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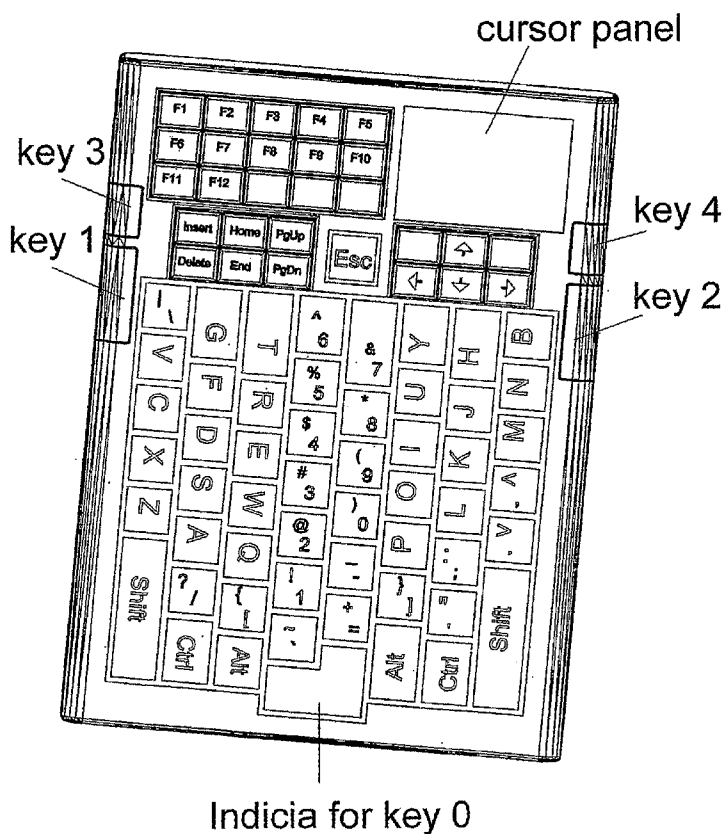
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(54) Title: BACK-TYPING ERGONOMIC KEYBOARD



(57) Abstract: A free-standing, compact size ergonomic computer keyboard. All the alphabetic, number and symbol keys are placed on the back side of the keyboard that are off sight of the operator. The positions of the keys on the back side are shown by a key indicia area on the front side of the keyboard, so that the operator can locate the keys on the back side. The layout of the keys is suitable for touch typing from the back side but still keeps most of the fingering of the QWERTY layout. 'F1'~'F12' keys, arrow keys, 'Insert', 'Delete', 'Esc' keys and the page control keys are placed on the upper part of the front side of keyboard to be operated by thumbs. 'Space', 'Backspace', 'Return', 'Shift', 'Ctrl', 'Alt', 'Caps Lock', 'Tab', 'Fn', 'Esc' and 'Delete' keys can be allocated onto four predefined key zones on the keyboard surface in different arrays and combinations. A cursor tracking device (mouse) is also integrated with the keyboard. During touch typing, the keyboard is held lightly in hands with or without the lower end of the keyboard stands on operator's lap or abdomen or on a table with the key indicia facing to the operator. The operator is free to sit, couch or even lie down on his back while typing.

Back-Typing Ergonomic Keyboard

BACKGROUD OF THE INVENTION

1. Field of Invention.

The present invention relates to a keyboard or a data input device, in particular to an ergonomically designed back-typing keyboard, which can be held in hands during typing.

2. Review of Prior Arts

Driven by the ever prevalent use of computer, computer keyboard has now become the most common tool in offices, homes and public places for the purpose of work, entertainment, travel and various usages. Following Moore's Law, computer is getting more and more compact while getting more powerful. With the new developments in LCD, LPD and projector technologies, the size of the display screen also gets larger. However, keyboard, while indispensable, the most important human-computer interface has become a modern antic. The currently most used keyboard layout is inherited from QWERTY typewriter that was designed in 1886 by Christopher Sholes. The basic design and shape of the keyboard, especially the layout and the way of touch typing keep unchanged for more than a hundred and twenty years.

Dvorak (U.S. patent No. 2040248, Dvorak et. al. May 12, 1936) developed a new key layout in an attempt to reduce the finger movements on a keyboard during touch typing, so far DVORAK keyboard is the only alternative keyboard that can be seen in some applications. There had been other attempts targeting at the improvement of the efficiency or typing speed of keyboards (e.g. U.S. patent No. 4,332,493, Einbinder, June 1, 1982). Some other keyboards have the key layouts that are easier to remember (U.S. patent No. 4,963,044, Warner, October 16, 1990). However, very limited people are

willing to adapt to a new keyboard layout. A strong habitual inclination in people makes them stick to the standard QWERTY keyboard.

It is now known to most people that the ever serious problem associated with the use of QWERTY keyboard is that long-time typing job may cause Repetitive Motion Injuries (RMI) such as Carpal Tunnel Syndrome (CTS). Many studies show that pronation of the hands and abduction of the elbows would cause stress and arouse problems on waists, shoulders, back and neck. Spencer, (U.S. patent No. 5137384, Aug. 11, 1992) introduced an ergonomic keyboard to relief such problems by splitting the keyboard into two vertical halves. Such a design allows the operator's hands and arms to be maintained in a substantially relaxed, natural position. Mirrors are provided on both sides of the keyboard to reflect the key positions.

More efforts have been made out to solve the CTS/RMI problems in the past years, Ergonomic keyboards of various shapes like curved mound (U.S. patent No. 6,132,118, Grezeszak, October 17, 2000), pyramid shaped (U.S. patent No. 5,426,449, Danzige,r 1995) and side mounted (U.S. patent No. 5,160,919, Mohler, et al., November 3, 1992) have been developed to change the position of hands, as well as the way of typing, to alleviate the problems as mentioned above.

A data entry system with ergonomic base including upper surface controls and side surface controls was suggested by Willner, et al. (U.S. patent No. 5,874,906, February 23, 1999). This design suggested a shape of a joystick with two hand grip portions. Together with combination of the upper surface and side surface keys, mode selection is used to generate key signals. Such a keyboard is different from the standard QWERTY keyboard both in shape and in the key sets. Goodenough and Gary Lee (US patent No. 6,939,066, Sep.6, 2005) suggested a handle structured keyboard with front and back key functionalities, in which a software algorithm was provided to aid the user to locate the keys in the back of the keyboard that are not visible to the operator.

For all the known different keyboards as mentioned above, so far we haven't seen them widely used. The inventor concludes here some possible reasons and also suggests some certain aspects that can be further improved even for a standard QWERTY keyboard.

1. The prior art has tried many ways to introduce new key layout, but full abandonment of the QWERTY keyboard is difficult to be accepted by most of the people that already established the habit of using standard keyboard and customized to the fingering.

2. In comparison with the standard keyboard, various shapes of keyboards seem too complicated and whimsical to the users. The shape and size of the keyboard, as well as the portability of the keyboard, always affect the user's choice. The user needs a simple and common tool that is easy to be used and carried around.

3. The keyboards with split keypads not being widely accepted is probably due to the reason that the mind would be distracted when typing in separate key pads simultaneously. One would likely lose the focus when putting two hands apart during typing. The split keyboard is also relatively difficult to be placed, deployed and packed than a standard keyboard.

4. For most of the users, key positions need to be visible because they don't remember all the key positions on the keyboard, and even if they do remember the key positions, their eyes would need to check the keys from time to time. For some of the known keyboard, the key positions cannot or can hardly be seen. Especially the keyboards with keypads facing to the right and left sides.

5. The visibility of the key positions is not good even on a standard keyboard because the key indicia on a standard keyboard are not facing directly to operator's eyes but facing upward to the roof. Moreover, the operating hands are blocking eyesight of the operator. It is also difficult

for the operator to locate the less remembered digital and symbol keys that lined on the far edge of the standard keyboard.

6. Round keys, triangle keys and keys of various shapes on a computer keyboard are space consuming and difficult to form an efficient layout, we have seen many known keyboards look like a button panel in an old space ship. The inventor believes that a keyboard uses mostly the adjacent rectangular keys would be suitable for an efficient and compact keyboard.

7. In a computer keyboard, the minimal total number of keys is over 70. Thus it is not possible to cover all of them only by finger movements without moving hands to different locations. In fact, in a standard computer keyboard, hands frequently moves out of the 'home position' to reach the keys such as arrow keys or page control keys. Many known designs intend to gives hands a fixed 'home' position or a holding position, which means that the hand movements out of the 'home position' is very much limited and only finger movements are allowed to finish the touch typing. This will lead to too crowded key space and too small key size, or the other way, keys are assigned with too many functions.

SUMMARY OF THE INVENTION

The purpose of the invention is to provide a novel ergonomic keyboard that can be held vertically with two hands, which allows a touch typing on the back side of the keyboard.

