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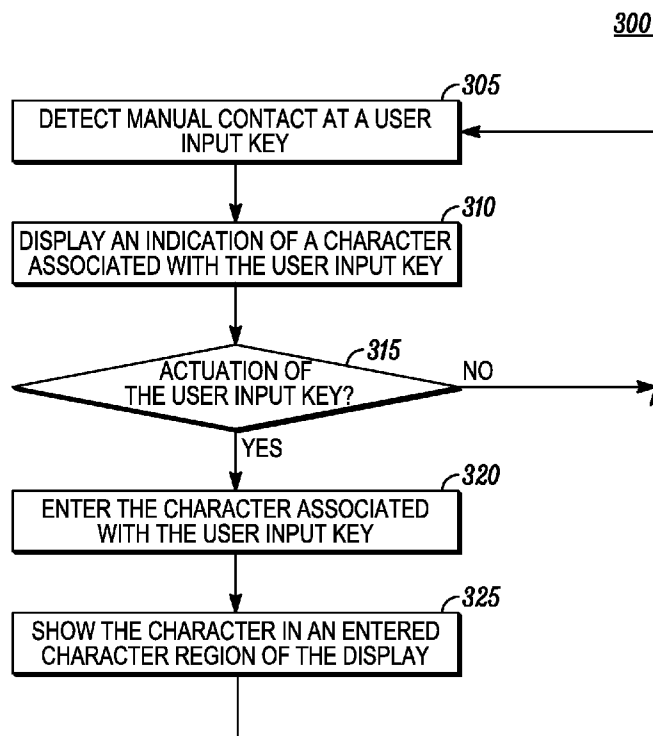
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[Continued on next page]

(54) Title: ENTERING A CHARACTER INTO AN ELECTRONIC DEVICE



(57) Abstract: A method of entering a character into an electronic device (100), the method comprising displaying an indication of the character (405) on a display (105) of the electronic device (100) in response to detecting manual contact at a user input key (265) of the electronic device, the user input key being associated with the character, and entering the character in response to actuation of the user input key of the electronic device.

FIG. 3

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CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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ENTERING A CHARACTER INTO AN ELECTRONIC DEVICE

FIELD OF THE INVENTION

5 The present invention relates generally to the field of user interfaces and user data entry in an electronic device.

BACKGROUND OF THE INVENTION

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 Portable handheld electronic devices such as handheld wireless communications devices (e.g. cellphones) that are easy to transport are becoming commonplace. Such handheld electronic devices come in a variety of different form factors and support many features and functions.

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 Cellular telephones, Personal Digital Assistants (PDAs), tablet computers and other similar portable electronic devices, and electronic devices in general, sometimes have an input tablet that is typically a touch screen providing a two-way user interface which may include soft user input keys for data entry, invoking applications and menu traversing. In an alternative approach, these electronic devices may offer a keypad including a number of user input keys adjacent a non-touch sensitive screen.

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 Given the increasing miniaturisation of such electronic devices, there is a tendency for the user input keys to become increasingly small. However this can make it difficult for users to actuate the right key. This problem is exacerbated for the elderly or other users with deteriorating vision, sense of touch, and/or positional awareness of their actuating digit(s). Some

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electronic devices display a character associated with the actuated key in a large font in order to facilitate viewing of the character. However actuating the wrong key is both frustrating and time consuming, as it often leads to the requirement for additional key actuations in order to correct or recover from actuation of the wrong key.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be readily understood and put into practical effect, reference will now be made to an exemplary embodiment as illustrated with reference to the accompanying figures, where like reference numerals refer to identical or functionally similar elements throughout the separate views. The figures together with a detailed description below, are incorporated in and form part of the specification, and serve to further illustrate the embodiments and explain various principles and advantages, in accordance with the present invention where:

Fig. 1 is a schematic block diagram illustrating circuitry of an electronic device in accordance with the invention;

Fig. 2A, 2B, and 2C illustrate in more detail a keypad and a touch sensitive tablet of the electronic device of FIG. 1;

Fig. 3 illustrates a method of operating the electronic device of FIG. 1 in order to enter a character;

Fig. 4A and 4B illustrate screen displays of the electronic device of FIG. 1 following the method of FIG. 3; and

5 Fig. 5A and 5B illustrate further screen displays of the electronic device of FIG. 1 following the method of FIG. 3.

10 Skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions of some of the elements in the figures may be exaggerated relative to other elements to
15 help to improve understanding of embodiments of the present invention.

DETAILED DESCRIPTION

20 Before describing in detail embodiments that are in accordance with the present invention, it should be observed that the embodiments reside primarily in combinations of method steps and device components related to character entry in an electronic device.
25 Accordingly, the device components and method steps have been represented where appropriate by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments of the present invention so as not to obscure
30 the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein.

