed to each user fairly.

Some telecommunications service operators have proposed a system in which a special code (an "Account Code") has to be entered as additional dialled digits, either before or after dialling the required number, to allow connection to be
10 authorised. Different users are allocated different codes. This arrangement finds use in particular where several different users have access to the same exchange line, and wish to apportion the costs of the resulting bill. It may also be used to allow certain classes of call (e.g. added value services or international calls) to be barred from certain users, since the exchange can be programmed to only permit
15 those categories of call if the correct account code is transmitted. This system is clearly open to abuse by users dialling each other's codes, and also requires that each user remembers and keeps secret his/her own code.

According to a first aspect of the invention there is provided a telephone apparatus comprising means for connection to a telecommunications network
20 exchange line and means for selectively establishing communication with one of a plurality of associated handsets to enable telecommunication between individual handsets and the telecommunications network, wherein the handsets may each initiate an outward call over the exchange line by transmission of dialled digits and wherein the apparatus includes means for identifying which of its associated
25 handsets is initiating a call, the apparatus further including means for generating additional digits for transmission to the telecommunications network, indicative of the handset which initiated the call.

According to a second aspect of the invention, there is provided a telephone subscriber apparatus having means for establishing communication with
30 each of a plurality of handsets, means for receiving and verifying identification codes associated with each handset, and means for transmitting dialled digits and other telecommunications signals between any of the handsets and a telecommunications network, further comprising means for deriving, from the verification code associated with each handset, an identification sequence of

digits, and means for transmitting the identification sequence associated with the handset to the telecommunications network when the handset initiates a call.

According to a third aspect, there is provided a method of operating a telephone system comprising a plurality of handsets connected to an exchange
5 connection through connections to a single base station; wherein when a handset establishes an outgoing call attempt, the base station identifies the handset and generates and transmits a sequence of digits to the exchange connection, and the telephone system controls the call attempt in response to the received sequence of digits.

10 The sequence of digits is of the same format as the digits which a user would actually have generated by operating his/her keypad, typically a sequence of DTMF toner. Since the additional digits are generated automatically by the base station itself in response to the identification of the handset, the abuses described above can be prevented because the handset from which the call is made is
15 identified. The invention may be embodied in a system in which the base station is connected to the handsets by fixed (wired) links, the physical link on which a signal is received identifying the handset. However, in a preferred arrangement, the base station is part of a cordless telephone system, arranged for wireless communication with the handsets, and the base station has means for identifying a
20 verification code transmitted by a handset and generating a corresponding sequence of digits for transmission to the network.

Some existing cordless telephone systems use verification codes to ensure that a handset is co-operating with the correct base station. However, these codes are quite lengthy, as they need to be unique. The invention allows the base
25 station to transmit, to the network billing system or other systems, a much shorter code of just one or two digits, since it is only necessary for it to identify to the network which of the small number of handsets associated with the exchange line is in use. This reduces the signalling required to be transmitted. Moreover, the ability to translate the cordless handset identification code to another code allows
30 the "Account Code" to be generated according to any format required by the telecommunications network system, without modification of either the handset or the network.

Two embodiments of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 shows a cordless base station for generating a handset identity.

Figure 2 shows a unit for generating a handset identity for wired handsets.

5 Figure 3 is a flow chart illustrating the operation of the embodiment of figure 1.

Features of both embodiments may be combined to provide a base station for use with both types of handset.

10 In Figure 1 an antenna 2 in communication with cordless units 3a, 3b provides inputs to a handset identification unit 31 with an associated register 34 and a dialled digit converter 33. The handset identification unit 31 provides an output to an DTMF digit generator 32. Both the DTMF digit generator 32 and the dialled digit converter 33 transmit DTMF digits to an exchange line 6. The apparatus is under the overall control of a controller 30.

