(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
29 August 2013 (29.08.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/123571 A1

(51) International Patent Classification:
G06F 3/041 (2006.01) *H04W 88/02* (2009.01)
G06F 3/048 (2013.01) *G06F 15/02* (2006.01)
H03M 11/20 (2006.01)

(21) International Application Number:
PCT/CA2012/050362

(22) International Filing Date:
31 May 2012 (31.05.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/603,094 24 February 2012 (24.02.2012) US

(71) Applicant *(for all designated States except US)*: **RESEARCH IN MOTION LIMITED** [CA/CA]; 295 Phillip Street, Waterloo, Ontario N2L 3W8 (CA).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **PASQUERO, Jerome** [CA/CA]; 295 Phillip Street, Ext. 74260, Waterloo, Ontario N2L 3W8 (CA). **PINHEIRO, Gil** [CA/CA]; 295 Phillip Street, Ext. 15730, Waterloo, Ontario N2L 3W8 (CA). **MCKENZIE, Donald Somerset Mcculloch** [CA/CA]; 295 Phillip Street, Ext. 71318, Waterloo, Ontario N2L 3W8 (CA). **GRIFFIN, Jason Tyler** [CA/CA]; 295 Phillip Street, Ext. 72251, Waterloo, Ontario N2L 3W8 (CA). **FYKE, Steven Henry** [CA/CA]; 295 Phillip Street, Ext. 72943, Waterloo, Ontario N2L 3W8 (CA). **MCCARTY, Stephanie Elizabeth** [CA/CA]; 295 Phillip Street, Ext. 10858, Waterloo, Ontario N2L 3W8 (CA).

(74) Agents: **DE KLEINE, Geoffrey** et al.; Borden Ladner Gervais LLP, 1200 Waterfront Centre, 200 Burrard Street, P.O. Box 48600, Vancouver, British Columbia V7X 1T2 (CA).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD,

[Continued on next page]

(54) Title: VIRTUAL KEYBOARD WITH DYNAMICALLY RECONFIGURABLE LAYOUT

(57) Abstract: A method includes displaying a first keyboard on a touch-sensitive display of an electronic device, detecting a touch on the first keyboard, and when the touch is associated with a keyboard transformation function, changing the first keyboard into a second keyboard by moving keys of the first keyboard relative to other keys of the first keyboard, from first locations, along respective key paths, to second locations on the touch-sensitive display.

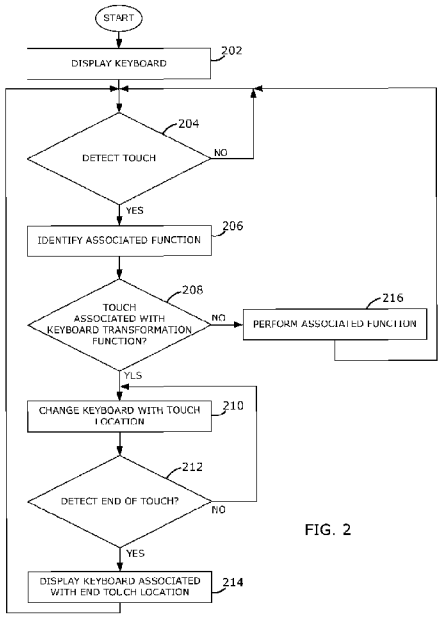


FIG. 2

WO 2013/123571 A1

SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:

— *with international search report (Art. 21(3))*

VIRTUAL KEYBOARD WITH DYNAMICALLY RECONFIGURABLE LAYOUT

FIELD OF TECHNOLOGY

[0001] The present disclosure relates to electronic devices including but not limited to portable electronic devices having touch-sensitive displays and their control.

BACKGROUND

[0002] Electronic devices, including portable electronic devices, have gained widespread use and may provide a variety of functions including, for example, telephonic, electronic messaging and other personal information manager (PIM) application functions. Portable electronic devices include several types of devices including mobile stations such as simple cellular telephones, smart telephones (smart phones), Personal Digital Assistants (PDAs), tablet computers, and laptop computers, with wireless network communications or near-field communications connectivity such as Bluetooth® capabilities.

[0003] Portable electronic devices such as PDAs, or tablet computers are generally intended for handheld use and ease of portability. Smaller devices are generally desirable for portability. A touch-sensitive display, also known as a touchscreen display, is particularly useful on handheld devices, which are small and may have limited space for user input and output. The information displayed on the display may be modified depending on the functions and operations being performed.

[0004] Improvements in electronic devices with touch-sensitive displays are desirable.

SUMMARY

[0005] According to one aspect, a method is provided. The method includes displaying a first keyboard on a touch-sensitive display of an electronic device, detecting a touch on the first keyboard, and when the touch is associated with a keyboard transformation function, changing the first keyboard into a second keyboard by moving keys of the first keyboard relative to other keys of the first keyboard, from first locations, along respective key paths, to second locations on the touch-sensitive display.

[0006] According to another aspect, an electronic device is provided. The electronic device includes a touch-sensitive display and at least one processor coupled to the touch-sensitive display and configured to display a first keyboard on the touch-sensitive display, detect a touch on the first keyboard, and when the touch is associated with a keyboard transformation function, change the first keyboard into a second keyboard by moving keys of the first keyboard relative to other keys of the first keyboard, from first locations, along respective key paths, to second locations on the touch-sensitive display.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Embodiments of the present disclosure will now be described, by way of example only, with reference to the attached Figures, wherein:

[0008] FIG. 1 is a block diagram of a portable electronic device in accordance with an example;

[0009] FIG. 2 is a flowchart illustrating an example of a method of changing a keyboard displayed on an electronic device; and

[0010] FIG. 3 through FIG. 9 are front views illustrating one example of changing a keyboard displayed on an electronic device in accordance with the method of FIG. 2.

DETAILED DESCRIPTION

[0011] The following describes an electronic device and method including displaying a first keyboard on a touch-sensitive display of an electronic device, detecting a touch on the first keyboard, and when the touch is associated with a keyboard transformation function, changing the first keyboard into a second keyboard by moving keys of the first keyboard relative to other keys of the first keyboard, from first locations, along respective key paths, to second locations on the touch-sensitive display.

[0012] For simplicity and clarity of illustration, reference numerals may be repeated among the figures to indicate corresponding or analogous elements. Numerous details are set forth to provide an understanding of the examples described herein. The examples may be practiced without these details. In other instances, well-known methods, procedures, and components are not described in detail to avoid obscuring the examples described. The description is not to be considered as limited to the scope of the examples described herein.

[0013] The disclosure generally relates to an electronic device, such as a portable electronic device as described herein. Examples of electronic devices include mobile, or handheld, wireless communication devices such as pagers, cellular phones, cellular smart-phones, wireless organizers, personal digital assistants, wirelessly enabled notebook computers, tablet computers, mobile internet devices, electronic navigation devices, and so forth. The portable electronic device may also be a portable electronic device without wireless communication capabilities, such as a handheld electronic game device, digital photograph album, digital camera, media player, e-book reader, and so forth.

[0014] A block diagram of an example of a portable electronic device 100 is shown in FIG. 1. The electronic device 100 includes multiple components, such as a processor 102 that controls the overall operation of the portable electronic device 100. Communication functions, including data and voice communications, are performed through a communication subsystem 104. Data received by the

portable electronic device 100 is decompressed and decrypted by a decoder 106. The communication subsystem 104 receives messages from and sends messages to a wireless network 150. The wireless network 150 may be any type of wireless network, including, but not limited to, data wireless networks, voice wireless networks, and networks that support both voice and data communications. A power source 142, such as one or more rechargeable batteries or a port to an external power supply, powers the portable electronic device 100.

