

**METHOD AND SYSTEM OF OPERATING PORTABLE PHONE
BY VOICE RECOGNITION**

BACKGROUND OF THE INVENTION

5 1. Technical field

The present invention relates to a portable phone, and more particularly to method and system of operating a portable phone by voice recognition, which may dial a phone number, make a call and receive a call by recognizing a voice command.

10 2. Description of the Prior Art

In case that a user wants to make a call with a general portable or cellular phone or a car-phone, the user should open a cover switch of the portable phone or pick up a handset of the car-phone to convert the phone into a calling standby state, push a phone number of a called person, and
15 then push a SEND button, which makes the phone dial the phone number. In addition, in case that the user wants to receive a call in a called standby state, the user should open the cover switch or push the SEND button in order to make a call. If the user pushes an incorrect phone number, the user pushes a CLEAR button in order to erase the
20 inputted phone number.

However, the method of manipulating the phone as above, such as opening the cover switch with the hand and confirming the inputted

number with the eyes may cause accidents when the user is driving a car.

In addition, such portable phone is very inconvenient to use when the user does other works with the hands or has some troubles in the eyes or the hand.

5

SUMMARY OF THE INVENTION

Therefore, the present invention is designed to overcome above problems of the prior art. An object of the present invention is to provide method and system of operating a portable phone by voice recognition,
10 which has functions of dialing a phone number, making a call and cutting off a call by recognizing a key input of a simple command and a phone number for operating the portable phone with a voice.

Another object of the present invention is to provide method and system of operating a portable phone by voice recognition, in which, in
15 addition to the above object, a user may register frequently used person or firm names, department name distinguished by extension numbers, region name having regional codes and national codes (including an international telephone connecting number of each communication service provider) with a voice in order to give a shortened key dialing function
20 using voice recognition.

Still another object of the present invention is to provide method and system of operating a portable phone by voice recognition, which has a

function of erasing a phone number, incorrectly inputted or having an error, with a voice command.

Further another object of the present invention is to provide a portable phone, which may reduce power consumption by selectively
5 determining whether to operate a voice recognition process or not according to an employed power source.

In order to accomplish the above objects, the present invention provides a voice recognition system of a portable phone comprising: a voice recognition processor for recognizing an inputted voice by measuring
10 similarity between a predetermined reference pattern and an inputted pattern obtained by sampling specific parameters from a voice signal including a voice command and a phone number; an interface unit connected to the voice recognition processor, a handset key input unit and a cover switch, the interface unit logically combining an output signal
15 value of the cover switch or the handset key input unit having a function corresponding to a signal value recognized by the voice recognition processor; and a control unit for controlling overall operations of the portable phone related to storing and erasing a recognized phone number, dialing the phone number, starting a call and finishing the call according
20 to the combined signal from the interface unit.

In order to achieve the above object, the present invention also provides a voice recognition system comprising: a handfree socket

including a voice recognition processor for recognizing a voice command and a phone number inputted through a microphone; and a handset connected to the handfree socket for wire/wireless communication therebetween, the handset receiving the voice command and the phone
5 number recognized in the voice recognition processor and executing a corresponding operation related to dialing the phone number, starting a call and finishing a call according to the corresponding command.

The voice recognition processor can be driven by selectively receiving a power of an internal battery according to ON/OFF operation of a
10 selection switch.

The voice recognition processor can be also driven by receiving a power from an external power source through a handfree socket.

The voice recognition processor may include a memory for storing the reference patterns generated by inputting the voice command and the
15 phone number with a voice of a user.

The voice recognition processor may also include a memory for storing the reference patterns generated by the voice command and the phone number obtained from an average utterance of several persons.

The voice recognition processor may recognize an inputted voice by
20 measuring similarity between a predetermined reference pattern and an inputted pattern obtained by sampling specific parameters from a voice signal including a voice command, a keyword and a phone number.

The voice recognition processor may have a unit for detecting whether to use an external power source or an internal battery, the voice recognition processor being operable only when to be connected to an external power source.

- 5 The voice recognition processor may be installed out of the portable phone and connected to the controller through the interface unit extended by the handfree socket and the voice recognition processor is operated with use of power from the external power source.

10 The voice recognition processor may include a memory for registering a name of a person, a firm, a domestic or foreign region, a country and a department in advance and storing a an international telephone connecting number of a communication service provider, a national code for each country, a regional code of each domestic or foreign region and a phone number of each person or firm, correspondingly.

