

## COMMUNICATION DEVICE ✓

## FIELD OF THE INVENTION

The present invention relates to communication devices having a plurality of communication modes such as personal mode and public mode.

## BACKGROUND OF THE INVENTION

Communication devices having a plurality of communication modes have been used. An example of such a communication device is a PHS (personal handyphone system) terminal. In a type of the PHS terminal, a plurality of telephone numbers are stored in advance, and dialing is performed by searching a desired number from the stored telephone numbers.

However, in general, when performing dialing by searching for a desired telephone number, it is not

necessarily search all of the telephone numbers in every communication mode. The telephone numbers are often classified according to the communication modes, for example, into a group of telephone numbers used mainly in the public mode and a group of telephone modes used mainly in the personal mode. However, in the above-mentioned conventional communication device, a desired telephone number is searched out from all of the stored telephone numbers irrespectively of the communication modes. Therefore, when dialing a telephone number according to the communication mode, it takes a long time to search for the telephone number.

#### SUMMARY OF THE INVENTION

It is an object of the present invention to provide a communication device capable of searching for a desired telephone number in a short time.

In order to achieve the object, a communication device of the present invention has a plurality of communication modes, an operating section for inputting telephone numbers, a memory section for storing the telephone numbers and communication modes, a detecting section for detecting a communication mode in current use, and a control section for controlling

the memory section to store each telephone number input by the operating section and a corresponding communication mode as related data, and for reading out from the memory section the telephone numbers corresponding to a communication mode detected by the detecting section so as to search for a desired telephone number.

This communication device has a speed dialing function and, for example, stores a plurality of telephone numbers in the form of "speed-dial data" in the memory section. When making a call using the speed dialing function, the communication device searches the telephone numbers in the memory section, and transmits a desired telephone number.

In the communication device, when entering a telephone number as speed-dial data, the telephone number is input through the operating section, and stored in a state corresponding to a predetermined communication mode in the memory section. When searching for a desired telephone number, the control section reads out from the memory section the telephone numbers corresponding to a communication mode detected by the detecting section, and searches for the desired telephone number. Consequently, when dialing a telephone number according to the

communication mode, the telephone number can be searched out in a short time.

For a fuller understanding of the nature and advantages of the invention, reference should be made to the ensuing detailed description taken in conjunction with the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a functional block diagram showing the electric structure of a communication device according to an embodiment of the present invention.

Fig. 2 is an explanatory view showing a state of speed-dial data stored in the memory section of the communication device.

Fig. 3 is a flow chart showing the control of an operation for entering the speed-dial data in the communication device.

Fig. 4 is a flow chart showing the control of an operation for selecting a communication mode when a call comes in the communication device.

Fig. 5 is a flow chart showing the control of an operation for making a call using the speed-dial data in the communication device.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

The following description will explain an embodiment of the present invention with reference to Figs. 1 to 5.

Like the PHS, a communication device of this embodiment has a plurality of communication modes including a personal mode for making communications by connection to its main telephone set or a private branch base station, and a public mode for achieving communications by connection to a public base station. In this embodiment, a communication device having two communication modes, namely the personal mode and public mode, is illustrated as an example of the present invention.

This communication device further includes a speed dial button, and performs a speed dialing function by pressing the button. For the speed dialing function, for example, a plurality of telephone numbers are stored in the form of "speed-dial data" in a memory section. Specifically, when making a call using the speed dialing function, first, the speed dial button is pressed by a user. As a result, in the communication device, a plurality of telephone numbers stored in the memory section are searched by a control section, and displayed in a display section. The user selects a desired telephone

number from the telephone numbers displayed in the display section, and transmits the selected number.

As illustrated in Fig. 1, the communication device includes an antenna 1, a radio section 2 as receiver means, a communication circuit section 3, an operating section 4 as operating means, a display section 5, a control section 6 as control means and detecting means, a speaker 7, a memory section 8 as memory means, and a microphone 9.

