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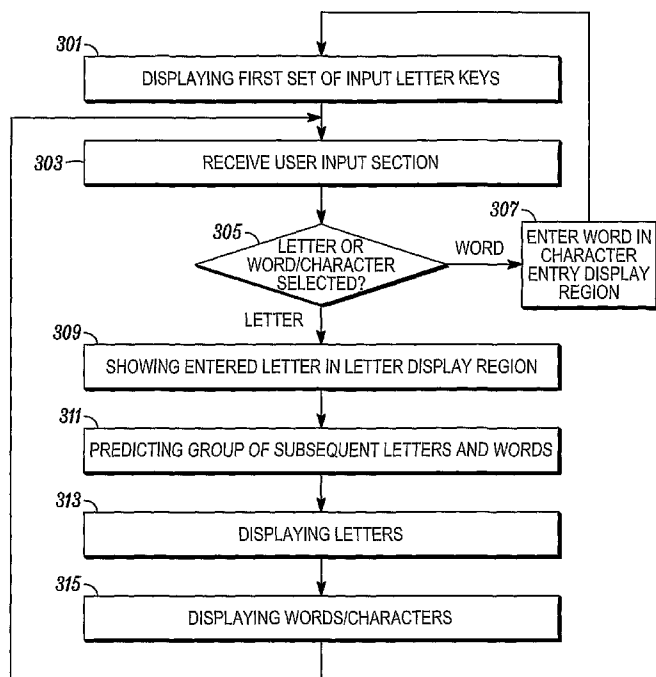
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(54) Title: ENTERING TEXT INTO AN ELECTRONIC DEVICE



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(57) Abstract: A method (300) for entering a character into an electronic device (100) that includes displaying (301) input character keys (204) displaying a first set of input letter keys (207) in a text entry keyboard touch sensitive region (203) of a display screen (105) of the device (100). Predicting (311) is then performed to predict a group of potential subsequent letters that follow an entered letter, the entered letter being selected by actuation of one of the letter keys (207). Next, the method (300) performs displaying (313) a second set of input letter keys (407) identifying the potential subsequent letters, the second set of input letter keys (407) replacing the first set of letter keys (207) displayed in the text entry keyboard touch sensitive region, the second set of input letter keys (407) substantially filling the text entry keyboard touch sensitive region (203).

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ENTERING TEXT INTO AN ELECTRONIC DEVICE

FIELD OF THE INVENTION

5 The present invention relates generally to the field of character input into an electronic device. The invention is particularly useful for, but not necessarily limited to, entering phone numbers or short text messages into an electronic device having a relatively small touch screen.

BACKGROUND OF THE INVENTION

10 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.

20 For purposes of convenience there is a general trend toward miniaturization of many types of handheld electronic devices, specifically handheld wireless communication devices. Miniaturization generally makes it easier to carry the device, including fitting the device into a user's pocket/purse or attaching the device to a user's belt. Furthermore, touch screens have been used on handheld electronic devices in which the keypad keys are displayed on the touch screen and allow a user to enter text and commands by simply use of a stylus ``touching'' an area of the screen displaying a key associated with a desired letter or command. Although touch screens are useful and offer ease of use, the trend towards miniaturization has resulted in smaller keys displayed thereon. This can make the keys difficult for the user to locate and select. For example in a QWERTY keyboard, fitting 50 keys onto a display area of typically 2.5cm by

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5cm results in a key size of about 5mm by 5mm. The difficulty in seeing the keys and identifying the wanted key is exacerbated by movement of the user, for example whilst seated on a train or whilst the user moves about the environment. The portability of these devices encourages usage in such circumstances, however the above described method of entering data or commands makes this difficult to achieve satisfactorily.

10 A related problem is that the small keys are difficult for the user to select with a stylus often resulting in the user selecting an adjacent key by mistake. This is both frustrating for the user, and requires additional keystrokes to recover from the mistake. As with the problem of identifying the keys in the first place, the problem of correctly selecting them with a stylus is exacerbated by user movement.