[0015] The processor 102 interacts with other components, such as a Random Access Memory (RAM) 108, memory 110, a touch-sensitive display 118, an auxiliary input/output (I/O) subsystem 124, a data port 126, a speaker 128, a microphone 130, short-range communications 132 and other device subsystems 134. The touch-sensitive display 118 includes a display 112 and touch sensors 114 that are coupled to at least one controller 116 that is utilized to interact with the processor 102. Input via a graphical user interface is provided via the touch-sensitive display 118. Information, such as text, characters, symbols, images, icons, and other items that may be displayed or rendered on a portable electronic device, is displayed on the touch-sensitive display 118 via the processor 102. Optionally, the processor may interact with one or more force sensors 122. The processor 102 may also interact with an accelerometer 136 that may be utilized to detect direction of gravitational forces or gravity-induced reaction forces.

[0016] To identify a subscriber for network access, the portable electronic device 100 may utilize a Subscriber Identity Module or a Removable User Identity Module (SIM/RUIM) card 138 for communication with a network, such as the wireless network 150. Alternatively, user identification information may be programmed into memory 110.

[0017] The portable electronic device 100 includes an operating system 146 and software programs, applications, or components 148 that are executed by

the processor 102 and are typically stored in a persistent, updatable store such as the memory 110. Additional applications or programs may be loaded onto the portable electronic device 100 through the wireless network 150, the auxiliary I/O subsystem 124, the data port 126, the short-range communications subsystem 132, or any other suitable subsystem 134.

[0018] A received signal such as a text message, an e-mail message, or web page download is processed by the communication subsystem 104 and input to the processor 102. The processor 102 processes the received signal for output to the display 112 and/or to the auxiliary I/O subsystem 124. A subscriber may generate data items, for example e-mail messages, which may be transmitted over the wireless network 150 through the communication subsystem 104. For voice communications, the overall operation of the portable electronic device 100 is similar. The speaker 128 outputs audible information converted from electrical signals, and the microphone 130 converts audible information into electrical signals for processing.

[0019] The touch-sensitive display 118 may be any suitable touch-sensitive display, such as a capacitive, resistive, infrared, surface acoustic wave (SAW) touch-sensitive display, strain gauge, optical imaging, dispersive signal technology, acoustic pulse recognition, and so forth. A capacitive touch-sensitive display includes one or more capacitive touch sensors 114. The capacitive touch sensors may comprise any suitable material, such as indium tin oxide (ITO).

[0020] One or more touches, also known as touch contacts or touch events, may be detected by the touch-sensitive display 118. The processor 102 may determine attributes of the touch, including a location of the touch. Touch location data may include data for an area of contact or data for a single point of contact, such as a point at or near a center of the area of contact. The location of a detected touch may include x and y components, e.g., horizontal and vertical components, respectively, with respect to one's view of the touch-sensitive display 118. A touch may be detected from any suitable input member, such as a finger, thumb, appendage, or other objects, for example, a stylus, pen, or

other pointer, depending on the nature of the touch-sensitive display 118. Multiple simultaneous touches may be detected.

[0021] One or more gestures may also be detected by the touch-sensitive display 118. A gesture, such as a swipe, also known as a flick, is a particular type of touch on a touch-sensitive display 118 and may begin at an origin point and continue to an end point, for example, a concluding end of the gesture. A gesture may be identified by attributes of the gesture, including the origin point, the end point, the distance travelled, the duration, the velocity, and the direction, for example. A gesture may be long or short in distance and/or duration. Two points of the gesture may be utilized to determine a direction of the gesture. A gesture may also include a hover. A hover may be a touch at a location that is generally unchanged over a period of time or is associated with the same selection item for a period of time.

[0022] Optional force sensors 122 may be disposed in conjunction with the touch-sensitive display 118 to determine or react to forces applied to the touch-sensitive display 118. The force sensors 122 may be force-sensitive resistors, strain gauges, piezoelectric or piezoresistive devices, pressure sensors, quantum tunneling composites, force-sensitive switches, or other suitable devices. Force as utilized throughout the specification, including the claims, refers to force measurements, estimates, and/or calculations, such as pressure, deformation, stress, strain, force density, force-area relationships, thrust, torque, and other effects that include force or related quantities. Optionally, force information associated with a detected touch may be utilized to select information, such as information associated with a location of a touch. For example, a touch that does not meet a force threshold may highlight a selection option, whereas a touch that meets a force threshold may select or input that selection option. Selection options include, for example, displayed or virtual keys of a keyboard; selection boxes or windows, e.g., "cancel," "delete," or "unlock"; function buttons, such as play or stop on a music player; and so forth. Different magnitudes of force may be associated with different functions or input. For

example, a lesser force may result in panning, and a higher force may result in zooming.

[0023] A flowchart illustrating an example of a method of changing a keyboard displayed on an electronic device, such as the electronic device 100, is shown in FIG. 2. The method may be carried out by software executed, for example, processor 102 and/or the controller 116. Coding of software for carrying out such a method is within the scope of a person of ordinary skill in the art given the present description. The method may contain additional or fewer processes than shown and/or described, and may be performed in a different order. Computer-readable code executable by at least one controller or processor of the portable electronic device to perform the method may be stored in a computer-readable medium, such as a non-transitory computer-readable medium.

[0024] A keyboard is displayed on the touch-sensitive display 118 at 202. The keyboard may be any suitable keyboard such as a QWERTY keyboard, QWERTZ keyboard, AZERTY keyboard, and so forth. The keyboard includes a plurality of keys that are associated with characters that may be entered utilizing the keyboard. The keyboard may be displayed in any suitable application. For example, the keyboard may be displayed for composition of a message in a messaging application. The keyboard may be displayed for entry of information in a data entry field in a Web browser application. The keyboard may be displayed for entry of information in other applications, such as a calendar application, a contacts or address book application, a word processing application, or any other suitable application.

[0025] When a touch is detected on the keyboard at 204, the attributes of touch on the touch-sensitive display 118 are determined. The touch may be a gesture, a multi-touch gesture, a tap, a multi-touch tap, or any other suitable touch. The attributes include, for example, duration of a touch, number of touch contacts, direction of the touch when the touch is a gesture, and so forth.

[0026] The touch may be associated with a function and the function is identified at 206. The function that is associated with the touch is dependent on the attributes of the touch. For example a gesture on the keyboard may be associated with a keyboard transformation function to change the layout of the keys of the keyboard, for example. A tap on a location associated with one of the keys of the keyboard may be associated with entry of the character associated with the one of the keys. Another gesture, such as a swipe from a location on the keyboard, in the downward direction, may be associated with a function to hide the keyboard.

[0027] When the touch is associated with a keyboard transformation function at 208, the process continues at 210. The keyboard transformation function is a function to change the keyboard layout by changing the locations of the keys, for example, to increase the number of rows of the keyboard, to decrease the number of rows of the keyboard, to increase the number the columns, or to decrease the number of columns. Different keyboard layouts may also include greater or fewer numbers of keys. The locations of the keys are changed by moving keys of the keyboard relative to other keys of the keyboard. The keys that are moved, move along their respective key paths. For example, when increasing the number of rows of the keyboard, keys may move along a path from one row to the new row. Other keys may also move along a path from one row to another row. Still other keys may move along a path within the row. The keys of the keyboard may also be resized based on the available display width and based on the number of keys of the keyboard. Additional keys may be added when the number of rows is increased. Alternatively, keys may be removed when the number of rows is decreased.