The radio section 2 transmits and receives control signals, and information such as voice and image data to/from its main telephone set, a private branch base station or public telephone station through the antenna 1 by means of a radio wave. The communication circuit section 3 demodulates the signals received by the radio section 2, and outputs the resultant signals to the speaker 7 to be explained later. In addition, the communication circuit section 3 modulates and demodulates voice signals from the microphone 9 to be explained later, and outputs the signals to the radio section 2. The operating section 4 includes the speed dial button, a communication mode select button for selecting a communication mode using the speed dialing function, an area code button for inputting the area code of a communication device, and

a ten-key (numeric keys) for inputting telephone numbers, etc. The display section 5 displays speed-dial data, the state of the device, etc. The control section 6 controls the radio section 2 to control the radio system and the entry/transmission of the speed-dial data according to the signals received by the radio section 2 and an instruction from the operating section 4. The speaker 7 outputs the signals demodulated by the communication circuit section 3 as voice signals to the outside of the device. The memory section 8 stores the speed-dial data, information indicating in which communication mode (public mode, personal mode, or every mode) each speed-dial data is used, and the area code of a communication device. The microphone 9 collects external sounds, and outputs the sounds to the communication circuit section 3.

Regarding the information of the speed-dial data stored in the memory section 8, as illustrated in Fig. 2, a telephone number and a corresponding communication mode in which the telephone number is used are stored as related data in a data reading pointer.

Referring now to the flow chart shown in Fig. 3, the following description will explain the operation

for storing the speed-dial data in the communication device having the above-mentioned structure.

First, in a state in which the control section 6 monitors whether a speed-dial-data entry button of the operating section 4 is pressed, when the user presses the speed-dial-data entry button (YES in step S1), the control section 6 starts monitoring whether speed-dial data is input by the operating section 4 (S2). If the speed-dial data is input by the user (YES in S2), the control section 6 temporarily stores the input speed-dial data.

The control section 6 also monitors whether the information representing a communication mode in which the speed-dial data is to be used or the information indicating that the speed dial is to be used in every communication mode is input through the communication mode select button of the operating section 4. When a communication mode is selected by the user (YES in S3), the temporarily stored speed-dial data is stored together with the information of the selected communication mode as related data in the memory section 8 (S4), and the entry of the speed-dial data is complete.

On the other hand, after the input of the speed-dial data, when any communication mode is not

specified (NO in S3), the control section 6 stores the temporarily stored speed-dial data and a communication mode in current use as related data in the memory section 8 (S5), and the entry of the speed-dial data is complete.

Thus, with the above-mentioned operation control, it is possible to enter speed-dial data and a communication mode that serves as a keyword for searching for the speed-dial data as related data.

Next, referring to the flow chart shown in Fig. 4, the following description will explain the operation in receiving a call.

First, in a state in which the radio section 2 is monitoring the presence of the information about a caller (hereinafter referred to as the "caller information") that is to be received when a call comes in through a communications line, if the radio section 2 receives the caller information (YES in S11), the control section 6 reads out the speed-dial data from the memory section 8 to search for a speed-dial data identical with the received caller information..

At this time, if the speed-dial data identical with the caller information is stored in the memory section 8 (YES in S12), the communication mode corresponding to the speed-dial data is replaced by

the current communication mode and stored in the memory section 8 (S13), and the reception of the call is complete. On the other hand, when there is no speed-dial data identical with the received caller information (NO in S12), the reception of the call is complete without updating the communication mode.

Thus, after the entry of speed-dial data, it is possible to automatically select a communication mode that functions as a keyword in searching for the speed-dial data.

Next, referring to the flow chart shown in Fig. 5, the following description will explain the operation for making a call using the speed-dial data.

First, in a state in which the control section 6 monitors whether the speed dial button of the operating section 4 is pressed, when the user presses the speed dial button (S21), the control section 6 reads out the current communication mode from the memory section 8 (S22). Furthermore, the control section 6 set the search setting to a search of frequent speed-dial data that are frequently used so that the speed-dial data are searched in the order of frequency in use, i.e., the most frequently used speed-dial data is searched first (S23). Then, a speed-dial-data reading pointer is initialized (S24),

and the speed-dial data corresponding to the pointer is read out from the memory section 8 (S25).