15 In existing cordless telephone systems such as these operating on the DECT system, individual handsets, e.g. 3a, 3b, are identified to their respective base stations, and vice versa, by the transmission of paging signals and responses, in order to ensure that the handset is co-operating with its correct base station, rather than another one located nearby. In systems with several handsets, each
20 handset has its own identification code, so that the individual handsets can be distinguished by the base station. This allows the user of one handset to contact the user of another handset through the base station. In the present invention, the identification of a handset by the base station may be used in conjunction with the account code signal according to the identity of the handset. In figure 3 the
25 various steps performed by the units 31, 32, 33 of the base station are indicated. Steps 61 to 64 are performed by the handset identifier 31, steps 65 and 66 by the digit generator 32, and steps 67, 68 and 69 by the dialled digit converter.

30 When a handset is put into an "off hook" condition, (which for a cordless handset is actually performed by operating a switch on the handset), this condition is detected by the handset and transmitted over the radio interface to antenna 2

and thus to the handset identifiers identified as 31. When such a signal is received it is detected by the handset identifier 31 (step 61).

The handset identifier first checks that the handset identifier is one of those stored in the register 34 (step 62). If it is not, this signifies that the handset
5 belongs to another base station, as may occur for example, if a number of domestic users of cordless telephones have base stations within radio range of each other's handsets. If this is the case, then the handset identifier 31 disregards the "off hook" indicator from the handset (step 63) and takes no further action. If the handset is recognised then the handset identifier 31 selects the account code
10 corresponding to the handset identifier indicated to it. These account codes are stored in the register 34, with one account code corresponding to each handset identity stored in the register.

The selected account code is then transmitted to a DTMF digit generator 32, which generates DTMF tones corresponding to the account code number it
15 receives (step 65). These DTMF tones are then transmitted over the exchange connection 6 to the PSTN 7 (step 66). The dialled digit converter 33, controlled by the controller 30, then detects the digits dialled at the handset, 3a which are transmitted by conventional cordless telephony techniques over the air interface to the antenna 2. If the handset identifier has not recognised the base station's
20 identity as one of those stored in the register 34, then the controller 30 prevents operation of the dialled digit converter 33. Provided that the dialled digit converter 33 is not so prevented, the digits are detected (step 67) and converted to DTMF tones (step 68) for transmission as DTMF tones over the exchange connection 6 to the PSTN 7 (step 69). The operation of the dialled digit converter 33 is suspended
25 until the digits transmitted by the DTMF digit generator 32 have been transmitted. This may require the digits transmitted over the air interface from handset 3a to be stored in a buffer in the converter 33 until required.

In an alternative arrangement, not shown, the account code is transmitted after the dialled digits. In this case the steps 67, 68, 69 take place between steps
30 62 and 64 as shown in figure 3. Nevertheless the dialled digits are not transmitted by the dialled digit converter 33 until the handset identity has been verified in step 62.

It will be appreciated that much of the above operation already occurs in a conventional cordless base station. Only the steps 64, 65 and 66, generating the

account code according to the handset identity, as verified by reference to the register 34, have been added. As both the handsets and the network are unmodified, the interaction between them and the base station can take place without modification of either interface. This ensures that all calls made by one
5 handset's user are attributed to his or her own allocated account code, provided that the handset itself is not available for use by others (e.g. because it requires a code number to use it, or is kept in a secure place not available to the other users).

The handset identity code for a cordless system is necessarily complex, since its principal purpose is to avoid inadvertent connection to any base station
10 other than its own. In contrast, the account code need only be sufficient to distinguish between users of the same exchange line, and is unlikely to require more than one or two keystrokes. The base station is therefore arranged to convert the long handset identity transmitted over the cordless telephone air interface into a shorter Account Code, in the form of a short sequence of DTMF
15 tones.