20 These problems have been addressed to some extent by enlarging the key, and surrounding key, that a user's stylus is located on, so that as the user scans across a small key keyboard, the keys surrounding the tip of the stylus enlarge to make it easier to see and select them. This mechanism is particularly useful if the user is familiar with the keyboard layout and can then go to the area of the screen where a wanted character key resides.

30 Another method of addressing these problems is with the use of predictive text entry which aims to reduce the number of key strokes required by the user, and hence the identification burden mentioned above as well as the number of mistakes in selecting keys. Predictive text entry uses well known algorithms to predict likely dictionary words based on and containing a number of character keys selected by the user. The word or words are displayed in a different part of the display, and the user can select an appropriate word if it is the one he or she was intending to enter

using the keyboard keys. This can reduce the number of keys the user needs to identify and select.

5 A variation of this method highlights keys on the keyboard which correspond to the next character in each predicted word. This makes it easier for the user to identify the most likely next keys on the keyboard. The algorithm predicts the most likely words the user is trying to input based on characters already entered by the user.

10 SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided a method for entering text into an electronic device, the method including: displaying a first set of input letter keys in a text entry keyboard touch sensitive region of a display screen of the device, each key in the first set of input letter keys identifying an associated letter; predicting a group of potential subsequent letters that follow an entered letter, the entered letter being selected by actuation of one of the letter keys; and displaying a second set of input letter keys identifying the potential subsequent letters, the second set of input letter keys replacing the first set of letter keys displayed in the text entry keyboard touch sensitive region, the second set of input letter keys substantially filling the text entry keyboard touch sensitive region.

30 The method may suitably further include showing the entered letter in a display region of the screen.

Suitably, the second set of input letter keys are aligned in a single row across the text entry keyboard touch sensitive region. Each key comprising the second set of input letter keys may extend across a full width of the text entry keyboard touch sensitive region.

5 The displaying a second set of input letter keys suitably includes refreshing the text entry keyboard touch sensitive region to replace all of the first set of input letter keys with the second set of input letter keys.

10 Suitably, the method may include determining a group of potential words in response to actuation of one of the second set of input letter keys.

15 The group of potential words may be represented as ideographic characters displayed on the display screen. The method may also suitably include entering in a display region of the screen one of the potential characters.

20 BRIEF DESCRIPTION OF THE DRAWINGS

25 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:

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

35 Fig. 2 illustrates an initial touch screen layout with a first set of input letter keys displayed on a display screen of the electronic device of Fig 1;

Fig. 3 is a flow diagram illustrating a method for entering text into the electronic device Fig. 1 in accordance with the present invention;

Fig. 4 illustrates a touch screen layout with a second set of input letter keys displayed on a display screen of the electronic device of Fig 1;and

Fig. 5 illustrates a touch screen layout with a third set of input letter keys displayed on a display screen of the electronic device of Fig 1

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 help to improve understanding of embodiments of the present invention.

DETAILED DESCRIPTION

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 apparatus components related to entering characters into an electronic device using a touch sensitive display screen. 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 the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein.

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 method 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 method or device. An element preceded by "comprises" does not, without more constraints, preclude the existence of additional identical elements in the process, method, article, or apparatus 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 entering characters into an electronic device using a touch sensitive display screen 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 entering characters into an electronic device using a touch sensitive display screen. 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. 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.

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It will be appreciated that embodiments of the invention described herein may also be comprised of one or more software programs, embodied as processor control code, for example on a carrier medium such as a disk, CD- or DVD-ROM, programmed memory such as read only memory (Firmware),
10 or on a data carrier such as an optical or electrical signal carrier, for example an Internet download. As the skilled person will appreciate, the code may be distributed between a plurality of coupled components in communication
15 with one another.

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
20 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 touch screen 105 and auxiliary keys 165. There is also an alert module 115 that typically contains an alert speaker,
25 vibrator motor and associated drivers. The touch screen 105, auxiliary keys 165 and alert module 115 are coupled to be in communication with the processor 103.