Such a purpose is achieved by means of a ergonomic keyboard which can be held in hands during typing, comprising:

a free-standing flat keyboard body including a front side facing the operator and an opposite back side;

a back keypad on said back side of the keyboard body, which is partitioned into 3 adjacent zones including:

Zone 0, a major area in the middle of said back keypad,

Zone 1, an area in the lower part of said back keypad including the right and left edges,

Zone 2, an area in the upper part of said back keypad;

a front keypad on said front side of the keyboard body, which is partitioned into 3 adjacent zones including:

Zone 3, an area on the left edge of the keyboard body, which is closed to the front side,

Zone 4, an area on the right edge of the keyboard body, which is closed to the front side,

Zone 5, an area in the upper part of said front side of the keyboard body; keys being grouped and allocated as follows:

Group 1 keys, including all the alphabetic keys, number keys and symbol keys, arranged in said Zone 0 on the back side,

Group 2 keys, including 'F1'~ 'F12', 'Insert', 'Delete', 'PgUp', 'PgDn', 'Home', 'End' keys, 4 arrow keys and extended function keys, arranged in said Zone 5 on the front side,

Group 3 keys, including 'Space', 'Backspace,' 'Return (Enter)', 'Caps Lock', 'Tab', 'Shift', 'Ctrl', 'Alt', 'Fn', 'Esc' and 'Delete' keys, allocated to said Zone 1, Zone2 , Zone 3 and Zone 4 in different arrays and combinations; and

a key indicia area below said Zone 5 on said front side of the keyboard body, with its position and size corresponding to the back keypad on said back side, for indicating the key positions of the back keypad in a visible manner.

Preferably, all of the keys are designed in a rectangular form, and are arranged adjacent to each other in the respective zones.

To be clear, the term 'front side' means the keyboard surface that is facing the operator, and the term 'back side' means the keyboard surface that is off sight of the operator. The conventional QWERTY keyboard is referred to as

‘standard keyboard’ in the following, in contrast with the invention herein. As would be appreciated by those skilled in the art, a standard flat keyboard also includes conventional DVORAK keyboard.

In a preferable keyboard layout according to the invention, the keys in the back keypad are arranged in 8 vertical rows. In particular, the alphabetic keys and number keys covered by the right and left hands has the same arrangement as the keys covered by the same hands on a standard flat keyboard, but in a vertical manner. In an even better variation, the key distribution and key offset on a standard QWERTY keyboard are kept unchanged.

Moreover, the ‘F’ and ‘J’ keys are preferably horizontally aligned, so that the index fingers of the right and left hands can easily find their home positions. With such a design, the keyboard allows the hands to move out of the home position to type certain keys as well as operating an integrated mouse. Thumb finger and index finger are more frequently used due to extended key areas applied. This would further release the overwork of the small fingers.

According to keyboard layout as mentioned above, the characteristics of a traditional QWERTY layout are preserved as much as possible. That is to say, the number and sequence of the keys in each vertical row of the back keypad, as well as the position shifts (or offsets) between the key rows, are realized in the same manner as those on a standard QWERTY keyboard, so as to keep the most similar typing fingering. This would largely save the operator from learning new layout and new key positions.

To make the layout of the back keypad more symmetrical, the positions of some symbol keys, e.g. ‘\|’, ‘}’’, ‘=+’ and ‘/?’ keys, can be adjusted.

In another variation, the inventive keyboard has a palm adaptive portion to fit the hand size and adjust the distance between the palms and the keys. Said palm adaptive portion is integrated with or detachable from the keyboard

body.

In a further preferable embodiment, the inventive keyboard further comprises an integrated cursor panel or a cursor ball on said front side to be operated by thumb, as well as cursor buttons on said back side of the keyboard body to be operated by other fingers.

As a free-standing keyboard, the inventive keyboard can be connected to a computer with a cable or in a wireless matter, and can be carried around.

The idea of the invention is inspired by musical instruments like guitar, cello, accordion, hand drum, etc., as well as the ways that musicians play them, and the operation of such a keyboard would be natural and viable in view of human ergonomics.

For a back-typing keyboard, the visibility of the keys on the back side is a major consideration. To tackle this problem, the inventor adds a key indicia area on the front side indicating the positions of the keys on the back side of the keyboard, that are out of sight of the operator. Alternatively, the key indicia area indicates the positions of the keys on the back keypad by means of dummy keys, lighted key indicia, stickers, transparent keyboard body or a display screen. By doing this, the invention gives even better visibility of the key positions than a standard keyboard due to the following reasons:

- a. The keyboard body is erected so that the key indicia area is now facing directly to the operator's eyesight.
- b. The hands typing on the back side of the keyboard will not block the eyesight from the key indicia.
- c. When the indicia for the number keys and symbol keys are located in the middle of the key indicia area, they now appear more obvious for the operator than on a standard keyboard.

The inventive keyboard has the advantage of compact size and good appearance. The keyboard and its keys are designed with a simple and normal shape. Rectangular keys and flat book-like keyboard body are chosen to

construct a simple and compact structure. The inventive keyboard fully utilizes the surfaces of the keyboard body, and the keys are arranged in a more compact layout. With the same key size as that on a standard keyboard, the dimension of the inventive keyboard is around of a B5 paper size. If using smaller rectangular keys, the keyboard dimension can be further reduced to an A5 paper size or even smaller. It is convenient to be packed, put in a hand bag or carried around.

With the inventive keyboard, it is possible for a user to do the typing job comfortably while sitting before a desk, in a couch or in sofa, or even lying on a bed. The key indicia area is facing to the eyesight of the operator even when the operator lies flat with his head adequately pillowed. The present invention might not solve all CTS/RMI problems, but, in contrast to the standard keyboard, it can provide a change of positioning for shoulders, arms and hands. This allows the operator's hands and arms to maintain in a substantially relaxed, natural position, i.e. arms can keep a relaxed position by the operator's side, with hands holding the keyboard lightly, palms facing each other and fingers bending naturally inwards towards the operator. Also, it allows a relaxed back-lying position during typing, and, therefore, further gives relief for back and neck problems caused by strict sitting work conditions.

On the other hand, the application of large LCD and LPD screens and projectors requires the operator to stay far from the screen. In many cases, putting the keyboard on a table might be awkward and unnecessary. A keyboard that is more compact and easy to be operated without table is much more practical. The invention herein provides possibilities to type 'off table' comfortably.

Reports show that the keyboard might be the dirtiest device in the world. Exposed to the daily dust, sweat and grease of hands, the keyboard becomes a resort of bacteria and virus. It's even worse for the keyboards in net pubs or

shared offices. Due to the portable compact size and full function, the invention has provided a way to personalize the keyboard that can be connected to different computers and screens in various locations. In another word, one can bring his own personalized keyboard to avoid using public keyboards. Another meaning for a personalized keyboard is that one can even chose different keyboard size and style according to his taste and hand size.

The invention can also be a hardware integration platform. Within the compact and flat keyboard body, the keyboard can be integrated with hand writing panel or small size LCD display screen on (or underneath) the area of key indicia. It can be even developed into a palm computer. A picture of the future application is that people may only need to bring his small size 'back-type-keyboard computer' during travel and remotely connect it to a large screen wherever available.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is the front view of the keyboard according to a first embodiment of the invention. The areas labeled with Key 1, Key 2, Key 3 and Key 4 can be allocated with different keys from Group 3 keys that will be defined in more details in the following description.

FIG. 2 is the back view of the keyboard according to the first embodiment as shown in FIG 1. The areas labeled with Key 0, Key 5 and Key 6 also can be allocated with different keys from Group 3 keys that will be defined in more details in the following description.

FIG. 3 is the front view of the keyboard showing the zone partition according to the invention, in which Zone 3, Zone 4 and Zone 5 are shown in different types of shading.

FIG. 4 is the back view of the keyboard showing the zone partition according to the invention, in which Zone 0, Zone 1 and Zone 2 are shown in different types of shading.

FIG. 5 shows the layout of Group 1 keys (26 Alphabet keys, all number keys and all symbol keys), which is obtained by mapping the standard QWERTY layout into Zone 0 on the back side of the inventive keyboard. It can be seen that Group 1 keys are arranged in 8 vertical rows with the row numbers above the respective rows. The horizontal line shows the alignment of the shaded 'F' and 'J' keys.

FIG. 6 is a reversion of the layout shown in FIG. 5. Group 1 keys in FIG 6 have a more symmetrical layout than in FIG 5.

FIG. 7 shows two examples of the key indicia that can be alternatively used in the first embodiment.

FIG. 8 shows the front view of the keyboard according to a second embodiment without Zone 3 and Zone 4 on the right and left edges.

FIG. 9 shows the back view of the keyboard according to the second embodiment as shown in FIG 8.

FIG. 10 shows the front view of the keyboard according to a third embodiment with a palm adaptive portion.