- 15 In order to obtain the above object, the present invention also provides a method of operating a portable phone by voice recognition comprising the steps of: (a) in a called standby state, converting into a calling standby state in case of recognizing a voice of a "Power On" command and converting into a calling state in case of recognizing a voice
20 of a "Connect" command during detecting a bell ringing; (b) in the calling standby state, converting into a calling state after dialing a phone number in case of recognizing voices of the phone number, continuously inputted

within a predetermined time, and a "Send" command; and (c) in the calling state, finishing the call and converting into the called standby state in case of recognizing a voice of a "Call Stop" command.

The step (b) may convert into the calling standby state again in case
5 of recognizing a voice of a "Stop Clear" command.

The step (b) may also comprise the steps of: recognizing and storing a voice of the full phone number and then generating and outputting the stored phone number; determining that the phone number has an error in case of recognizing a voice of the "Stop Clear" command after generating
10 and outputting the phone number, deleting the stored full phone number, and converting into the calling standby state; and dialing the stored phone number in case of recognizing the "Send" command after generating and outputting the phone number.

In case that a power source of a voice recognition processor
15 executing the steps (a) to (c) is used from an internal power source, ON/OFF operation of the voice recognition processor is controlled according to an output signal of a selection switch.

In case of a voice recognition processor executing the steps (a) to (c) uses a power from an external power source through a handfree socket,
20 the external power source drives the voice recognition processor without hesitation when mounting to the handfree socket.

Reference voice patterns stored in a voice recognition processor

executing the steps (a) to (c) may be made by inputting and registering the corresponding voice commands, numerals and symbols with a voice of a user.

The reference voice patterns stored in a voice recognition processor
5 executing the steps (a) to (c) may also be the corresponding voice commands, numerals and symbols obtained by an average utterance of several persons.

BRIEF DESCRIPTION OF THE DRAWINGS

10 These and other features, aspects, and advantages of the present invention will become better understood with regard to the following description, appended claims, and accompanying drawings, in which like components are referred to by like reference numerals. In the drawings:

FIG. 1 shows a configuration of a portable phone operating system
15 according to the present invention;

FIG. 2 shows states and operating flows of the portable phone operating system according to the present invention;

FIG. 3 is a flowchart for illustrating a portable phone operating method by voice recognition according to the present invention; and

20 FIG. 4 and FIG. 5 are flowcharts for illustrating other embodiments of the portable phone operating method according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

The conventional portable phone includes a transmitting unit, a
5 receiving unit, a logic unit, an antenna, a display and a power source.
The present invention further includes a voice recognition processor in addition to the conventional portable phone in order to operate the portable phone by voice recognition without changing a configuration of the conventional system.

10 FIG. 1 shows a configuration of a portable phone according to the present invention.

Referring to the figure, a controller 100 is connected to a received signal processing unit 110, a transmitting signal processing unit 120, a power supply 130, a memory unit 140 and an interface 180. The
15 controller 100 controls overall operations of the portable phone.

The received signal processing unit 110 is controlled by the controller 100, and receives a radio signal from an antenna (not shown) and demodulates the received radio signal. The demodulated signal is outputted in a voice signal through a receiver 111. The transmitting
20 signal processing unit 120 is controlled by the controller 100, and modulates a voice signal from a transmitter 121 and outputs the modulated signal through the antenna.

The power supply 130 can be an internal battery in a handset or an external power source in a handfree socket, and the power supply 130 supplies power to each unit according to the controller 100.

The memory unit 140 including volatile/non-volatile memories for
5 storing a main processing program of the controller 100 and temporarily storing various data generated when processing the main processing program.

The interface 180 is connected to a voice recognition processor 150, a handset key input unit 160 and a cover switch 170. The interface 180
10 logically combines output signals from the voice recognition processor 150, the handset key input unit 160 and the cover switch 170 and provides the combined signals to the controller 100. The logical combination operates logical add or logical product for output signal values of the handset key input unit and the cover switch having same functions as the signal values
15 recognized in the voice recognition processor 150, and then provides the operated value to the controller 100. Therefore, when the user pushes a button or utters a command or a numeral, the controller receiving a corresponding output signal executes the same operation.

The voice recognition processor 150 recognizes a corresponding voice
20 signal, inputted from the transmitter 121, such as a voice command ("Power On", "Stop Clear", "Send", "Connect", "Call Stop" or "Keyword"), a reserved word (keyword) and a voice handset key value (numerals or

symbols) through a known voice recognition algorithm for extracting a characteristic parameter of a time or frequency area from the voice signal.