The processor 103 includes an encoder/decoder 111 with an associated code Read Only Memory (ROM) 112 for storing
30 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 micro-processor 113 coupled, by a common data and address bus 117, to the encoder/decoder 111, a character Read Only Memory (ROM)
35 114, a Random Access Memory (RAM) 104, static programmable memory 116 and a Removable User Identity Module (RUIM) interface 118. 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 micro-processor 113 has ports for coupling to the touch screen 105, the auxiliary keys and the alert module 115. Also, micro-processor 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 micro-processor 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.

Referring to FIG. 2, there is illustrated an initial touch screen layout 200 associated with the display screen 105 of the electronic device 100. The touch screen layout 200 comprises: a primary character entry display region 201; a first touch sensitive region 202 having a text entry keyboard touch sensitive region 203 and other input key

region(s) 204; a second touch sensitive region 205; and a letter display region 206.

5 The primary character entry display region 201 displays text such as words, ideographic characters or other data that can be entered by the user. The user enters the words, ideographic characters or other data by selecting (touching) keys typically with a stylus displayed in the first touch sensitive region 202. The first touch
10 sensitive region 202 displays an initial keyboard layout having a text entry keyboard touch sensitive region 203 that initially displays a first set of input letter keys 207 each identifying an associated letter of the alphabet (a to z).. As illustrated, the text entry keyboard touch
15 sensitive region 203 is a standard QWERTY type keyboard layout.

Letters are input into the device 100 and displayed on the secondary character entry display region 206 by a user
20 selecting the letter keys 207. The second touch sensitive region 205 displays predicted words or ideographic characters (such a Chinese characters) corresponding to a sequence of letters entered by the user. These words are also user selectable by contact with a stylus or finger at
25 an appropriate part of the second touch sensitive region 205. A selected word or ideographic character is therefore entered into the primary character entry display region 201 by selecting the appropriate word or ideographic character in the second touch sensitive region 205.

30 Predictive text algorithms are well known in the art, and any suitable algorithm may be implemented. A predictive text algorithm which provides likelihood information associated with each predicted word is typically used
35 according to pre-defined frequency of use statistics. This information can then be used to determine an order identifying which of the predicted or potential words are

most likely given the characters already entered by the user. The likelihood information may be a number or a percentage, or any other parameter suitable for use by other applications resident on the device. As is known, the predicted words are drawn from those stored in an on-board dictionary, typically stored in the static memory 116, and may include special terms such as device specific commands for example.

Referring to FIG. 3 there is illustrated a flow diagram of a method 300 of entering text into the electronic device 100. At step 301 there is provided displaying 301 a first set of input letter keys 207 in the text entry keyboard touch sensitive region 203 of the display screen 105 of the device 100, each key in the first set of input letter keys 207 identifying an associated letter of the alphabet (a to z). The electronic device 100 then receives a user input selection, at step 303, that corresponds to actuation of one of the first set of input letter keys 207 or if appropriate selection of a predicted word displayed in the second touch sensitive region 205.

The method 300 then determines whether a letter or a word was selected or entered at a test step 305. It should be noted that in this specification the term "word" is interpreted broadly and includes an idiographic character that may form a complete word or syllable as will be apparent to a person skilled in the art. If a word was selected from second touch sensitive region 205, the word (forming text) is displayed at step 307 in the character display region 201, and the method 300 returns to the first step 301 (and the screen is refreshed to display the initial touch screen layout 200 with the word (text) displayed in region 201) or the method 300 terminates by a suitable interrupt command. If a letter was selected at step 303 by appropriate actuation of one of the letters from the first set of input letter keys 207, then after the

test step 305 the corresponding entered letter may be shown on the letter display region 206 at an optional showing step 309.