35 In this document, relational terms such as first and second, top and bottom, and the like may be used solely to distinguish one entity or action from another entity or action without necessarily requiring or implying any

actual such relationship or order between such entities or actions. The terms "comprises," "comprising," or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or device that comprises a list of elements does not include only those elements but may include other elements not expressly listed or inherent to such process, method, article, or device. An element preceded by "comprises ...a" does not, without more constraints, preclude the existence of additional identical elements in the method, or device that comprises the element. Also, throughout this specification the term "key" has the broad meaning of any key, button or actuator having a dedicated, variable or programmable function that is actuatable by a user.

It will be appreciated that embodiments of the invention described herein may be comprised of one or more conventional processors and unique stored program instructions that control the one or more processors to implement, in conjunction with certain non-processor circuits, some, most, or all of the functions of character entry in an electronic device described herein. The non-processor circuits may include, but are not limited to, a radio receiver, a radio transmitter, signal drivers, clock circuits, power source circuits, and user input devices. As such, these functions may be interpreted as steps of a method to perform character entry in an electronic device. Alternatively, some or all functions could be implemented by a state machine that has no stored program instructions, or in one or more application specific integrated circuits (ASICs), in which each function or some combinations of certain of the functions are implemented as custom logic. Of course, a combination of the two approaches could be used. Thus, methods and means for these functions have been described herein. Further, it is expected that one

of ordinary skill, notwithstanding possibly significant effort and many design choices motivated by, for example, available time, current technology, and economic considerations, when guided by the concepts and principles disclosed herein will be readily capable of generating such software instructions and programs and ICs with minimal experimentation.

According to one aspect of the present invention there is provided a method of entering a character into an electronic device, the method comprising: displaying an indication of the character on a display of the device in response to detecting manual contact at a user input key of the electronic device, the user input key being associated with the character; and entering the character in response to actuation of the user input key of the electronic device.

According to another aspect of the present invention there is provided an electronic device comprising: a processor, a display and a number user input keys; and the processor being arranged to display an indication of a character in response to detecting manual contact at a user input key associated with the character, and to enter the character in response to actuation of the user input key.

Referring to FIG. 1, there is a schematic diagram illustrating an electronic device 100, typically a wireless communications device, in the form of a mobile station or mobile telephone comprising a radio frequency communications unit 102 coupled to be in communication with a processor 103. The electronic device 100 also has a display 105 such as an LCD screen and a keypad 165. There is also an alert module 115 that typically contains

an alert speaker, vibrator motor and associated drivers. The display 105, keypad 165 and alert module 115 are coupled to be in communication with the processor 103. The electronic device 100 also comprises a touch sensitive tablet 170 coupled to the processor 103.

The processor 103 includes an encoder/decoder 111 with an associated code Read Only Memory (ROM) 112 for storing data for encoding and decoding voice or other signals that may be transmitted or received by the electronic device 100. The processor 103 also includes a microprocessor with character indication function 113 coupled, by a common data and address bus 117, to the radio communications unit 102, the encoder/decoder 111, a character Read Only Memory (ROM) 114, radio communications unit 102, a Random Access Memory (RAM) 104, static programmable memory 116 and a Secure Memory 119 which may comprise a Removable User Identity Module card (RUIM) in subscriber card based mobile phones. The static programmable memory 116 and a RUIM card 119 (commonly referred to as a Subscriber Identity Module (SIM) card) operatively coupled to the RUIM interface 118 each can store, amongst other things, Preferred Roaming Lists (PRLs), subscriber authentication data, selected incoming text messages and a Telephone Number Database (TND phonebook) comprising a number field for telephone numbers and a name field for identifiers associated with one of the numbers in the name field. The RUIM card 119 and static memory 116 may also store passwords for allowing accessibility to password-protected functions on the mobile telephone 100.

The microprocessor with character indication function 113 has ports for coupling to the display 105, the keypad 165, the touch sensitive tablet 170, and the alert module 115. Also, the microprocessor with character indication function 113 has ports for coupling

to a microphone 135 and a communications speaker 140 that are integral with the device.

The character Read Only Memory 114 stores code for decoding or encoding text messages that may be received by the communications unit 102. In this embodiment the character Read Only Memory 114, RUIM card 119, and static memory 116 may also store Operating Code (OC) for the microprocessor with character indication function 113 and code for performing functions associated with the mobile telephone 100.

The radio frequency communications unit 102 is a combined receiver and transmitter having a common antenna 107. The communications unit 102 has a transceiver 108 coupled to the antenna 107 via a radio frequency amplifier 109. The transceiver 108 is also coupled to a combined modulator/demodulator 110 that couples the communications unit 102 to the processor 103.

The touch sensitive tablet 170 detects manual contact from a user's digit (finger) or a stylus, and although shown separately here for simplicity may be integrated with the keypad 165 or the display 105 of the electronic device 100. The detected manual contacts are interpreted by the processor 103 as points or lines of contact or touch across an xy co-ordinate system of the touch sensitive tablet 170. The interpretation of the detected manual contacts as points or lines of contact by the processor 103 will typically be implemented with the execution of program code as will be appreciated by those skilled in the art. In alternative embodiments, this function may be achieved using an ASIC or equivalent hardware.