The voice recognition processor 150 may be realized either in software or in hardware. In case of realized in hardware, though not
5 shown in the figures, the voice recognition processor 150 may include a first memory for storing the reference patterns (for the voice command, the reserved word (keyword) and the handset key value), a processor for creating an input pattern by sampling various parameters of a voice from the transmitter 121 and recognizing the input voice by estimating
10 similarity (or by pattern matching) between the input pattern and the predetermined reference pattern, a second memory for temporarily storing the voice recognized in the voice recognition processor 150 and a third memory for storing phone numbers of frequently used persons and firms, regional codes, national codes, extension numbers or international
15 telephone connecting numbers of each communication service provider corresponding to each reserved word (keyword).

On the other hand, in the preferred embodiment, the reference pattern may be created in a database according to either a caller dependent method or a caller independent method. In case of the caller
20 dependent method, the user of the portable phone directly utters and registers the voice commands, the keywords, the phone numbers, the symbols such as sharp (#) and star (*), etc. with his/her own voice. If

using the portable phone with storing the reference pattern of his/her own voice in the memory such as EEPROM (Electrically Erasable and Programmable Read Only Memory), accuracy of voice recognition is over 90%, which is very effective ratio. In case of the caller independent
5 method, average patterns of the voice commands, the keywords, the phone numbers, the symbols such as the sharp (#) and the star (*), etc. collected from various persons are stored in the memory in advance.

The voice recognition processor 150 receives power from the power supply 130 through the interface 180 according to control of the controller
10 100, as described above.

On the other hand, the voice recognition processor 150 may be driven by directly receiving power from an internal battery or an external power source. The voice recognition processor 150 therefore includes a unit for sensing whether to be connected to the external power source or
15 the internal battery. In case of using the internal battery, a selection switch for voice dialing is mounted in order to connect or block the voice recognition processor 150 to/from the internal battery of the handset. Such selection switch may give effects of reducing size and weight of the portable phone and lowering power consumption of the voice recognition
20 processor 150 to the maximum for the purpose of using the battery for a long time.

In addition, in case of using the external power source such as an

automobile battery, the external power source directly supplies power to the voice recognition processor 150 in order to drive the voice recognition processor 150 without hesitation when mounting the handset to the handfree socket. In such configuration, the external power source, which
5 may supply sufficient power, directly drives the voice recognition processor 150 though the user does not push the selection switch in fact that the function of dialing with voice recognition is essential to the user in driving. In addition, when not using the external power source, the voice recognition processor 150 is driven according to ON/OFF operation of the
10 selection switch. Such configuration is convenient for the user and economical.

In another embodiment, the voice recognition processor 150 may be configured to operate only in using the external power source as the power supply 130 in order that the user may use the voice recognition function
15 only in a vehicle. This may ensure additional reduction of power consumption of the internal battery in the portable phone.

In still another embodiment, the voice recognition processor 150 may be installed out of the portable phone and connected to the controller 100 through the interface 180 extended by the handfree socket. At this
20 time, the voice recognition processor 150 can be operated with use of power of the external power source.

A method of operating the portable phone by voice recognition is

described with reference to FIGs. 2 and 3. FIG. 2 shows the method of operating a portable phone by voice recognition according to the present invention, while FIG. 3 is a flowchart for illustrating the method of operating a portable phone by voice recognition according to the present invention.

Referring to FIG. 2, there are five states of the portable phone, and processes changing from one state to another state according to voices of the user are illustrated. Dotted lines indicate conventional processes according to the button input, and solid lines indicate the processes of the present invention according to voice input. The terms registered for the voice recognition should not be a word frequently used in common conversation, but be words, which are public and easily memorized in point of sampling for voice recognition.

Now, each state is described below.

1) In a called standby state, opening a cover switch converts the portable phone into a calling standby state. Though not opening the cover switch, the portable phone converts into the calling standby state when the user says the voice command of "Power On". A function of the term "Power On" is different from that of a power button (<PWR>) used to turn on the portable phone. In other word, the "Power On" command is a command for preparing for making a call with the portable phone turned on.

