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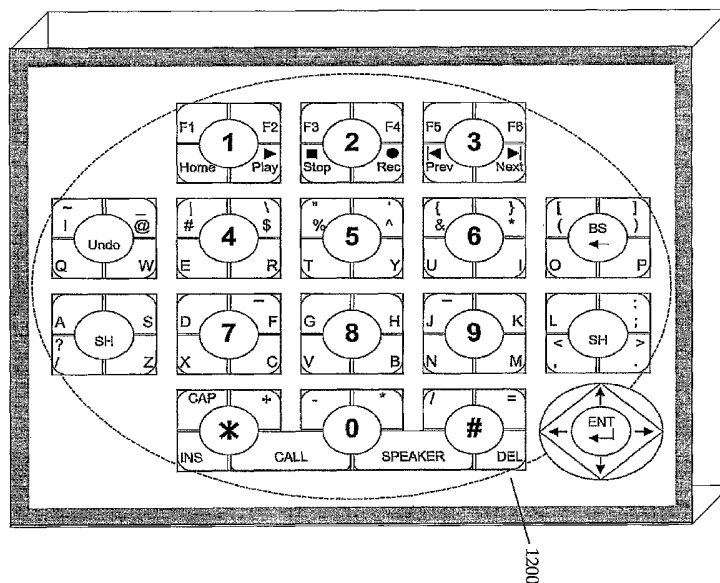
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(54) **Title:** KEYPAD INPUT DEVICE



(57) **Abstract:** A keypad input device comprising a keypad and a plurality of key units being arranged in said keypad in a spaced apart relationship. Each key unit comprises a main actuator portion and a plurality of sub-actuator portions. The sub-actuator portions are arranged along the periphery of the main actuator portion. The key units of the keypad input device are arranged on the keypad in a regular grid having a plurality of rows and columns.

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KEYPAD INPUT DEVICE

DESCRIPTION

[001] The present invention relates to a keypad input device, more specifically, to a
5 keypad input device that includes a 'Qwerty' layout keyboard and a numeric keyboard
within said keypad input device.

[002] Many modern electronic devices, such as mobile phones and computers, for
example, utilize two main types of keyboards. The first keyboard being the numeric
10 keyboard (also referred to as numeric keypad), such as those used for the entry of
numerals in communication devices and calculators, while the second is the conventional
'Qwerty' keyboard, such as those used in desktop computing, for example. The majority
of these electronic input devices that require alphanumeric inputs are still based very
much upon the traditional 'Qwerty' keyboards. Accordingly, there exists such a level of
15 familiarity and comfort between users and the 'Qwerty' keyboard, that the
implementation of a 'Qwerty'-like interface, as an input device at every level, is
considered optimal.

[003] However, as there are numerous input keys, the size of a 'Qwerty' keyboard
20 prevents it from being the preferred user input interface for many devices, especially
compact mobile devices. Mobile phones may be seen as an example of where the
implementation of a 'Qwerty' styled keyboard is not yet feasible due to the desire to
minimize the size of a mobile phone. Instead, the majority of mobile phones have
implemented a numeric keypad that requires a user to use nine keys to input at least
25 twenty-six alphabetic characters as in the case of text messaging or when using the short-
message service, for example.

[004] Standard telephones, although not restricted by the space constraints of mobile
phones, have largely adopted a similar input keypad layout as the mobile phones.
30 Examples of some keypad systems are described in the following.

[005] United States Patent 4,891,777 (Lapeyre) discloses a keyboard system wherein twelve input keys are geometrically arranged in a staggered manner to conform, somewhat, to the human hand structure. According to Lapeyre, the key layout permits touch-typing and full alphanumeric capabilities with the actuation of at least two or more
5 input keys, meaning that for particular characters, two, or more keys would have to be depressed by a user at a given instant.

[006] French Patent FR 2 746 524 A1 (Belaiche) discloses a telephone keypad that is adapted to permit the data entry of alphanumeric characters. The data entry is achieved by
10 the actuation of a particular combination of keys (at least two). A given combination of keys corresponds to a fixed alphanumeric character. The various combinations are illustrated in figures 2 and 3 of the cited document. Similarly, United States Patent US 5,339,358 (Danish et al.) discloses a method and apparatus for permitting full alphanumeric Dual Tone Multiple Frequency (DTMF) entry. The DTMF signals, that
15 define each alphanumeric character, are generated when the appropriate key pairs are actuated.