Subsequently, the control section 6 judges if the current search is the search of frequent speed-dial data (S26). If so (YES in S26), the control section 6 judges whether the communication mode corresponding to the speed-dial data read out from the memory section 8 is every mode (S27). If not (NO in S27), the control section 6 determines if the communication mode is the same as the communication mode in current use (S28).

When the communication mode is every mode (YES in S27) or the current communication mode (YES in S28), the control section 6 displays the speed-dial data read out from the memory section 8 in the display section 5 (S30).

In a state where the speed-dial data is displayed in the display section 5, when the user presses the speed dial button of the operating section 4 (S32), or when the communication mode corresponding to the speed-dial data read out from the memory section 8 is not the every mode (NO in S27) nor the current communication mode (NO in S28), the control section 6 increases the count of the speed-dial-data reading pointer (S33), and judges whether all of the speed-dial data have been searched (S34). Here, if it is

judged that all of the speed data have not been searched yet (NO in S34), the speed-dial data corresponding to the pointer with the increased value is read out (S25), and thereafter the operation is controlled in the same manner as in above.

On the other hand, when it is judged all of the speed-dial data have been searched (YES in S34), the control section 6 determines if the current setting is the setting of frequent speed-dial data. If not (NO in S35), the speed dialing operation is complete.

Whereas, when the control section 6 judges that the current setting is the search of frequent speed-dial data (YES in S35), the search setting is set to a search of infrequent speed-dial data that are used less frequently (S36). Then, a speed-dial-data reading pointer is initialized (S24). Furthermore, the speed-dial data corresponding to the initialized pointer is read out from the memory section 8 (S25).

In the search of infrequent speed-dial data, after reading out the speed-dial data in S25, the communication device moves from S26 to S29, and the control section 6 judges whether the communication mode corresponding to the speed-dial data differs from the current communication mode. If it is judged that the communication mode corresponding to the speed-dial

data is different from the current communication mode (YES in S29), the speed-dial data is displayed in the display section 5 (S30). On the other hand, if it is judged that the communication mode corresponding to the speed-dial data is not different from the current communication mode (NO in S29), the count of the speed-dial-data reading pointer is increased (S33).

According to the above-mentioned operation control, it is possible to search speed-dial data corresponding to the current communication mode, and then search speed-dial data which do not correspond to the current communication mode.

Meanwhile, in the state in which the speed-dial data is displayed in the display section 5 (S30), when the user performs dialling through the operating section 4 (S31), the control section 6 judges if the speed-dial data read out from the memory section 8 contains area code data (S37).

If it is judged that the speed-dial data does not contain area code data (NO in S37), the control section 6 judges whether the current communication mode is the personal mode (S38). When the control section 6 judges that the current communication mode is not the personal mode (NO in S38), the area code data of this communication device that has been stored

in the memory section 8 in advance is read out, and the area code data is transmitted by the radio section 2 and antenna 1 (S39). Thereafter, the read speed-dial data is transmitted by the radio section 2 and antenna 1 (S40), and the dialing operation is complete.

On the other hand, when it is judged that the speed-dial data contains area code data (YES in S37), or when the control section 6 judges the current communication mode is the personal mode (YES in S38), the transmission of the read speed-dial data is performed by the radio section 2 and antenna 1 (S40) without transmitting the area code in S39, and the dialing operation is complete.

As described above, the communication device of this embodiment has a plurality of communication modes, such as the personal mode for making communications by connection to its main telephone set or the private branch base station, and the public mode for making communications by connection to the public base station, and includes the operating section 4 for inputting telephone numbers, the memory section 8 for storing the telephone numbers input through the operating section 4 and their corresponding communication mode as related data, and

the control section 6 for detecting an available communication mode and reading out telephone numbers corresponding to the detected communication mode from the memory section 8 so as to search for a desired telephone number.