FIG 2A, 2B, and 2C illustrate in more detail an arrangement of the keypad 165 comprising actuable user input keys 265 and the touch sensitive tablet 170 which

is integrated with the user input keys 265. The keypad 165 comprises a number of user input keys 265 which are integrated in an overlaying relation with the touch sensitive tablet 170 as shown. The touch sensitive tablet 170 provides a touch sensitive user interface on the electronic device 100 which allows for receiving user contact or touch points or lines of contact with the touch sensitive tablet 170. Such tablets are typically implemented using an array of capacitive sensors which detect changes in capacitance corresponding to the presence of a user's digit or other object such as a stylus. Detection of a finger or stylus therefore does not require pressure against the sensor array or tablet, but typically just a light touch or contact against the surface of the keypad; or even just close proximity. It is therefore possible to integrate the user input keys 265 and the touch sensitive tablet 170, as the keys require physical pressure or a tactile force for actuation whereas the capacitive sensors do not. Thus it is possible to detect manual contact at the user input keys 265 without actuating any of these user input keys 265. An example of a touch sensitive tablet 170 is the finger writing recognition tablet on the A668 mobile phone available from Motorola Incorporated.

Whilst capacitive sensors are typically used, other sensor arrays may alternatively be used such as ultrasound sensors to detect the user input object's position. Similarly the "activation" of a sensor may be configured to correspond to contact between a user input object such as a finger and the surface of the tablet, or even close proximity of the distal end of a user input object with the sensor such that actual physical contact with the tablet surface may not be required.

The changes in capacitance detected at the sensors are translated into a contact location on an xy grid by

the processor 103. Alternatively the points or strokes of contact may be captured by an ink trajectory processor as ink trajectories with respect to the co-ordinate system of the touch sensitive tablet 170. These inks or manual
5 contact locations are then forwarded to the processor 103 and interpreted as manual contact locations for further processing as described in more detail below. A suitable ink trajectory processor may be that used in the MotorolaTM A688 mobile phone.

10 The touch sensitive tablet 170 comprises a number of regions 270 each of which corresponds to a user input key 265. Each region may be defined using predetermined ranges of xy coordinates on the xy grid of the touch sensitive tablet 170. Each region 270 and its
15 corresponding user input key 265 are typically substantially co-located as shown. Thus detecting proximity of a user digit or stylus at one of the regions corresponds to proximity of the user digit to the co-located user input key 265. Therefore manual contact at a
20 region 270 (tablet region) can be used to detect manual contact at a corresponding user input key 265. For example manual contact at the top left user input key of FIG. 2C, which is associated with the character "5", can be detected by detecting proximity of a user digit at the
25 corresponding region 270 surrounding this user input key 265.

FIG 3 illustrates a method of operating the electronic device of FIG. 1 in order to enter a
30 character. This functionality will typically be implemented by executing a software program from the static memory 116 on the microprocessor with character indication function 113 which receives inputs from the touch sensitive tablet 170 and user input keys 265. The
35 method 300 initially detects manual contact at a user input key 265 at step 305. This step may be implemented

by a capacitive or other sensor embedded in the touch sensitive tablet 170 adjacent the corresponding user input key 265. The location of the manual contact is determined by the processor 103 or equivalent function, and can be associated with one of the regions 270 of the touch sensitive tablet 170. Once associated with a region 270 of the touch sensitive tablet 170, the point or location of manual contact can also be associated with one of the user input keys 265 of the keypad 165.

If manual contact at a user input key is detected (305Y), the method 300 then displays an indication of a character associated with that user input key 265 at step 310. Thus for example if the user input key 265 is associated with the character "8", an enlarged character "8" may be displayed on the display 105. This indication is illustrated in Fig. 4A and 4B which both illustrate an electronic device 100 in the form of a wireless communications device such as a mobile phone. The electronic device 100 includes a keypad 165 including a number of user input keys 265 and a display 105. Fig. 4A shows the display 105 without performance of step 310, and Fig. 4B shows the display 105 following performance of step 310. This step 310 is performed in response to detecting proximity of a user digit 410 at the number eight user input key as shown. In this case an indication of the character "8" associated with the user input key "8" (265) is displayed. The indication of the character 405 is an enlarged character having a size such that only one said character can be displayed on the display 105. Various other sizes may be used which may also be easy to read by a user with limited vision. Alternatively or additionally, the indication may comprise a symbol representative of the character such as eight dots or lines, a flashing character or a particular colour or combination of colours.