2) In the calling standby state, conventionally, the user may make a call by pushing a desired phone number on the portable phone and then pushing the SEND button. Instead, in the present invention, the user says terms of "one" for "1", "two" for "2", "three" for "3", "four" for "4", "five"
5 for "5", "six" for "6", "seven" for "7", "eight" for "8", "nine" for "9", "zero" for "0", "star" for "*", and "sharp" for "#", and then says "Send" in order to convert into a generating mode. In the generating mode, the portable phone generates again and outputs the recognized and stored phone number for confirmation of the user. If the voice recognition processor
10 recognizes utterance of the user correctly and the user then says "Send", the portable phone dials the recognized phone number and then converts into a calling state. If the voice recognition processor fails to recognize utterance of the user and the user then says "Stop Clear", the portable phone converts into the calling standby state again.

15 3) In the called standby state, conventionally, if the bell rings, the user should open the cover switch of the portable phone in order to speak over the phone. If the bell rings with the cover switch opened, the user should push the SEND button. Instead, in the present invention, the portable phone converts from the called standby state to the calling state
20 when detecting a bell ringing, and then converts into the calling state if the user says "Connect". That is, the portable phone may convert into the calling state only when the user says "Connect" during the bell ringing.

4) In the calling state, conventionally, the user should close the cover or push the END button in order to finish the call. Instead, in the present invention, the portable phone finishes the call and converts into the called standby state when the user says "Call Stop".

5 5) In the calling standby state, conventionally, when the user inputs a phone number incorrectly, the user should push the CLEAR button. If the user pushes the CLEAR button once in a short time, a portion of the phone number is erased, while, if pushing for a longer time, all of the phone number is erased. Instead, in the present invention, when the user
10 says an incorrect phone number or the voice recognition processor recognizes the utterance of the user having an error, the user says "Stop Clear" in order to erase the phone number and input another phone number. Then, the portable phone converts into the calling standby state, and may recognize another phone number.

15 Referring to FIG. 3, it is assumed that voice recognition processor 150 is operating by turning on the selection switch in case of using the internal battery or with use of the external power source.

At first, in the called standby state of the step 300, the controller 100 of FIG. 1 detects an incoming control signal through the received
20 signal processing unit 110 and then outputs a bell ringing signal. Then, in the step 311, the controller 100 checks whether the voice recognition processor 150 recognizes a voice inputted from the transmitter 121 as

"Connect". At this time, the voice recognition processor 150 transmits the recognized result to the controller 100 through the interface 180. The interface 180 operates logical product for a pulse value of the recognized "Connect" voice and a signal of sensing the bell ringing and then provides
5 the result to the controller 100.

If the voice recognition processor 150 does not recognize the voice as "Connect", a corresponding operation is executed according to the main processing program of the controller 100 in the step 320, while, if recognizing as "Connect", the call service described above is provided in
10 the step 312.

In the step 313, the controller 100 checks whether the voice recognition processor 150 recognizes an input voice as "Call Stop". If the voice recognizing processor 150 recognizes the input voice as "Call Stop", the engaged call is finished and the portable phone converts into the called
15 standby state in the step 314.

On the other hand, when a bell ringing is not detected in the called standby state in the steps 300, 310, the controller 100 checks whether the voice recognition processor 150 recognizes an input voice as "Power On" in the step 330. At this time, a result signal of the voice recognition
20 processor 150 is transmitted through the interface 180 to the controller 100. The interface 180 operates logical add for an output pulse value of the handset key input unit 160 and a pulse value of "Power On" voice, and

then provides the result to the controller 100.

If the voice recognition processor 150 does not recognize the input voice as "Power On", a corresponding operation according to the main processing program of the controller 100 is executed in the step 320. If
5 the voice recognition processor 150 recognizes the input voice as "Power On", the controller 100 checks whether the voice recognition processor 150 recognize a numeral for the phone number in the step 331. If the voice recognition processor 150 does not recognize a numeral, the step 331 is executed again, while, if recognizing a numeral, the recognized phone
10 number is stored in the memory.

On the other hand, during executing the step 332, the controller 100 checks whether the voice recognition processor 150 recognizes an input voice as "Stop Clear" in the step 333.

If the voice recognition processor 150 recognizes the input voice as
15 "Stop Clear", the controller 100 determines that the user utters a wrong numeral even when the user has uttered a series of numerals and the numerals are stored. Then, the controller 100 erases all of the recognized numerals and then forwards to the step 331 in order to receive the numerals from the first.

20 If the voice recognition processor 150 does not recognize the input voice as "Stop Clear", the controller 100 checks whether the voice recognition processor 150 recognizes the input voice as "Send" in the step

334. If the voice recognition processor 150 does not recognize the input voice as "Send", the controller 100 forwards to the step 320 and executes the corresponding operations. On the other hand, if the voice recognition processor 150 recognizes the input voice as "Send", the controller 100
5 reads the phone number stored in the memory and then generates and outputs the phone number with sound in the step 335.

