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U1S S2215

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Online:EDOC,WPI

(54) Abstract Title
A mobile telephone

(57) A mobile telephone includes a protruding part 15, which is rotatable and longitudinally moveable within a pencil style housing 10. The degree of rotation of the protruding part sensed by a variable resistor determines input data e.g.a numeral displayed on LCD 12 and a pulse within a preset time (T, Figure 7) resulting from a single click operation of switch 22 confirms the generated data. This process is repeated until a telephone number is inputted when a double pulse application of the switch within the preset time (T) causes the number to be dialled. A single pulse within the preset time (T) switches the telephone on, and a single pulse exceeding the preset time (T) switches the telephone off. Call-waiting and communication modes are also described.

FIG. 1

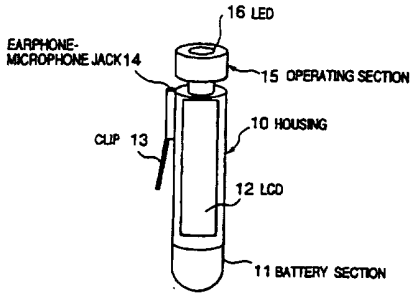

FIG. 2

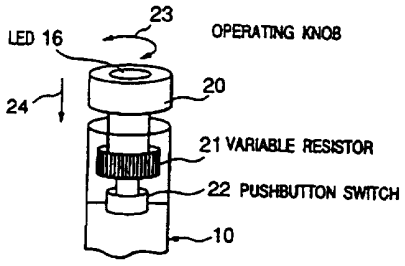

FIG. 3

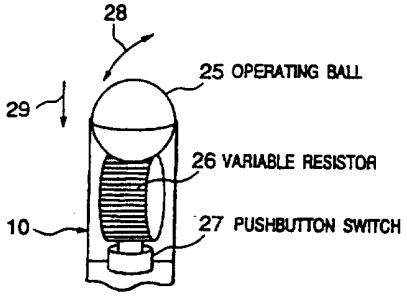

FIG. 4

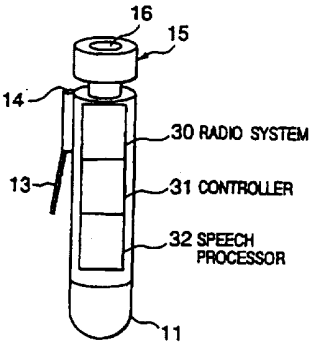

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FIG. 1

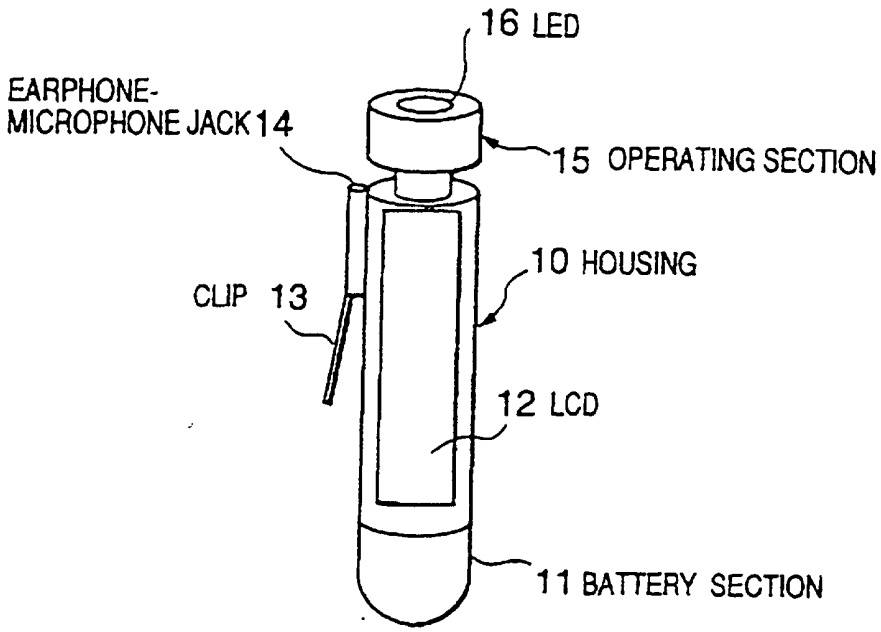

16 LED
EARPHONE-
MICROPHONE JACK 14
15 OPERATING SECTION
10 HOUSING
CLIP 13
12 LCD
11 BATTERY SECTION

FIG. 4

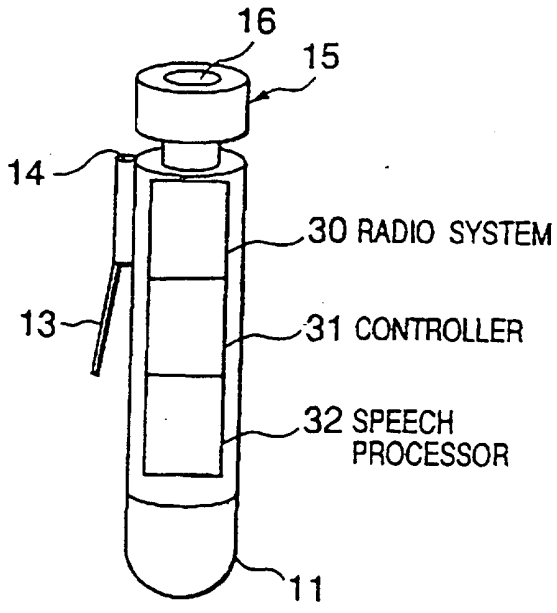

16
15
14
30 RADIO SYSTEM
13
31 CONTROLLER
32 SPEECH
PROCESSOR
11

FIG. 2

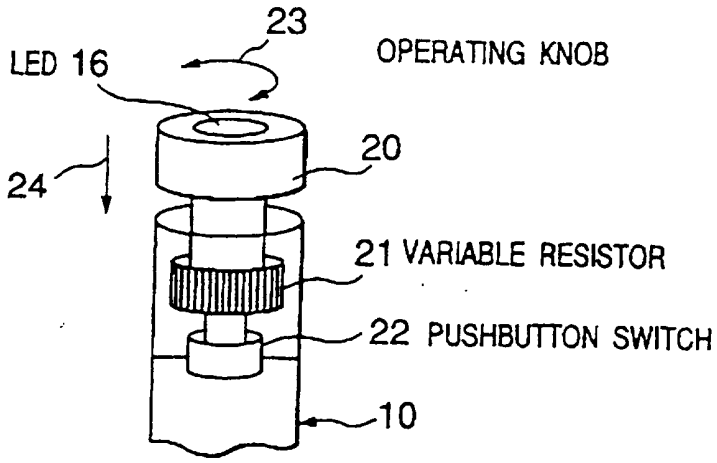

23
OPERATING KNOB
LED 16
20
24
21 VARIABLE RESISTOR
22 PUSHBUTTON SWITCH
10

FIG. 3

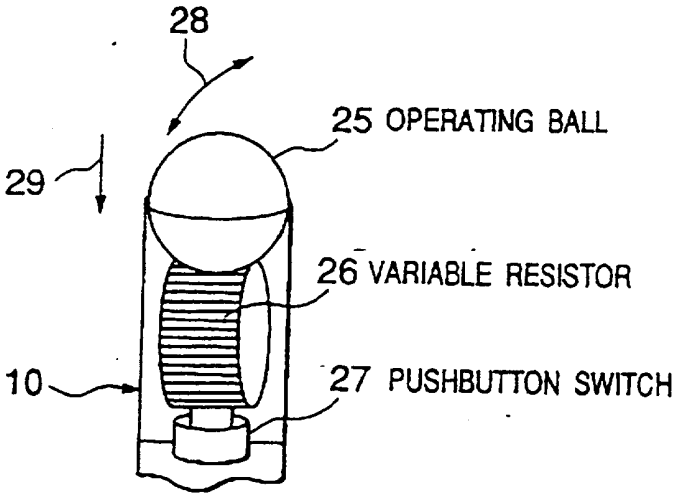

28
25 OPERATING BALL
29
26 VARIABLE RESISTOR
10