[007] United States Patent application US 2004/0077384 A1 discloses a key input device arranged on a surface body. Each input key is adapted to input characters that are mapped
20 onto the said key. In addition, the patent application discloses means for including LEDs within the telephone to provide illumination for the keys.

[008] The devices described provide a means of keying in data by adopting the standard nine or twelve button input keypad. In the devices, the alphabetic characters are available
25 for input often with the actuation of at least two keys. Such actuation of the one or more keys occurs either concurrently or in consecutive strokes. In the case of the T9 input method commonly used in many mobile phones, consecutive strokes of one or more keys are used to achieve the input of characters. In some instances, more than one stroke of a particular key is required to achieve the desired input.

30

[0009] PCT application WO 01/85460 discloses a standard 'Qwerty' keyboard for a wireless communication device. A portion of the keys on the keyboard is arranged to resemble that of a standard telephone keypad. The visually differentiated telephone keypad shares the functions of keying in numerals and alphabet characters. The secondary
5 function of each differentiated key is attained when an alternate mode of data entry is selected using an alternate mode function key.

[0010] Despite the above-mentioned approaches, there is still a need for a data input interface, which provides for the input of an alphanumeric character. There is also a
10 further need for an input device that is compact, but yet ergonomic, and cost-effective. In this regard, a device as defined in the appended independent claim overcomes the above-mentioned difficulties.

[0011] Accordingly, the input device as defined in the independent claim provides a
15 keypad, said keypad having a plurality (at least two) of key units being arranged in a spaced apart relationship. Each key unit includes a main actuator portion and a plurality (at least two) of sub-actuator portions. The sub-actuator portions are arranged along or around the periphery of the main actuator portion. The various portions (main and sub-actuator), in combination make up a single key unit. Whether the portions are combined
20 together as a single element (key element) or remain as individual portions arranged adjacent to each other in the above-mentioned manner, they still form the entire key unit.

[0012] As an illustrative statement, the present invention provides a keypad input device, which generally enables a user to achieve the input of any alphanumeric character
25 through the actuation of just one actuator portion of a key unit. Accordingly, the keypad input device provides a conventional 'Qwerty'-like keyboard incorporated within the framework of a telephone keypad that is nevertheless cost - effective, easy to implement and compact.

30 [0013] In all embodiments of the invention described herein, each actuator portion of the keypad input device may include an actuator element located on the underside of said

actuator portion. For example, the main actuator portion may have an actuator element located on the underside of the main actuator portion (see **Figures 2A** or **3A**). In this example, the actuation of the main actuator portion results in the main actuator element sending an output signal. In all embodiments described herein, it should be noted that the
5 output signal refers to the signal generated by the actuation of any key unit of the keypad. This output signal is typically sent to an apparatus (for example a communication device or a household appliance) that the keypad input device is implemented in. The output signal is further processed by said apparatus and the character or function that corresponds to the output signal may be optically displayed by the device if the apparatus
10 includes a display unit.

[0014] In a further embodiment of the keypad input device, the main actuator portion may not have said actuator element while the sub-actuator portions include said actuator element (see **Figures 2C** or **3C**). In such an embodiment, the main actuator portion is
15 adapted such that, when actuated, at least two sub-actuator portions are also actuated simultaneously. As mentioned previously, it follows that the at least two actuated sub-actuator portions, which each have a corresponding sub-actuator element, will produce an output signal that corresponds to the input designated to the main actuator portion. The utilization of at least two parallel/consecutive inputs to achieve a third input is well
20 known in the state of art as a logical actuation.

[0015] The key units in the keypad input device may be arranged in a regular grid having a plurality of rows and/or columns. Alternatively, the key units in the keypad input device may be arranged in an arc shape, for example, as a means to improve the ergonomics of
25 such a device. In the arc shape layout, each subsequent row of key units may be concentric to the preceding one.

[0016] In another embodiment, the main actuator portion and the plurality of sub-actuator portions of each key unit of the keypad input device may be formed as integrated parts of
30 a single key element. The single key element may have a plurality of actuator elements located on the underside such that when actuated, the actuator elements contact an

electrical circuit surface to produce the desired output. In this embodiment, the actuator portions may be also linked in such a manner that when either the main or sub actuator portion is actuated, only a single actuator element contacts said electrical surface to trigger an output.