In another embodiment, in case that the user wants to make a call to a phone number of 02-700-7000, for example, the user should utters "zero, two, seven, zero, zero, seven, zero, zero, zero" for making a call to the
10 destination. However, if the user utters as "zero, two, seven, zero, zero, um..., seven, zero, zero, zero", the voice recognition processor 150 should recognize only the numerals without the word "um...".

Then, the controller checks whether the voice recognition processor 150 recognizes an input voice as "Send" in the step 336. If not "Send",
15 the controller 100 determines that the phone number recognized by the voice recognition processor 150 is incorrect, and then forwards to the step 331 in order to receive the phone number again. If recognized as "Send", the controller 100 determines that the phone number is correct, and then dials the recognized phone number in the step 337. At this time, a
20 recognition result of the voice recognition processor 150 is transmitted through the interface 180 to the controller 100. The interface 180 operates logical add for an output pulse value of the SEND button and a

pulse value of the recognized "Send" voice, and then provides the result to the controller 100, which makes the output pulse value of the SEND button and the pulse value of the recognized "Send" voice give same operation.

5 Then, a radio base station exchanges a signal with a called terminal according to a common calling signal setting protocol in order to receives an assigned channel and establish a speech line. At this time, in the step 338, the controller 100 determines whether the call is connected and forwards to the step 320 if the call is not connected.

10 In the step 338, the controller 100 forwards to the step 339 in order to provide a call service if the call is connected. During the call service, the controller 100 checks whether the voice recognition processor 150 recognizes an input voice as "Call Stop" in the step 340. If recognized as "Call Stop", the controller 100 finishes the established call in the step 341,
15 then executes a call disconnection procedure with the radio base station, and then forwards to the called standby state in the step 300.

In still another embodiment, the voice recognition processor for recognizing a voice may be installed in a handfree socket.

If the voice recognition processor 150 recognizes a voice command
20 or a phone number inputted through a microphone of the handfree socket, a signal value of the recognized voice command or phone number is provided to the controller of the handset through a connector (interface)

between the handfree socket and the handset by wire or wireless. Configuration and operation of the voice recognition processor in the handfree socket and operation of the portable phone according to the controller of the handset based on the voice command or the phone
5 number are similar to the above description of FIGs. 1, 2 and 3, and not described in detail.

FIG. 4 and FIG. 5 are flowcharts for illustrating other embodiments of the present invention. In the below description, it is assumed that the voice recognition processor 150 is operating by turning on the selection
10 switch in case of using the internal battery or with use of the external power source.

Referring to FIG. 4, during the called standby state of the step 400, if detecting the bell ringing in the step 410, the controller 100 checks whether the voice recognition processor 150 recognizes a voice inputted
15 through the receiver 121 as "Connect" in the step 411.

If the voice recognition processor 150 does not recognize as "Connect", the corresponding operation predetermined according to the main processing program is executed in the step 440. If recognized as "Connect", the controller 100 tries connecting the received call in a
20 conventional manner in the step 412. The controller 100 then determines whether the connection of the received call is successful in the step 413.

If connected to the received call, the process forwards to the steps 431,

432 in order to convert into the calling state and provide call service for the received call. The controller 100 then checks whether the voice recognition processor 150 recognizes a voice inputted through the receiver 121 as "Call Stop" in the step 433. If recognized as "Call Stop", the process forwards to the step 434 in order to finish the call and then converts into the called standby state.

On the other hand, if not detecting the bell ringing in the called standby state in the steps 400, 410, the controller 100 checks whether the voice recognition processor 150 recognizes an input voice as "Power On" in the step 420.

If not recognized as "Power On" in the step 420, a corresponding operation according to the main processing program is executed in the step 440. If recognized as "Power On", the controller 100 checks whether the voice recognition processor 150 recognizes an input voice as a numeral, or a phone number, in the step 421. If not recognized as a numeral, the process forwards to the step 450 in FIG. 5 for recognizing a "Keyword" command in order to perform the shortened key dialing function. If recognized as a numeral, the controller 100 stores a phone number recognized by a voice in the memory in the step 422.

On the other hand, during executing the step 422, the controller 100 checks whether the voice recognition processor 150 recognizes an input voice as "Clear" in the step 423.

