

2100096

"TELEPHONE APPARATUS"

This invention relates to telephone apparatus of the touch tone dial type

With the prior art telephone apparatus, an abbreviated dialling function or re-dial function could have
5 been obtained by using a "X" key or "#" key among the keys provided on the usual keyboard as an abbreviated dialling key or a re-dial key or newly providing an abbreviated dialling key or a re-dial key on the key-
10 board. For example, it has been in practice to arrange such that by operating keys for a two-digit numeral data after operating a "X" key to couple a data "XOO", an opposite side telephone number corresponding to the data "OO", which has been stored in a memory in advance, is
15 read out and sent out to a repeater section. Also, by operating a "#" key the opposite side telephone number having been keyed in advance is read out from the memory and sent out the repeater station. However, in order to provide for various additional functions including the abbreviated dialling function and re-dial
20 function as mentioned above, it is necessary to add new keys to the existing keys on the keyboard. In addition, in case of using the existing "X" and "#" keys as special keys, although these keys can provide an instruction for reading out data stored in memory, the
25

(B)

instruction itself is not set out as manual dial signal to the repeater station. Therefore, although it would have been possible to add various functions to the telephone apparatus if signals produced by operating the
5 "*" and "#" keys were sent out as manual dial data, this could not have been realized with the prior art apparatus. Furthermore, the prior art telephone apparatus produces a dual tone multifrequency signal when the asterisk "*" key or the number "#" is
10 operated. Further, there is another function which has hitherto been desired, namely a function of effecting a plurality of successive abbreviated dialling operations. For example, there may be a case when it is desired to make a phone call from a point A in New York
15 City, New York to a point B in California. In such a case, if there is a company E which possesses an exclusive telephone line between a point C in New York City and a point D in California, it is convenient for the telephone subscriber at point A to conclude a
20 contract with the company E for use of the exclusive line. If this is realized, the subscriber at point A can obtain directly communication with the opposite side at point B without need of waiting despite the state of congestion of communication. In this case, it is
25 necessary for the subscriber at point A to dial first the telephone number of the company E at point C, then the telephone number of the company at point E and then

(4)

3

the telephone number of the opposite side at point B.

The present invention has been intended in the light of the above, and it has for its object to provide a telephone apparatus, with which a number of additional functions are realized by making use of existing keys on the keyboard.

According to the invention, there is provided a telephone system which comprises telephone apparatus including keyboard means having at least 10 digit keys and two special keys, the system further including controller means for operating said apparatus in a normal dial mode by actuation of said two special keys to permit corresponding dial signals to be transmitted and for operating said apparatus in a repertory dial mode by actuation of at least one of said two special keys or at least one of said two special keys and at least one of said 10 digit keys; and mode switching means for effecting the switch of said two modes in said controller means by actuation of said two special keys in a predetermined sequence.

With this construction of the telephone apparatus, it is possible to realize various functions by making use of the existing keys on the keyboard and providing the special keys such as the "*" and "#" with a function of sending out signal in a manual dial mode. More particularly, various functions such as re-dial function, contracted dial function and a function of sending out a plurality of telephone numbers in succession by a plurality of successive abbreviated dialling operations by switching the mode switching means to set a given mode and then operating special keys such as the "*" and "#" keys and also the other keys, i.e. ten keys, a predetermined number of times and in a predetermined order according to a given sequence.

15 An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

Fig. 1 is a block circuit diagram showing one embodiment of the telephone apparatus according to the

16

- 5 -

invention;

Fig. 2 is a concrete circuit arrangement showing one preferred embodiment of a controller in Fig. 1; and

Fig. 3 is a flow chart for explaining the operation of the telephone apparatus shown in Fig. 1.

As shown in Fig. 1, the telephone apparatus

includes a keyboard 101, which has 10 numeral keys or so-called ten keys for numerals "0" to "9" and a "*" key and a "#" key as special keys. A controller 102 is connected to the keyboard 101, and it can send out code data coupled by operating the aforementioned keys in a predetermined sequence as manual dial mode data. The controller 102 is a one-chip unit including a well-known schedule electronic calculator CPU 100 as shown in Fig. 2 as a main element; for instance Memonote T6027 (a trade name) may be used for the controller 102.

