HANDHELD ELECTRONIC DEVICE WITH KEYBOARD

[0001] This application claims the benefit of priority from U.S. Provisional Application No. 60/341,758 filed on December 21, 2001

FIELD OF THE INVENTION

[0002] This invention relates generally to the field of small handheld electronic devices and especially to dual-mode handheld communication devices or mobile stations with a keyboard input. More particularly, the present invention relates to textual input keyboards for use in such devices.

BACKGROUND OF THE INVENTION

[0003] Existing keyboards or keypads for small handheld devices often use the standard 12-key telephone keypads (herein collectively referred to as keypads). These keypads typically have four rows of three buttons. The first three rows typically are typically formed from the numbers 1-9, arranged left to right, top to bottom, in increasing order. The fourth row is formed from the keys '*' '0' and '#'. Alphabetic values are ascribed to keys 2-9 in a standardized alphabetic order. Typing text using such keypads requires the user to input data in an unfamiliar manner. Other kinds of keyboards follow the Dvorak or, more commonly, the QWERTY keyboard models and are used in portable handheld devices such as the RIM 950 Wireless Handheld™. This kind of keyboard when adapted to handheld devices uses a plurality of small individual keys optimised for operation with the thumbs of the user. However, such a keyboard has considerably more keys than a keypad and the larger number of individual keys requires more space on a printed circuit board (PCB) than a keypad. Typically, each key requires its own footprint and switch on the PCB. Because of the relatively small size of such handheld devices, PCB space is limited and a QWERTY or Dvorak type keyboard takes up valuable real estate on the PCB.

[0004] Such a keyboard also requires a great deal of tooling in order to accommodate the large number of individual keys in the housing of a handheld device. This tooling adds to manufacturing costs. Furthermore, on a device with a

QWERTY style keyboard, it is difficult to enter numerical inputs such as a telephone number. Traditionally phone numbers are entered using keypads, and having to use a QWERTY style keyboard for such inputs, where the numbers appear in a row above the letters, is considered awkward by users.

[0005] It is, therefore, desirable to reduce the number of keys necessary for a QWERTY or DVORAK type keyboard layout used with handheld devices. It is, also desirable to combine the functionality of a QWERTY style keyboard and a keypad for use in a dual-mode communication device.

SUMMARY OF THE INVENTION

[0006] It is an object of the present invention to obviate or mitigate at least one disadvantage of existing keyboards or keypads used with small handheld electronic devices.

[0007] In a first aspect, the present invention provides a keyboard for a mobile device. The keyboard includes an alphabetic key, a plurality of alphanumeric keys, a command key, and a keyboard interpreter. The alphabetic key corresponds to at least one alphabetic value, and is for actuating a signal corresponding to its at least one alphabetic value. Each of the plurality of alphanumeric keys corresponds to a numeric value and at least one alphabetic value, and is for actuating a signal that corresponds to its corresponding numeric and at least one alphabetic values. The plurality of alphanumeric keys are arranged to provide the numeric layout of a telephone keypad, and in a presently preferred embodiment the full keypad, and arranged in conjunction with the alphabetic key to provide a standard keyboard layout. The command key is for actuating a signal corresponding to a command key value. The keyboard interpreter is for receiving the signals actuated by the alphabetic key, the plurality of alphanumeric keys, and the command key, and mapping the received signals to a sequence of alphanumeric, alphabetic and command values. In a presently preferred embodiment , the standard keyboard layout is a conventional QWERTY keyboard layout, and the keypad is centered within it. In an alternate embodiment, the alphabetic key, the plurality of alphanumeric keys, and the command key are provided by an electronic touch display, which is preferably a touch sensitive liquid crystal

display. In another embodiment of the first aspect, the alphanumeric keys include only alphabetic values. In a further embodiment, the alphabetic key and each of the plurality of alphanumeric keys provides one input signal to the keystroke interpreter, which employs predictive text routines for mapping the received signals to a sequence of alphanumeric and command values. In another embodiment, the command key corresponds to one of a group consisting of an ALT key, a SPACEBAR key, a RETURN key, a BACKSPACE key and a SHIFT key.