[0028] At 210, the keys move at a rate or speed that is dependent on the speed of the gesture detected. Thus, a slow gesture may be utilized to move the keys slowly to the new locations. Alternatively, a fast gesture may be utilized to move the keys quickly. The keys move with movement of the touch such that the keys move a distance along their respective key paths based on a location of

the touch. When the touch moves farther from an origin or origins of the touch, the keys move farther along their respective key paths. If the direction of the gesture is reversed such that the touch moves in the reverse direction, toward the origin point(s) of the touch, the movement of the keys may be reversed. The distance of movement of the keys may be dependent on the distance of movement of the touch until, for example, the keys are located at their respective end locations along their respective key paths. Thus, further movement of the touch may not result in further movement of the keys.

[0029] When the touch ends at 212, the keyboard associated with the last detected location of the touch is displayed 214. For example, when the touch moves a distance that does not meet a threshold, the keys may return, along their respective key paths, to their starting locations, or locations prior to the touch. When the touch moves a distance that meets or exceeds the threshold, the keys may move to end locations along their respective key paths.

[0030] The movement of the keys along their respective key paths is displayed on the touch-sensitive display 118 when the keyboard is changed. Ready identification of the new locations of keys is facilitated by displaying the movement of the keys during changing of the keyboard.

[0031] When the touch is not associated with a keyboard transformation function at 208, the process continues at 216 where a function associated with the touch is performed.

[0032] One example of changing a keyboard displayed on an electronic device 100 is illustrated in FIG. 3 through FIG. 9 and described with continued reference to FIG. 2. In the front view of FIG. 3, a first keyboard 302 is displayed on the touch-sensitive display 118 at 202. In the example of FIG. 3, the first keyboard 302 is a QWERTY keyboard and includes three rows 304, 306, 308 of keys 310. The keys 310 of the keyboard are sized such that the rows 304, 306, 308 fit the width of the touch-sensitive display 118 when the touch-sensitive display 118 is in the landscape orientation.

[0033] A touch is detected on the keyboard at 204 and the attributes of the touch, including touch contact locations and the directions of movement on the touch-sensitive display 118 are determined. In the example illustrated in FIG. 4, the touch is a multi-touch gesture, including one touch contact beginning at the location illustrated by the circle 402 and moving upwardly in the direction illustrated by the arrow 404 and another touch contact beginning at the location illustrated by the circle 406 and moving upwardly in the direction illustrated by the arrow 408.

[0034] The touch contacts are illustrated by the circles 402, 406 in FIG. 4 through FIG. 9. The touch contacts begin at locations illustrated in FIG. 4, that are associated with the "S" and "L" keys of the keyboard 302. For the purpose of the example of FIG. 3 through FIG. 9, the "S" and "L" keys are predetermined locations on the keyboard 302, from which an upward gesture is associated with the function to change the layout of the keyboard, referred to as the keyboard transformation function, and the function is identified at 206.

[0035] In the example illustrated in FIG. 3 through FIG. 9, the keyboard transformation function is a function to change the keyboard layout by changing the locations of the keys 310, for example, to increase the number of rows of the keyboard to four rows. The keyboard is changed at 210. The change is illustrated in FIG. 5 through FIG. 9.

[0036] As illustrated in FIG. 5, each of the rows 304, 306, 308 of keys 310 of the keyboard 302 are moved upwardly, away from the bottom edge 502 of the display area 504 of the touch-sensitive display 118 as the touches, or locations of touch contact, move. The terms up or upwardly and down or downwardly are utilized herein to refer to directions relative to the orientation of the displayed keyboard illustrated in the figures. The rows of keys 310 are moved upwardly with the gesture such that the contact locations, illustrated by the circles 402, 406 in FIG. 4, are locations at which the keyboard 302 is grabbed to move the

keys 310. The keys 310 are moved a sufficient distance from the bottom edge 502 to provide space for an additional row of keys 310.

[0037] After the keys are moved away from the edge 502, keys drop back down toward the edge 502 as the locations of touch contact move. Not all the keys drop back down toward the edge as the keys move relative to each other, i.e., ones of the keys move relative to other ones of the keys. In this example, the space key 506 drops down and the backspace key 508 and return key 510 drop down such that the space key 506 and the return key 510 move along their respective key paths, to a new or fourth row, as illustrated in FIG. 5 and FIG. 6. The backspace key 508 moves from the second row 306 to the third row 308. Two new keys, including the period, or "." key 512 and the comma, or "," key 514 are added. The two new keys are added to the new, or fourth row 516 of keys. The new keys are displayed as entering the display area of the touch-sensitive display 118, from the bottom edge 502.

[0038] Movement of the space bar to the fourth row 516 provides additional space in the third row 308. As the locations of touch contact continue to move, the keys in the third row 308 are moved along their respective key paths to new locations in the third row, to utilize the space, as illustrated in FIG. 7. The "Z" key 702, the "X" key 704, the "C" key 706, and the V" key 708 move to the right such that the "Z" key 702 moves away from the left edge 710 of the display area 504 to leave a space between the left edge 710 and the "Z" key 702. The "B" key 712, the "N" key 714, the "M" key 716, and the backspace key 508 move along respective key paths to new location in the third row 308 to utilize the space left after movement of the space key 506. Keys in the second row 306 may also be moved along their respective key paths to new locations in the second row to utilize the space left after movement of the backspace key 508.

[0039] Additionally, the shift key 718 and a key 720 that is associated with a numeric/symbolic keyboard are moved down along their respective key paths such that the key 718 associated with the numeric/symbolic keyboard is moved

to the fourth row 516 and the shift key 720 is moved from the second row 306 to the third row 308.

[0040] As the locations of touch contact move further, the keys in the first row 304 are moved along their respective key paths to space the keys along the first row 304, as illustrated in FIG. 8. Each of the keys is resized by changing the width of the keys such that the keys are spaced along and generally fill the width of the display area, with small spaces between the keys, as illustrated in FIG. 9, which shows the second keyboard. As illustrated, the key widths in the second keyboard are not all equal. The keys in the first row 304, for example, are not as wide as the keys in the second row 306 and the third row 308. The fourth row 516 includes keys of greater width than the remaining keys, including the space key 506, the return key 510, and the key 720 associated with the numeric/symbolic keyboard.

[0041] When the touch ends, the last detected locations of touch contact are beyond a threshold distance, as illustrated by the dashed line 902. Thus, the second keyboard is maintained on the touch-sensitive display 118 when the touch ends.

[0042] When a touch ends at locations that are a distance that does not meet the threshold, e.g., are located below the line 902 illustrated in FIG. 9, the keys return, along their respective key paths, to the three row keyboard illustrated in FIG. 3. A multi-touch gesture, such as the gesture illustrated by the circles 402, 406 in FIG. 4 through FIG. 9, may meet the threshold when one or when both touches meet or extend beyond or above the line 902. Alternatively, a multi-touch gesture may be determined to meet the threshold when both touches meet or extend above the line 902.

[0043] In the example described above with reference to FIG. 3 through FIG. 9, a first keyboard that includes three rows of keys is changed to a second keyboard that includes four rows of keys. The keyboard may include other rows

of keys and more rows of keys may be added. The number of rows may also be reduced, for example, from four to three rows.

[0044] The method is not limited to the portable electronic device illustrated in the examples. The method may be applied utilizing other electronic devices. The method may also be applied to a keyboard displayed in a portrait orientation.

[0045] A method includes displaying a first keyboard on a touch-sensitive display of an electronic device, detecting a touch on the first keyboard, and when the touch is associated with a keyboard transformation function, changing the first keyboard into a second keyboard by moving keys of the first keyboard relative to other keys of the first keyboard, from first locations, along respective key paths, to second locations on the touch-sensitive display.

[0046] An electronic device includes a touch-sensitive display and at least one processor coupled to the touch-sensitive display and configured to display a first keyboard on the touch-sensitive display; detect a touch on the first keyboard, and when the touch is associated with a keyboard transformation function, change the first keyboard into a second keyboard by moving keys of the first keyboard relative to other keys of the first keyboard, from first locations, along respective key paths, to second locations on the touch-sensitive display.