If recognized as "Clear", the controller 100 determines that the user utters an incorrect numeral even during storing numerals one by one and erases all of the currently inputted phone number in the step 424. Then, the process forwards to the step 421 in order to recognize the phone
5 number again.

If not recognized as "Clear" in the step 423, the controller 100 checks whether the voice recognition processor 150 recognizes an input voice as "Send" in the step 425. If not recognized as "Send", the process forwards to the step 421 and executes the operation of determining
10 whether the voice recognition processor 150 recognizes a numeral or a reserved word (keyword). However, if recognized as "Send", the controller 100 reads the phone number stored in the memory and outputs the phone number with sound in the step 426.

Now, in the step 427, the controller 100 checks whether the voice
15 recognition processor 150 recognizes an input voice as "Send". If not recognized as "Send", the controller 100 determines that the voice recognition processor 150 recognizes the phone number incorrectly and forwards to the step 421. If recognized as "Send", the controller 100 determines that the recognized phone number is correct and dials the
20 phone number in the step 428. Then, the radio base station and the called terminal transmits a signal according to the common calling signal setting protocol so to establish a communication path in the step 429. At

this time, the controller 100 checks whether the call connection is successful in the step 430. If not successful, the process forwards to the step 427 for redialing, and the steps 428 to 430 are executed again.

If the controller 100 successfully connects the call in the step 430,
5 the process forwards to the step 431 for conversion into the calling state and then to the step 432 for providing call service. During the call service, the controller 100 checks whether the voice recognition processor 150 recognizes an input voice as "Call Stop" in the step 433. If recognized as "Call Stop", the controller 100, in the step 434, finishes the call by a
10 common call disconnection process with the radio base station and converts into the called standby state.

On the other hand, in the step 450 of FIG. 5, the controller 100 checks whether the voice recognition processor 150 recognizes an input voice as "Keyword" command, predetermined for the shortened key dialing
15 function. If recognized as "Keyword", the controller 100 converts into a keyword input state in the step 451 and then determines whether the voice recognition processor 150 recognizes any keyword in the step 452. At this time, if the voice recognition processor 150 recognizes any keyword, the controller 100 stores the recognized keyword in the memory in the step
20 454. However, if the voice recognition processor 150 does not recognize any keyword for a predetermined time, the controller 100 outputs an error message in the step 453 and forwards to the step 400 so to convert into

the called standby state.

After the step 454, the controller 100 checks whether the voice recognition processor 150 recognizes an input voice as "Clear" in the step 455. If recognized as "Clear", the controller 100 erases the currently
5 recognized keyword in the step 456. However, if not recognized as "Clear", the controller 100 checks whether the voice recognition processor 150 recognizes at least one numeral in the step 457. If the voice recognition processor 150 recognizes at least one numeral, the controller determines that the numerals are required in connection with a number
10 corresponding to the keyword in order to configure the phone number of a called part, and stores the recognized number in the memory in the step 458. Then, the controller 100 checks whether the voice recognition processor 150 recognizes an input voice as "Clear" in the step 459. If recognized as "Clear", the controller 100 erases the currently recognized
15 numerals in the step 460. However, if not recognized as "Clear", the controller 100 determines whether the voice recognition processor 150 recognizes an input voice as "Send" in the step 461. At this time, if the voice recognition processor 150 does not recognize a numeral in the step 457, the process directly forwards to the step 461 in order to recognize a
20 "Send" command. In this case, the controller 100 considers that the keyword corresponds to the full phone number, that is, any other numeral in addition to the number corresponding to the keyword is not required to

form the phone number of the called part.

If the voice recognition processor 150 does not recognize a "Send" command for a predetermined time in the step 461, the processor forwards to the step 400 and converts into the called standby state. However, if the
5 voice recognition processor 150 recognizes the "Send" command, the controller 100 retrieves the reserved number corresponding to the recognized keyword, stored in the third memory, in the step 462 and then generates and outputs the retrieved phone number and, if required, the recognized numerals with voice in the step 463.

10 The process then returns to the step 427 of FIG. 4 and if the voice recognition processor 150 recognizes an input voice as "Send", the controller 100 dials the phone number corresponding to the recognized keyword.

Such dialing process using the shortened key dialing function may
15 be executed in various manners.

First, after the voice recognition processor 150 recognizes a series of numerals (e.g. one, two, three, four, five, six, seven) as a phone number, the controller dials the phone number (123-4567) corresponding to a series of the numerals.