5 Referring to both Fig. 3 and Fig. 4, and by way of example assume a letter "m" was selected (entered) at step 303 and displayed in the letter display region 206 at an optional showing step 309. Then at step 311 the method 300 performs predicting a group of potential subsequent letters
10 that follow the entered letter. The predicting is based on identifying words that comprise the entered letter (or letters) using any well known predictive text algorithm. The predicting may also include predicting possible or potential words and specifically in this example the words
15 are Chinese ideographic characters that are represented by alphabetic letters in the commonly used pinyin representation.

The method 300 then, at step 313, performs displaying
20 a second set of input letter keys 407 identifying the potential subsequent letters, the second set of input letter keys 407 replacing the first set of letter keys 207 displayed in the text entry keyboard touch sensitive region 203. As shown, the second set of input letter keys 407
25 substantially fills the text entry keyboard touch sensitive region 203. Since, the letter "m" was selected then for pinyin entry the only possible following letters are "a", "e", "u", "i" and "o", and thus these letters are the only letters that belong to the second set of input letter keys 407.

30 As shown, the set of input letter keys 407 are aligned in a single row across the text entry keyboard touch sensitive region. Also, each key comprising the second set of input letter keys 407 extend across a full width of the
35 text entry keyboard touch sensitive region. It will also be noted that in order for the displaying of the second set of input letter keys 407 the displaying includes refreshing

the text entry keyboard touch sensitive region to replace all of the first set of input letter keys 207 with the second set of input letter keys 407.

5 At step 315 the predicted potential words, in this example Chinese ideographic characters, are displayed in the second touch sensitive region 205. Next, the method 300 then returns to step 303 in anticipation of receiving a user input selection, that corresponds to actuation of one
10 of the second set of input letter keys 407 or if appropriate selection of a predicted word displayed in the second touch sensitive region 205. The method 300 then again determines whether a letter or a word was selected or entered at a test step 305. If a word was selected from
15 second touch sensitive region 205, the word is displayed at step 307 in the character display region 201, and the method 300 returns to the first step 301 (and the screen is refreshed to display the initial touch screen layout 200 with the word displayed in region 201) or the method 300
20 terminates by a suitable interrupt command.

Referring to both Figs. 3 and 5, if a letter was entered (selected) at step 303, for example the letter ``o'' then the corresponding entered (selected) letter may be
25 shown on the letter display region 206 next to the already entered letter ``m:'' at an optional showing step 309. Accordingly, steps 311, 313 and 315 perform predicting both: another group of potential subsequent letters that follow the entered letter and potential words. The another
30 group of potential subsequent letters are displayed in third set of input letter keys 507 that replace the second set of letter keys 407. Since, the letters "mo" were sequentially selected then for pinyin entry there is only one possible letter ``u'' and thus this letter is the only
35 letter that belongs to the third set of input letter keys 507.

After repeating step 315 in which the predicted potential words are displayed in the second touch sensitive region 205 the method 300 again returns to step 303. Since there is only one letter that belongs to the third set of input letter keys 507 the user simply selects a word from the second touch sensitive region 205 that is then (entered) displayed at step 307 in the character display region 201. The method 300 returns to the first step 301 (and the screen is refreshed to display the initial touch screen layout 200 with the word displayed in region 201) or the method 300 terminates by a suitable interrupt command.

The described embodiment is especially well suited to facilitate improved text or data entry in portable or other small screen devices such as mobile phones, smart phones, PDA's, portable media devices and the like. The invention is ideally suited for small handheld electronic devices with small display screens, where the second set or subsequent third or (even fourth set etc) of input letter keys substantially fill the text entry keyboard touch sensitive region 203. Hence, by filling the text entry keyboard touch sensitive region 203 the keys are substantially larger than normal and therefore selection errors are somewhat reduced.

In addition to small handheld electronic devices other types of devices may also benefit from the described methods and apparatus. The embodiments may be used for example for entering text into email or SMS messages, or phone number, address and name information into a phone book database. Various other data entry and command entry applications can also be envisioned.