[0008] A second aspect of the present invention provides a mobile device, such as a two-way pager, a data-messaging device, a personal data assistant and a cellular telephone. The mobile device has a keyboard, a microprocessor and a software application executable by the microprocessor. The keyboard has an alphabetic key corresponding to at least one alphabetic value, for actuating a signal corresponding to its at least one alphabetic value, a plurality of alphanumeric keys, each of the plurality corresponding to a numeric value, an at least one alphabetic value, each key for actuating a signal corresponding to its corresponding numeric and at least one alphabetic values, the plurality of alphanumeric keys arranged to provide the numeric layout of a telephone keypad, and arranged in conjunction with the alphabetic key to provide a standard keyboard layout, a command key, for actuating a signal corresponding to a command key value and a keyboard interpreter for receiving the signals actuated by the alphabetic key, the plurality of alphanumeric keys, and the command key, for mapping the received signals to a sequence of alphanumeric, alphabetic and command values. The microprocessor is operatively connected to the keyboard and receives from the keyboard a sequence of alphabetic, alphanumeric and command values, which are used for controlling the operation of the device. The software application provides a plurality of operational features and initiates such features upon detection of certain inputs from the keyboard. In an embodiment of the second aspect of the present invention, the mobile device includes a display, which is preferably a touch sensitive liquid crystal display. In one embodiment, the keyboard is displayed on the touch sensitive liquid crystal display., and the keyboard interpreter employs predictive text routines for mapping the received signals to a sequence of alphabetic, alphanumeric and command values.

[0009] The keyboard of the present invention provides a keyboard with a standard layout, so that a user can input information and commands with a keyboard that is familiar, while allowing a manufacturing process that reduces the number of keys required to provide the standard keyboard layout. This allows for a reduction in the complexity of the casing, and reduces the number of dome switches required on a PCB. The use of predictive text input simplifies text input for a user, though the use of a standard 'tap method' of text entry is also foreseen.

[0010] Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Embodiments of the present invention will now be described, by way of example only, with reference to the attached Figures, wherein:

Fig. 1 is a block diagram of a mobile communication device to which the present invention may be applied;

Fig. 2 is a top elevation of a typical handheld device to which a keyboard in accordance with one embodiment of the invention may is applied;

Fig. 3 is a front elevation of the device of Fig. 2;

Fig. 4 is a right side elevation of the device of Fig. 2;

Fig. 5 is a left side elevation of the device of Fig. 2;

Fig. 6 is a keyboard layout according to one embodiment of the present invention;

Fig. 7 is a keyboard layout according to a further embodiment of the present invention;

Fig. 8 is a keyboard layout according to an alternate embodiment of the present invention;

Fig. 9 is a keyboard layout according to another alternate embodiment of the present invention;

Fig. 10 is a keyboard layout according to another alternate embodiment of the present invention;

Fig. 11 is a keyboard layout according to a further embodiment of the present invention; and

Fig. 12 is a keyboard layout according to a further alternate embodiment of the present invention.

DETAILED DESCRIPTION

[0012] Generally, the present invention provides a reduced keyboard for a mobile device, that provides the user with a standard keyboard layout on fewer keys, while maintaining the numeric layout of a standard keypad, such as a DTMF keypad. Though a presently preferred embodiment provides a complete replication of a standard keypad, various embodiments of the present invention provide only the numeric layout of a standard keypad and position the '*' and '#' key in other positions on the keyboard. Presently preferred embodiments provide a standard DTMF keypad, but other standard keypads such as those provided on computer keyboards are also contemplated.

[0013] By reducing the number of keys used to provide a standard keyboard, the present invention provides a manufacturer the ability to reduce the number of dome switches on a PCB, and the amount of tooling required to create the apertures in the front plate of the mobile device. The reduced number of keys also provides users with the ability to actuate larger keys as the same surface area of a device that would otherwise be required to provide keys for all 26 alphabetic values, 10 numeric values and at least two non-alphanumeric values can now be used to provide fewer, and thus larger, keys. The presence of larger keys reduces the difficulty of actuating a single small key that is surrounded by other keys.

[0014] Referring now to the drawings, Fig. 1 is a block diagram of a mobile communication device **10** in which the present invention may be implemented. The mobile communication device **10** is preferably a two-way communication device having at least voice and data communication capabilities. The device preferably has

the capability to communicate with other computer systems on the Internet. Depending on the functionality provided by the device, the device may be referred to as a data messaging device, a two-way pager, a cellular telephone with data messaging capabilities, a wireless Internet appliance or a data communication device (with or without telephony capabilities).

[0015] Where the device **10** is enabled for two-way communications, the device will incorporate a communication subsystem **11**, including a receiver **12**, a transmitter **14**, and associated components such as one or more, preferably embedded or internal, antenna elements **16** and **18**, local oscillators **13**, and a processing module such as a digital signal processor (DSP) **20**. As will be apparent to those skilled in the field of communications, the particular design of the communication subsystem **11** will be dependent upon the communication network in which the device is intended to operate. For example, a device **10** destined for a North American market may include a communication subsystem **11** designed to operate within the Mobitex™ mobile communication system, DataTAC™ mobile communication system, or 1X CDMA based data networks, whereas a device **10** intended for use in Europe may incorporate a General Packet Radio Service (GPRS) communication subsystem **11**.