[0047] More rows may be added to a keyboard such that additional keys may be added to increase the number of characters that may be entered utilizing the keyboard, and/or to increase the size of keys of the keyboard to facilitate selection of the keys. Alternatively, keys may be removed when the number of rows is decreased or the size of keys may be decreased. The movement of the keys along their respective key paths is displayed on the touch-sensitive display when the keyboard is changed. Ready identification of the new locations of keys is facilitated by displaying the movement of the keys during changing of the keyboard. The user may control the movement of the keys, for example, by controlling the speed. A user may also reverse the movement of the keys by

reversing the direction of movement of the touch. Thus, the user may follow the movement of the keys to their new locations.

[0048] The present disclosure may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the present disclosure is, therefore, indicated by the appended claims rather than by the foregoing description. All changes that come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed is:

Claims

1. A method comprising:

displaying a first keyboard on a touch-sensitive display of an electronic device;

detecting a touch associated with the first keyboard; and

when the touch is associated with a keyboard transformation function, changing the first keyboard into a second keyboard by moving keys of the first keyboard relative to other keys of the first keyboard, from first locations, along respective key paths, to second locations on the touch-sensitive display.

2. The method according to claim 1, wherein changing comprises resizing the keys.

3. The method according to claim 2, wherein resizing the keys comprises changing a width of the keys.

4. The method according to claim 3, wherein the width of the keys is changed based on the available display width.

5. The method according to claim 1, wherein the touch comprises a gesture.

6. The method according to claim 1, wherein the touch comprises a multi-touch gesture.

7. The method according to claim 1, wherein the touch comprises a gesture beginning at predetermined locations on the first keyboard.

8. The method according to claim 1, wherein the touch comprises an upward gesture beginning on the first keyboard and wherein the keys are moved upwardly to provide a space for an addition key row.

9. The method according to claim 8, wherein ones of the keys drop down along their respective key paths, after being moved upwardly into the additional key row.

10. The method according to claim 9, wherein changing comprises resizing the keys after the ones of the keys are dropped down into the additional key row.

11. The method according to claim 9, wherein others of the keys are moved along their respective key paths after the ones of the keys are dropped down.

12. The method according to claim 8, wherein further keys are added to the additional key row.

13. The method according to claim 1, wherein the touch comprises a downward gesture beginning on the first keyboard to remove a key row.

14. The method according to claim 1, wherein the touch comprises a gesture beginning on the first keyboard to add or remove a key row.

15. The method according to claim 1, wherein a distance of movement of the keys along respective key paths is based on a distance of movement of the touch.

16. The method according to claim 15, comprising reversing movement of the keys along their respective key paths in response to a change in direction of movement of the touch.

17. A computer-readable medium having computer-readable code executable by at least one processor of a portable electronic device to perform the method according to any one of claims 1 to 16.

18. An electronic device comprising:

a touch-sensitive display;

at least one processor coupled to the touch-sensitive display and configured to display a first keyboard on the touch-sensitive display, detect a touch on the first keyboard, and when the touch is associated with a keyboard transformation function, change the first keyboard into a second keyboard by moving keys of the first keyboard relative to other keys of the first keyboard, from first locations, along respective key paths, to second locations on the touch-sensitive display.

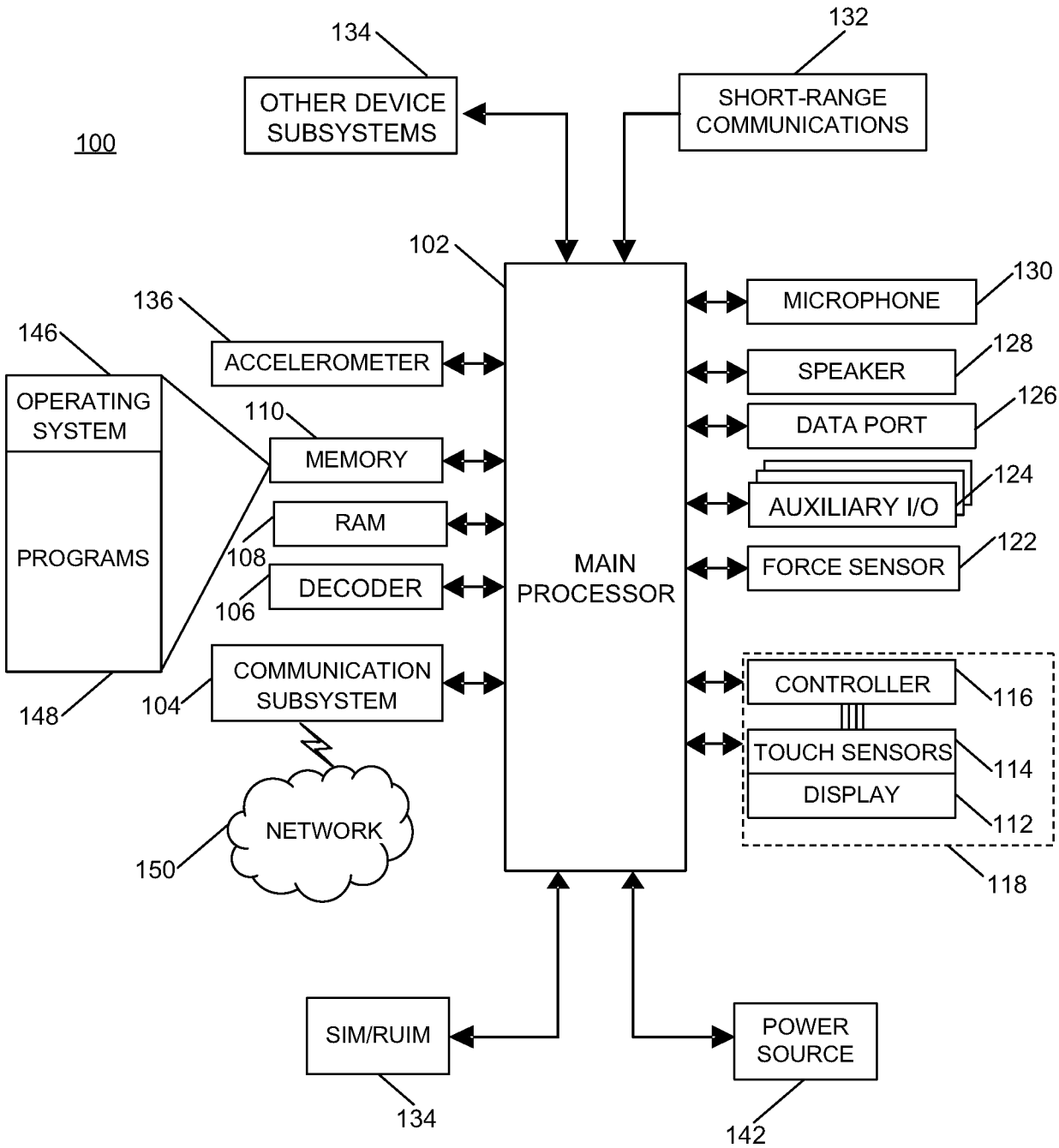

100
134
OTHER DEVICE SUBSYSTEMS
132
SHORT-RANGE COMMUNICATIONS
102
MAIN PROCESSOR
136
ACCELEROMETER
146
OPERATING SYSTEM
PROGRAMS
110
MEMORY
RAM
108
DECODER
106
COMMUNICATION SUBSYSTEM
104
148
NETWORK
150
MICROPHONE
130
SPEAKER
128
DATA PORT
126
AUXILIARY I/O
124
FORCE SENSOR
122
CONTROLLER
116
TOUCH SENSORS
114
DISPLAY
112
118
SIM/RUIM
134
POWER SOURCE
142