FIG. 11 shows the back view of the keyboard according to the third embodiment as shown in FIG 10.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 and FIG 2 show the front and back views of the keyboard according to a first embodiment of the invention, respectively. The inventive keyboard or data input device has a shape of an ordinary book or a flat brick, which can be conveniently held in both hands during touch typing. While typing with the inventive keyboard, an operator need to touch the keys on the back side of the keyboard body with the fingers of the both hands, and locate the keys by looking at the key indicia area on the frond side of the keyboard body at the same time.

The hand-movement around the inventive keyboard's surfaces is very

delicate and has various possibilities, especially with the both hands operating the keyboard and cooperating with each other. One can emulate the situation by holding a diary note-book with two hands. After considering the finger movement and the function of all of the keys, the inventor groups all of the keys into 3 groups and partitions the both sides of the keyboard body into 6 different zones.

Said three key groups are defined as follows:

Group 1 keys include 26 alphabet keys 'A'~'Z', number keys '0' ~ '9', and all the symbol keys, such as '~', ';;', '""', '=+', '-_', '<', '>', '[{', '}]', '\|' and '/?' keys.

Group 2 keys include function keys 'F1'~ 'F12', 'Insert', 'Delete', 'PgUp', 'PgDn', 'Home', 'End', 'Esc' keys and 4 arrow keys, as well as some extended function keys if required, such as 'PrtSc', 'NumLk' 'Pause', etc.

Group 3 keys include the remaining keys, such as 'Space', 'Backspace', 'Return(Enter)', 'Shift', 'Ctrl', 'Alt', 'Caps Lock', 'Tab', 'Fn', 'Esc' and 'Delete'. All of the keys in Group 3 have dedicated key functions and are frequently used when editing a text.

The partition of the zones on the front and back sides of the keyboard body can be seen from FIG. 3 and FIG. 4, respectively. These zones are defined as follows:

Zone 0 is a middle major area of the back keypad on the back side of the keyboard body as shown in FIG. 4. Zone 0 is assigned only with all **Group 1 keys**.

Zone 1 is a lower area of the back keypad on the back side of the keyboard body adjacent to Zone 0. The boundary between Zone 1 and Zone 0 can be adjusted according to the key layout and the shape of Zone 0. During touch typing, Zone 1 can be touched by little fingers and ring fingers. This zone also includes the right and left edges of the back keypad. For example,

as shown in FIG 2, key 'Fn' from Group 3 keys is allocated at the left edge of the back keypad. Moreover, as shown in FIG 2, the keys 'Alt', 'Ctrl' and 'Shift' from Group 3 keys are preferably duplicated in the right and left sides of Zone 1 in a symmetrical manner, so that the operator can type these keys alternatively with the right and left hands.

Zone 2 is an upper extended area of the back keypad on the back side of the keyboard body adjacent to Zone 0. The boundary between Zone 2 and Zone 0 also can be adjusted according to the key layout and the shape of Zone 0. Compared to a standard flat keyboard, Zone 2 is a new extended area, which can be reached by the index finger and middle fingers. It is a very convenient position for touch typing and some frequently used keys can be allocated in this zone. As shown in FIG 2, key 'ESC' from Group 3 keys is located in the middle of Zone 2, above Group 1 keys. Also, in this embodiment, Zone 2 includes two areas labeled with Key 5 and Key 6, which are located on the left and right sides of key 'ESC', respectively.

Zone 3 is an area at the left edge of the front keypad on the front side of the keyboard body, as shown in FIG. 3. Zone 3 is suitable for being pressed with the left thumb. As shown in FIG 1, Zone 3 includes two areas labeled with Key 3 and Key 1.

Zone 4 is an area at the right edge of the front keypad of the front side of the keyboard body. Zone 4 is suitable for being pressed with the right thumb. As shown in FIG 1, Zone 4 includes two areas labeled with Key 4 and Key 2.

Zone 5 is an upper area of the front keypad on the front side of the keyboard body. Zone 5 is assigned only with Group 2 keys. As shown in FIG 1, the function keys, such as 'F1'~'F12', are arranged in the upper left part of the front side of the keyboard body. In this embodiment, 'Insert', 'Delete', 'Home', 'End', 'PgUp' and 'PgDn' keys are arranged on the left, and the arrow keys are arranged on the right.

As shown in FIG. 3, a key indicia area is provided on the front side of the

keyboard body, which occupies a major part of the front side, below Zone 5. It is clear from FIG 1 that the key indicia area has a print of key indicia at least corresponding to the keys in Zone 0 and Zone 1 on the back side of the keyboard, with the same size and positions. For the keys in Zone 2, their positions will not be shown in the key indicia area if these keys are arranged directly behind Zone 5. However, as shown in FIG 1, the indicia for key 'ESC' is also shown on the front side, since the position of 'ESC' is not concealed by the keys in Zone 5.

The keys in Zone 0, 1 and 2 in the back keypad on the back side are to be typed with the fingers of the both hands except thumbs. The hands start typing with the index fingers touching the 'F' and 'J' keys as 'home' positions, just like they do in a standard QWERTY keyboard. The keys in Zone 3, 4 and 5 in the front keypad on the front side are to be operated only by thumbs (that is why they are also referred to as 'thumb pad'). The keys in Zone 3 and Zone 4 are to be typed by thumbs without the hands leaving the 'home' positions or they only need to move slightly out of the home positions. The keys in Zone 5 need to be typed by thumbs with hands moving out of said home positions. It is not necessary to arrange Zone 3, 4 and 5 in a separated manner, as shown on FIG. 3, that is to say, said zones can be jointed together according to the size, shape and number of the keys.

As described above, all of the alphabet keys, number and symbol are named as Group 1 keys and mapped into Zone 0. FIG. 5 shows an example of mapping group 1 keys from a standard QWERTY layout into said Zone 0.

As shown in FIG. 5, 'F' and 'J' keys are aligned horizontally, to keep the 'home positions' of the both hands aligned. Group 1 keys are arranged in 8 vertical rows so that the left hand and the right hand each cover 4 rows. Preferably, the right hand and the left hand each cover the same sub-sets of Group 1 keys as on a standard QWERTY keyboard.

In such a layout, number keys '0'~'9' and most of the symbol keys are

positioned in the two middle rows (Row 4 and Row 5). It would make the number keys and the symbol keys have a better visibility for the operator than on a standard keyboard.

The shifts of key positions (or key offsets) between the adjacent key rows are the same as that on a standard QWERTY keyboard. So the fingering of Group 1 keys is kept as much as possible.

In a more practical variation shown in FIG. 6, the layout of Group 1 keys is adjusted by moving 4 symbol key, e.g. '\|', ']}', '=+' and '/?' to their new positions. This new layout retains most of the characteristics of the layout shown in FIG. 5 and will not incur much change in fingering, but looks more symmetric, so that Group 3 keys can be allocated in Zone 1 in a more rational arrangement.

The term 'symmetric' here means that the keys in Row 1 and Row 8 are aligned and have the same shape, and the keys in Row 2 and Row 7 are also aligned and has the same shape.

Preferably, the right and left edges of Zone 1 are aligned with the keys in Zone 0.

It is apparent for those skilled in the art that there are many other ways to re-locate the symbol keys to make layout more symmetrical. When trying to retain as much as possible the characteristics of a standard keyboard, the practical ways to reallocate the symbol keys are very limited, and the variations will not deviate much from the illustrated example in FIG. 5. The symbol keys to be adjusted to form a symmetric layout would be no more than 5 keys selected from '?/', ';;', '""', '{[, ']}', '\|', '=+' and '~'.

Now we go further to other zones for Group 2 and Group 3 keys.

As described above, page control keys (i.e. 'PgUp', 'PgDn', 'Home' and 'End'), 'Insert', 'Delete', 'F1'~ 'F12' keys and 4 arrow keys, as well as some extended function keys if have, are defined as Group 2 keys. In many computer keyboards (e.g. for a portable computer), these keys have smaller

size, because it's less likely for the operator to type them in quick and multiple combinations.

As shown on the FIG. 3 and FIG. 1, Group 2 keys are placed in Zone 5 on the front side to be operated by thumbs, wherein the arrow keys are to be covered by the right thumb and 'PgUp', 'PgDn', 'Home', 'End', 'Insert' and 'Delete' keys are to be covered by the left thumb. The 'F1' ~ 'F12' keys are placed on the upper left part of Zone 5, while 'Fn' key is placed on the right hand side in Zone 1 area. It should be noted that the hands need to move out from said 'home position' to enable the thumbs to reach Group 2 keys. It is also possible to make a 'mirror' layout arrangement of Group 2 keys for left-hand users.

As defined above, Group 3 keys including 'Space', 'Backspace,' 'Return', 'Shift', 'Ctrl', 'Alt', 'Caps Lock', 'Tab', 'Fn', 'Esc' and 'Delete' (in some cases, 'Esc' and 'Delete' keys may not be included in Group 3 keys). Group 3 keys can be allocated into Zone 1, 2, 3 and 4 in different shapes, arrays and combinations. Some useful combinations and arrays are described as follows, wherein the functions of the keys, the typing habits on a standard keyboard and ergonomic features are taken into consideration:

As seen from FIG 2, 'Shift', 'Ctrl', 'Alt' and 'Fn' to be typed by little fingers can be allocated into Zone 1, on both the left hand side and right hand side.