27 PUSHBUTTON SWITCH

FIG. 5

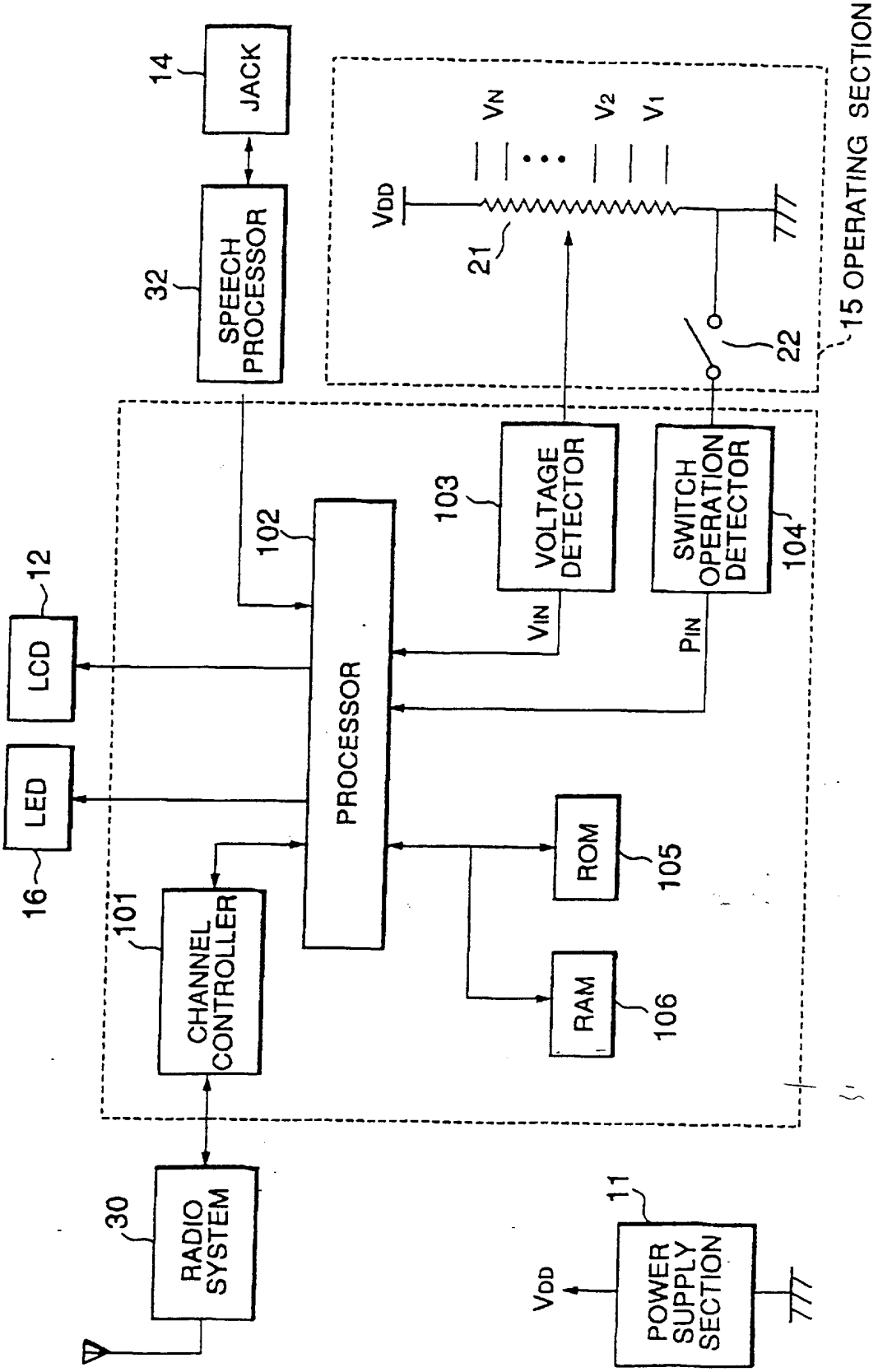

14
JACK
32
SPEECH PROCESSOR
VDD
VN
V2
V1
21
22
15 OPERATING SECTION
12
LCD
LED
16
102
PROCESSOR
103
VOLTAGE DETECTOR
VIN
104
SWITCH OPERATION DETECTOR
PIN
101
CHANNEL CONTROLLER
ROM
105
RAM
106
30
RADIO SYSTEM
11
POWER SUPPLY SECTION
VDD

FIG. 6

TABLE

DETECTED VOLTAGE V_{IN}	GENERATED DATA DEPENDING ON MODE SELECTION			
V_1	NUMEREL	ALPHABET		
V_2	1.			
V_3	2	A	B	C
V_4	3	D	E	F
V_5	4	G	H	I
V_6	5	J	K	L
V_7	6	M	N	O
V_8	7	P	Q	R
V_9	8	S	T	U
V_{10}	9	V	W	X
V_{11}	0 _	Y	Z	
V_{12}	#			
V_{13}	*			

FIG. 7

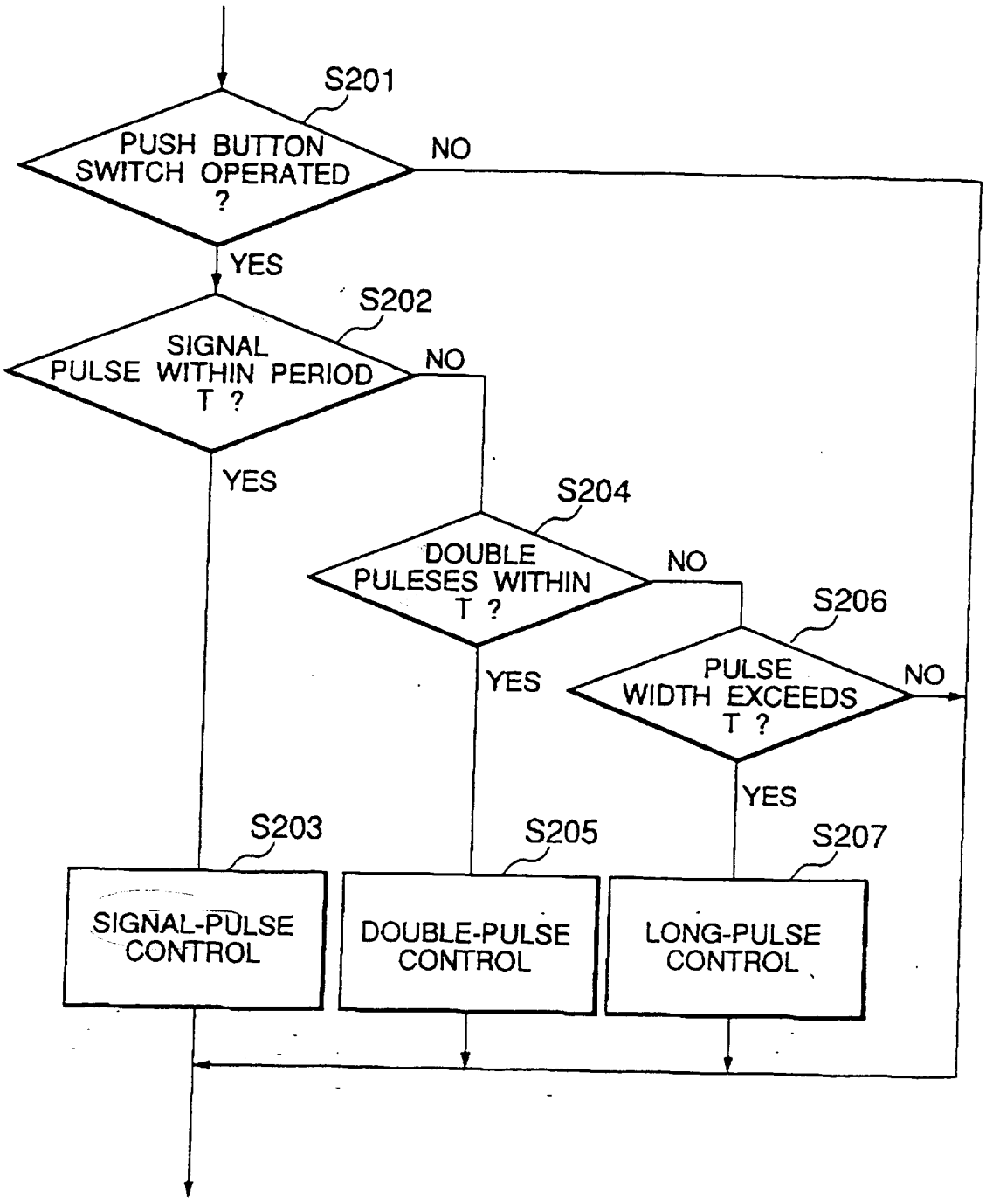

S201
PUSH BUTTON SWITCH OPERATED ?
NO
YES
S202
SIGNAL PULSE WITHIN PERIOD T ?
NO
YES
S204
DOUBLE PULESES WITHIN T ?
NO
YES
S206
PULSE WIDTH EXCEEDS T ?
NO
YES
S203
SIGNAL-PULSE CONTROL
S205
DOUBLE-PULSE CONTROL
S207
LONG-PULSE CONTROL