The method 300 then determines whether the user input key has been actuated at step 315. This step may be implemented by detecting a tactile force applied to the user input key 265, for example by the user input key establishing an electrical connection or circuit in response to pressure against the user input keys 265 from the user's digit 410; as would be appreciated by those skilled in the art. A time limit may be set for actuating the user input key 265, for example 2 seconds. Actuation of other user input keys 265 may be disabled at this time, so that only the user input key 265 associated with the character currently displayed may be actuated. If a user input key 265 is not actuated (315N), for example within 2 seconds, then the method returns to the detect manual contact at a user key step (305). Thus if the user moves their finger over another user input key 265, the enlarged character associated with the other user input key will be displayed at step 310. This means that an indication of the user input keys will be displayed as the user moves their finger over each respective user input key 265 and corresponding region 270 of the touch sensitive tablet 170. This allows the user to more easily see which user input key 265 their finger is currently positioned over, so that once the right key is found, that key may be actuated.

If the user input key is actuated (315Y), the method enters the character associated with the actuated user input key at step 320. Thus a function or other method operating on the electronic device 100 receives the character or data entry from the user which corresponds to the actuated user input key 265. For example, where the user wishes to dial a phone number, the numerals of the phone number may be entered using the method 300, so that each numeral or character is displayed in a large font prior to actuation of the corresponding user input key 265. This reduces the likelihood of inadvertently

entering the wrong character by actuating the wrong user input key.

The method 300 then shows the entered character in an entered character region of the display at step 325. This is illustrated in Fig. 5A and 5B which both illustrate an electronic device 100 in the form of a wireless communications device such as a mobile phone. The electronic device 100 includes a keypad 165 including a number of user input keys 265 and a display 105. Fig. 5A shows the display 105 following performance of step 310. In this case an indication of the character "4" associated with the user input key "4" (265) is displayed. Thus the user's digit or finger is over or touching the "4" user input key 265. Following actuation of this user input key 265 (associated with the character "4"), the character ("4") is shown in the entered character region 505 of the display 105. This entered character region 505 shows all the entered characters in a phone number dialling application. In Fig. 5B the user's digit or finger 410 is now over or touching the "1" user input key 265, and an indication of this character 405 is also displayed as shown. Typically, the indication of the character 405 will be larger than the characters shown in the entered characters region 505.

The indication of the character 405 may be displayed in a background of the display 105, such that other display elements are in the foreground and overwrite the background elements. The foreground elements may include the characters shown in the entered character region 505. As shown in Fig. 5A and 5B, the foreground elements such as a character in the character region (505) may only partially overwrite the background elements such as a character(405) such that the indication of the character 405 can still be partially seen through the entered character region 505.

Following showing of the character in the entered character region 505 at step 325, the method 300 returns to the detect manual contact at user input key step 305. Thus a user of the electronic device 100 may move their finger over the keypad 165 with an indication of the character associated with each user input key 265 that the user's finger touches being displayed. This makes it easier for the user to determine which user input key 265 that their finger is currently touching, and therefore whether or not to actuate that user input key 265. Therefore the incidence of incorrect key actuations is reduced, which reduces the corrective action that needs to be taken and makes small key user interfaces easier to use, especially for those with poor vision such as the elderly or disabled. In an example application, the method 300 can be used to enter numerals of a telephone number to be dialled by the electronic device.

In the foregoing specification, specific embodiments of the present invention have been described. However, one of ordinary skill in the art appreciates that various modifications and changes can be made without departing from the scope of the present invention as set forth in the claims below. Accordingly, the specification and figures are to be regarded in an illustrative rather than a restrictive sense, and all such modifications are intended to be included within the scope of present invention. The benefits, advantages, solutions to problems, and any element(s) that may cause any benefit, advantage, or solution to occur or become more pronounced are not to be construed as a critical, required, or essential features or elements of any or all the claims. The invention is defined solely by the appended claims including any amendments made during the pendency of this application and all equivalents of those claims.

WE CLAIM:

1. A method of entering a character into an electronic device, the method comprising:

5 displaying an indication of the character on a display of the device in response to detecting manual contact at a user input key of the electronic device, the user input key being associated with the character; and

10 entering the character in response to actuation of the user input key of the electronic device.

2. A method of entering a character into an electronic device as claimed in claim 1, further comprising showing the character in an entered character region of the display, the indication of the character being larger than the character in the entered character region of the display.

3. A method of entering a character into an electronic device as claimed in claim 2, wherein the indication of the character comprises displaying the character on a background of the display and showing the character in the entered character region in a foreground of the display.

4. A method of entering a character into an electronic device as claimed in claim 1, wherein the indication of the character comprises displaying the character at a size such that only one said character can be displayed on the display.

5. A method of entering a character into an electronic device as claimed in claim 1, wherein a number of user input keys are integrated in an overlaying relation with

a touch sensitive tablet having a number of regions, each region of the touch sensitive tablet corresponding to one of the user input keys.

5 6. A method of entering a character into an electronic device as claimed in claim 1, wherein the character is a numeral of a telephone number to be dialled by the electronic device.

10 7. A method of entering a character into an electronic device as claimed in claim 1, wherein detecting manual contact at a user input key comprises detecting proximity of a user digit and actuation of a user input key comprises detecting a tactile force applied to the user
15 input key.