Moreover, since 'Space' and 'Return' keys are frequently used, they should be placed in the most convenient positions. They can be allocated twice if necessary.

As shown on FIG. 3 and FIG. 1, the key indicia area on the front side of the keyboard show the exact positions of the keys on the back side. Unlike the standard keyboard that lies flat on a table, the inventive keyboard is hold in hands with the key indicia facing directly to the operator's eyes and the operator's eyesight will not be blocked by the operator's hand like the way in

the standard keyboard.

FIG. 7 shows two examples of the key indicia area that can be alternatively used, wherein the number keys and symbol keys are now located in the middle of the indicia area (i.e. in Row 4 and Row 5). Thus it is now much easier to identify the positions even than a standard QWERTY keyboard.

The difference between said two examples lies in that the first key indicia in the upper part of the figure has a print with vertical alphabetic letters, so that they can be easily read by the operator, while the second key indicia in the lower part of the figure has a print with horizontal alphabetic letters, so that the operator is ready to trace back the familiar key layout on the back side and recall the fingering for touch typing.

It should be noted that there are many simple and apparent mechanisms to illustrate the key positions on the front of the keyboard, such as stickers, dummy keys, LED lights, transparent keyboard body (it can even shows the movement when real keys are pressed), or even by a display screen.

The purpose of the invention herein is to develop a full function data input device that can be carried around and away from the table. The integration of the function of a mouse or cursor tracking device is important. As illustrated in FIG. 1, 2, 3 and 4, a cursor panel is provided on the upper right portion on the front side of the keyboard body, with the cursor buttons on the corresponding back side of the keyboard. Likewise, for a left-handed operator, the cursor panel, together with its keys, can be placed on the left of the keyboard body. Accordingly, 'F1'~'F12' keys in Group 2 keys can be moved to the right hand side, and 'Fn' key need to be moved to the left to be operated by the little finger of the left hand.

Preferably, a palm adaptive portion can be added to the hand hold part of the keyboard body to make the keyboard fit the hand size. It also adjusts the distance and allows the fingers to be placed on the 'F' and 'J' home positions.

One possibility is to make the hand adaptive portions detachable from the keyboard body and replaceable with different shapes and size to fit different operators' hands.

In FIG 10 and FIG 11 an example of the palm adaptive portion is shown, which is designed as two projections extending to the both sides of the keyboard body.

Some typical embodiments are described in the following:

As shown in FIG. 1 and FIG. 2 (also refers to FIG 3 and FIG 4), the symmetrically arranged Group 1 keys can be adapted as shown on FIG 6. As part of Group 3 keys, 'Shift', 'Ctrl' and 'Alt' keys are fixed in Zone 1 on both left and right sides. 'Fn' key is also placed in Zone 1 at the right edge on the back side of the keyboard.

In Zone 1, 2, 3 and 4, six special key positions named Key 0, 1, 2, 3, 4, 5 and 6, respectively, are left open for further assignment of some of Group 3 keys in different combinations. All these key positions are convenient for different typing functions, e.g. Key 1 and Key 2 are convenient to be pressed by thumbs, so it is natural to assign 'Space' key in these positions, as on a standard keyboard. After experiments, the following possible assignments are recommended without excluding other possible choices:

Key 0 can be assigned with 'Return' or 'Back Space' key;

Key 1 and Key 2 can be assigned with 'Space', 'Backspace' or 'Return';

Key 3 and Key 4 can preferably be assigned with 'Tab', 'Caps Lock', Backspace or Delete;

Key 5 and Key 6 can be assigned with 'Space', 'Backspace' and/or 'Return', 'Delete', 'Tab' or 'Caps Lock'.

A typical assignment is suggested as follows:

Key 0--- Return

Key 1 ---Space

Key 2 ---Space

Key 3 --- Tab

Key 4 --- Caps Lock

Key 5 --- Back Space

Key 6 --- Delete

One advantage of such assignment is that it has a minimum key numbers in Zone 1, so that the small fingers will not be overburdened. The keyboard also looks more symmetric and keeps a golden section ratio between the width and length.

In a preferable variation, 'Esc' key appears in the corresponding positions on the both sides of the keyboard body.

FIG. 8 and FIG. 9 show another embodiment, in which 'Return', 'Back space', 'Tab', 'Caps Lock', 'Shift', 'Ctrl', 'Alt' and 'Fn' keys are allocated in Zone 1. In this case, Zone 3 and Zone 4 at the right and left edges of the keyboard are allocated with no keys, so these zones can be dispensed with. As shown in FIG 9, Zone 2 is only assigned with two 'Space' keys in a symmetric manner, but the positions of these 'Space' keys are not shown in the key indicia area on the front side.

One drawback of this embodiment is that the little fingers would be too busy and Zone 1 would be crowded by keys.

Dispensing with Zone 3 and Zone 4 leaves the thumbs less used. However, an advantage of such an arrangement is that the thumbs can be used to press against the right and left edges to help to hold the keyboard. The operator will find that this is a practical way to operate the inventive keyboard.

In this embodiment, 'Shift' keys are allocated in Row 2 and Row 7. For some operators, they may feel more comfortable. Alternatively, 'Esc' key can be allocated in Zone 5 on the front side.

FIG. 10 and FIG.11 show still another embodiment, in which a palm adaptive portion is added to the hand hold portion, for adjusting the distance between the keys and the palms to make the operator feel more comfortable.

Also, 'Fn' key is arranged in Zone 2 close to the right side. This utilizes more free space in Zone 2.

Those skilled in the art would appreciate that it is also possible to make further changes and modifications to the inventive keyboard, without departing from the spirit and scope of the invention.

In addition, the similar grouping and partition schemes stated herein can also be applied to Dvorak layout or other prevalent layout of different languages other than English.

In order to provide a more applicable keyboard, the keys are designed with the same size as they are on a lap top computer keyboard. For example, most of the keys on the back side of the keyboard body may have the key size of 18.5×18.5 mm (some keys may need to be prolonged), and Group 2 keys in Zone 5 may have the key size of 16.5×12.5 mm. The keyboard body may be around 240 mm in length and 183 mm in width, just like a B5 paper. The size of the keyboard body can be reduced to an A5 paper and be even more compact when smaller keys are adopted.

The keyboard is normally made rigid and with smooth surfaces. The edges of the keyboard body can be rounded, and especially the right and left edges to be held by hands are rounded in appropriate radius to fit the hands' grip and moving around. The keyboard can be connected to a computer with a cable (e.g. via USB interface) or in a wireless manner (e.g. by Bluetooth).

Since the keys are all located around the keyboard surfaces, it may be needed to avoid pressing down a wrong key by mistake when the keyboard is in use or lay idle. One possible way is to make the surface of the keyboard frame higher or equal than the top of the keys. Moreover, the keyboard can stand in a special support when it is not being used. As a free-standing keyboard, the inventive keyboard can be powered with its own battery.

Since the key indicia area in the front side of the keyboard provides a flat and blank area only for showing the positions of the keys on the back side, as

an option, it is possible for the manufacturer to integrate a hand writing board or a LCD display screen on the key indicia area.

The operator is allowed to use the inventive keyboard in different positions:

1) Placing the lower end of the keyboard on a table or a lower drawer of the table, when the operator is sitting straight on a chair.

2) Placing the lower end keyboard on the operator's lap, when the operator is sitting on a chair, sofa or couch.

3) Placing the lower end keyboard on the operator's abdomen, when the operator is lying in bed.

4) The inventive keyboard with very light weight can even be only hold in hands while typing.

The inventive keyboard should be hold in hands vertically or inclined forward with the key indicia area facing to the operator's eyes. The operator's palms and fingers surround the keyboard loosely, with the two palms facing each other and the two index fingers slightly touching the home positions.

During touch typing, the right and left hands need to help each other in a harmonious way. While one hand is typing, the other hand can grip and help to fix the position of the keyboard or press the combination keys such as 'shift' or 'ctrl' if necessary. The fingering for typing Group 1 keys on the inventive keyboard is similar to that on a standard computer keyboard. While the fingers are typing Group 1 keys on the back side of the keyboard, the thumbs touch lightly against the keyboard to maintain its position. The thumbs are mostly used to type Group 2 keys and some of Group 3 keys in Zone 3 and Zone 4, and also to operate the cursor tracking panel on the front side of the keyboard. Hands needs to move out of the 'home position' when do so.

For the people already familiar with standard QWERTY keyboard, one could soon gain typing speed again on the inventive keyboard, since the

invention reserves most of the characteristics of the QWERTY layout. It is better to 'imagine' the QWERTY layout keys on the back side of the keyboard and only look at the key indicia area when the key positions are forgotten.