FIG. 8

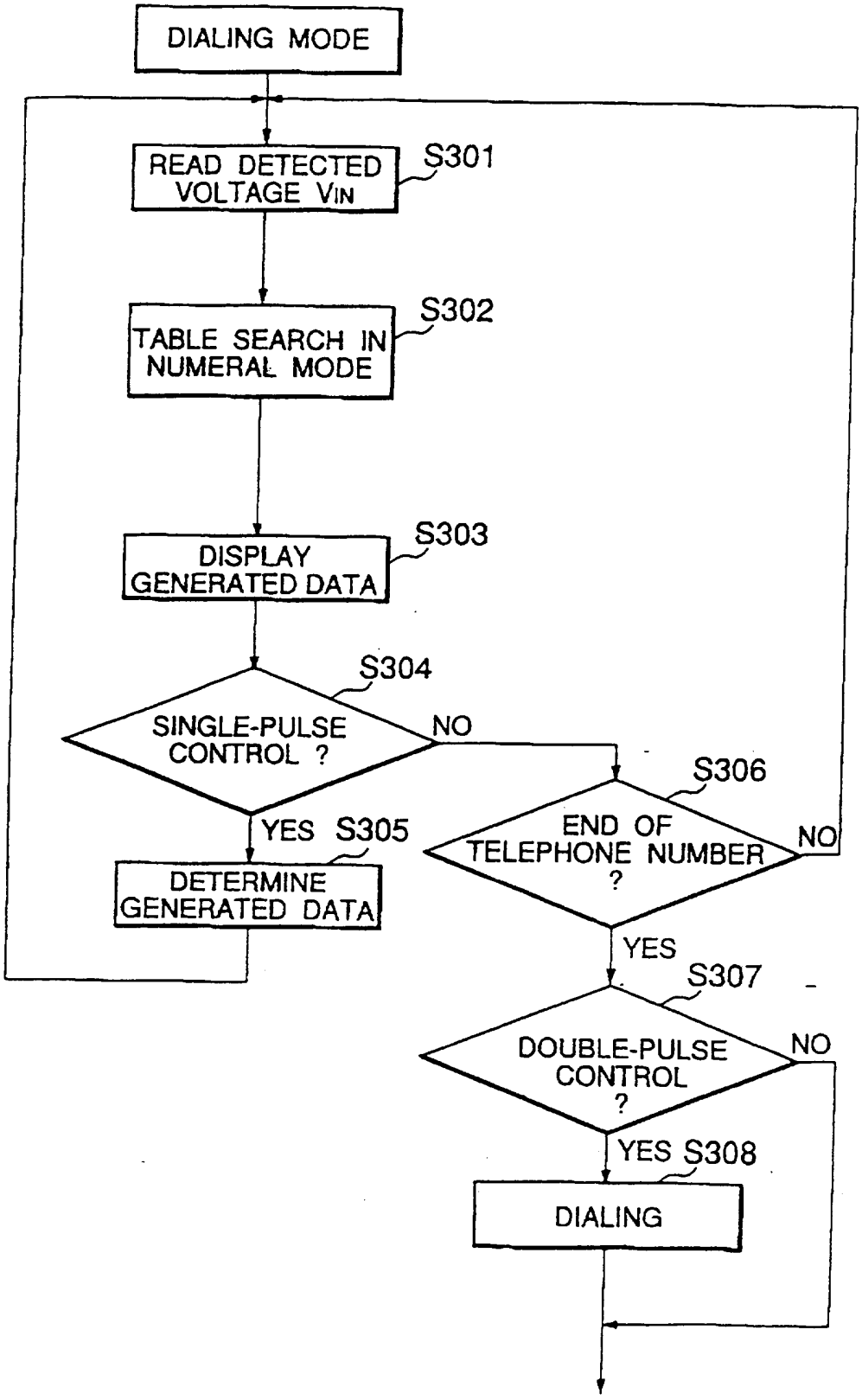

DIALING MODE
READ DETECTED VOLTAGE VIN
S301
TABLE SEARCH IN NUMERAL MODE
S302
DISPLAY GENERATED DATA
S303
S304
SINGLE-PULSE CONTROL ?
NO
YES
S305
DETERMINE GENERATED DATA
S306
END OF TELEPHONE NUMBER ?
NO
YES
S307
DOUBLE-PULSE CONTROL ?
NO
YES
S308
DIALING