FIG. 1

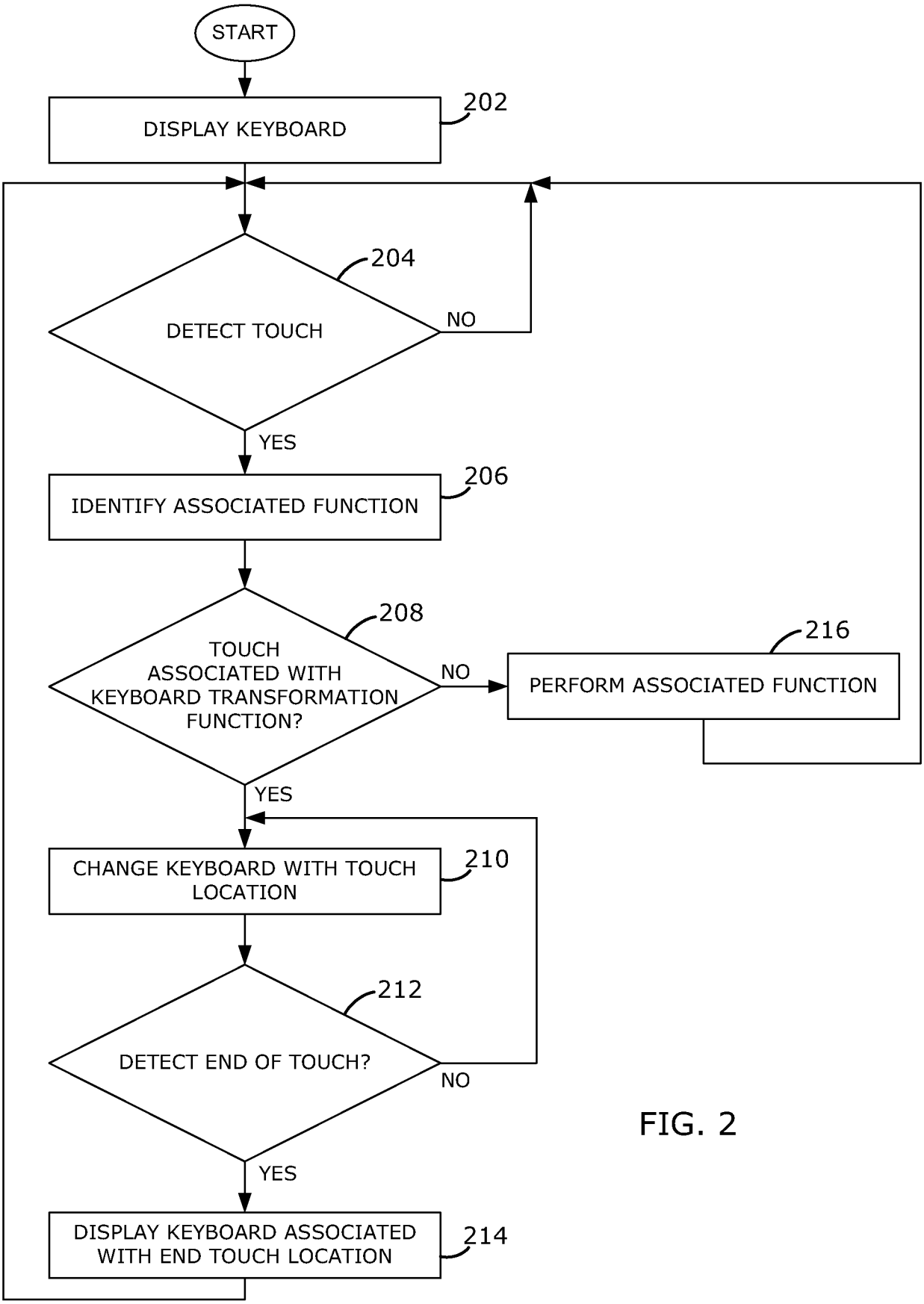

START
DISPLAY KEYBOARD
202
DETECT TOUCH
204
NO
YES
IDENTIFY ASSOCIATED FUNCTION
206
TOUCH ASSOCIATED WITH KEYBOARD TRANSFORMATION FUNCTION?
208
NO
PERFORM ASSOCIATED FUNCTION
216
YES
CHANGE KEYBOARD WITH TOUCH LOCATION
210
DETECT END OF TOUCH?
212
NO
YES
DISPLAY KEYBOARD ASSOCIATED WITH END TOUCH LOCATION
214