CLAIMS

1. An ergonomic keyboard which can be held in hands during typing, comprising:

a free-standing flat keyboard body including a front side facing the operator and an opposite back side;

a back keypad on said back side of the keyboard body, which is partitioned into 3 adjacent zones including:

Zone 0, a major area in the middle of said back keypad,

Zone 1, an area in the lower part of said back keypad including the right and left edges,

Zone 2, an area in the upper part of said back keypad;

a front keypad on said front side of the keyboard body, which is partitioned into 3 adjacent zones including:

Zone 3, an area on the left edge of the keyboard body, which is closed to the front side,

Zone 4, an area on the right edge of the keyboard body, which is closed to the front side,

Zone 5, an area in the upper part of said front side of the keyboard body;

keys being grouped and allocated as follows:

Group 1 keys, including all the alphabetic keys, number keys and symbol keys, arranged in said Zone 0 on the back side,

Group 2 keys, including 'F1'~ 'F12', 'Insert', 'Delete', 'PgUp', 'PgDn', 'Home', 'End' keys, 4 arrow keys and extended function keys, arranged in said Zone 5 on the front side,

Group 3 keys, including 'Space', 'Backspace,' 'Return (Enter)', 'Caps Lock', 'Tab', 'Shift', 'Ctrl', 'Alt', 'Fn', 'Esc' and 'Delete' keys, allocated to said Zone 1, Zone2 , Zone 3 and Zone 4

in different arrays and combinations; and

a key indicia area below said Zone 5 on said front side of the keyboard body, with its position and size corresponding to the back keypad on said back side, for indicating the key positions of the back keypad in a visible manner.

2. An ergonomic keyboard according to claim 1, wherein Group 1 keys in Zone 0 are arranged in 8 vertical rows, and the alphabetic keys and number keys covered by the right and left hands has the same arrangement as the keys covered by the same hands on a standard flat keyboard, but in a vertical manner.

3. An ergonomic keyboard according to claim 2, wherein the offset of Group 1 keys is kept unchanged as on a standard flat keyboard.

4. An ergonomic keyboard according to claim 3, wherein the 'F' and 'J' keys are horizontally aligned to enable the index fingers of the right and left hands to find their home positions.

5. An ergonomic keyboard according to claim 1, wherein the positions of the symbol keys are adjusted to make the layout of Group 1 keys more symmetrical.

6. An ergonomic keyboard according to claim 1, further comprising an integrated cursor panel or a cursor ball to be operated by a thumb in the upper part of said front side of the keyboard body, and cursor buttons on said back side of the keyboard body to be operated by other fingers.

7. An ergonomic keyboard according to claim 1, wherein only 'Esc' key among Group 3 keys is arranged in Zone 2.

8. An ergonomic keyboard according to claim 1, wherein 'Esc' key is also arranged in Zone 5 on said front side.

9. An ergonomic keyboard according to claim 1, wherein the right and left edges of Zone 1 are aligned with the keys in Zone 0.

10. An ergonomic keyboard according to claim 1, wherein 'Return' or

'Back Space' key is arranged in the middle of Zone 1, and 'Alt', 'Ctrl' and 'Shift' keys are duplicated on the right and left parts of Zone 1 in a symmetrical manner.

11. An ergonomic keyboard according to claim 1, wherein at least one of 'Esc', 'Delete' and 'Backspace' keys are arranged on the both side of the keyboard body.

12. An ergonomic keyboard according to claim 1, wherein at least one of 'Space' and 'Enter' are arranged at both the right and left edges on the front side of the keyboard body.

13. An ergonomic keyboard according to claim 1, wherein the edges of the keyboard body are rounded.

14. An ergonomic keyboard according to claim 1, wherein the keyboard includes a palm adaptive portion to fit the hand size and adjust the distance between the palms and the keys.

15. An ergonomic keyboard according to claim 14, wherein said palm adaptive portion is integrated with or detachable from the keyboard body.

16. An ergonomic keyboard according to claim 1, wherein said key indicia area on the front side of the keyboard body indicates the positions of the keys on the back keypad by means of dummy keys, lighted key indicia, stickers, transparent keyboard body or a display screen.

17. An ergonomic keyboard according to claim 1, wherein the surfaces of said front and back sides of the keyboard body are slightly curved.

18. An ergonomic keyboard according to claim 1, wherein the keyboard is connected to a computer system with a cable or in a wireless manner.

19. An ergonomic keyboard according to claim 1, wherein the keyboard is powered with its own battery.

20. An ergonomic keyboard according to claim 1, wherein the keyboard can stand in a special support when it is not being used.

21. An ergonomic keyboard according to claim 1, wherein all of the keys are designed in a rectangular form, and are arranged adjacent to each other in the respective zones.