FIG. 9

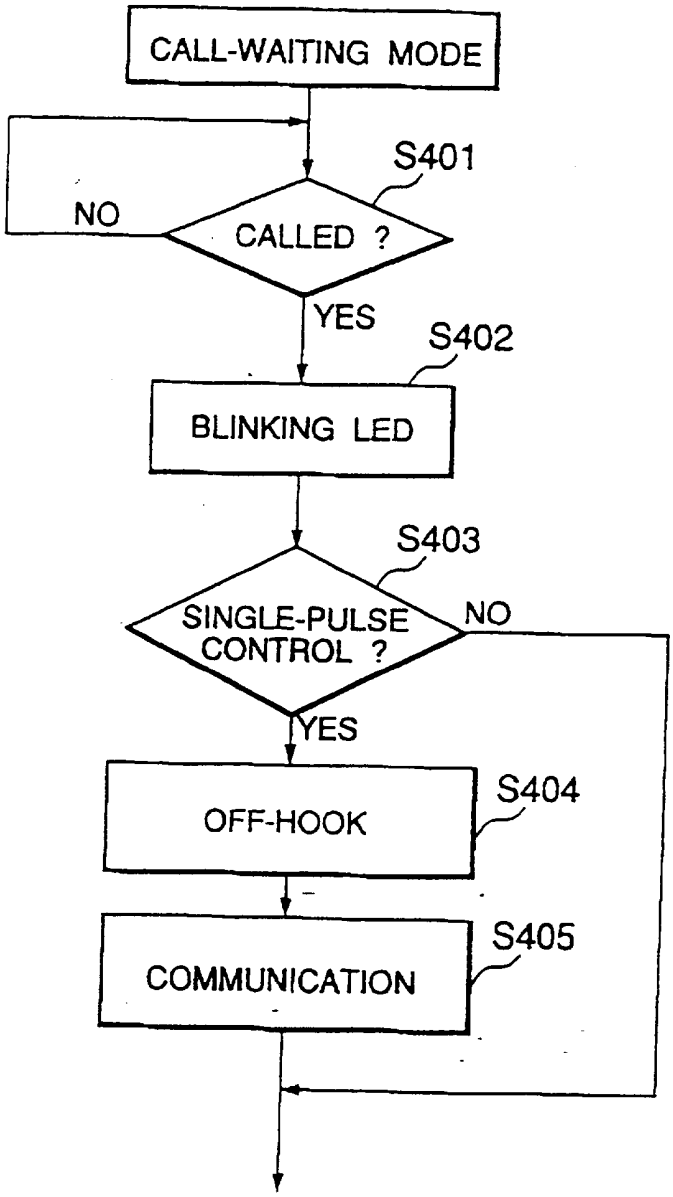

CALL-WAITING MODE
S401
NO
CALLED ?
YES
S402
BLINKING LED
S403
SINGLE-PULSE CONTROL ?
NO
YES
S404
OFF-HOOK
S405
COMMUNICATION

FIG. 10

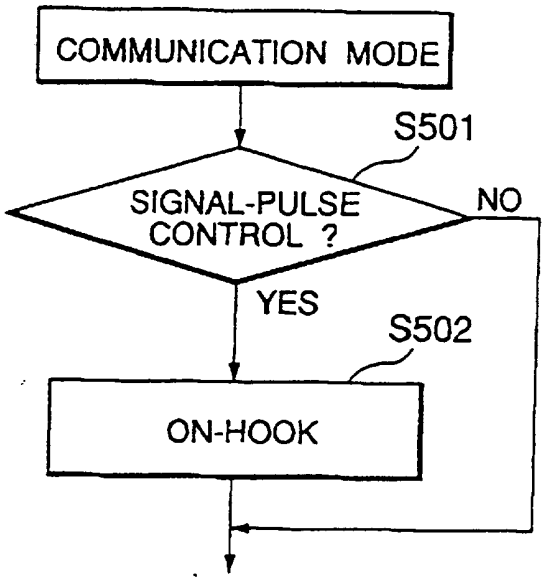

COMMUNICATION MODE
S501
SIGNAL-PULSE CONTROL ?
NO
YES
S502
ON-HOOK

FIG. 11

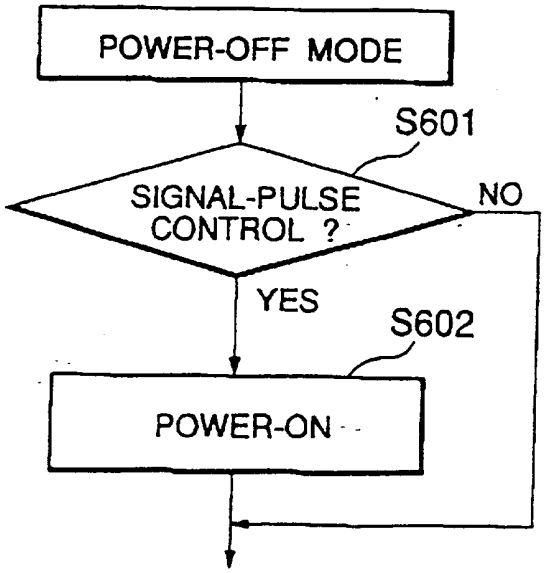
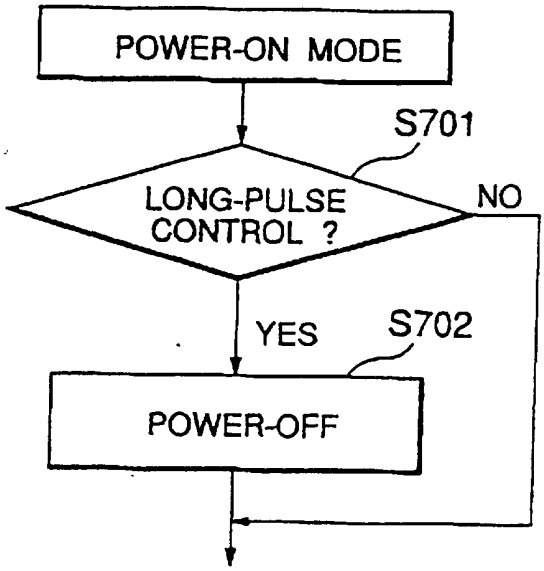

POWER-OFF MODE
S601
SIGNAL-PULSE CONTROL ?
NO
YES
S602
POWER-ON

FIG. 12



INPUT DEVICE

The present invention generally relates to an input device, particularly to a small-size data processing system, and in particular to an input operating apparatus and an input control method for a small-size data processing system such as a pencil-style mobile telephone terminal.

Since a pencil-style apparatus is a convenience for portability, there have been proposed several pencil-style mobile telephone terminals in, for example, Japanese Patent Unexamined Publication No. 4-40046 and Japanese Utility-model Unexamined Publication No. 6-62657. These pencil-style mobile telephone terminals have a key pad placed on the side wall of a pencil style housing thereof.

However, such a key pad requires a certain space on the pencil style housing, forming a bottleneck in miniaturization. In other words, with a smaller keypad, there is a difficulty in pushing respective keys for input. Further, since the key pad is placed on the side wall of the pencil style housing, it is very difficult to perform input operations such as dialing in the state of holding

the housing with the user's hand.