The code data sent out from the controller 102 is coupled to a dial sender 104 and converted therein into a tone signal as a multi-frequency signal (FM signal) which is fed to a telephone network 105. The telephone network 105 is connected through mode switching means, for example a hook switch 103 to the controller 102 and is also connected to a handset 106. It is further connected to a terminal 107. It receives the multi-frequency signal as

(17)

tone signal from the dial sender 104 mentioned above and a voice signal from the handset 106 and sends out signal through the terminal 107 to a repeater station.

5 The dial sender 104 and telephone network 105 may be well-known networks, for instance as disclosed in "Telecommunication Data Book" (Mostek Corporation, issued March 1981,) page IV-2, Figure 2 and page IV-6, Figure 10.

10 In the circuitry as described above, the controller 102 executes a program as shown in the flow chart of Fig. 3. When the telephone apparatus is rendered operative with power furnished thereto, the controller 102 first executes a step S01, in which it supplies an output for resetting the dial sender 104. The controller
15 102 receives an output signal which is determined by either an "on" or an "off" state of the hook switch, or whether the telephone apparatus is in the off hook state or in the on hook state, in the initial power "on" state, and it is set in a setting ready mode A when the
20 hook switch 102 is in the "on" state while it is set in a dial input ready mode E when the hook switch 102 is in the "off" state. The program then proceeds to a step S02, in which the controller 102 receives a signal produced by key operation in the keyboard 101 or a signal
25 produced by a switching of the hook switch 103, and then in a step S03 the controller 102 checks whether there has been an input. If there has been no input and the

check yields a decision a "NO" the program returns to the step S02. If there has been an input so that the check in the step S03 yields a "YES", the program proceeds to a step S04, in which a dial input processing is effected. When the step S04 is ended, the program returns to the step S02 of monitoring an input of signal due to key operation in the keyboard 101 or switching of the hook switch 103.

Specific examples of execution of the flow chart will now be described with reference to a Decision Table shown below. In the Decision Table, the hook switch is in the on state, or the telephone apparatus is in the off hook state in the mode A to D, and the hook switch is in the off state, or the telephone apparatus is in the on hook state in the mode off hook state. The Decision Table designates a relation between the setting mode corresponding to a variation of input state and the processing or the variation of the mode.

Decision Table

Input		Hook operation		Dial operation		
Mode		Off-hook	On-hook	0	9	#
Setting ready	A	Mode E (1)	(2)	Ineffective (3)	Ineffective (4)	Mode B0 (5)
Contraction ready	B0	Interrupt setting mode E (6)	(7)	Ineffective (8)	Mode B1 (9)	Mode A (10)
Contraction address ready	B1	(11)	(12)	Address setting, mode B2 (13)	Ineffective (14)	(15)
Contraction address ready	B2	(16)	(17)	Address setting, mode C (18)	(19)	(20)
Setting input ready	C	(21)	(22)	Mode D if digits are over, input setting (23)	(24)	Complete setting, mode A (25)
Over-digit	D	(26)	(27)	Ineffective (28)	(29)	(30)
Input ready	E	(31)	Mode A (32)	Dial send-out, mode F0 (33)	Mode F1 (34)	Re-dial send-out mode F0 (35)
Contraction X ready	F0	(36)	Dial stop mode A (37)	Dial send-out (38)	Mode F1 (39)	Ineffective (40)
Contraction address ready	F1	(41)	(42)	Address setting (43)	Ineffective (44)	Mode G (45)
Contraction address ready	F2	(46)	(47)	Contracted dial sent-out with address obtained, mode F1 (48)	Mode F1 (49)	Mode F0 (50)
Manual dial	G	(51)	(52)	Dial sent-out (53)	Dial sent-out (54)	Dial sent-out (55)

10

In the table, "/" indicates that there is no pertinent mode, and "+" indicates that the pertinent process or mode is the same as that in the row immediately above.