In Figure 2 each telephone handset 53a, 53b is connected by a wired connection 50a, 50b to a base unit 54. The connections 50a, 50b may be lockable to prevent unauthorised interchanging of these connections. Each connection has an associated DTMF digit generator 52a, 52b which generates a
20 predetermined "account code" sequence of digits when a call is initiated from the respective handset, for example by recognition of an "off-hook" condition. In this arrangement each handset 53a, 53b has its own associated account code generator 52a, 52b which is permanently connected to a socket 50a, 50b, dedicated to that handset. Each generator 52a, 52b is thus merely required to
25 store a single stored sequence of DTMF digits. This sequence is transmitted to the PSTN 7 over an exchange link 6 in response to a predetermined condition. For example, if the network requires the account code before the dialled number, the sequence is transmitted on recognition of dial tone on the exchange line 6. If the network requires the dialled number before the account code, the code is
30 transmitted on receipt of a signal from the exchange line 6 or from the respective handset 53a, 53b that the dialled number is complete. The exchange line 6 may be arranged to transmit a cue requesting an account code when the sequence of dialled digits is recognised as a valid number. Alternatively, the handset user may be required to operate a special "send" key to identify the end of the sequence of

digits he has dialled himself, which automatically causes the account code to be transmitted.

A base station may be configured for connection to one or more cordless handsets and also to one or more fixed handsets, by combining the features of the
5 two embodiments described herein.

CLAIMS

1. A telephone apparatus comprising means for connection to a
5 telecommunications network exchange line and means for selectively establishing
communication with one of a plurality of associated handsets to enable
telecommunication between individual handsets and the telecommunications
network, wherein the handsets may each initiate an outward call over the
exchange line by transmission of dialled digits and wherein the apparatus includes
10 means for identifying which of its associated handsets is initiating a call, the
apparatus further including means for generating additional digits for transmission
to the telecommunications network, indicative of the handset which initiated the
call.
- 15 2. A telephone subscriber apparatus having means for establishing
communication with each of a plurality of handsets, means for receiving and
verifying identification codes associated with each handset, and means for
transmitting dialled digits and other telecommunications signals between any of
the handsets and a telecommunications network, further comprising means for
20 deriving, from the verification code associated with each handset, an identification
sequence of digits, and means for transmitting the identification sequence
associated with the handset to the telecommunications network when the handset
initiates a call.
- 25 3. Apparatus according to claim 1 or claim 2 wherein the apparatus is the
base station of a cordless telephone system arranged for wireless communication
with the handsets, and wherein the base station has means for identifying a
verification code transmitted by a handset and generating a corresponding
sequence of dialled digits for transmission to the network.
- 30 4. Apparatus according to claim 3, wherein the sequence of dialled digits is
shorter than the verification code.

5. Apparatus according to claim 2 comprising a plurality of connection means, each for connecting a telephone handset thereto, and comprising means for identifying when a call is being initiated from a handset connected to one of said connection means, and means for generating, and transmitting to the
5 telecommunications system, an identification sequence corresponding to the said connection means.

6. Apparatus according to claim 5 comprising means for recognition of an off-hook condition of a handset connected to one of the connection means, and
10 means for transmitting the corresponding identification code to the network in response to such condition.

7. Apparatus according to claim 5, comprising means for recognition of the completion of a sequence of dialled digits and transmitting the corresponding
15 identification code to the network in response to such completion.

8. A method of operating a telephone system comprising a plurality of handsets selectively connectable to an exchange connection through connections to a single base station; wherein when a handset establishes an outgoing call
20 attempt, the base station identifies the handset, the base station then transmits a sequence of digits to the exchange connection, and the telephone system controls the call attempt in response to the transmitted sequence of digits.

9. A method according to claim 8 wherein the base station is the base
25 station of a cordless telephone system, arranged for wireless communication with the handsets, and wherein the base station identifies a verification code transmitted by a handset and generates a corresponding sequence of dialled digits for transmission to the network.

30 10. A method according to claim 9 wherein the sequence of dialled digits is shorter than the verification code.

11. A method according to claim 8, wherein the base station has a plurality of connection means, each for connecting a telephone handset thereto and comprising the steps of identifying when a call is being initiated from a handset connected to one of said connection means, and the steps of generating, and
5 transmitting to the telecommunications system, an identification sequence corresponding to the said connection means.