20 Second, in case of registering a person name or a firm name with voice and registering a phone number corresponding to the name, when the voice recognition processor 150 recognizes the registered name and the

voice command (e.g. Stewart Send), the controller 100 retrieves and generates the phone number corresponding to the name (e.g. if "Stewart" is registered with a corresponding phone number 123-4567, the phone number 123-4567 is retrieved) and then dials the phone number when
5 recognizing the "Send" command.

Third, in case of registering a region name and a regional code of the corresponding region with voice, after recognizing the region name (e.g. Pusan) with voice, the controller 100 retrieves and generates a regional code (e.g. if "Pusan" is registered with a corresponding regional code 051,
10 the regional code 051 is retrieved) and then automatically dials the regional code together with other phone number (inputted with voice or previously registered) when recognizing the "Send" command.

Fourth, in case of registering cities over the world together with a regional code, a national code and an international telephone connecting
15 number for the corresponding city with voice, after recognizing a keyword corresponding to a specific city (e.g. San Jose) with voice, the controller 100 retrieves and generates a regional code, a national code and an international telephone connecting number of a communication service provider for the registered city (e.g. 001 (an international telephone
20 connecting number of a communication service provider), 01 (national code of USA), 408 (regional code of San Jose)) and then automatically dials the international telephone connecting number of the communication

service provider, the national code and the regional code together with a phone number (inputted with voice or previously registered) when recognizing the "Send" command.

Fifth, in case of registering a department, which may be classified
5 with an extension number, and registering an extension number of the corresponding department with voice, when recognizing a keyword corresponding to the registered department with voice (e.g. 123 for the administration department), the controller 100 retrieves and generates the corresponding extension number and then automatically dials the
10 extension number when recognizing the "Send" command.

Such portable phone using voice recognition may reduce inconvenience of the user, specially when the user uses the portable phone in driving, the user wishes to dial a phone number fast without pushing buttons or the user is blind.

15 As described above, the present invention enables the portable phone to be operated with a voice by adding the voice recognition processor and the interface for simple logical operation to the conventional portable system (a handset or a handfree socket) without alteration of a circuit of the conventional portable phone.

20 In addition, the present invention may reduce consumption of power by selectively driving the voice recognition processor in case of using an internal battery of the portable phone. The present invention may also

prevent an accident due to key manipulation in driving by driving the voice recognition processor without hesitation when the portable phone is mounted to the handfree socket and employs an external power source.

Furthermore, the present invention may be applied to a general
5 home telephone and a public telephone.

The system and method of operating a portable phone by voice recognition according to the present invention have been described in detail. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the
10 invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

What is claimed is:



1. A method of operating a portable phone by voice recognition comprising the steps of:

5 (a) in a called standby state, converting into a calling standby state in case of recognizing a voice of a "Power On" command and converting into a calling state in case of recognizing a voice of a "Connect" command during detecting a bell ringing;

(b) in the calling standby state, converting into a calling state after
10 dialing a phone number in case of recognizing voices of the phone number, continuously inputted within a predetermined time, and a "Send" command; and

(c) in the calling state, finishing the call and converting into the called standby state in case of recognizing a voice of a "Call Stop"
15 command.

2. The method of operating a portable phone by voice recognition as claimed in claim 1, wherein the step (b) converts into the calling standby state again in case of recognizing a voice of a "Stop Clear"
20 command.

3. The method of operating a portable phone by voice recognition



as claimed in claim 1, wherein the step (b) comprises the steps of:

recognizing and storing a voice of the full phone number and then
generating and outputting the stored phone number;

determining that the phone number has an error in case of
5 recognizing a voice of the "Stop Clear" command after generating and
outputting the phone number, deleting the stored full phone number, and
converting into the calling standby state; and

dialing the stored phone number in case of recognizing the
"Connect" command after generating and outputting the phone number.

10

4. The method of operating a portable phone by voice recognition
as claimed in claim 1, wherein, in case that a power source of a voice
recognition processor executing the steps (a) to (c) is used from an internal
power source, ON/OFF operation of the voice recognition processor is
15 controlled according to an output signal of a selection switch.

5. The method of operating a portable phone by voice recognition
as claimed in claim 1, wherein, in case of a voice recognition processor
executing the steps (a) to (c) uses a power from an external power source
20 through a handfree socket, the external power source drives the voice
recognition processor without hesitation when mounting to the handfree
socket.