An object of at least the preferred embodiments of the present invention is to provide a data input apparatus which can easily input data without the need of a keypad.

Another such object is to provide a small-size communication apparatus which can achieve both the convenience of portability and the operability.

In one aspect, the present invention provides an input device provided within a generally cylindrical housing of a portable data processing apparatus, the device comprising a protruding part provided at an end of the housing, the protruding part being rotatable and longitudinally movable, a first input controller for inputting data variable with the degree of rotation of the protruding part, and a second input controller for inputting a control signal variable with the degree of longitudinal movement of the protruding part.

According to a preferred embodiment of this aspect of the present invention, an input device provided within a pencil style housing of a portable data processing apparatus is comprised of a protruding part provided at an end of the pencil style housing such that the protruding part is rotatable and longitudinally movable. A first input controller inputs data varying depending on rotation of the protruding part and a second input controller inputs a control signal varying depending on longitudinal movement of the protruding part.

The first input controller may include a voltage adjuster which produces a voltage varying depending on rotation of the protruding part. The voltage adjuster may be supported with longitudinal movement allowed within the pencil style housing. The second input controller may include an on-off switch in contact with the voltage adjust such that the on-off switch switching on and off depending on longitudinal movement of the protruding

part.

According to another aspect of the present invention, a portable communication apparatus includes a memory for storing alphanumeric data and a protruding part provided at an end of a pencil style housing such that the protruding part is rotatable and longitudinally movable. A first input controller selectively inputs alphanumeric data depending on rotation of the protruding part and a second input controller inputs a control signal varying depending on longitudinal movement of the protruding part. A controller determines a piece of alphanumeric data input by the first input controller to be input depending on the control signal input by the second input controller.

The pencil-style portable communication apparatus may be provided with a display provided on a side wall of the pencil style housing, wherein the controller displays the piece of alphanumeric data input by the first input controller on the display. Further, The pencil-style portable communication apparatus may be provided with a voice synthesizer within the pencil style housing, wherein the controller controls the voice synthesizer such that the piece of alphanumeric data input by the first input controller is converted into voice.

According to still another aspect of the present invention, in a cylindrical mobile telephone terminal, a protruding part is rotated to input alphanumeric data, the protruding part being provided at an end of a cylindrical housing such that the

protruding part is rotatable and longitudinally movable. And then, the protruding part is pushed to determine the input alphanumeric data to be input.

The input alphanumeric data may be determined to be input when the protruding part has been pushed once. Further, dialing is performed using the input alphanumeric data as a telephone number when the protruding part has been pushed twice within a predetermined time period.

As described above, a protruding part is rotatable and longitudinally movable by which input data is varied depending on rotation of the protruding part and a control signal is varied depending on longitudinal movement of the protruding part. Therefore, data input can be easily performed without the need of a keypad and both the convenience of portability and the operability can be achieved.

Preferred features of the present invention will now be described, purely by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 is a perspective view showing one embodiment of a pencil-style mobile telephone apparatus;

Fig. 2 is a diagram showing one embodiment of an input apparatus;

Fig. 3 is a diagram showing a second embodiment of an input apparatus;

Fig. 4 is a schematic diagram showing an arrangement of internal circuit blocks of the pencil-style mobile telephone apparatus of Fig. 1;

Fig. 5 is a block diagram showing the internal circuit of internal circuit blocks of the pencil-style mobile telephone apparatus as shown in Fig. 1;

Fig. 6 is a schematic diagram showing the contents of a table which is used to input data;

Fig. 7 is a flowchart showing an operation of a pushbutton switch of the input apparatus;

Fig. 8 is a flowchart showing an operation of the input apparatus in dialing mode;

Fig. 9 is a flowchart showing an operation of the input apparatus in call-waiting mode;

Fig. 10 is a flowchart showing an operation of the input apparatus in communication mode;

Fig. 11 is a flowchart showing an operation of the input apparatus in power-off mode; and

Fig. 12 is a flowchart showing an operation of the input apparatus in power-on mode.

Referring to Fig. 1, a pencil-style mobile telephone apparatus is comprised of a pencil style housing 10 having a battery section 11 provided at one end thereof. A liquid-crystal display (LCD) 12 having a rectangular screen is longitudinally placed on the side wall of the pencil style housing 10. A clip 13 incorporating an earphone-microphone jack 14 is placed on the side wall of the pencil style housing 10 and spaced from the LCD 12. At the other end of the pencil style housing 10, an operating section 15 having a light-emitting diode (LED) 16 on the top thereof is operably provided. As will be described later, data and various instructions can be input by rotating and clicking the operating section 15.

Referring to Fig. 2, a first example of the operating section 15 is comprised of an operating knob 20, a variable resistor (potentiometer) 21 and a pushbutton switch 22. The operating knob 20 is mechanically connected to the twist-knob of the variable

resistor 21 which is supported to be longitudinally movable in the pencil style housing 10. The protruding knob of the pushbutton switch 22 makes contact with the bottom of the variable resistor 21. Therefore, the variable resistor 21 can be adjusted by a user rotating the operating knob 20 as indicated by an arrow 23 and the pushbutton switch 22 can be on and off by the user pushing the operating knob 20 as indicated by an arrow 24.

Referring to Fig. 3, a second example of the operating section is comprised of an operating ball 25, a variable resistor (potentiometer) 26 and a pushbutton switch 27. The operating ball 25 is rotatably supported in the pencil style housing 10 and making contact with the twist-knob of the variable resistor 26 so that the rotation of the operating ball 25 is imparted to the twist-knob of the variable resistor 26. The operating ball 25 is further supported to be longitudinally movable in the pencil style housing 10. The protruding knob of the pushbutton switch 27 makes contact with the variable resistor 26. Therefore, the variable resistor 26 can be adjusted by the user rotating the operating ball 25 as indicated by an arrow 28 and the pushbutton switch 27 can be on and off by the user pushing the operating ball 25 as indicated by an arrow 29.