[0016] Network access requirements will also vary depending upon the type of network **19**. For example, in the Mobitex and DataTAC networks, mobile devices such as device **10** are registered on the network using a unique personal identification number or PIN associated with each device. In GPRS networks however, network access is associated with a subscriber or user of a device **10**. A GPRS device therefore requires a subscriber identity module (not shown), commonly referred to as a SIM card, in order to operate on a GPRS network. Without a SIM card, a GPRS device will not be fully functional. Local or non-network communication functions (if any) may be operable, but the device **10** will be unable to carry out any functions involving communications over network **19**. When required network registration or activation procedures have been completed, a device **10** may send and receive communication signals over the network **19**. Signals received by the antenna **16** through a communication network **19** are input to the receiver **12**, which may perform such common receiver functions as signal amplification, frequency down conversion,

filtering, channel selection and the like, and in the example system shown in Fig. 1, analog to digital conversion. Analog to digital conversion of a received signal allows more complex communication functions such as demodulation and decoding to be performed in the DSP **20**. In a similar manner, signals to be transmitted are processed, including modulation and encoding for example, by the DSP **20** and input to the transmitter **14** for digital to analog conversion, frequency up conversion, filtering, amplification and transmission over the communication network **19** via the antenna **18**.

[0017] The DSP **20** not only processes communication signals, but also provides for receiver and transmitter control. For example, the gains applied to communication signals in the receiver **12** and transmitter **14** may be adaptively controlled through automatic gain control algorithms implemented in the DSP **20**.

[0018] The device **10** preferably includes a microprocessor **38** that controls the overall operation of the device. Communication functions, preferably including at least data and voice communications, are performed through the communication subsystem **11**. The microprocessor **38** also interacts with further device subsystems such as the display **22**, flash memory **24**, random access memory (RAM) **26**, auxiliary input/output (I/O) subsystems **28**, serial port **30**, keyboard **32**, speaker **34**, microphone **36**, a short-range communications subsystem **40** and any other device subsystems generally designated as **42**.

[0019] Some of the subsystems shown in Fig. 1 perform communication-related functions, whereas other subsystems may provide "resident" or on-device functions. Notably, some subsystems, such as keyboard **32** and display **22** for example, may be used for both communication-related functions, such as entering a text message for transmission over a communication network, and device-resident functions such as a calculator or task list.

[0020] Operating system software used by the microprocessor **38** is preferably stored in a persistent store such as flash memory **24**, which may instead be a read only memory (ROM) or similar storage element (not shown). Those skilled in the art will appreciate that the operating system, specific device applications, or parts thereof,

may be temporarily loaded into a volatile store such as RAM **26**. It is contemplated that received communication signals may also be stored to RAM **26**.

[0021] The microprocessor **38**, in addition to its operating system functions, preferably enables execution of software applications on the device. A predetermined set of applications which control basic device operations, including data and voice communication applications for example, will normally be installed on the device **10** during manufacture. A preferred application that may be loaded onto the device may be a personal information manager (PIM) application having the ability to organize and manage data items relating to the device user such as, but not limited to e-mail, calendar events, voice mails, appointments, and task items. Naturally, one or more memory stores would be available on the device to facilitate storage of PIM data items on the device. Such PIM application would preferably have the ability to send and receive data items, via the wireless network. In a preferred embodiment, the PIM data items are seamlessly integrated, synchronized and updated, via the wireless network, with the device user's corresponding data items stored or associated with a host computer system thereby creating a mirrored host computer on the mobile device with respect to the data items at least. This would be especially advantageous in the case where the host computer system is the mobile device user's office computer system. Further applications may also be loaded onto the device **10** through the network **19**, an auxiliary I/O subsystem **28**, serial port **30**, short-range communications subsystem **40** or any other suitable subsystem **42**, and installed by a user in the RAM **26** or preferably a non-volatile store (not shown) for execution by the microprocessor **38**. Such flexibility in application installation increases the functionality of the device and may provide enhanced on-device functions, communication-related functions, or both. For example, secure communication applications may enable electronic commerce functions and other such financial transactions to be performed using the device **10**.