First, a function of sending out an abbreviated dial number will be described. In this case, it is necessary to store the relevant telephone number as the abbreviated dial number in a memory stored in the controller 102 in advance. The setting of the abbreviated dial number is made as follows. The hook switch 103 is set to the on-hook state or the telephone apparatus is in the off hook state, and the "#" key as one of the special keys is depressed. With reference to the Decision Table, when the "#" key is depressed in the setting ready mode A, the controller 102 is set to a mode B0 in a process (5). The mode B0 is an abbreviation X ready mode. When the "X" key is subsequently depressed, the mode is switched to a mode B1 in a process (9). The mode B1 is an abbreviation address ready mode. Then, a numeral data "10" is keyed in as a designation signal for specifying a predetermined address of a memory in the controller 102 corresponding to the abbreviated dial number. When the first numeral "1" of the data "10" is keyed in, the mode is switched to a mode B2 in a process (13). The mode B2 is again the abbreviation address ready mode. Then, a telephone number of the opposite side which is desired to be abbreviated, for instance "0425 83 1111", is keyed in. If the memory capacity of



the controller 102 is 16 digits, any telephone number of 16 or less digits may be stored without any problem. However, if the keyed-in telephone number data exceeds 16 digits, the mode is changed to a mode D in a process (23). This mode is an over-digit mode, and any further numeral data coupled by operating keys in this mode is made ineffective in a process (28). When the setting of the abbreviated dial is ended, the "#" key is depressed, whereby the mode A is brought about again in a process (25).

When setting the abbreviated dial number as described above, for instance setting "0425 83 1111" as telephone number of the opposite side as an abbreviated dial number "10", data "#X100425831111#" may be keyed in.

While in the above description the numeral value as the telephone number has been keyed in the setting input ready mode C, it is impossible to store an instruction signal coupled by operating the "X" or "#" key in the memory of the controller 102 at this time. This is so because if the "X" key is depressed, it is made ineffective in a process (24) in the Decision Table, while the depression of the "#" key is not memorized but is treated as data of the completion of setting so that the mode is switched to the initial mode A. Further, when the "#" key is depressed in the abbreviation X ready mode B by switching of the mode mode A is brought about in a

process (10). Further, whenever the hook switch 103 is switched from the "on" state to the "off" state or the telephone apparatus is in a hook state, a mode E, which is an input ready mode, is brought about in a process
5 (1), (6), (11), (16), (21) or (26).

Now, the function of sending out the abbreviated dial number set in the above way will be described. In this case, the hook switch 103 is switched from the "on" state to the "off" state, or the telephone apparatus is switched from off hook state to the on hook state,
10 by the operator of the telephone apparatus. As a result, the controller 102 is set to the input ready mode E. When the "X" key is depressed in this mode, the mode is changed to a mode F1, which is the abbreviated address ready mode, in a process (34). Then, by keying
15 in data "1" in the data "10", the mode is held in the abbreviated address mode F2 in a process (43). When the next data "0" in the data "10" is keyed in, the address corresponding to the data "10" in the memory of the
20 controller 102 is specified in a process (48), and the stored content "0425 83 1111" in this address is read out, and then the mode is switched to the mode F0. By switching the hook switch 103 from the "off" state to the "on" state at this time, a dial stop is caused while
25 causing a change of the mode to the initial setting ready mode A in a process (37), thus bringing an end to the function of sending out abbreviated dial number.

23

If it is desired to send out successive abbreviated dial numbers in the abbreviated dial number send-out function, after key operation for "10" as mentioned above succeeding data "X□□", "X△△", ..., may be keyed in
5 by keying in each 2-digit data after operation of the "X" key which is the special key, whereby the telephone numbers of the opposite side stored in the relevant addresses of the memory of the controller 102 are successively read out. By realizing touch successive abbreviated
10 viated dial number send-out function, the number of key operations required in the prior art can be extremely reduced.

Now, a re-dial function as a further function according to the invention will be described. This
15 function is to send out a telephone number of the opposite side once again. In this case, the hook switch 103 is switched from the "on" state to the "off" state, thereby setting the controller 102 to the input ready mode E. By depressing the "#" key in this mode, a re-
20 dial send-out function is executed in a process (35), and when this send-out process is ended, the mode is changed to the mode F0.