FIG. 1

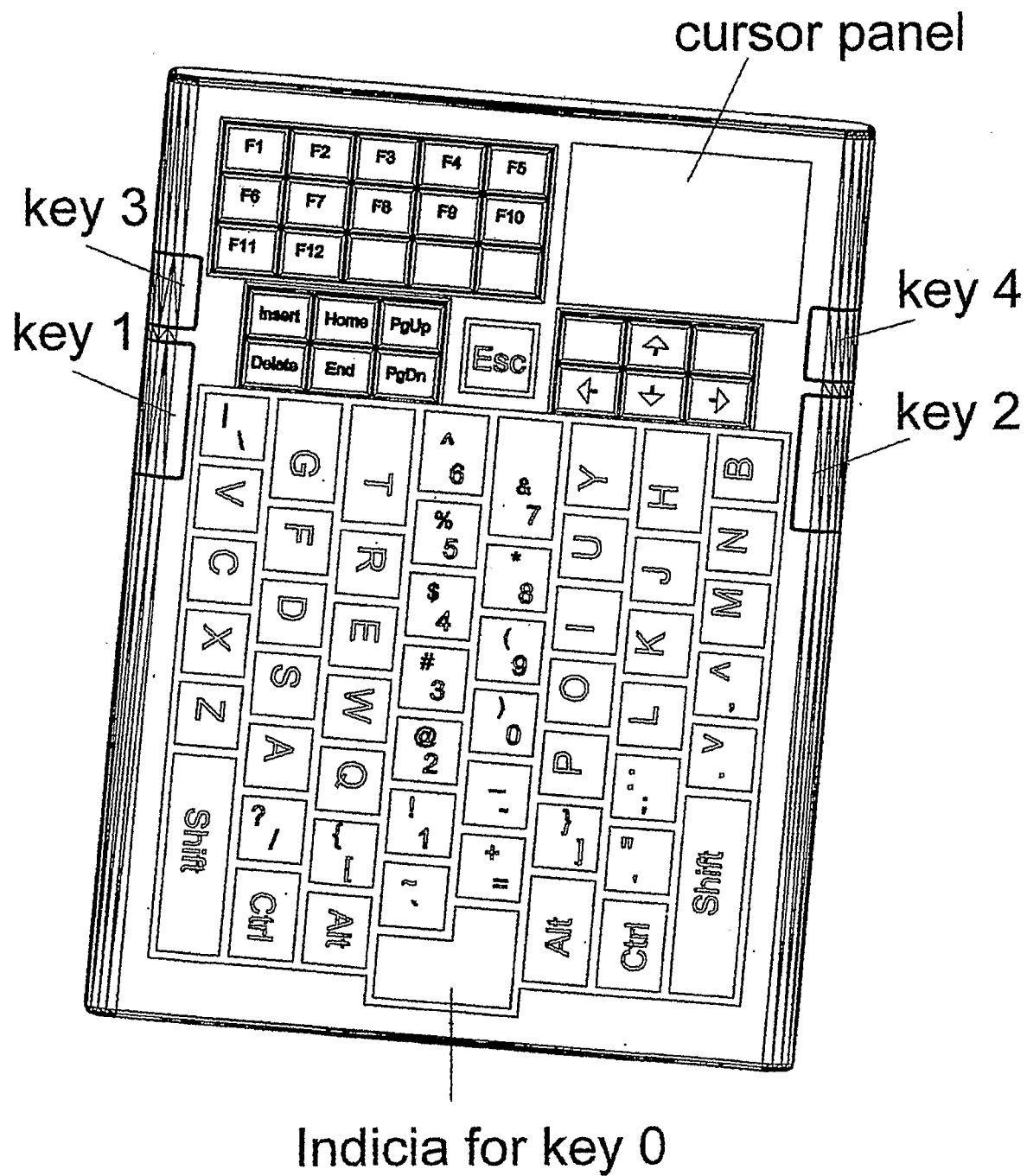


FIG. 2

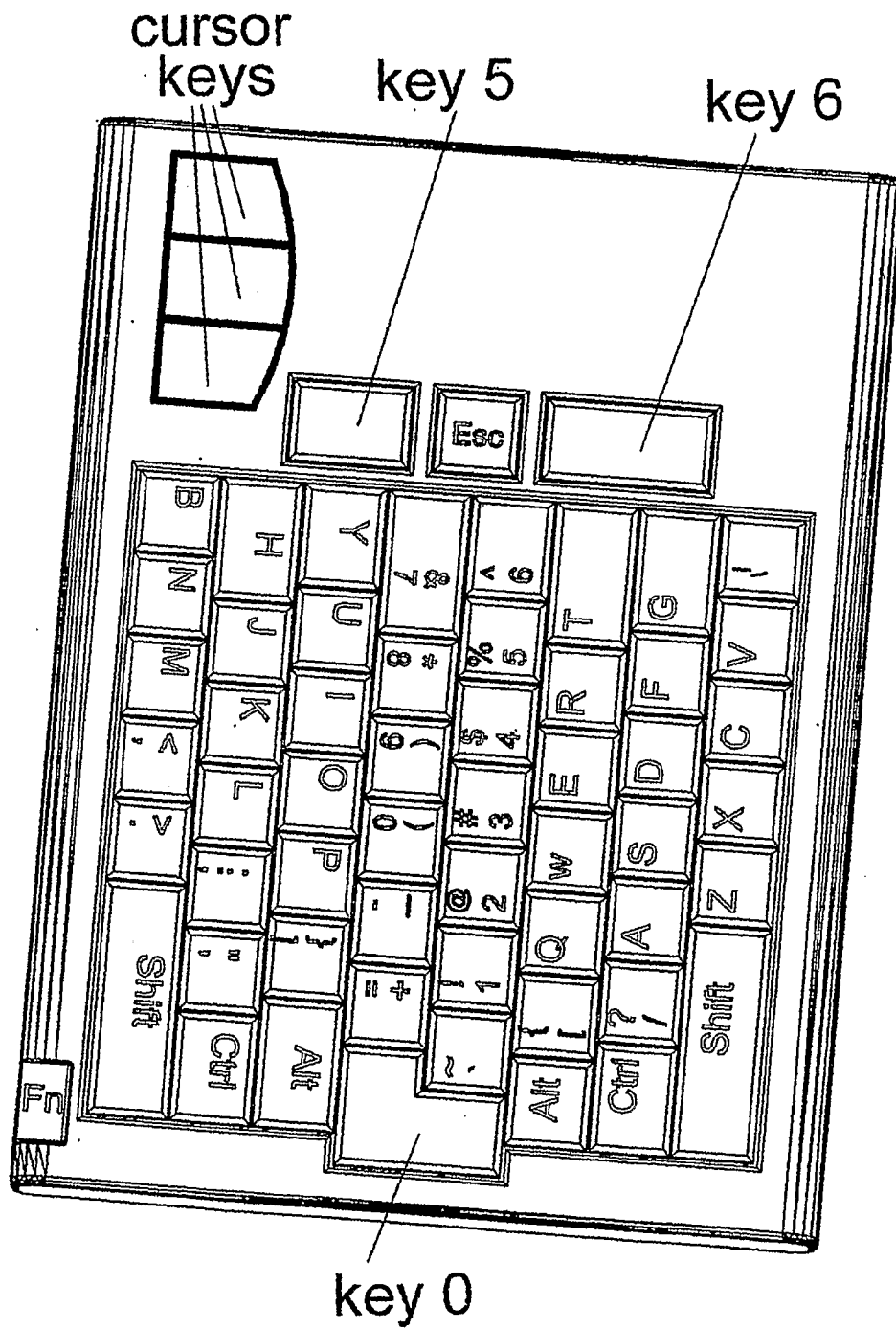


FIG. 3

Front Side

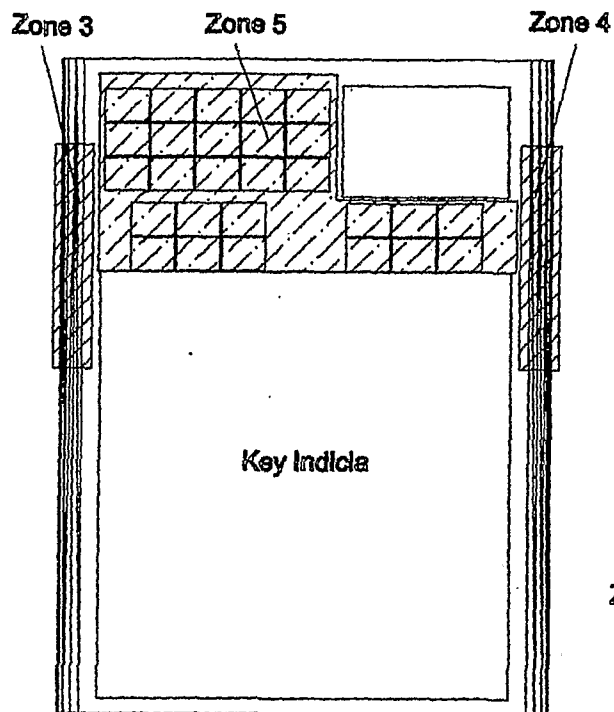


FIG. 4

Back Side

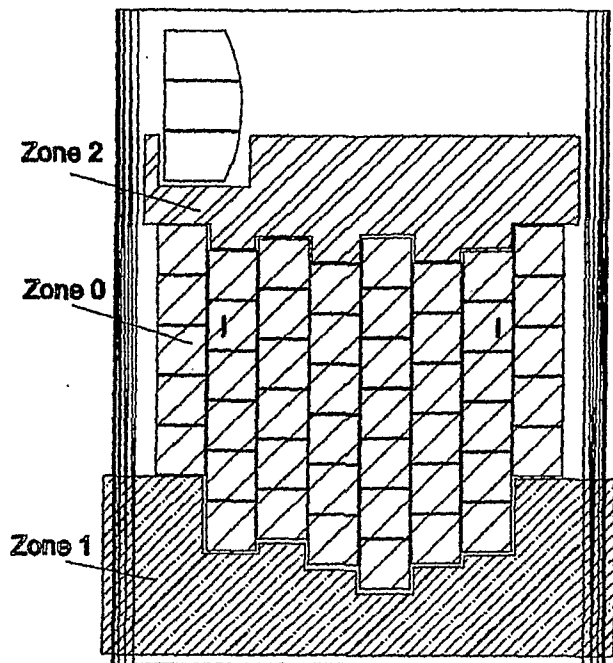


FIG. 5

Row	1	2	3	4	5	6	7	8
1	Q	W	E	R	T	A	S	D
2	F	G	H	I	J	K	L	M
3	N	O	P	Q	R	S	T	U
4	V	W	X	Y	Z	[]	[]	[]
5	[]	[]	[]	[]	[]	[]	[]	[]
6	[]	[]	[]	[]	[]	[]	[]	[]
7	[]	[]	[]	[]	[]	[]	[]	[]
8	[]	[]	[]	[]	[]	[]	[]	[]

FIG. 6

Row	1	2	3	4	5	6	7	8
1	Q	W	E	R	T	A	S	D
2	F	G	H	I	J	K	L	M
3	N	O	P	Q	R	S	T	U
4	V	W	X	Y	Z	[]	[]	[]
5	[]	[]	[]	[]	[]	[]	[]	[]
6	[]	[]	[]	[]	[]	[]	[]	[]
7	[]	[]	[]	[]	[]	[]	[]	[]
8	[]	[]	[]	[]	[]	[]	[]	[]

FIG.7

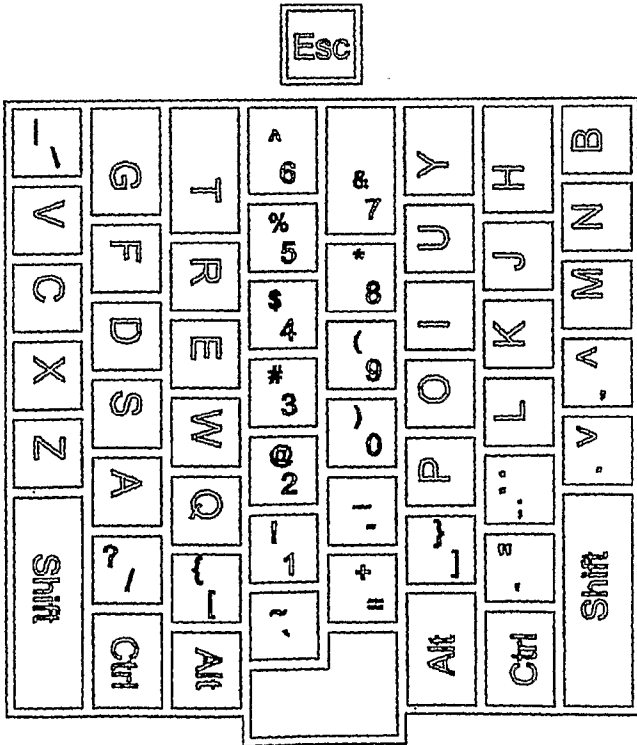
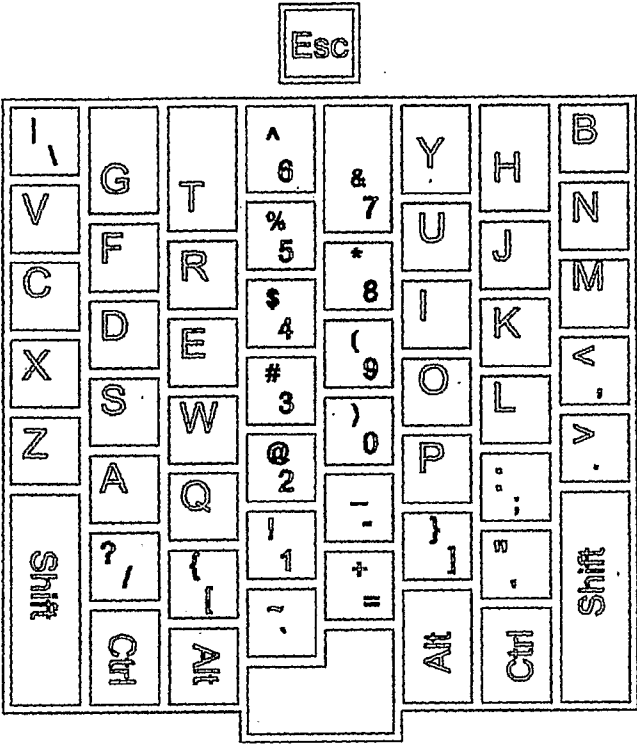