In the foregoing specification, a specific embodiment of the present invention has 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 for entering text into an electronic device, the method including:

5 displaying a first set of input letter keys in a text entry keyboard touch sensitive region of a display screen of the device, each key in the first set of input letter keys identifying an associated letter;

10 predicting a group of potential subsequent letters that follow an entered letter, the entered letter being selected by actuation of one of the letter keys; and

15 displaying a second set of input letter keys identifying the potential subsequent letters, the second set of input letter keys replacing the first set of letter keys displayed in the text entry keyboard touch sensitive region, the second set of input letter keys substantially filling the text entry keyboard touch sensitive region.

20 2. A method for entering text into an electronic device as claimed in claim 1 further including showing the entered letter in a display region of the screen.

25 3. A method for entering text into an electronic device as claimed in claim 1 wherein the second set of input letter keys are aligned in a single row across the text entry keyboard touch sensitive region.

30 4. A method for entering text into an electronic device as claimed in claim 1 wherein each key comprising the second set of input letter keys extend across a full width of the text entry keyboard touch sensitive region.

35 5. A method for entering text into an electronic device as claimed in claim 1 wherein the displaying a second set of input letter keys includes refreshing the text entry keyboard touch sensitive region to replace all

of the first set of input letter keys with the second set of input letter keys.

5 6. A method for entering text into an electronic device as claimed in claim 1 including determining a group of potential words in response to actuation of one of the second set of input letter keys.

10 7. A method for entering text into an electronic device as claimed in claim 6, wherein the group of potential words are represented as ideographic characters displayed on the display screen.

15 8. A method for entering text into an electronic device as claimed in claim 1 further including entering in a display region of the screen one of the potential characters.