12. A method according to claim 11, comprising the steps of recognition of an off-hook condition of a handset connected to one of the connection means, and
10 transmitting the corresponding identification code to the network in response to such a condition.

13. A method according to claim 11, comprising the steps of recognition of the completion of a sequence of dialled digits and transmitting the corresponding
15 identification code in response to such completion.

14. Telephone apparatus substantially as described with reference to the drawings.

20 15. A method of operating a telephone system substantially described with reference to the drawings.

FIGURE 1

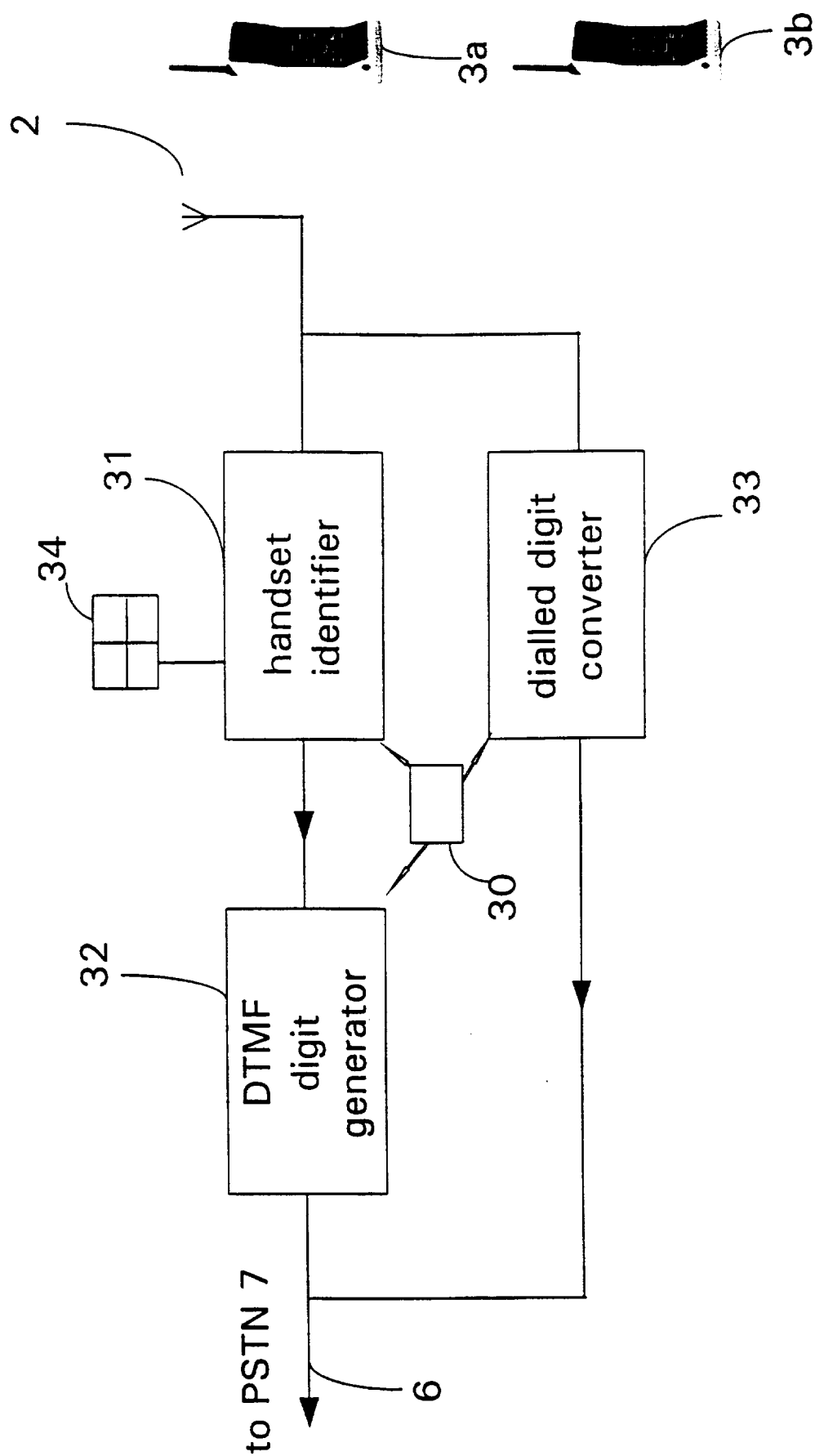


FIGURE 2

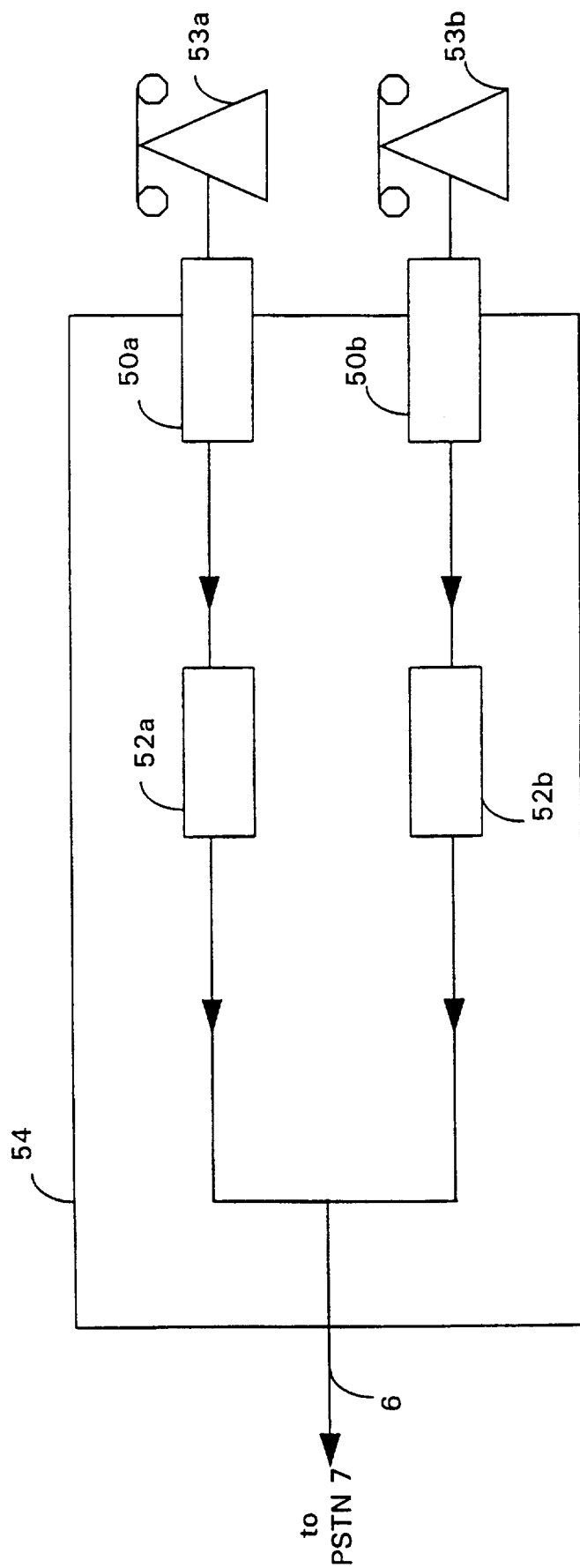
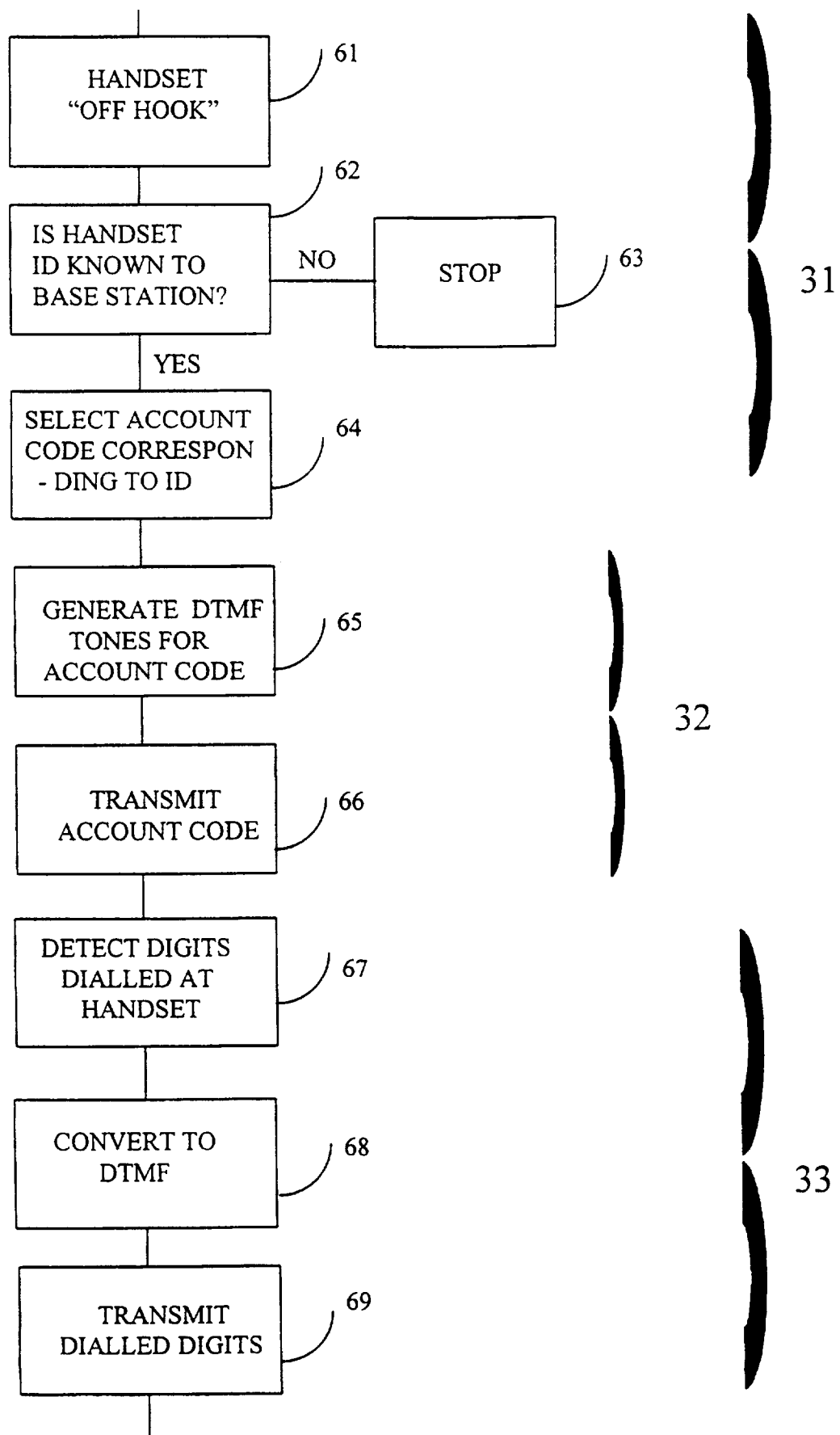


FIGURE 3



INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 97/01849

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04M1/72 H04M1/66 H04M15/00 H04M15/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04M H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X A	EP 0 115 240 A (GRANDMOUGIN) 8 August 1984 see page 5, line 8 - page 11, line 36; figures 1-3 see page 14, line 29 - page 24, line 27 ---	1,3,14, 15 2,8,9
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☒ Further documents are listed in the continuation of box C.

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NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
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