FIG. 8

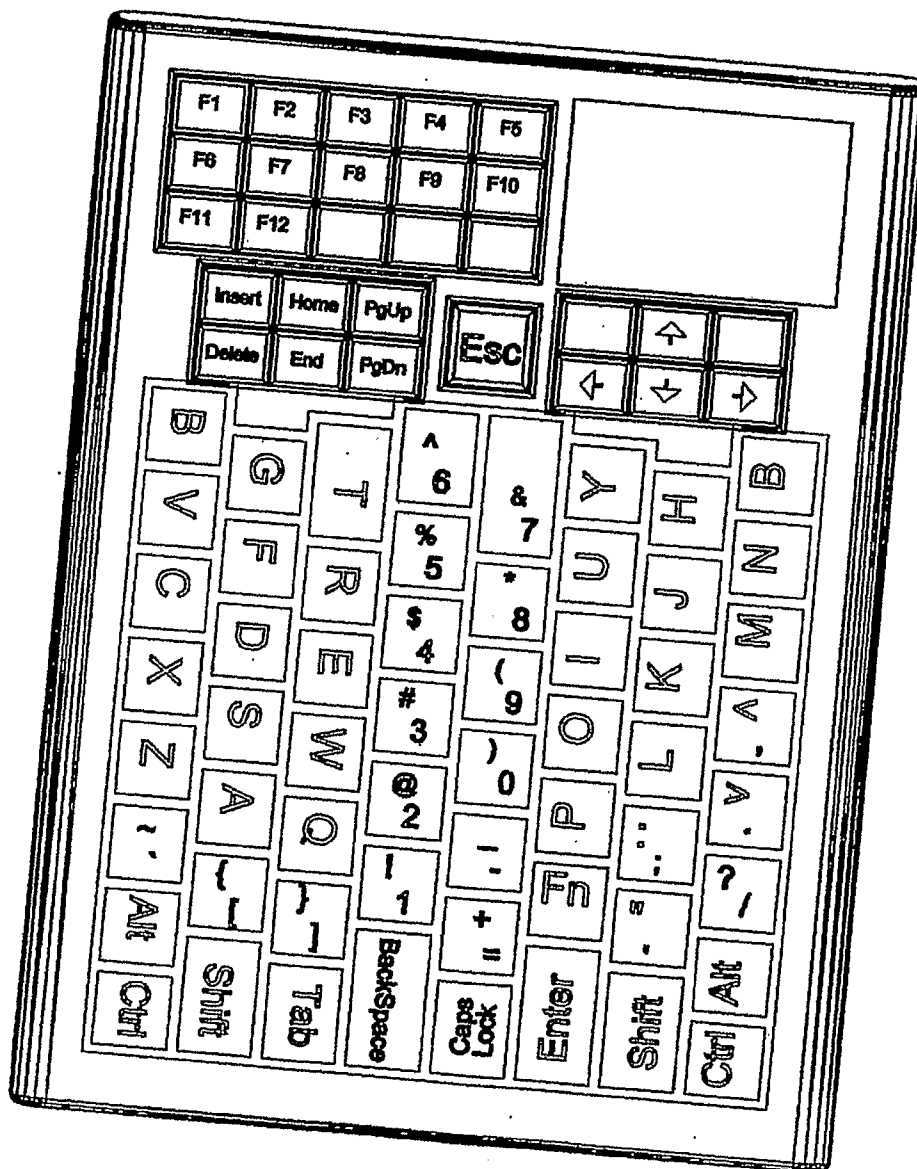


FIG. 9

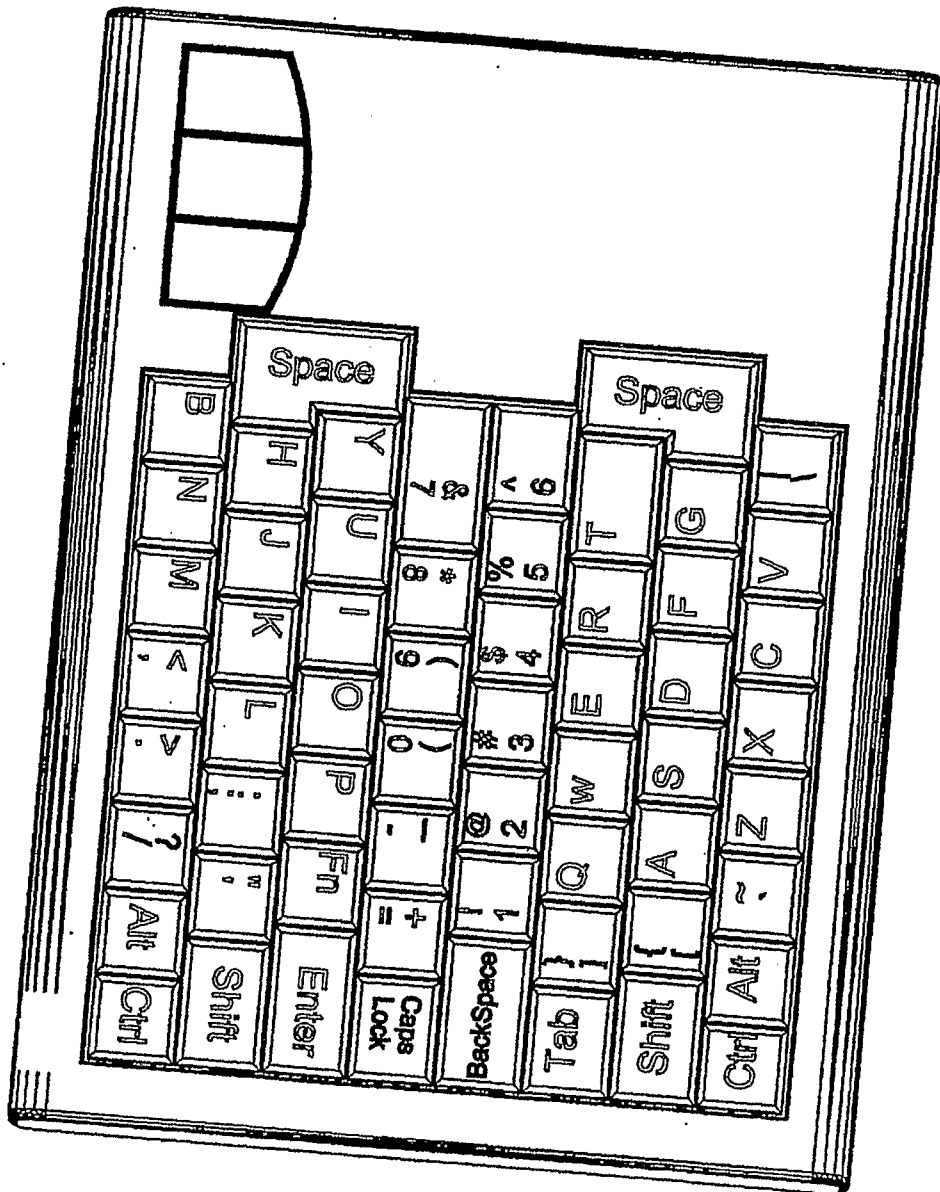


FIG.10

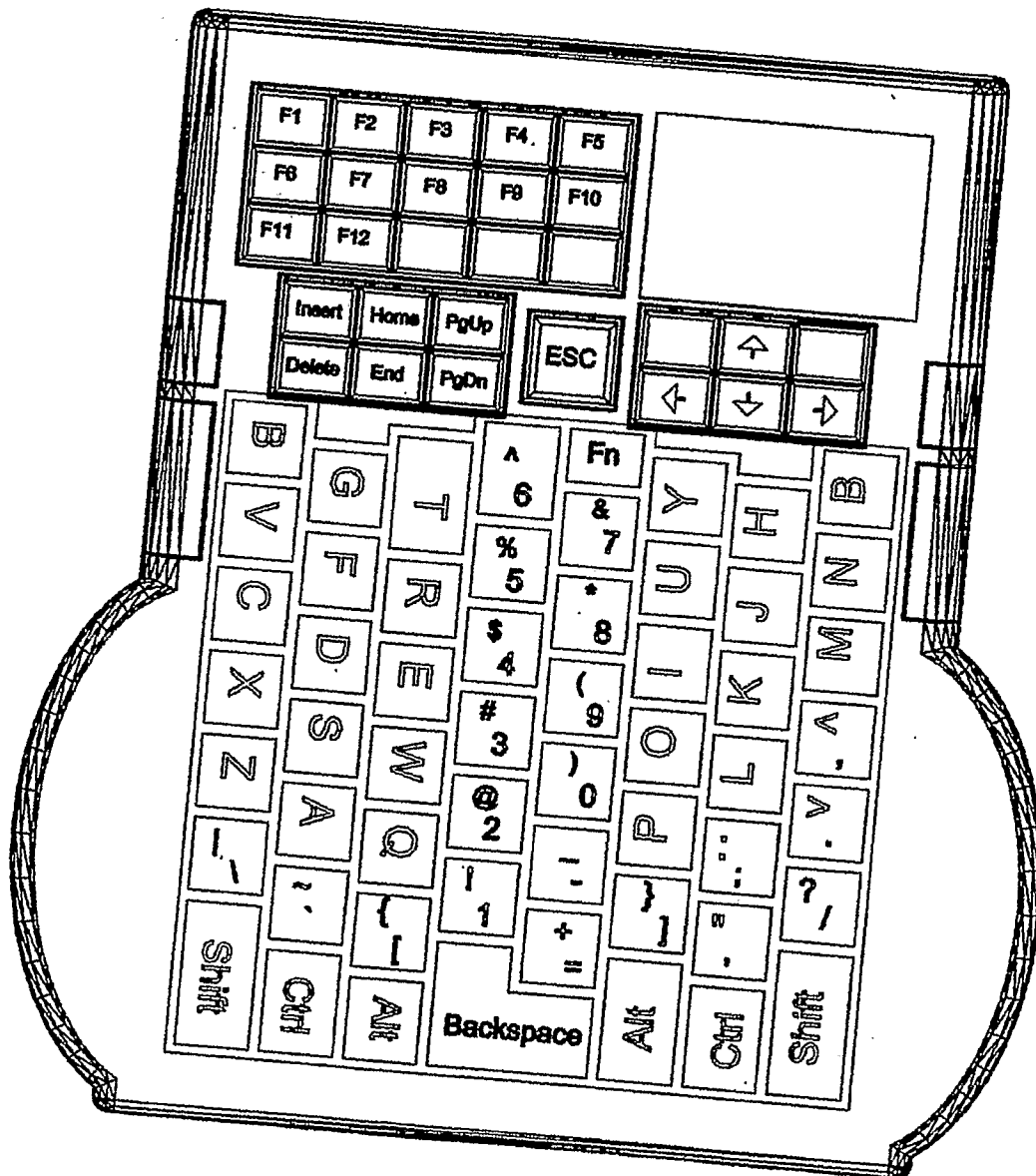
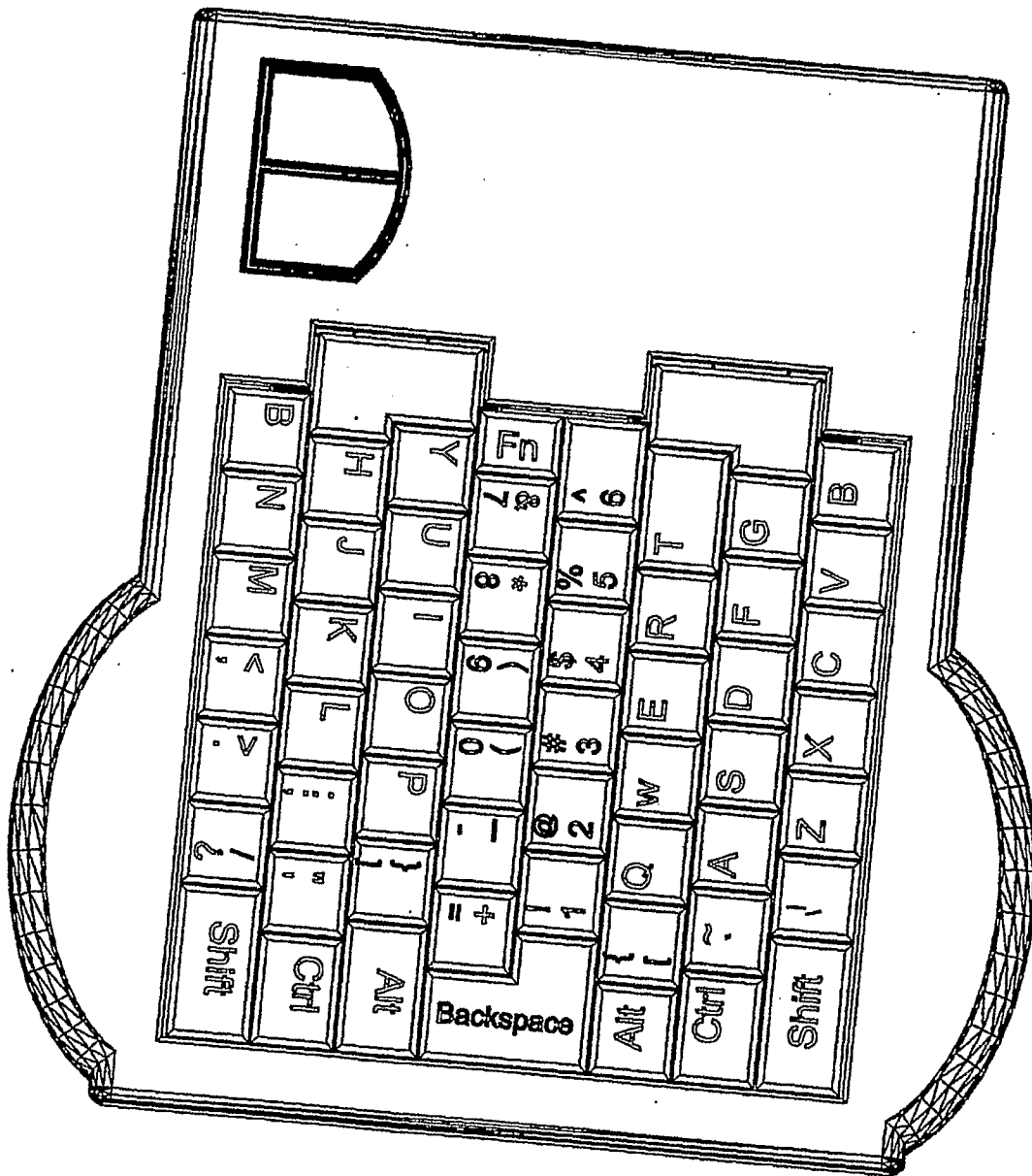


FIG. 11



INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2007/001904

A. CLASSIFICATION OF SUBJECT MATTER

G06F3/02 (2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: G06F3/

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

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

CNPAT,CNKI,EPODOC,WPI,PAJ keyboard, input, device, apparatus, back w side, hand, layout, thumb, finger, hold, computer

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US2004208681A1, (DECHENE JOSEPH FERNAND), 21 Oct. 2004(21.10.2004), the abstract, the description [0089] to [0100], claims 1-15, Figs. 8-16	1-21
X	JP11272360A, (TOKYO SHIBAURA ELECTRIC CO), 08 Oct. 1999(08.10.1999), the abstract, the description [0008] to [0016], Figs.1,2	1-21
Y	CN2267481Y, (FAN CHUN YING), 12 Nov. 1997(12.11.1997), the abstract, the description page 1 line 9 to page 4 line 19, Figs. 1-3,9,10	1-21
Y	CN2781452Y, (HU XIAO DONG), 17 May 2006(17.05.2006), the abstract, the description page 1 line 12 to page 3 line 3, Figs.1-4	1-21

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
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"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 07 Sep. 2007(07.09.2007)	Date of mailing of the international search report 27 Sep. 2007 (27.09.2007)
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer BAI,Xuetao Telephone No. (86-10)62084935

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2007/001904

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP8305471A, (MATSUSHITA ELECTRIC IND CO LTD), 22 Nov. 1996(22.11.1996), the whole document	1-21
A	JP11003159A, (CASIO COMPUTER CO LTD), 06 Jan. 1999(06.01.1999), the whole document	1-21

International application No.
PCT/CN2007/001904

Form PCT/ISA/210 (patent family annex) (April 2007)