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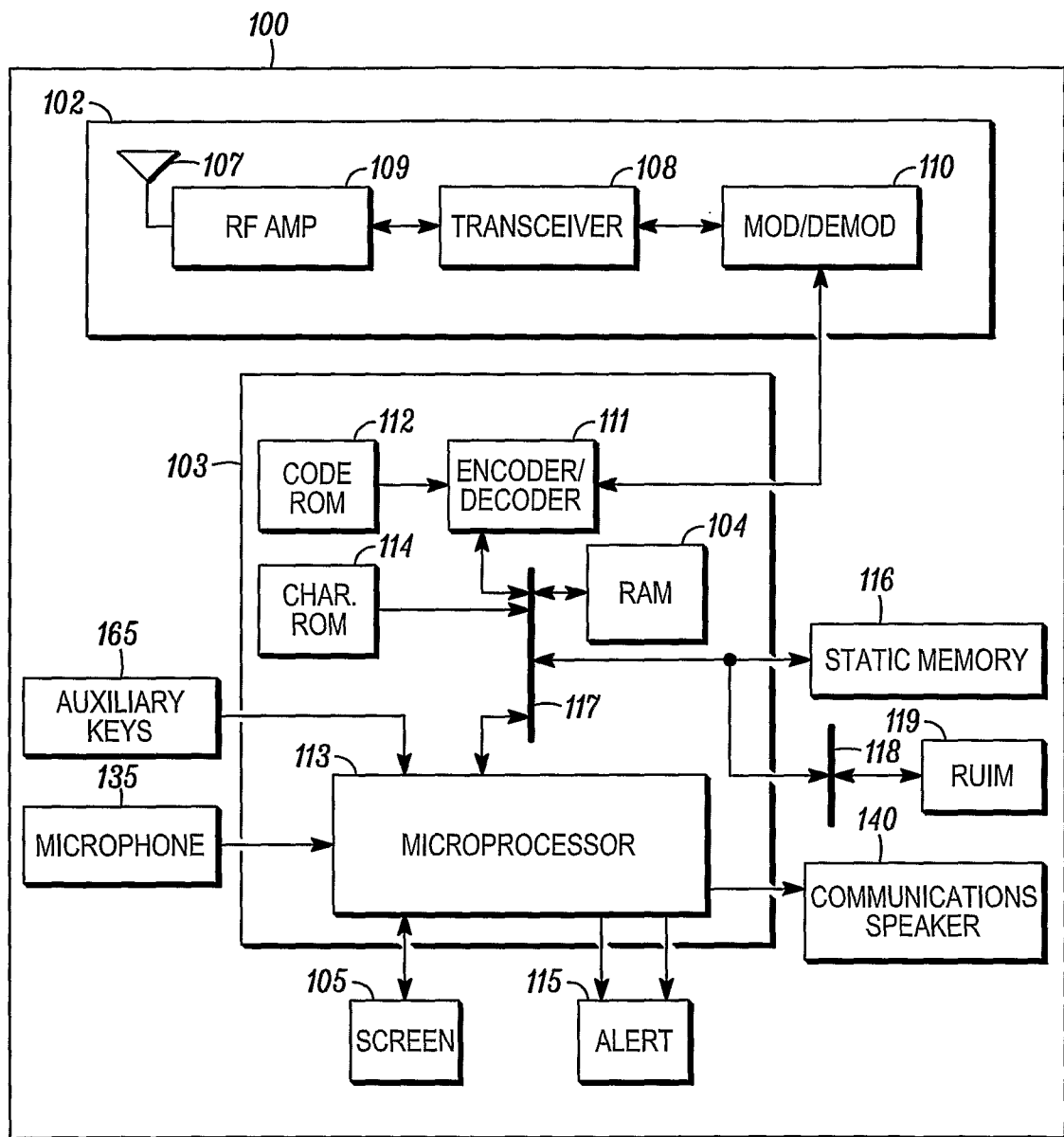
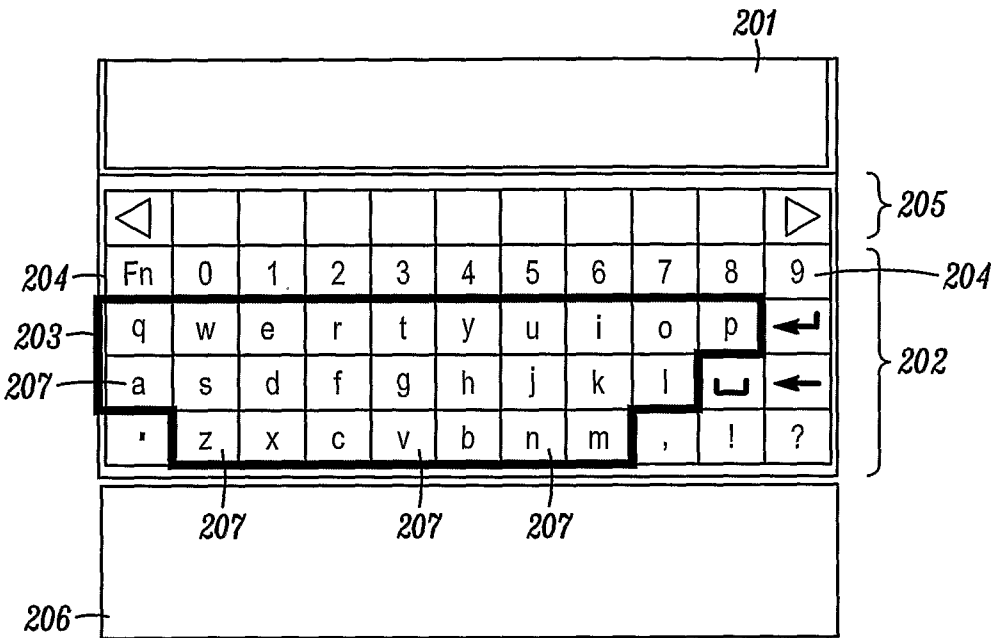