FIG. 2

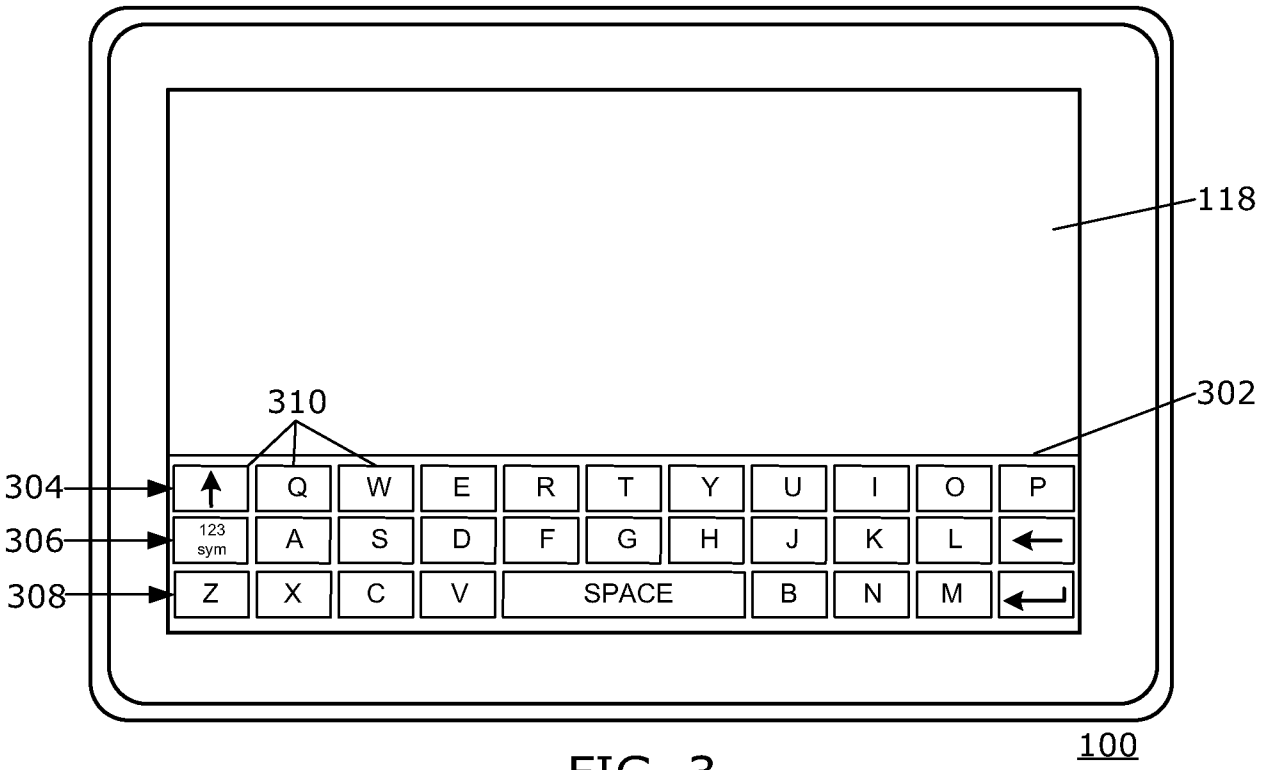

118
310
302
304
306
308
Q W E R T Y U I O P
123 sym
A S D F G H J K L
Z X C V SPACE B N M
100

FIG. 3

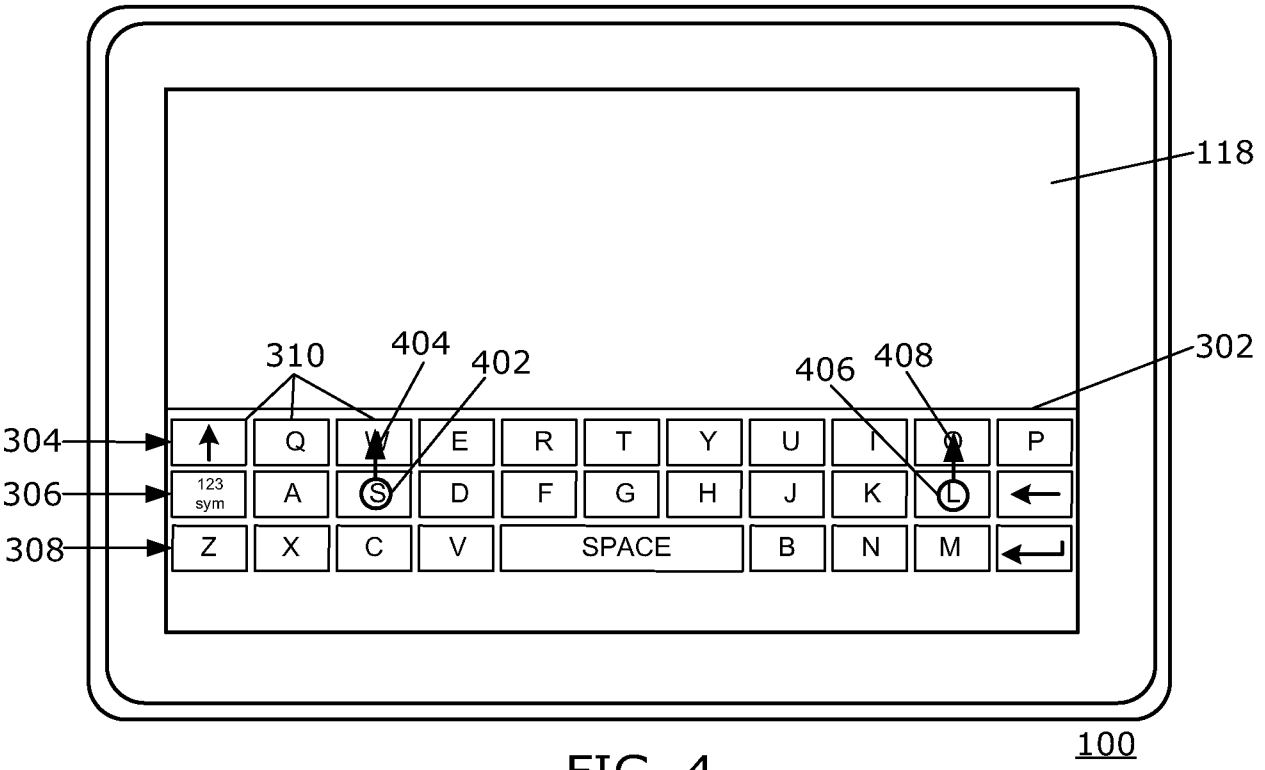

118
310
404
402
406
408
302
304
306
308
Q W E R T Y U I O P
123 sym
A S D F G H J K L
Z X C V SPACE B N M
100

FIG. 4

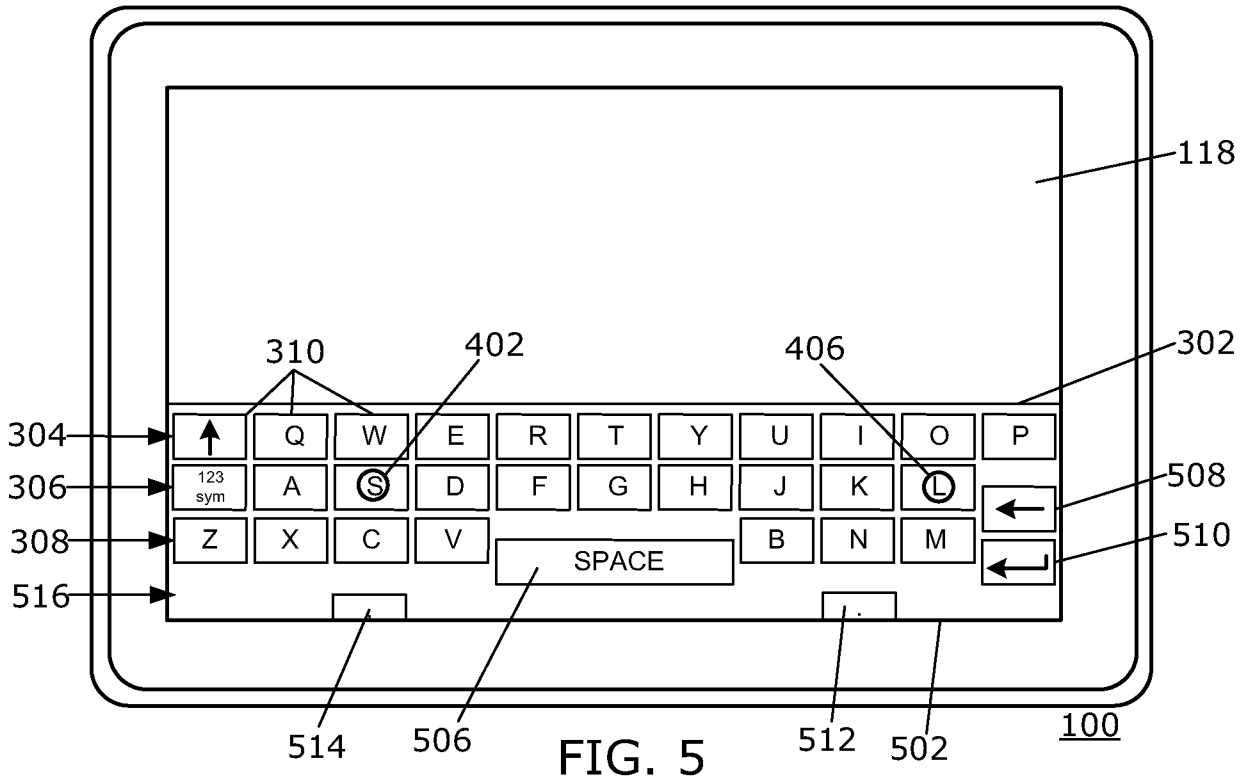

118
310
402
406
302
304
306
308
516
508
510
Q W E R T Y U I O P
123 sym
A S D F G H J K L
Z X C V B N M
SPACE
514
506
512
502
100