8. An electronic device comprising:
 a processor, a display and a number user input keys;
 the processor being arranged to display an
20 indication of a character in response to detecting manual contact at a user input key associated with the character, and to enter the character in response to actuation of the user input key.

25 9. An electronic device as claimed in claim 8, wherein the processor is further arranged to show the character in an entered character region of the display, the indication of the character being larger than the character in the entered character region of the display.

30 10. An electronic device as claimed in claim 9, wherein the character is displayed on a background of the display and the character in the entered character region is shown in a foreground of the display.

11. An electronic device as claimed in claim 8, wherein the character is displayed at a size such that only one said character can be displayed on the display.

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12. An electronic device as claimed in claim 8, wherein a number of user input keys are integrated in an overlaying relation with a touch sensitive tablet having a number of regions, each region of the touch sensitive tablet corresponding to one of the user input keys.

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13. An electronic device as claimed in claim 8, wherein the electronic device is a wireless communications device and the character is a numeral of a telephone number to be dialled by the electronic device.

15

14. An electronic device as claimed in claim 8, the processor is arranged to detect proximity of a user digit in order to detect manual contact at a user input key and wherein the processor is arranged to detect a tactile force applied to the user input key in order to detect actuation of the user input key.

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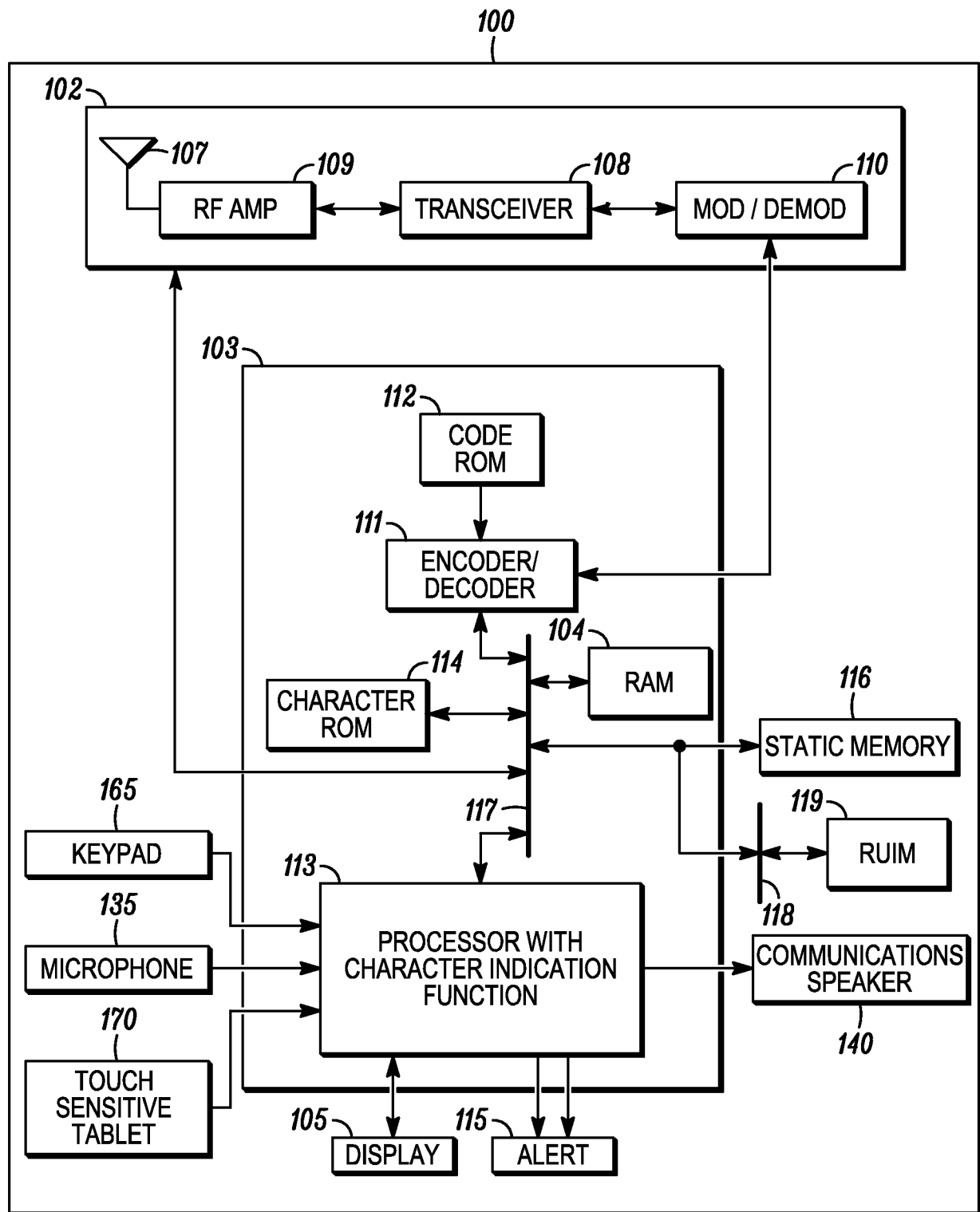


