Title: TERMINAL DESIGN WITH KEYBOARD ARRANGED ON THE BACK OR SIDE SURFACE OF THE TERMINAL

Abstract: The present invention relates to a portable device or terminal (1) comprising a terminal display (4) on the front surface and a keyboard (2) on the back surface or side surface of the terminal, which is partly or completely invisible from the front of the terminal. The portable device or terminal comprises detection means for providing data of the positions of a user's fingers relative to the keys of the keyboard, and means for visualising said data as representations of the fingers (6, 7, 8) and their respective positions relative to the keys (9) of the keyboard, on the display (4). The terminal design according to the present invention makes the user aware of his finger positions in relation to the keys, thus making it easier for the user to understand how to reach the desired keys. The present invention provides good ergonomics, and quicker and more efficient feedback of the user's keyboard operations.
TERMINAL DESIGN WITH KEYBOARD ARRANGED ON THE BACK OR SIDE SURFACE OF THE TERMINAL

Field of the Invention

The present invention relates to a portable device which visualises the keyboard operations made on the back surface or side surface of the terminal, or which is partly or completely invisible from the front of the terminal, on a display at the front surface of the terminal. The display shows a representation of the keys of the keyboard and the user's fingers, the fingers' position relative to the keys, and whether the keys are activated or not.

Background of the Invention

Since handheld terminals, such as cell phones, are small, there is a problem to make room for both a display and a keyboard on the device. It is also difficult to manage the device with one hand, or finger(s).

Handheld terminals generally present a compromise between size and functionality. In the pocket the terminal should take almost no place at all. When in use, the terminal should be easy to access with the hands/fingers.

When a terminal is in the hand of a user, the user's fingers are often placed under the terminal while the thumb is on the front surface. This forces the user to use the thumb when operating the keyboard. Since the overall operation speed is low when using only the thumb, and said operation is uncomfortable from an ergonomic point of view, it would be better if the keyboard could be operated with the other four/eight fingers.

An alternative situation, is when the terminal is gripped by a user in one hand and the user operates the keyboard with the other hand. The keys of the keyboard are small and difficult to operate, due to the fact that they are closely spaced and the user's fingertips are broad or the user has enough finger motor activity. The operating efficiency would thus be increased if the keyboard could be operated with both hands.
Still another alternative situation, is when a user operates a portable terminal having the keyboard keys arranged on the side surface of the terminal, such that the keys are partly or fully invisible from the front of the terminal. In that case, the terminal would normally be resting in one of the user's hands and the user would then operate the terminal by pressing the keyboard keys by using one or both hands.

CN-1356622, US-6297752, US-5515305 and KR-20020004420 discloses different devices that all have a keyboard arranged on the back surface. None of said documents include means for indicating, on a display provided at the front side, the position of the user's fingers on the keyboard.

DE-10260499 discloses a keyboard for portable devices. The keyboard is arranged on the back surface of the device, and is transparent so that the user can see where the fingers are. One disclosed embodiment comprises a card on the front surface showing the positions of the keys. This in combination with transparency of the terminal makes it possible to see, through the terminal, where the fingers are positioned on the keyboard.

One obvious problem of having the keyboard on the back surface or side surface of the terminal, is that the user cannot see, or can only partly see, where the fingers are positioned on the keyboard.

The problem of the prior art devices is that they do not provide enough information about the positions of the fingers relative to the keys of the keyboard, such that a user may enjoy a much improved operational speed. The features of a transparent terminal casing and a position-indicating card as disclosed in DE-10260499, do not provide the user with the type of information that is required for him to operate the keyboard at significantly higher speeds. This is prevented by the fact that he cannot clearly see the position of the fingers through the position card, the front surface of the terminal casing, circuits and the back surface of the casing/keys of the keyboard. Moreover, in order to locate the position of the fingers, the user is forced
to look down at the keys and can therefore not follow the result of his operations in
the application window. It will also be very difficult to see whether a key is activated
or not.

5 The prior art fails to disclose any means of giving the user a direct feedback of the
finger positions relative to the keys of the keyboard and the keyboard operations.

Summary of the Invention
In view of the shortcomings of the portable devices according to the prior art having
the keyboard arranged on the back surface of the terminal, or arranged such that
the keyboard keys are partly or completely invisible from the front of the terminal,
there is a need for a portable device providing quicker and more efficient feedback of
the user's finger positions relative to the keys of the keyboard and keyboard
operations.

15 The present invention provides a novel and efficient way of giving the user such
information. The present invention achieves such feedback by the terminal design
defined in claim 1.

20 The present invention relates to a portable device, which visualises the keyboard
operations made on a keyboard arranged on the back surface or side surface of a
terminal, on a display on the front surface of the terminal. The display shows a
representation of the keys of the keyboard and the user's fingers, and the current
position of the fingers relative to the keys of the keyboard, and whether keys are
activated or not. In this way, since the user is aware of the positions of the fingers
in relation to the keys, it is easy for the user to understand how to reach the
desired keys and to quickly activate a key, thus improving the overall speed with
which keys are operated.