[0022] In a data communication mode, a received signal such as a text message or web page download will be processed by the communication subsystem **11** and input to the microprocessor **38**, which will preferably further process the received signal for output to the display **22**, or alternatively to an auxiliary I/O device

28. A user of device **10** may also compose data items such as email messages for example, using the keyboard **32**, which is preferably a complete alphanumeric keyboard or telephone-type keypad, in conjunction with the display **22** and possibly an auxiliary I/O device **28**. Such composed items may then be transmitted over a communication network through the communication subsystem **11**.

[0023] For voice communications, overall operation of the device **10** is substantially similar, except that received signals would preferably be output to a speaker **34** and signals for transmission would be generated by a microphone **36**. Alternative voice or audio I/O subsystems such as a voice message recording subsystem may also be implemented on the device **10**. Although voice or audio signal output is preferably accomplished primarily through the speaker **34**, the display **22** may also be used to provide an indication of the identity of a calling party, the duration of a voice call, or other voice call related information for example.

[0024] The serial port **30** in Fig. 1 would normally be implemented in a personal digital assistant (PDA)-type communication device for which synchronization with a user's desktop computer (not shown) may be desirable, but is an optional device component. Such a port **30** would enable a user to set preferences through an external device or software application and would extend the capabilities of the device by providing for information or software downloads to the device **10** other than through a wireless communication network. The alternate download path may for example be used to load an encryption key onto the device through a direct and thus reliable and trusted connection to thereby enable secure device communication.

[0025] A short-range communications subsystem **40** is a further optional component which may provide for communication between the device **24** and different systems or devices, which need not necessarily be similar devices. For example, the subsystem **40** may include an infrared device and associated circuits and components or a Bluetooth™ communication module to provide for communication with similarly enabled systems and devices.

[0026] Thus, it will be apparent that handheld devices of this type perform a wide variety of complex functions and it is a challenge to provide a keyboard which is

sufficiently compact to match the form factor of the handheld device but which provides the necessary level of functionality required by the user

[0027] Fig. 2 is a top view of the device, which shows the device housing in two pieces: a front housing **50**, and a back housing **52**. This view also shows the location of an optional infrared device **54**. On the right side of the device **10**, there is a plurality of auxiliary input devices, including thumbwheel **56**.

[0028] Fig. 3 is a front view of the device. The front housing **50** has several openings to incorporate a plurality of input and output devices. A speaker **62**, display **22**, keyboard **32** and microphone (not shown) are preferably mounted within the front surface **50** of the device housing. Preferably, the speaker is positioned above the display **22** near the top of the front housing **50**, and approximately in the horizontal middle of the front surface **50**. The speaker **62** is positioned above the display **22**. Below the speaker **62**, the display **22** is mounted centrally in the front surface **50**. Although a rectangular display **22** is shown in Fig. 3, other geometrical configurations of the display may also be utilised. The cursor key **60** is preferably located in close proximity to the display.

[0029] The keyboard **32** and microphone are preferably mounted in the front housing **50** below the display **22**, although alternatively, the microphone may be positioned between the display **22** and the keyboard **32**. The keyboard **32** is preferably positioned centrally in the front surface **50**, in like manner to the display **22**.

[0030] The keyboard **32** comprises a plurality of letter and alphanumeric keys **32A** forming, in one embodiment, a QWERTY style layout as described in more detail below. In addition to these letter and alphanumeric keys **32A**, the keyboard also includes function keys and an optional spacebar key **32B**. The functions associated with these keys are determined by the layout of the inputs. Alternative layouts according to specific embodiments of the invention are illustrated in further figures.

[0031] Fig. 4 is a right side view of a device according to an embodiment of the present invention having a plurality of inputs. These inputs may include a thumbwheel **56**, cursor keys **58**, **60** and an escape key **64**. Other inputs will be apparent to those skilled in the art. Although Fig. 4 shows a layout of these input devices where the thumbwheel **56** is preferably between the two cursor keys **58**, **60**

and the escape key **64** is below the thumbwheel **56**, alternative layouts may also be used.

[0032] Fig. 5 is a left side view of the device. No input devices shown on this side of the device in the presently illustrated embodiment, though alternate embodiments may locate input devices on this side. In one envisaged embodiment, the inputs illustrated in Figure 4, are relocated to the left side of the device to create a left hand oriented device. Other alternate embodiments where inputs are split between the two sides, or redundant inputs are provided, will be understood by those skilled in the art.