FIG. 1

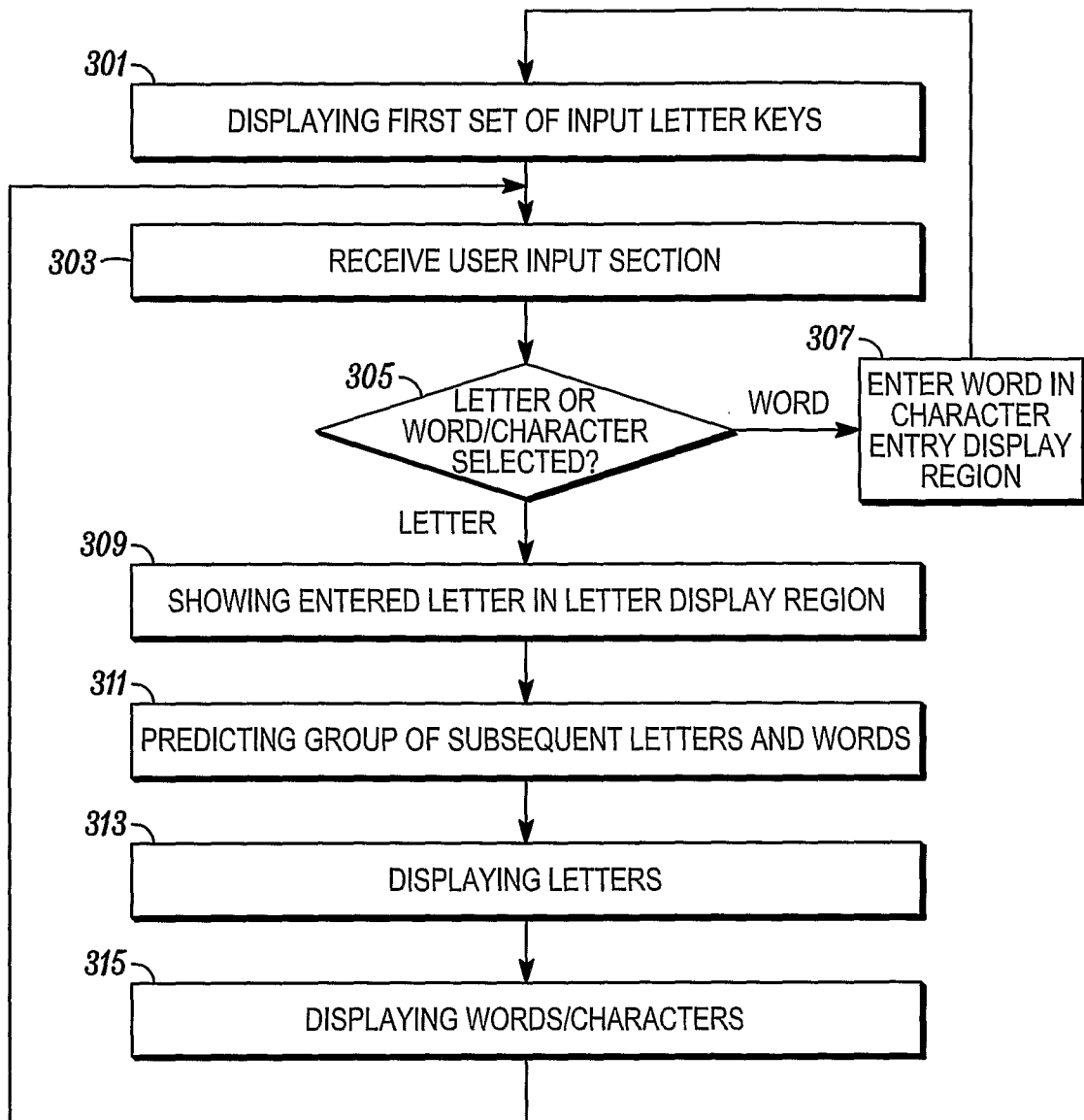
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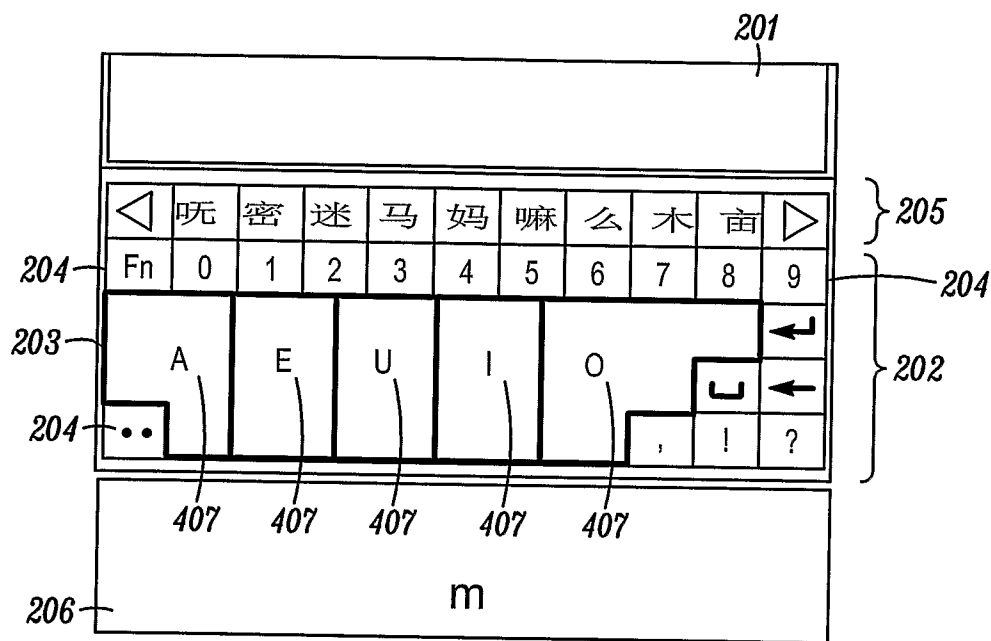
200