FIG. 1

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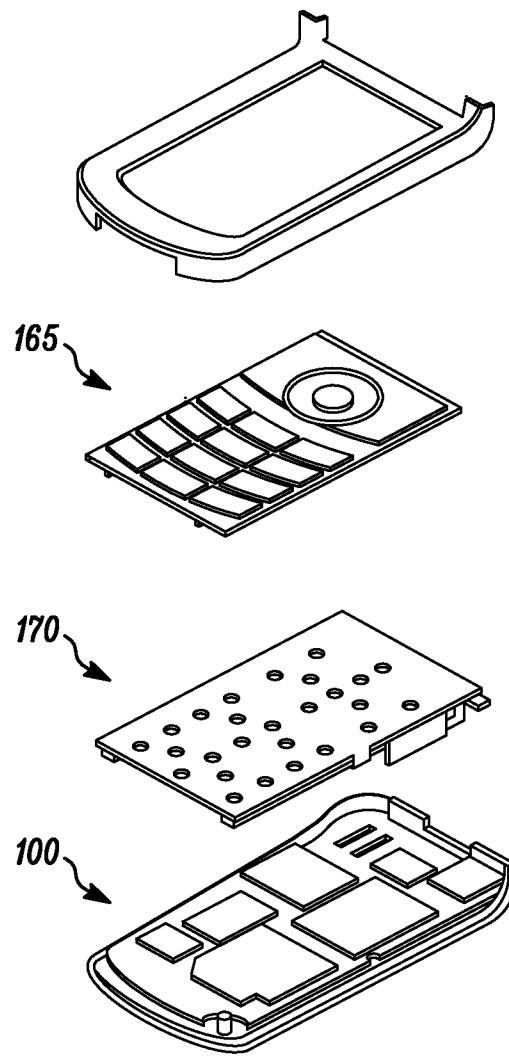


FIG. 2A

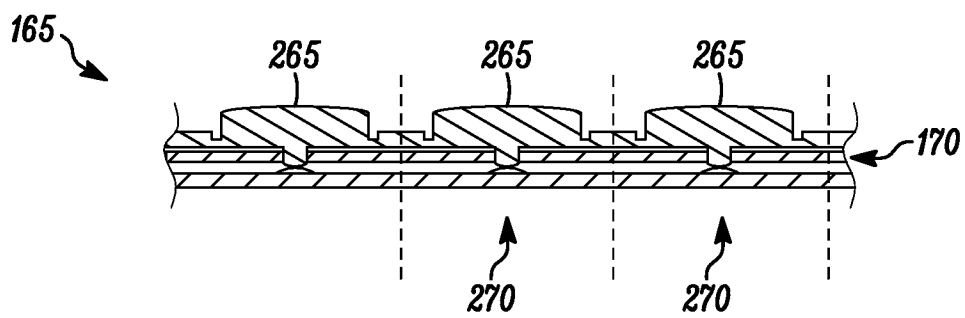
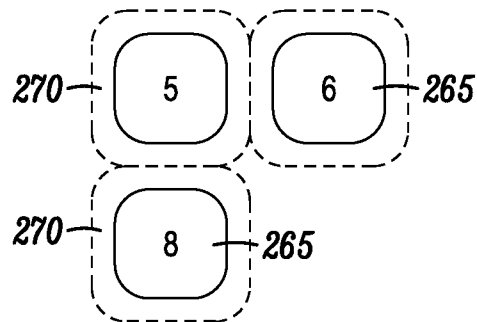
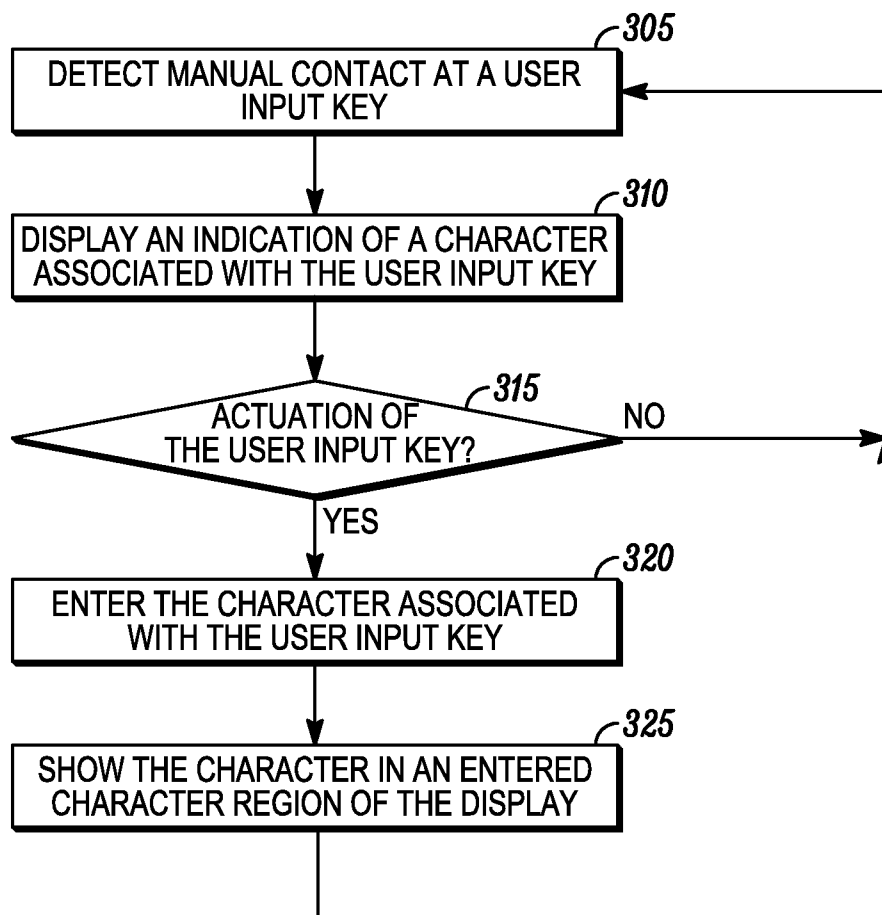