6. The method of operating a portable phone by voice recognition
as claimed in claim 1, wherein reference voice patterns stored in a voice
recognition processor executing the steps (a) to (c) are made by inputting
5 and registering the corresponding voice commands, numerals and symbols
with a voice of a user.

7. The method of operating a portable phone by voice recognition
as claimed in claim 1, wherein reference voice patterns stored in a voice
10 recognition processor executing the steps (a) to (c) are the corresponding
voice commands, numerals and symbols obtained by an average utterance
of several persons.

8. The method of operating a portable phone by voice recognition
15 as claimed in claim 1, wherein the step (b) further comprises the step of:
in case of recognizing a keyword and a "Send" command together
with a voice command predetermined for a shortened key dialing function
within a predetermined time in the calling standby state, retrieving a
phone number corresponding to the recognized keyword, dialing the
20 retrieved phone number and converting into the calling state.

9. The method of operating a portable phone by voice recognition



as claimed in claim 8, wherein the keyword includes a person name, a firm name, a domestic or foreign region, a country and a department name classified by an extension number.

5 10. The method of operating a portable phone by voice recognition as claimed in claim 9, wherein the keyword phone number dialing step dials a phone number of a called part together with an international telephone connecting number of a communication service provider, a national code and a regional code.

10

 *
 11. A voice recognition system of a portable phone comprising:
 a voice recognition processor for recognizing an inputted voice by measuring similarity between a predetermined reference pattern and an inputted pattern obtained by sampling specific parameters from a voice
15 signal including a voice command and a phone number;

 an interface unit connected to the voice recognition processor, a handset key input unit and a cover switch, the interface unit logically combining an output signal value of the cover switch or the handset key input unit having a function corresponding to a signal value recognized by
20 the voice recognition processor; and

 a control unit for controlling overall operations of the portable phone related to storing and erasing a recognized phone number, dialing the



phone number, starting a call and finishing the call according to the combined signal from the interface unit.

12. The voice recognition system of a portable phone as claimed
5 in claim 11, wherein the voice recognition processor is driven by selectively receiving a power of an internal battery according to ON/OFF operation of a selection switch.

13. The voice recognition system of a portable phone as claimed
10 in claim 11, wherein the voice recognition processor is driven by receiving a power from an external power source through a handfree socket.

14. The voice recognition system of a portable phone as claimed
in claim 11, wherein the voice recognition processor includes a memory
15 for storing the reference patterns generated by inputting the voice command and the phone number with a voice of a user.

15. The voice recognition system of a portable phone as claimed
in claim 11, wherein the voice recognition processor includes a memory
20 for storing the reference patterns generated by the voice command and the phone number obtained from an average utterance of several persons.



16. The voice recognition system of a portable phone as claimed in claim 11, wherein the voice recognition processor recognizes an inputted voice by measuring similarity between a predetermined reference pattern and an inputted pattern obtained by sampling specific parameters
5 from a voice signal including a voice command, a keyword and a phone number.

17. The voice recognition system of a portable phone as claimed in claim 16, wherein the voice recognition processor has a unit for
10 detecting whether to use an external power source or an internal battery, the voice recognition processor being operable only when to be connected to the external power source.

18. The voice recognition system of a portable phone as claimed
15 in claim 16, wherein the voice recognition processor is installed out of the portable phone and connected to the controller through the interface unit extended by the handfree socket and the voice recognition processor is operated with use of power from the external power source.

20 19. The voice recognition system comprising:
a handfree socket including a voice recognition processor for recognizing a voice command and a phone number inputted through a



microphone; and

a handset connected to the handfree socket for wire/wireless communication therebetween, the handset receiving the voice command and the phone number recognized in the voice recognition processor and
5 executing a corresponding operation related to dialing the phone number, starting a call and finishing a call according to the corresponding command.

20. The voice recognition system as claimed in claim 19, wherein
10 the voice recognition processor includes a memory for storing reference patterns generated by inputting the voice command and the phone number with a voice of a user.

21. The voice recognition system as claimed in claim 19, wherein
15 the voice recognition processor includes a memory for storing the reference patterns generated by the voice command and the phone number obtained from an average utterance of several persons.

22. The voice recognition system as claimed in claim 19, wherein
20 the voice recognition processor includes a memory for registering names of a person, a firm, a domestic or foreign region, a country and a department in advance and storing an international telephone connecting



number of a communication service provider, a national code for each country, a regional code of each domestic or foreign region and a phone number of each person or firm, correspondingly.