Referring to Fig. 4, a radio telephone circuit is mounted within the pencil style housing 10. The radio telephone circuit includes a radio system 30, a controller 31 and a speech processor 32. The details of the radio telephone circuit will be described hereinafter.

Referring to Fig. 5, the variable resistor 21 of the operating section 15 has a predetermined resistor to which the power supply voltage V_{DD} is applied. Since the variable resistor 21 can be adjusted to provide varying amounts of resistance, arbitrary voltage ranging from 0 to V_{DD} can be generated by rotating the operating knob 20.

The mobile telephone terminal is provided with the radio system 30 which receives and transmits a radio signal from and to a nearby base station through an antenna. The controller 31 includes a channel controller 101 and a processor 102.

A voltage detector 103 detects varying voltages generated by the variable resistor 21. The detected voltage is converted into a digital voltage signal V_{IN} which is output to the processor 102. A switch operation detector 104 is connected to one terminal of the pushbutton switch 22 having the other terminal connected to the ground. Therefore, when the pushbutton switch 22 is closed and then opened for a short time period by the user clicking the operating knob 20, the switch operation detector 104 can detect a voltage drop to the ground to produce a detection pulse signal P_{IN} which is output to the processor 102. As will be described later, the variable resistor 21 is used to select data and the pushbutton switch 22 is used to determine selected data.

The processor 102 performs the operation controls including the input control using a ROM 105 and a RAM 106. The ROM 105 stores programs, a data table and a subscriber ID number. The processor 102 runs necessary programs to perform the control. The data

table stores numerals, characters and other marks with respect to each detected voltage step V_{IN} as shown in Fig. 6. As will be described later, the processor 102 performs the input control referring to the data table based on a digital voltage signal V_{IN} and a detection pulse signal P_{IN} received from the voltage detector 103 and the switch operation detector 104, respectively.

The speech processor 32 encodes speech signals received from the earphone-microphone jack 14 and outputs encoded signals to the processor 102 and decodes encoded signals received from the processor 102 and outputs decoded speech signals to the earphone-microphone jack 14.

Further, the speech processor 32 may include a voice synthesizing function which can be used to produce a voice signal under the control of the processor 102. The LCD 12 displays necessary information and the LED 16 blinks when called under the control of the processor 102.

As shown in Fig. 6, the data table of the ROM 105 stores numerals (1-9 and 0), alphabet characters (A to Z) and other marks (here, # and *) with respect to each detected voltage step V_{IN} ranging from V_1 to V_{13}. The stored data are classified under two modes: Numeral and Alphabet, and the Alphabet data are further classified under three columns: (A, D, G, ..., Y), (B, E, H, ..., Z), and (C, F, I, ..., X).

For example, when the voltage step V_1 is detected, the processor 102 selects numeral mode by default. In this state, when the user clicks the pushbutton switch 22 once, the mode is

changed to the alphabet mode. Subsequently, when the user clicks the pushbutton switch 22 once more, the mode is changed back to the numeral mode. In the case of numeral mode, when the voltage step V_3 is detected, the processor 102 selects numeral "2". On the other hand, in the case of alphabet mode, the processor 102 selects "A" of the first column by default. In this state, when the user clicks the pushbutton switch 22 once, the processor 102 selects "B" of the second column. Subsequently, when the user clicks the pushbutton switch 22 once more, the processor 102 selects "C" of the third column.

In this manner, any numeral and any alphabet character can be selected by adjusting the variable resistor 21 and clicking the pushbutton switch 22 and the selected data is displayed on LCD 12 under the control of the processor 102.

Referring to Fig. 7, the pushbutton switch 22 is used to determine selected data and to input a user's instruction. When the pushbutton switch 22 is operated (YES in step S201), the processor 102 determines whether the operation of the pushbutton switch 22 is a single click (step S202). If it is the single click (YES in step S202), the processor 102 performs a single-pulse control (step S203). If it is not the single click (NO in step S202), the processor 102 determines whether the operation of the pushbutton switch 22 is double clicks (step S204). If it is the double clicks (YES in step S204), the processor 102 performs a double-pulse control (step S205). If it is not the double clicks (NO in step S204), the processor 102 determines whether a pulse

generated by the operation of the pushbutton switch 22 exceeds a predetermined time period T (step S206). If affirmative (YES in step S206), the processor 102 performs a long-pulse control (step S207).

DIALING OPERATION

Referring to Fig. 8, in the case of dialing mode, the user twists the operating knob 20 to adjust the variable resistor 21 while looking at selected data displayed on the LCD 12. In such an operation, the processor 102 reads a detected voltage V_{IN} from the voltage detector 103 (step S301) and then searches the data table (see Fig. 6) for a voltage step including the detected voltage V_{IN} (step S302). Since the numeral mode is selected, the processor 102 reads a numeral corresponding to the found voltage step from the data table and displays it on the LCD 12 for confirmation (step S303). The selected numeral may be converted to a voice signal by the speech processor 32. After that, the processor 102 waits for a user's instruction.

If the numeral displayed on screen is what is desired, the user clicks the operating knob 20 once. This causes the switch operation detector 104 to generate a single pulse which in turn causes the processor 102 to perform the single-pulse control (YES in step S304). Therefore, the displayed numeral is determined (step S305) and then control goes back to the step S301. If the single pulse is not input (NO in step S304) and the input of a telephone number is not completed (No in step S306), control also goes back to the step S301.

When the telephone number has been input (YES in step S306), the user double-clicks the operating knob 20. This causes the switch operation detector 104 to generate double pulses which in turn cause the processor 102 to perform the double-pulse control (YES in step S307). In this case, the processor 102 makes the channel controller 101 off-hook and starts dialing according to the input telephone number displayed on the LCD 12 (step S308).