[0033] The keyboard arrangement as illustrated in the Figures 6-12 is designed to minimize the number of keys required to form a keyboard. The keyboard is comprised of both alphabetic keys, which are keys having only alphabetic values, and alphanumeric keys which correspond to keys having at least one alphabetic value, and a numeric value. The keys are placed so that the alphabetic values of the alphabetic and alphanumeric keys are arranged as they would be in a standard keyboard layout. The keys are also arranged so that the numeric values of the alphanumeric keys correspond to the layout of a standard telephone keypad. In addition to alphabetic and alphanumeric keys, there is at least one command key which allows the user to toggle between keyboard entry modes, so that the user can easily enter only alphabetic values, or only numeric values. In certain embodiments other command keys are present such as a "spacebar" key, and these keys may be shared by a numeric value such as zero. The following embodiments illustrate QWERTY key layouts, though other standard configurations, such as Dvorak keyboards, are contemplated. Reference to a standard keyboard, or a standard keyboard layout should be understood to refer to QWERTY, Dvorak, and other known keyboard configurations.

[0034] Because many of the keys correspond to a plurality of alphabetic or numeric values, the number of keys required to create a standard keyboard layout is reduced. This allows for a savings as fewer buttons need to be attached to the PCB. Additionally, a reduced number of dome switches are necessary to allow the keys to operate in conjunction with the PCB. A reduction in the number of keys used to form

the keyboard allows for a corresponding reduction in the tooling required to make the front housing **50** which once again lowers the cost of production, and complexity of design. This benefits handheld device manufacturers since handheld devices are becoming progressively smaller in size.

[0035] Fig. 6 shows one possible layout for the alphanumeric inputs on the keys **32A** of the keyboard. Although the embodiment shown in Fig. 6 includes keys representing up to four different inputs, each key may represent more or fewer inputs. The invention is in no way limited to the specific character assignments in Fig. 6.

[0036] The keyboard of Figure 6 illustrates a first embodiment of the key layout of the present invention. A central section of keys surrounded by dashed line **32C** forms the standard telephone keypad with numbers 1 through 0, an asterisk and a pound symbol. The keys corresponding to numeric values 1 through 9 are alphanumeric keys in that they have both numerals and letters as their possible values. In this embodiment, an alphabetic key, that is a key with only alphabetic values, is placed beside the top row of keys on either side of the alphanumeric keypad. This allows two letters to be assigned to each of the keys in the top row to form the top row of a standard QWERTY keyboard. The second row of the keypad is augmented on the left side by an alphabetic key, and on the right side by a command key, which in this case refers to a key with non-alphabetic or numeric values. The command key on the right side of the central row corresponds to an 'ENTER' or 'RETURN' value. The bottom row of keys in the keypad is surrounded on both sides by command keys, one corresponding to 'ALT' and the other corresponding to BACKSPACE. The asterisk, zero and pound symbols of the keypad are all on the bottom row as is common in keypad design. The zero key is shared with a key value corresponding to the spacebar, while the asterisk in conjunction with the 'ALT' key can be used as a numeric or alphabetic lock. The pound symbol can be used in conjunction with the alt key to effect a 'SHIFT' or 'caps lock' value. Thus the embodiment of Figure 6 assigns either two or three alphabetic values to all alphabetic and alphanumeric keys

[0037] This embodiment of the layout has three rows of five keys, **31**, **33** and **35** and has a space bar key **32B** and two function keys **32F** and **32G** below the three rows. In the first row **31**, the middle three keys have alphanumeric inputs and the end

keys have letter inputs. Each key in the first row **31** is associated with at least two letter characters. In the second row **33**, the middle three keys have alphanumeric inputs. The left-most key has letter inputs. The last key **32D** has an ENTER or RETURN input. Because of this input, the two left-most keys in this row **33** are each associated with two letter characters, while keys **32I** and **32J** are each associated with 3 letter characters. For example, in this layout, the key **32J** is associated with the characters 'G', 'H', and 'I' and the key **32I** is associated with the characters 'J', 'K', and 'L'.

[0038] In the third row **35**, the middle three keys have alphanumeric inputs. The left-most key **32H** acts as an ALT key to access special characters that may be associated with each key **32A**. When any of the alphanumeric keys are depressed in conjunction with the ALT key **32H**, the user is able to access special characters or symbols (not shown).

[0039] The right-most key **32E** in the third row **35** preferably acts as a BACKSPACE key. When this key **32E** is depressed, any text input that was made immediately prior to the depression of key **32E** is deleted.

[0040] In this row **35**, the middle three keys are alphanumeric and in this example, the key **32M** is associated with three letter inputs – namely, 'Z', 'X', and 'C'.