30 The means for transferring information of the positions of the fingers to the display
of the said finger movements may be embodied in many different ways. These are
defined by the dependent claims.
At present, no prior art discloses a terminal design that achieves said visualisation.

The main advantage of the device according to the present invention, in addition to good ergonomics, is the provision of quicker and more efficient feedback of the user's keyboard operations.

The terminal design according to the present invention is particularly suitable for portable devices, such as cell phones, palm tops, portable computers, PDA:s (personal digital assistants), handheld terminals of joystick-type, such as game pads, or manoeuvring or control units for equipment (cranes, robots or different tools), whether they are cordless or not.

**Brief Description Of The Drawing**

Fig. 1 is a schematic view of the back surface of a terminal designed according to the present invention, also showing a user's hands,

Fig. 2 is a schematic view of the front surface of a terminal designed according to the present invention, and

Fig. 3 is a schematic view of the front surface of a terminal designed according to the present invention, which is similar to that shown in Figure 2, but also showing a user's hands.

**Detailed Description of the Invention**

The present invention discloses a terminal design for portable devices, wherein the keyboard is arranged on the back surface or the side surface of the terminal. Holding the terminal with the thumbs on the front surface and the other fingers on the back surface of the terminal, the keyboard is easy to access.

An embodiment of the terminal design according to the present invention is shown in Figure 1. The figure shows the back surface of a terminal 1 designed according to the present invention. The terminal 1 have a keyboard or keys 2 arranged on its
back surface. A user’s fingers 3 are placed on the keyboard 2 and the fingers (excluding the thumb(s)) are used to press the keyboard keys.

Fig. 2 shows the front surface of the terminal 1 designed according to the present invention. The terminal comprises a display 4, which includes an application window 5, and finger 6, 7, 8 (here displayed as broad arrows) and key representations 9. When a finger is on the back surface of the terminal, the front surface display 4 will display said finger as a finger representation. Reference numeral 6 represents a finger resting on the terminal 1. If a finger is placed upon a key, said key will indicate that, e.g. by highlighting said key. Reference numeral 7 represents a finger placed on a key and a highlighted key. If a finger placed upon a key applies a certain amount of pressure on said key, the key will be activated and an action will be performed, whereby the key will return to the previous non-activated state, as indicated by reference numeral 7. Reference numeral 8 represents a finger activating a key.

Fig. 3 shows the front surface of the terminal 1 designed as in Figure 2. This terminal also comprises a display 4, which includes an application window 5, but display representations of the keys and the fingers (here displayed as fingers) on the back surface of the terminal as keys 9 and fingers 6. A user’s thumbs and hands 10 are also shown.

In an alternative embodiment, the keyboard keys may be arranged on the side of the terminal, such that the keys may only be partly visible from the front of the terminal. The representation of the fingers and keys would be displayed on the front display 4, as in the other embodiments according to the present invention.

In still an alternative embodiment, the keyboard keys may be arranged on the back of one or more wings arranged on the back or side surface of the terminal, at an angle if so desired. In this case, the keyboard keys would be completely invisible from the front of the terminal. Said wing(s) may also be foldable in order to reduce its size when not in operation. The representation of the fingers and keys would be
displayed on the front display 4, as in the other embodiments according to the present invention.

In still an alternative embodiment, the terminal may also be fitted with a detachable tube, such that the terminal may be held by inserting a thumb into said tube, when attached, and bending the thumb inside the tube in order to obtain secure holding of the terminal. The terminal is then operated by the fingers of one or both hands.

The terminal display 4 may display both the application window display 5 and the representations of fingers and keys as in the disclosed example above, but the fingers/keys may also be displayed in a separate display.

There are presently different ways of achieving the representation of the fingers/keys:

According to one embodiment (see Figure 2), the keyboard comprises a touch-controlled panel which produces information of the finger positions. A finger's position is here represented by an arrow on the display. The panel may be pressure-sensitive in such a way that it can distinguish between a user's finger simply being positioned on a key and said finger activating said key by applying a certain amount of pressure.

In still an alternative embodiment, the keyboard comprises optical sensors which detects the finger positions and produce information that are visualised as finger positions on the display 4. The distinction between activated and non-activated keys is achieved by a combination of optical sensors and a further detection means, e.g. the above-mentioned pressure-sensitive panel.

In still an alternative embodiment, the fingers are captured with a camera on the back surface of the terminal and are visualised as finger positions on the display 4. This detection means, as in the preceding embodiment, needs to be combined with a further detection means for distinguishing between activated and non-activated keys.
In still an alternative embodiment, the information of the finger positions are obtained by electromagnetic detection. The electromagnetic detection means may be combined with any further detection means described herein capable of distinguishing between activated and non-activated keys.

In still an alternative embodiment, the information of the finger positions are obtained by heat sensors. The heat sensors may provide the information needed for enabling the finger positions, as well activated or non-activated keys, to be displayed as representations of the fingers positions on the display 4. If the heat sensor detection means used is not capable of distinguishing between activated and non-activated keys, said detection means can be combined with any of the herein disclosed further detection means capable of achieving said function.