CALL-WAITING MODE

Referring to Fig. 9, in the state of the mobile telephone terminal being in intermittent receiving mode, when detecting the self ID number from a received selective calling signal (YES in step S401), the processor 102 informs the user of incoming call by blinking the LED 16 placed on the top of the operating knob 20 (step S402). In this state, when the user clicks the operating knob 20 once (YES in step S403), the processor 102 stops the LED 16 blinking and makes the channel controller 101 off-hook (step S404). This causes a connection to be established and communication can be started (step S405).

COMMUNICATION MODE

Referring to Fig. 10, when the communication is terminated in the state of telephone call being in progress, the user clicks the operating knob 20 once (YES in step S501). This causes the processor 102 to make the channel controller 101 on-hook (step S502).

POWER-ON/OFF

Referring to Fig. 11, when the user clicks the operating

knob 20 once in power-off state (YES in step S601), the processor 102 performs power-up control to allow calling operation (step S602).

Referring to Fig. 12, when the user pushes the operating knob 20 for a relatively long time period in power-on state (YES in S701), the processor 102 performs power-off control (step S702).

Each feature disclosed in this specification (which term includes the claims) and/or shown in the drawings may be incorporated in the invention independently of other disclosed and/or illustrated features.

The text of the abstract filed herewith is repeated below as part of the specification.

An input device includes a protruding part provided at an end of a pencil style housing of a portable data processing apparatus. The protruding part is rotatable and longitudinally moveable within the pencil style housing. The portable data processing apparatus inputs data varying depending on rotation of the protruding part and further inputs a control signal varying depending on longitudinal movement of the protruding part.

CLAIMS

1. An input device provided within a generally cylindrical housing of a portable data processing apparatus, the device comprising:

a protruding part provided at an end of the housing, the protruding part being rotatable and longitudinally moveable;

a first input controller for inputting data variable with the degree of rotation of the protruding part, and a second input controller for inputting a control signal variable with the degree of longitudinal movement of the protruding part.

2. A device according to Claim 1 provided within a pencil–style housing.

3. A device according to Claim 1 or 2, wherein the protruding part is a knob.

4. A device according to Claim 1 or 2, wherein the protruding part is a ball.

5. A device according to any preceding claim, wherein the first input controller comprises:

a voltage adjuster for producing a voltage variable with the degree of rotation of the protruding part, the voltage adjuster being supported to be longitudinally moveable within the housing.

6. A device according to Claim 5 wherein the second input controller comprises a switch in contact with the voltage adjuster for on and off switching depending on longitudinal movement of the protruding part.

7. A device according to any preceding claim, wherein the first input controller is arranged to select a piece of data from a plurality of predetermined pieces of data depending on the rotation of the protruding part, and the second input controller is arranged to input an instruction varying depending on longitudinal

movement of the protruding part.

8. A device according to Claim 7, wherein a selected piece of data is to be input by the first input controller only when the second input controller inputs a determined instruction.

9. Portable communication apparatus comprising:

a memory for storing alphanumeric data;

a protruding part provided at an end of a pencil style housing such that the protruding part is rotatable and longitudinally moveable;

a first input controller for selectively inputting alphanumeric data depending on rotation of the protruding part;

a second input controller for inputting a control signal varying depending on longitudinal movement of the protruding part; and

a controller for determining a piece of alphanumeric data, input by the first input controller, to be input depending on the control signal input by the second input controller.

10. Apparatus according to Claim 9, further comprising a display provided on a side wall of the pencil style housing for displaying the piece of alphanumeric data input by the first input controller.

11. Apparatus according to Claim 9, further comprising a voice synthesizer within the pencil style housing, wherein the controller is arranged to control the voice synthesizer such that the piece of alphanumeric data input by the first input controller is converted into voice.

12. A method of controlling the input of a cylindrical mobile telephone terminal, comprising the steps of:

rotating a protruding part to input alphanumeric data, the protruding part being provided at an end of a cylindrical housing such that the protruding

part is rotatable and longitudinally moveable; and

pushing the protruding part to input an instruction varying on how the protruding part is pushed.

13. A method according to Claim 12, wherein the input alphanumerical data is determined to be input when the protruding part has been pushed once.

14. A method according to Claim 12 or 13, wherein dialling is performed using the input alphanumeric data as a telephone number when the protruding part has been pushed twice within a predetermined time period.

15. A method according to any of Claims 12 to 14 wherein an off-hook instruction is input when the protruding part has been pushed once in a state of call occurrence.

16. A method according to any of Claims 12 to 15, wherein an on-hook instruction is input when the protruding part has been pushed once in a state of call being in progress.

17. A method according to any of Claims 12 to 16, wherein a power-on instruction is input when the protruding part has been pushed once in a state of power-off.

18. A method according to any of Claims 12 to 17, wherein a power-off instruction is input when the protruding part has been pushed for more than a predetermined time period in a state of power-on.

19. An input device or portable communication apparatus substantially as herein described with reference to and as shown in any of Figures 1 to 4 of the accompanying drawings.

20. A method of controlling the input of a cylindrical mobile telephone terminal substantially as herein described with reference to any of Figures 7 to 12 of the accompanying drawings.

Patent Office

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Application No: GB 9802116.5 **Examiner:** Peter Squire
Claims searched: 1-18 **Date of search:** 16 March 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Int Cl (Ed.6): G05G 1/00 9/02 11/00 13/00 G06F 3/02, 023 G06K 11/00 H04M 1/23, 274, 72

Other: Online:EDOC,WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	WO 93/14589 A1	(Motorola) see whole document	1-3 and 7-12
X	US 4744322	(Nakase) see col.5 line 48 - col.6 line 10	1-3 and 5-7

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.