FIG. 5

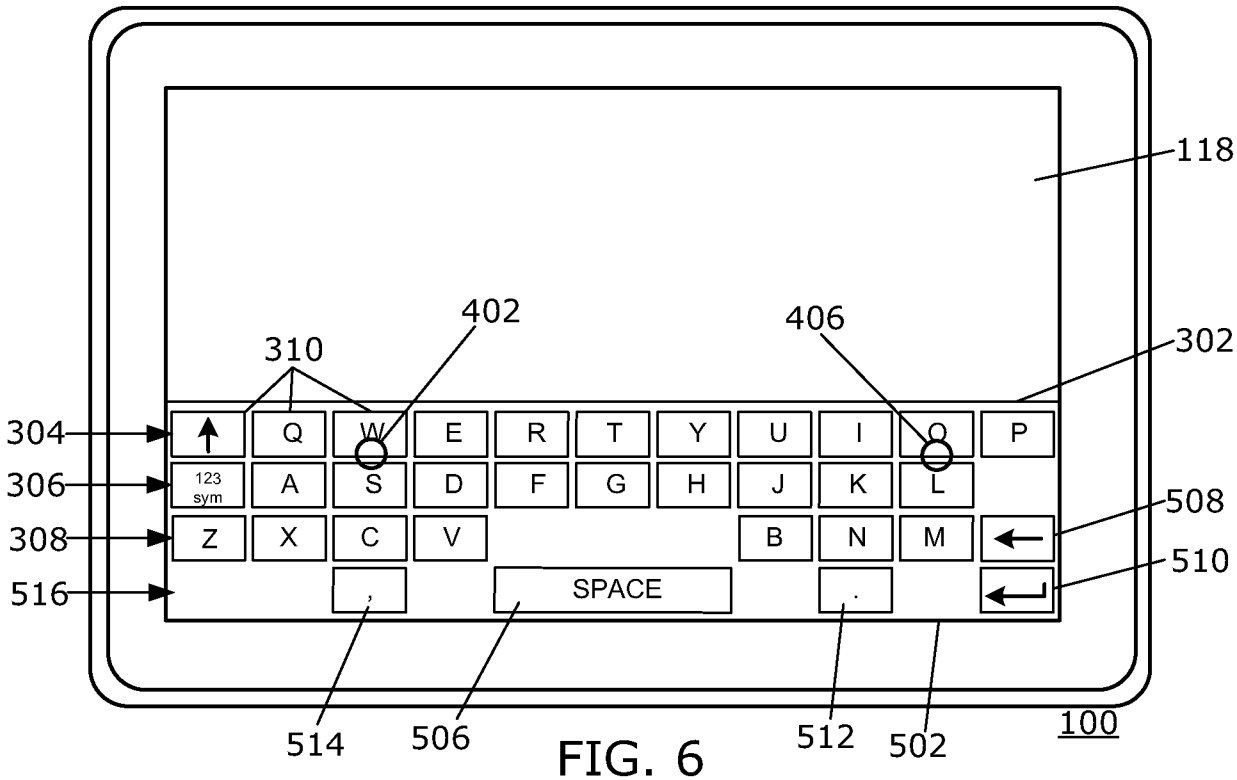

118
402
406
310
302
304
306
308
516
508
510
Q W E R T Y U I O P
123 sym
A S D F G H J K L
Z X C V B N M
SPACE
514
506
512
502
100

FIG. 6

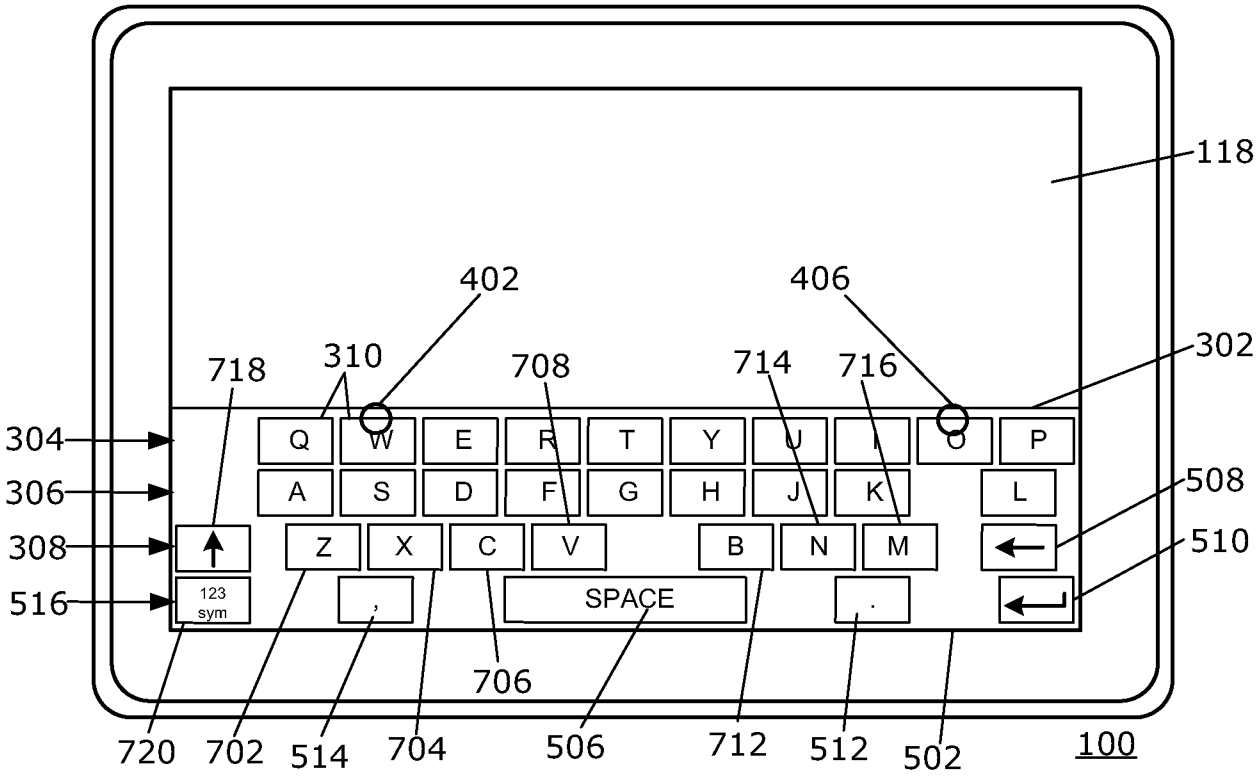

118
402
406
302
718
310
708
714
716
304
306
308
516
508
510
Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
123 sym
,
SPACE
.
706
720
702
514
704
506
712
512
502
100

FIG. 7

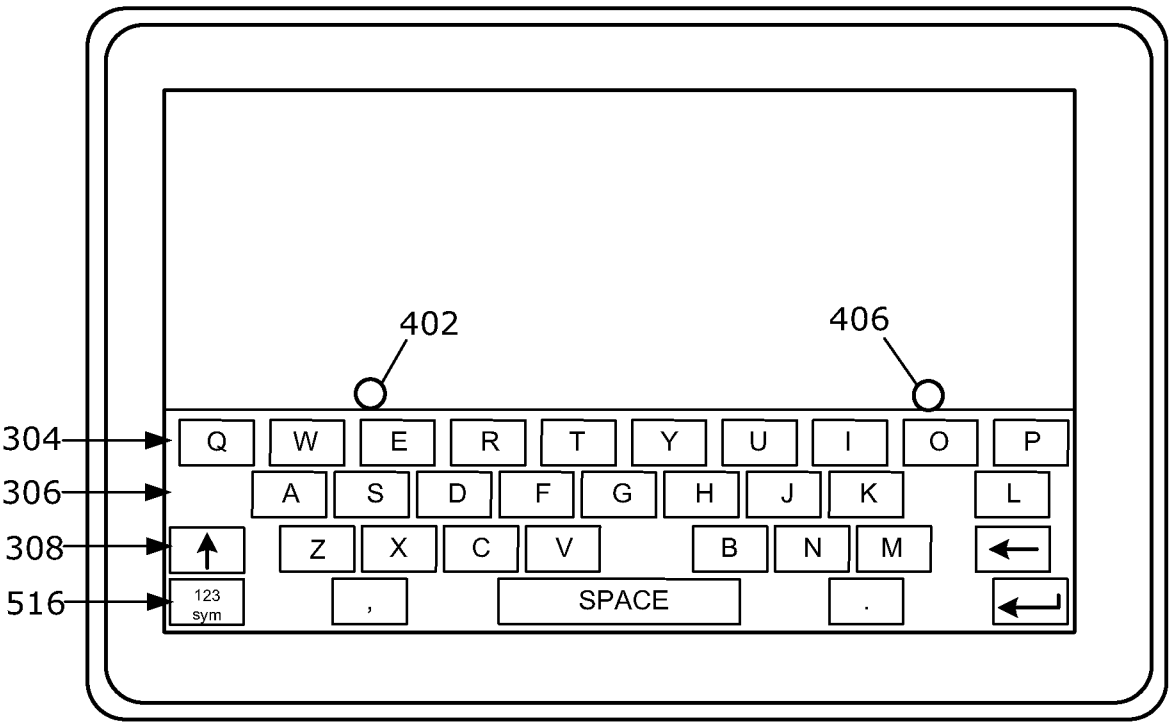

402
406
304
306
308
516
Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
123 sym
,
SPACE
.