As a further function according to the invention, a function of sending out a signal, which is produced by
25 operating the "X" or "#" key as the special key, not only as an instruction signal for manual dial setting but also as a manual dial signal by itself to the

repeater station.

By switching the hook switch 103 from the "on" state to the "off" state, the mode is switched to the input ready mode E to wait for data to be keyed in.

5 Then, by depressing the "*" key the mode is switched to the mode F1 in a process (34). Then by depressing the
"#" key a manual mode G is set in a process (45), and data subsequently keyed in is thus sent out as manual dial data. It will be seen from the Decision Table
10 above that the manual mode G may be brought about by depressing the "*" key and then the "#" key in the abbreviation * mode F0 and contraction address ready mode F2 as well. The data keyed in by operating the "*" key and
15 the "#" key after the setting of the mode G, causes the manual dial send-out function to be executed in the processes (54) and (55) while a signal of itself is send out to the repeater station.

It is also to be noted that by switching the hook switch 103 from the "off" state to the "on" state, the
20 operation of sending out signal by dial operation is stopped, and the mode is changed to the setting ready mode A. Further, by operating ten keys in the contraction * ready mode F0, the dial send-out function is executed in process (38). Further, by depressing the "#"
25 key in the contraction address ready mode F2, the mode is switched to the contraction * ready mode F0 in a process (50).

25

While various functions have been brought about through special sequences as shown in the Decision Table above, this is by no means limitative, and it is possible to set different sequence contents as represented by a different decision table so that various functions may be brought about with relevant modes set according to the state of the hook switch 103 and the sequence and number of times of operation of the ten keys and special keys.

10 Further, while in the above embodiment the controller 102 shown in Fig. 1, which is constituted by a schedule electronic calculator CPU, has been adapted to decide a given sequence from the keyed-in code data and execute a corresponding function according to the
15 decided sequence to send out data to the repeater station, this is by no means limitative, and it is possible to let the control functions to be undertaken by the repeater station in lieu of the CPU. In this case, the controller 102 in the circuit diagram of Fig. 1 may be
20 omitted, and the multi-frequency signal sent out from the telephone network 105 through the terminal 107 may be coupled to a telephone exchange unit (not shown) so that the telephone exchange unit may decide a sequence determined by the sequence and number of times of key
25 operation and provide corresponding signal as dial time signal to an outside central office.



CLAIMS

1. A telephone system which comprises telephone apparatus including keyboard means having at least 10 digit keys and two special keys, the system further including controller means for operating said apparatus
5 in a normal dial mode by actuation of said two special keys to permit corresponding dial signals to be transmitted and for operating said apparatus in a repertory dial mode by actuation of at least one of said two special keys or at least one of said two special
10 keys and at least one of said 10 digit keys; and mode switching means for effecting the switching of said two modes in said controller means by actuation of said two special keys in a predetermined sequence.

2. A telephone system according to claim 1 which
15 further includes hook switch means and said special keys are labeled "*" and "#" key; and

said controller means includes means for setting an abbreviated address in response to operation of any of said ten digit keys after said "*" key is operated and
20 for storing signal data to be transmitted in response to operation of any of said ten digit keys in association



with said abbreviated address in an "on" state of said hook switch so that operation of said "*" followed by subsequent entry of said abbreviated address causes said stored signal data to be transmitted by said apparatus in and "off" state of said hook switch.

3. A telephone system according claim 2, wherein said controller means further includes means for causing said successive stored signal data according to said different abbreviated addresses to be transmitted in response to successive operations of said "*" key, with which each successive operation followed by subsequent entry of said different abbreviated address in an "off" state of said hook switch.

4. A telephone system according to claim 1 wherein said controller means forms a part of the telephone apparatus.

5. A telephone system according to claim 1 said controller means forms a part of the repeater station.

6. A telephone system substantially as hereinbefore described with reference to the accompanying drawings.