[0041] The SPACE key **32B** is centrally located below the third row **35** On either side of the SPACE key, there are function keys **32G** and **32H**. In this example, the right function key **32F** (labelled ▲) is preferably used as a CAPS key to create upper-case letter inputs. When the ▲ function key **32F** is depressed, any letter key that is subsequently depressed will be inputted as an upper case letter.

[0042] The left function key **32G**, (labelled '123') is preferably used as a NUMERAL key to access numeral inputs that are labelled within the dotted lines **32C**. The numerical inputs of the keys that are within the dotted lines **32C** form a typical DTMF keypad. Having these keys form a typical DTMF keypad makes it easier for users to enter such numerical sequences as a telephone number. It would be much more difficult for users to input telephone numbers if the numerical inputs were laid out in the manner of a QWERTY keyboard.

[0043] Whenever the '123' function key **32G** is depressed, the numeric inputs that are labelled above the letter characters on these keys within the dotted lines **32C** are inputted whenever one of these keys is subsequently depressed.

[0044] Figure 7 illustrates a second embodiment of the present invention. As can be seen from Figure 7, the keypad arrangement provides a standard numeric keypad for a telephone set. The alphabetic values assigned to each of the alphanumeric keys are arranged that such that only two alphabetic values are assigned to each key, whereas the embodiment of Figure 6 had allowed for three alphabetic values to be assigned to certain alphanumeric keys. In the embodiment to Figure 7, the command key corresponding with 'ENTER' has been moved to the second from the bottom row, and the 'SHIFT' value of the pound key has been replaced with a 'BACKSPACE' function. The 'ALT' value now is co-located with the asterisk key. Thus the embodiment of Figure 7 provides a keyboard layout where no more than two alphabetic values are assigned to each alphabetic or alphanumeric key.

[0045] In the embodiment of Figure 7, each key **32A** is associated with at most two letter characters. The RETURN key **32K** may be located on the right-most key of the third row **35**. The BACKSPACE key **32L** is the right-most function key beside the SPACE key **32B**, which is located below the third row **35**. The ALT key **32M** is the left-most function key beside the SPACE key **32B**. Unlike the layout in Fig. 6, the keyboard layout in Fig.7 requires extra keys outside of the keyboard in order to access the numerical inputs within the dotted lines **32C** and to access upper-case letter inputs.

[0046] Figures 8, 9, 10, 11 and 12 provide further embodiments of the keyboard/keypad of the present invention. As can be seen from these Figures, alphanumeric keys have one numeric, and at least one alphabetic value. In addition, alphabetic keys exist which have only alphabetic values. These keys can have one, or a plurality of values. Command values can be located on either command keys, or they can be co-located with either alphabetic, or numeric keys. In each embodiment, each key can be categorized as an alphabetic, alphanumeric or command key. In the embodiment of Figure 10, the numeric values of the keypad are located on the left side of the key configuration, whereas the pound and asterisk keys are located on the

right side. Additionally, a directional keypad with additional command functions is present. One skilled in the art will readily appreciate that the directional keypad could be replaced with either a set of directional keys, or a joy stick type device.

[0047] Figure 8 illustrates an embodiment of the present invention wherein the standard DTMF keypad layout **32C** is reproduced in the center of keyboard **32**. Rows **31**, **33** and **35** provide the three rows of a standard QWERTY keyboard. The '*' key, in conjunction with the 'ALT' key found at the left of row **35**, is used to change between alphabetic and numeric modes. When in alphabetic mode, the '#' key serves as either a 'SHIFT' or a 'CAPS LOCK' value, so that capital letters can be entered. The '0' key, when in the alphabetic mode, serves as the 'SPACE BAR'. The 'BACKSPACE' and 'ENTER' keys are provided as the rightmost keys in rows **33** and **35** respectively.

[0048] Figure 9 illustrates an embodiment of the present invention wherein the standard DTMF keypad layout **32C** is reproduced in the center of keyboard **32**. Rows **31**, **33** and **35** provide the three rows of a standard QWERTY keyboard. The '*' key, in conjunction with the 'ALT' key found below the leftmost key in row **35** is used to change between alphabetic and numeric modes. When in alphabetic mode, the '#' key serves as either a 'SHIFT' or a 'CAPS LOCK' value, so that capital letters can be entered. This layout provides a keyboard configuration where no more than two alphabetic values are assigned to a single key. The '0' key, when in the alphabetic mode, serves as the 'SPACE BAR'. The 'BACKSPACE' key is provided as the rightmost key in row **35**, and the 'ENTER' key is provided below 'BACKSPACE' key.