FIG. 8

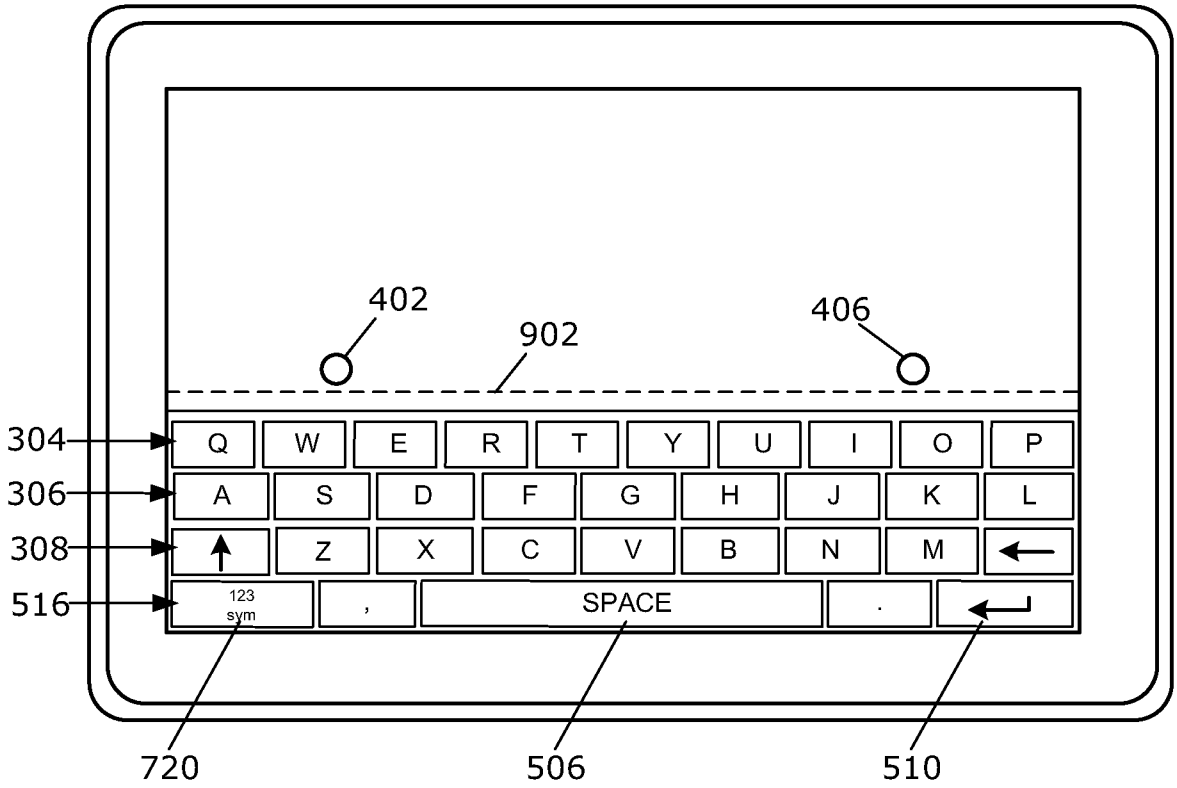

402
902
406
304
306
308
516
Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
123 sym
,
SPACE
.
720
506
510

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2012/050362

A. CLASSIFICATION OF SUBJECT MATTER

IPC: ***G06F 3/041*** (2006.01) , ***G06F 3/048*** (2006.01) , ***H03M 11/20*** (2006.01) , *H04W 88/02* (2009.01) , *G06F 15/02* (2006.01)

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: ***G, H*** (2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms *TotalPatent*™ & keywords:
virtual/soft/screen/on-screen/graphic/GUI/touch-screen/touchscreen/touch-sensitive keyboard;
move/relocate/reposition/translate/displace/drag/slide/(re)configure/(re)arrange/resize/reshape/customize keys;
change/modify/vary/adjust/alter/(re)shuffle layout/keys; increase/decrease/add/remove rows/columns;
gesture/swipe/sweep/drag/flick/brush/ touch-and-drag/drag-and-drop/ multi-touch

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant	Relevant to claim No.
X	WO 2008/057785 A2 (*Maw*) -15 May 2008 (15-05-2008) * p. 7, last par.; p. 10, 1st-3rd pars; Figs. 33, 41, 42 *	1-5, 7, 16-18
X	WO 2011/073992 A2 (*Ghassbian*) - 23 June 2011 (23-06-2011) * p. 5, ll. 27-30; p. 9, ll. 21-25; p. 13, ll. 5-9 *	1, 6, 15-18
X	US 2011/0090151 A1 (*Huang et al.*) - 21 April 2011 (21-04-2011) *[0013]; [0119]-[0122]; Figs. 13A, 13B, 14 *	1, 15, 16
A	US 2011/078613 A1 (*Bangalore*) - 31 March 2011 (31-03-2011) * [0021]; [0035]; [0037] *	1-7, 15-18

[ ] Further documents are listed in the continuation of Box [X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 October 2012 (18-10-2012)	07 November 2012 (07-11-2012)

Name and mailing address of the ISA/CA	Authorized officer
Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	Cristian S. Popa (819) 997-2299

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2012/050362

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
WO2008057785A2	15 May 2008 (15-05-2008)	CN101589355A	25 November 2009 (25-11-2009)
		EP2092405A2	26 August 2009 (26-08-2009)
		KR20090098967A	18 September 2009 (18-09-2009)
		US2010110012A1	06 May 2010 (06-05-2010)
		WO2008057785A3	04 December 2008 (04-12-2008)
WO2011073992A2	23 June 2011 (23-06-2011)	AU2010331756A1	05 July 2012 (05-07-2012)
		CA2783774A1	23 June 2011 (23-06-2011)
		IL202852D0	30 June 2010 (30-06-2010)
		IL205329D0	30 December 2010 (30-12-2010)
		IL206257D0	30 November 2010 (30-11-2010)
		IL207114D0	30 December 2010 (30-12-2010)
		IL207545D0	30 December 2010 (30-12-2010)
		IL207665D0	30 December 2010 (30-12-2010)
		IL208140D0	30 December 2010 (30-12-2010)
		IL208740D0	28 February 2011 (28-02-2011)
		IL208790D0	30 December 2010 (30-12-2010)
		IL209218D0	31 January 2011 (31-01-2011)
		IL209305D0	31 January 2011 (31-01-2011)
		IL209416D0	28 February 2011 (28-02-2011)
		IL209484D0	31 January 2011 (31-01-2011)
		WO2011073992A3	29 March 2012 (29-03-2012)
US2011090151A1	21 April 2011 (21-04-2011)	CN101266520A	17 September 2008 (17-09-2008)
		EP2293168A1	09 March 2011 (09-03-2011)
		JP2011516995A	26 May 2011 (26-05-2011)
		WO2009127168A1	22 October 2009 (22-10-2009)
US2011078613A1	31 March 2011 (31-03-2011)	None	