In the case when the keyboard keys are arranged on the side surface of the terminal, or on wings arranged on the back surface or side surface of the terminal, the above-mentioned detection means or further detection means are arranged on said side surface(s) or wings.

The transfer of information regarding the finger positions and whether the user has activated any of the keys, can be obtained by the use of any conventional means, such as electrical conductors, as well as radio means, such as Bluetooth®.

In all embodiments mentioned above, if not mentioned, the representations of the keys are displayed simultaneously with the representations of the fingers on the display 4.

As an alternative to arrows, a finger’s position in relation to the keyboard on the back or side surface of the terminal may be represented as a finger on the display on the front surface, as shown in Figure 3.

The keyboard keys are not necessarily discrete keys such as in the case of an ordinary keyboard, but can also be keys indicated on a touch panel or screen.
Keys that are activated (pressed) by the fingers may be highlighted, as shown in Figure 2, while keys that are not activated may be down-faded, either by colour or degrees of colour. Said highlighting and down-fading may be displayed when displaying the representations of the fingers and keys or be displayed in the application window, or by a combination of the two ways. Said highlighting and down-fading action may also be indicated with sounds. Any combination of visual and acoustic indications or signals may be used.

As described above, the representations of the keyboard keys and the fingers may be displayed in the terminal display used for displaying the application window (as disclosed in Figures 2 and 3). The representations of the keyboard keys and the fingers may also be displayed in a terminal display that is separate from, i.e. non-integrated with, the terminal display used for displaying the application window (not shown). Said displays may also be units that are separate from the terminal, and which are connected with the terminal and detections means or further detection means by electrical conductors or other conventional means involving optical or acoustic signals (not shown).

The device according to the present invention can be operated using one or both hands.
Claims

1. Portable device or terminal (1) comprising a terminal display (4) on the front surface and a keyboard (2) on the back or side surface of the terminal, which is partly or completely invisible from the front of the terminal, characterised by detection means for providing data of the positions of a user's fingers relative to the keys of the keyboard, and means for visualising said data as representations of the fingers (6,7,8) and their respective positions relative to the keys (9) of the keyboard, on the display (4).

2. Portable device according to claim 1, characterised in that the detection means are selected from the group consisting of a pressure-sensitive panel, optical sensors, electromagnetic sensors, heat sensors and a camera, or any combination thereof.

3. Portable device according to claim 2, characterised in that the detection means is capable of distinguishing between a mere contact between a user's finger and the keyboard and the pressing of a key by the finger in order to activate said key.

4. Portable device according to any of the preceding claims, characterised in that the display displaying the finger and keys representations is an integrated part of the display used for displaying an application window.

5. Portable device according to any of the preceding claims, characterised in that the display displaying the finger and keys representations is a display separate from the display used for displaying an application window.

6. Portable device according to any of the preceding claims, characterised in that the display used for displaying an application window and/or the display displaying the finger and keys representations are units that are separate from the terminal, and which are connected with the terminal and
detections means or further detection means by electrical conductors or other conventional means involving optical or acoustic signals.

7. Portable device according to claim 1, characterised in that activated keys are highlighted on the display while keys that are not activated are down-faded, either by colour or degrees of colour, or are indicated by an acoustic signal, or by a combination of them both.

8. Portable device according to claim 7, characterised in that said highlighting and down-fading of keys may be displayed when displaying the representations of the fingers and keys or be displayed in the application window, or by a combination of the two ways.

9. Portable device according to any of the preceding claims, characterised in that the portable device is selected from the group consisting of cell phones, palm tops, portable computers, PDA's (personal digital assistants), handheld terminals of joystick-type, such as game pads, or manoeuvring or control units for equipment (cranes, robots or different tools), whether they are cordless or not.

10. Portable device according to any of the preceding claims, characterised in that the portable device is fitted with a detachable tube, into which a user's thumb may be inserted in order to hold the device.

11. Portable device according to any of the preceding claims, characterised in that the keyboard keys are arranged one the back of one or more wing(s), foldable or not, arranged on the back or side surface of the terminal.

12. Portable device according to any of the preceding claims, characterised in that the keyboard keys are keys indicated on a touch panel or screen.
Fig. 2
**INTERNATIONAL SEARCH REPORT**

**International application No.**
PCT/SE 2004/001669

**A. CLASSIFICATION OF SUBJECT MATTER**

**IPC7:** G06F 3/023, G06F 3/02, G06F 1/16

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)

**IPC7:** G06F

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

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**EPO-INTERNAL, WPI DATA, PAJ**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<td>US 20020118175 A1 (FRANK LIEBENOW ET AL), 29 August 2002 (29.08.2002), [0007],[0025]-[0027], [0066]-[0067], FIGURE 1,2,5,7,12,15,16</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

**Date of the actual completion of the international search**

17 June 2005

**Date of mailing of the international search report**

23-06-2005

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Form PCT/ISA/210 (second sheet) (January 2004)
### INTERNATIONAL SEARCH REPORT

**International application No.**

PCT/SE 2004/001669

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