[0049] Figures 8 and 9 differ from the layout presented in figure 6 and 7 in the positioning of the 'BACKSPACE' and 'ENTER' keys.

[0050] Figure 10 illustrates an embodiment of the present invention, wherein the standard DTMF keypad **32C** is provided over half of the standard keypad. Nine numeric values, are provided across the first three columns of rows **31**, **33** and **35**. The '0' key is located below row **35** in a position that is relatively centered with respect to the DTMF keypad. The '*' and "#" keys are provided in a second half of the keyboard, so that only the DTMF keypad layout of numeric keys is fully provided.

This layout provides a larger keyboard configuration, and a separate 'SPACEBAR', while still reducing the number of keys required to provide a full standard keyboard.

[0051] Figure 11 illustrates an embodiment of the present invention wherein the standard DTMF keypad layout **32C** is reproduced relatively centered in keyboard **32**. Rows **31**, **33** and **35** provide the three rows of a standard QWERTY keyboard. The '*' key, in conjunction with the 'ALT' key which is the leftmost key in row **35,** is used to change between alphabetic and numeric modes. When in alphabetic mode, the '#' key serves as either a 'SHIFT' or a 'CAPS LOCK' value, so that capital letters can be entered. This layout provides a keyboard configuration where no more than two alphabetic values are assigned to a single key. The '0' key, when in the alphabetic mode, serves as the 'SPACE BAR'. The 'BACKSPACE' and 'ENTER' keys are provided as the rightmost keys in rows **33** and **35** respectively.

[0052] Figure 12 illustrates an embodiment of the present invention wherein a standard keyboard layout **32** is provided using four columns. The DTMF keypad layout **32C** is provided as the three leftmost columns in the keyboard, though one of skill in the art will readily appreciate that the DTMF keypad could be represented by the three rightmost columns as well. The three rows of a standard keyboard are provided in rows **31**, **33**, and **35**. The '*' key, in conjunction with the 'ALT' key found below the rightmost key in row **35** is used to change between alphabetic and numeric modes. When in alphabetic mode, the '#' key serves as either a 'SHIFT' or a 'CAPS LOCK' value, so that capital letters can be entered. The '0' key, when in the alphabetic mode, serves as the 'SPACE BAR'. The '0' key, when in the alphabetic mode, serves as the 'SPACE BAR'. The 'BACKSPACE' and 'ENTER' keys are provided as the rightmost keys in rows **33** and **35** respectively.

[0053] One skilled in the art will readily appreciate that when mounted on a PCB, each key activates a dome switch, or other similar device known to those skilled in the art. When depressed, the key actuates a signal, by depressing the dome switch and allowing current to flow to a keyboard interpreter, which receives the signal from the dome switch. The keyboard interpreter can determine which key was depressed based on the received signal.

[0054] In use, the present invention provides the user with a standard keyboard layout such as a QWERTY or Dvorak keyboard configuration. This allows the user to avoid the "hunt-and-peck" experience of using a standard telephone keypad where the alphabetic values assigned to each key are provided in a purely alphabetic fashion. When a key is depressed it actuates a signal corresponding to its assigned alphabetic and numeric values where appropriate. For keys with multiple alphabetic values, a key stroke interpreter, in the keyboard interpreter, is employed to determine the intended alphabetic value corresponding to each key. The keyboard interpreter can either use predictive text input, or what is referred to in the art as a "tap method". In a tap method, a key is depressed once to provide the first alphabetic value assigned to that key, the key is depressed twice to indicate that the second alphabetic value assigned to that key is desired, and so on. Thus a user may be required to hit a key multiple times to obtain the desired character. Using predictive text input, the keystroke interpreter obtains a string of key strokes matching the obtained string against a database of strings, which correspond to words. Common predictive text input algorithms are known under trade-names of Tegic T9™ and Motorola's iTAP™. One skilled in the art will readily appreciate the use of predictive text input with this keypad arrangement.

[0055] It is contemplated that the predictive text application may be activated after a certain number of keystrokes have been made, so that the root of a word can be identified, and the full word predicted. The initial characters in the minimum length root term may be manually selected, for example by depressing a key multiple times, by holding a key in a depressed position, or by operating a further key or input while holding a key in a depressed position.

[0056] It is further contemplated that the keypad may be provided on an electronic touch screen, such as an LCD display, and that the toggling between alphabetic and numeric inputs through a command input, will remove either the alphabetic values or the numeric values associated with the keys from the display so that the user will recognise which entry mode is being used. In a further contemplated embodiment, the alphanumeric keys are provided with only alphabetic values, so that a keyboard implementation is provided that requires fewer keys, while maintaining a

standard keyboard layout. In this configuration, a set of purely numeric keys is typically paired with the keyboard layout to provide a keypad for entry of telephone numbers.