With this structure, when searching for a desired telephone number, since the available communication mode is detected and then the desired telephone number is searched out from the telephone numbers corresponding to the detected communication mode in the memory section 8. Therefore, when the telephone numbers are classified according to the communication modes, it is possible to find a desired telephone number in a short time.

Moreover, in the above-mentioned communication device, the memory section 8 is capable of storing a plurality of communication modes for a single telephone number. Consequently, a telephone number that is used in the plurality of communication modes can be searched out in a short time.

Furthermore, in the above-mentioned communication device, the operating section 4 enables the input of a communication mode, and when storing a telephone number in the memory section 8, the control section 6 controls the communication mode input through the

operating section 4 to be stored together with the telephone number as related data. With this structure, when entering a telephone number, since the user can select by itself a communication mode in which the telephone number would be used, it is possible to set an appropriate communication mode.

Additionally, in the above-mentioned communication device, when storing a telephone number in the memory section 8, the control section 6 controls the telephone number to be stored together with a detected communication mode as related data. With this structure, when entering a telephone number, since a communication mode in which the telephone number would be used can be automatically set, it is possible to simplify the operation for entering a telephone number.

Besides, the above-mentioned communication device includes the radio section 2 for receiving the caller information that is to be received when a call comes in. In this device, when it is judged that the memory section 8 stores a telephone number that is identical with the caller's telephone number contained in the caller information received by the radio section 2, the control section 6 controls the memory section 8 to store the communication mode detected by the control

section 6 in receiving the call as a communication mode corresponding to the telephone number.

With this structure, after the entry of the telephone number, since a communication mode in which the entered telephone number would be used can be automatically set, the user can enter a telephone number in a simplified manner.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.



WHAT IS CLAIMED IS:

1. A communication device having a plurality of communication modes, comprising:

operating means for inputting telephone numbers;

memory means for storing the telephone numbers and communication modes;

detecting means for detecting a communication mode in current use; and

control means for controlling said memory means to store each telephone number input by said operating means and a corresponding communication mode as related data, and for reading out from said memory means the telephone numbers corresponding to a communication mode detected by said detecting means so as to search for a desired telephone number.

2. The communication device as set forth in claim 1,

wherein said memory means is capable of storing a plurality of communication modes for each telephone number.

3. The communication device as set forth in claim 1,

wherein said operating means is capable of



inputting a communication mode, and

when storing a telephone number input by said operating means in said memory means, said control means controls the telephone number input by said operating means and a communication mode input by said operating means to be stored as related data in said memory means.

4. The communication device as set forth in claim 1,

wherein, when storing a telephone number input by said operating means in said memory means, said control means controls the telephone number input by said operating means and a communication mode detected by said detecting means to be stored as related data in said memory means.

5. The communication device as set forth in claim 1, further comprising receiving means for receiving caller's information that is to be received when a call comes in,

wherein, when said memory means stores a telephone number which is identical with caller's telephone number contained in the caller's information received by said receiving means, said control means



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controls a communication mode, which is detected by said detecting means in receiving the call, to be stored as a communication mode corresponding to the telephone number in said memory means.

6. The communication device as set forth in claim 2,

wherein said operating means is capable of inputting a communication mode, and

when storing a telephone number input by said operating means in said memory means, said control means controls the telephone number input by said operating means and a communication mode input by said operating means to be stored as related data in said memory means.

7. The communication device as set forth in claim 2,

wherein, when storing a telephone number input by said operating means in said memory means, said control means controls the telephone number input by said operating means and a communication mode detected by said detecting means to be stored as related data in said memory means.



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8. The communication device as set forth in claim 2, further comprising receiving means for receiving caller's information that is to be received when a call comes in,

wherein, when said memory means stores a telephone number which is identical with caller's telephone number contained in the caller's information received by said receiving means, said control means controls a communication mode, which is detected by said detecting means in receiving the call, to be stored as a communication mode corresponding to the telephone number in said memory means.