FIG. 2

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300*FIG. 3*

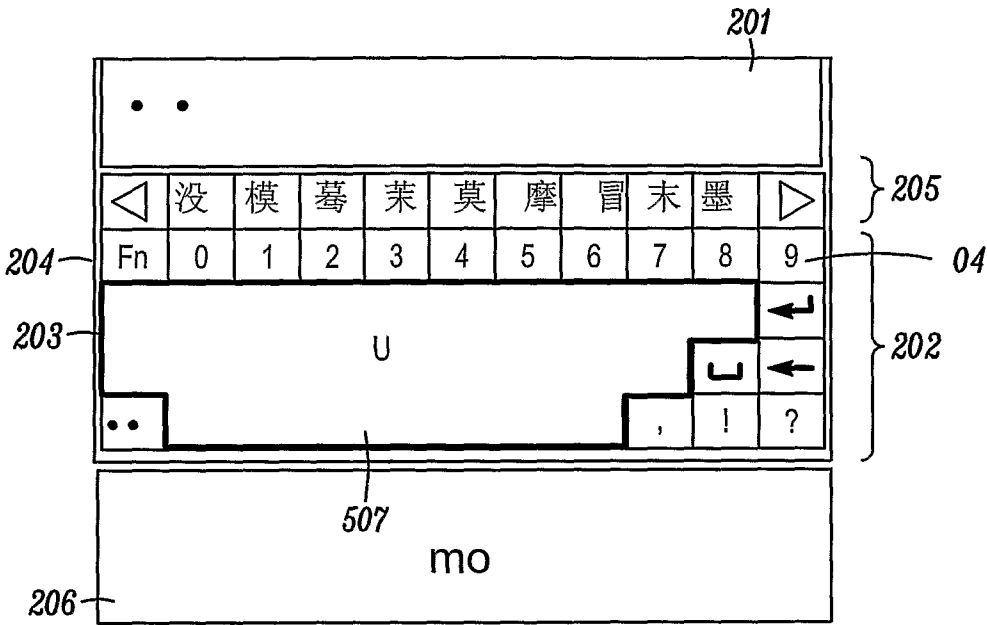
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FIG. 4

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FIG. 5