FIG. 2B

3/5*FIG. 2C*300*FIG. 3*

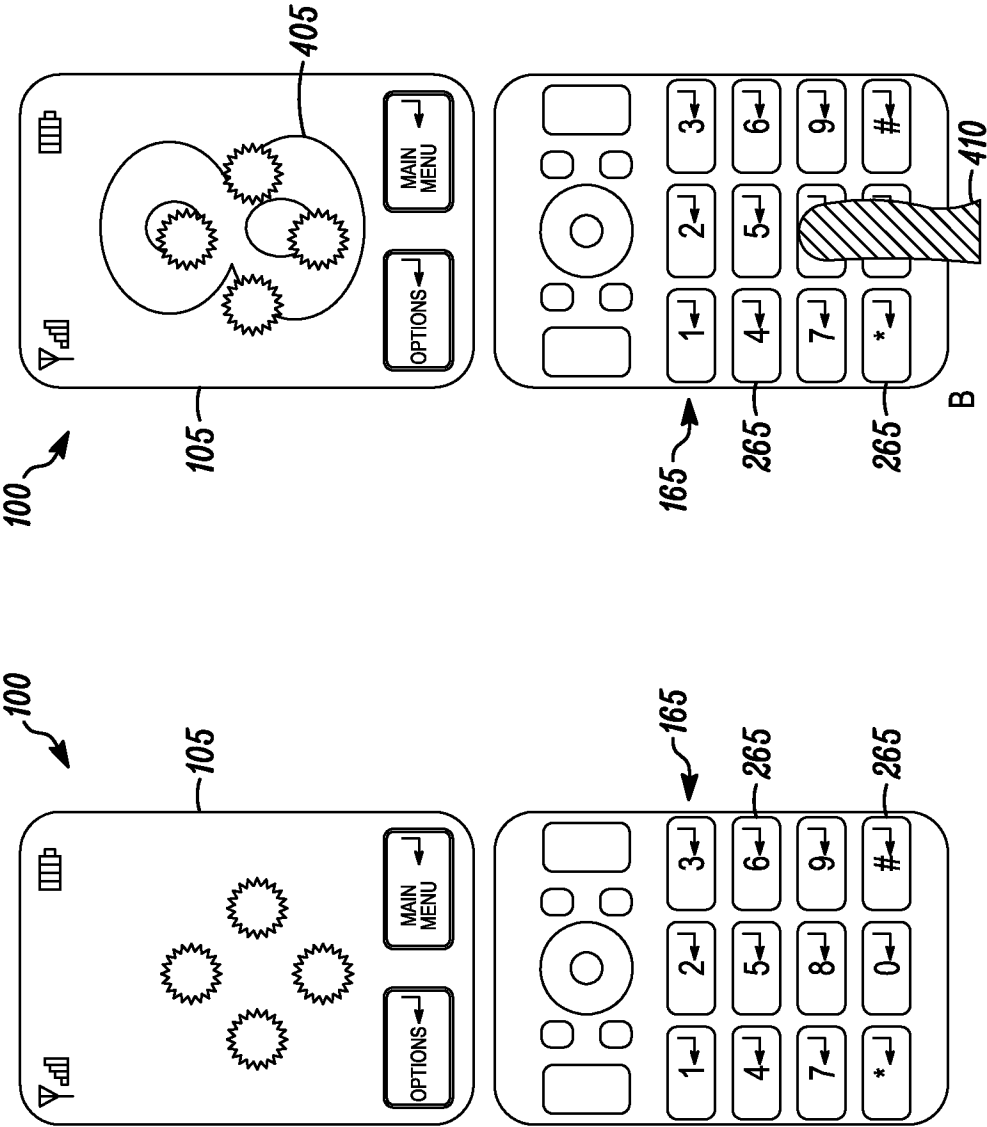


FIG. 4B

FIG. 4A

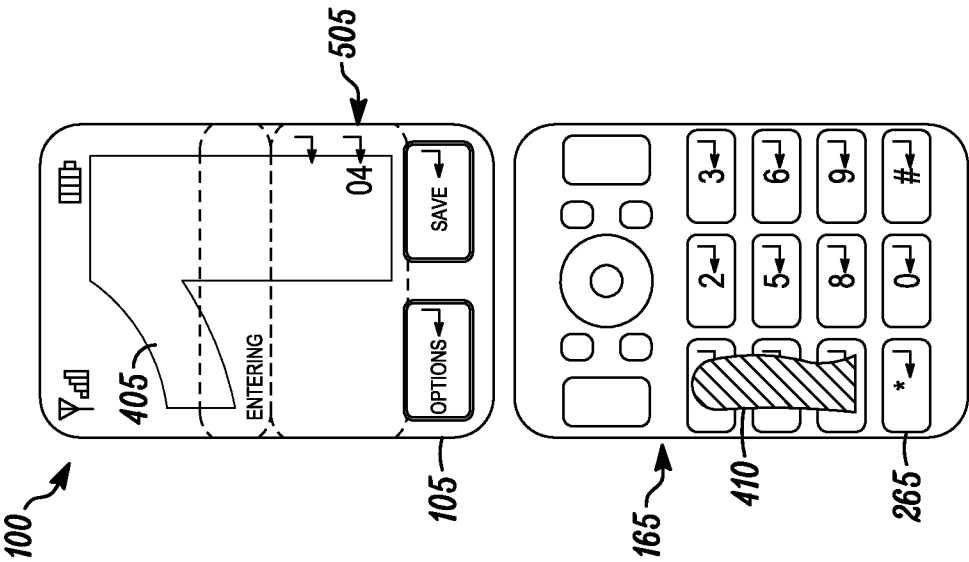


FIG. 5A

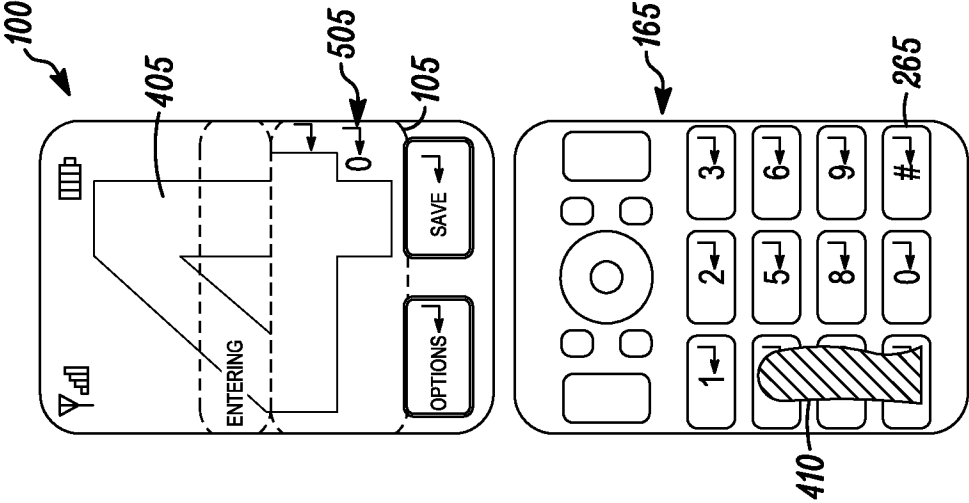


FIG. 5B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/068318**A. CLASSIFICATION OF SUBJECT MATTER*****H04B 1/40(2006.01)i, G06F 3/041(2006.01)i***

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 8 H04B, H04M, G06F, G09G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
KOREAN UTILITY MODELS AND APPLICATIONS FOR UTILITY MODELS SINCE 1975
JAPANESE UTILITY MODELS AND APPLICATIONS FOR UTILITY MODELS SINCE 1975Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKIPASS (KIPO internal) & keywords : "touch", "press", "character", "key"**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-2006-0003612 A (PANTECH CO., LTD.) 11 January 2006 See abstract; claims 1, 5-9, 11-13; figures 1-3 and their corresponding specifications.	1-14
P,X	US 2007-0205990 A1 (DANIEL MONTEITH GLOYD et al.) 06 September 2007 See abstract; paragraphs 34-49; and figures 3, 4, 9.	1-14
A	EP 1770484 A2 (NTT DOCOMO INC.) 04 April 2007 See abstract; figures 1-3 and their corresponding specifications.	1-14
A	JP 2004-318362 A (KYOCERA CORP) 11 November 2004 See abstract; figures 1, 3 and their corresponding specifications.	1-14

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

29 SEPTEMBER 2008 (29.09.2008)

Date of mailing of the international search report

29 SEPTEMBER 2008 (29.09.2008)

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