[0057] As illustrated in the numerous embodiments, the scope of the present invention is not restricted to a particular arrangement of alphabetic, and alphanumeric keys as a simple redeployment of said keys which would fall well within the scope of the present invention could be performed by one skilled in the art after having read these teachings. Thus the present invention provides a keypad/keyboard configuration with a reduced number of keys which allows for reduced tooling and machining, reduced space on the PCB, and allows the user faster input of data.

[0058] The above-described embodiments of the present invention are intended to be examples only. Alterations, modifications and variations may be effected to the particular embodiments by those of skill in the art without departing from the scope of the invention, which is defined solely by the claims appended hereto.

WE CLAIM:

1. A keyboard for a mobile device comprising:

an alphabetic key corresponding to at least one alphabetic value, for actuating a signal corresponding to its at least one alphabetic value;

a plurality of alphanumeric keys, each of the plurality corresponding to a numeric value and at least one alphabetic value, each key for actuating a signal corresponding to its corresponding numeric and at least one alphabetic values, the plurality of alphanumeric keys arranged to provide the numeric arrangement of a telephone keypad, and arranged in conjunction with the alphabetic key to provide a standard keyboard layout;

a command key, for actuating a signal corresponding to a command key value; and

a keyboard interpreter for receiving the signals actuated by the alphabetic key, the plurality of alphanumeric keys, and the command key, for mapping the received signals to a sequence of alphanumeric, alphabetic and command values.

2. The keyboard of claim 1, wherein the plurality of alphanumeric keys is arranged to provide a full telephone keypad.

3. The keyboard of claim 2, wherein the telephone keypad is centered within the standard keyboard layout.

4. The keyboard of claim 1, wherein the standard keyboard layout is a conventional QWERTY layout.

5. The keyboard of claim 1, wherein the alphabetic key, the plurality of alphanumeric keys, and the command key are provided by an electronic touch display.

6. The keyboard of claim 5, wherein the electronic touch display is a touch sensitive liquid crystal display.

7. The keyboard of claim 1, wherein the alphanumeric keys include only alphabetic values.

8. The keyboard of claim 1, wherein the alphabetic key and each of the plurality of alphanumeric keys provides one input signal.

9. The keyboard of claim 8, wherein the keystroke interpreter employs predictive text routines for mapping the received signals to a sequence of alphanumeric and command values.

10. The keyboard of claim 1, wherein the command key corresponds to one of a group consisting of an ALT key, a SPACEBAR key, a RETURN key, a BACKSPACE key and a SHIFT key.

11. A mobile device comprising:

keyboard having an alphabetic key corresponding to at least one alphabetic value, for actuating a signal corresponding to its at least one alphabetic value, a plurality of alphanumeric keys, each of the plurality corresponding to a numeric value and at least one alphabetic value, each key for actuating a signal corresponding to its corresponding numeric and at least one alphabetic values, the plurality of alphanumeric keys arranged to provide the numeric arrangement of a telephone keypad, and arranged in conjunction with the alphabetic key to provide a standard keyboard layout, a command key, for actuating a signal corresponding to a command key value; and a keyboard interpreter for receiving the signals actuated by the alphabetic key, the plurality of alphanumeric keys, and the command key, for mapping the received signals to a sequence of alphanumeric, alphabetic and command values;

a microprocessor, operatively connected to the keyboard for receiving the sequence of alphabetic, alphanumeric and command values, and for controlling the operation of the device; and

a software application, executable by the microprocessor, for providing a plurality of operational features and initiating such features upon certain inputs from the keyboard.

12. The mobile device of claim 11, further including a display.

13. The mobile device of claim 12, wherein the display is a touch sensitive liquid crystal display.

14. The mobile device of claim 13, wherein the keyboard is displayed on the touch sensitive liquid crystal display.

15. The mobile device of claim 11, wherein the keyboard interpreter of the keyboard employs predictive text routines for mapping the received signals to a sequence of alphabetic, alphanumeric and command values.

16. The mobile device of claim 11, wherein device is selected from the group consisting of a two-way pager, a data-messaging device, a personal data assistant and a cellular telephone.

17. The mobile device of claim 11, wherein the plurality of alphanumeric keys is arranged to provide a full telephone keypad.

18. The mobile device of claim 11, wherein the telephone keypad is centered within the standard keyboard layout.