5

[0017] In the above embodiment, the key unit may be supported in said keypad in a tiltable and/or depressible manner. When actuation takes place, the entire key unit may be tilted to allow at least one particular actuator portion to contact the said electrical circuit. A variation of the aforesaid embodiment may be one where the key element of the key
10 unit is depressible in addition to being able to be tilted. In such an embodiment, the main actuator portion of the key element may be only actuated via depression, for example. Accordingly, such an embodiment requires a direct application of force from a user. Naturally, it follows that the same main actuator, when not depressed directly, may instead act as a pivot point when the sub-actuator portions are depressed thereby resulting
15 in the above-mentioned tilting effect.

[0018] In another embodiment of the keypad input device, the main actuator portion and the plurality of sub-actuator portions of the key unit, may each be formed as individual key elements, in contradistinction to the previous embodiment. That is, the actuator
20 portions are not linked to influence each other during actuation. In such an embodiment, the individual key portions of the key unit may be supported in the keypad in a depressible manner. In other words, when one key is actuated, the remaining keys are not displaced in any way and do not produce an output signal.

25 [0019] In another embodiment, the individual key portions of a key unit may be arranged in the keypad input device with intermediate spacers in between each neighboring key portion. The intermediate spacers may also be along the periphery of the main actuator portion. The intermediate spacers may not be actuating and simply serve the purpose of providing a spacing between each key portion of the key unit to improve the ergonomics
30 and user-friendliness of the keypad input device. Alternatively, the intermediate spacers may be actuating portions as well. Intermediate spacers, that are actuating portions, may

have keys mapped onto them should there be a need for additional input keys, characters or functions.

[0020] In one exemplary embodiment of the keypad input device, the key unit may have 5 four sub-actuator portions being arranged around the periphery of a main actuator portion. The position of each sub-actuator portion may be such that each sub-actuator portion extends along approximately one quadrant of the periphery of the main actuator portion. Accordingly, the key unit provides for five actuator portions in total (four sub-actuator portions and one main actuator portion). The arrangement of the sub-actuator portions 10 may be, as described above, with intermediate spacers included to improve the ergonomics of the keypad. In addition, the key unit of the embodiment with four sub-actuator portions may be formed as a single key element or as individual distinct elements that make up the key unit.

15 [0021] The key unit, and said portions that constitute the key unit, may assume any regular shape. Examples of such regular shapes include, but are not limited to, a triangle, a rectangle, a circle and a polygonal. In each of the various embodiments, the arrangement of the key units follows the manner as described above.

20 [0022] Accordingly, the key unit may have at least two actuator portions in total. The number of actuator portions is by no means limited to just two or five, as mentioned in the earlier embodiments. The key unit may include any possible number of actuator portions like, for example, six actuator portions (one main actuator portion and five surrounding actuator portions in the shape of a pentagon). Alternatively, the key unit may include 25 seven actuator portions, for example (one main actuator portion and six surrounding actuator portions in the shape of a hexagon). As a further alternative, said key unit may even have nine actuator portions, for example (one main actuator portion and eight surrounding actuator portions in the shape of an octagon).

30 [0023] In any of the embodiments described herein, the main actuator portion may be formed of at least two sections. As an exemplary illustration, the main actuator portion

may include up to four sections if four sub-actuator portions surround the periphery of the main actuator portion.

[0024] In all the above-mentioned embodiments, the keypad may include, but is not limited to, a five by two (5 x 2), a five by four (5 x 4) or a three by four (3 x 4) grid pattern arrangement of key units. In the embodiment, which includes a combination of a five by two (5 x 2) and a three by four (3 x 4) arrangement, six key units are overlapping when said two arrangements are combined (See **Figure 7**). The grid arrangement may also be a combination of any of the above-mentioned grid patterns. The arrangement of the key units in any of these embodiments may resemble the layout of buttons as found in a standard telephone keypad, for example. Implementing the above arrangements in an apparatus such as a telephone or Personal Digital Assistant (PDA), for example, allows the key units to be generously spaced apart such that the fingers of a user are comfortably matched to it. Similarly, for typing, the distance between actuator portions with alphabets, for example, can also be maximized in these embodiments so ensuring and increasing comfort for the fingers of the user.

[0025] Another embodiment of the keypad input device provides for a selection of key units, taken from the total plurality of key units, to be grouped together. The grouped together selection of key units, which may include multiple key portions, may be assigned to provide a common output upon actuation. This allows for any of said selection of key units (or key portions) to provide the same output upon actuation. In effect, since a selection of key units (or key portions) is presented for actuation instead of merely a single key unit or key portion, the operable surface area available for actuation to achieve said common output increases. The operable surface area may be increased by arranging the selection of key units (or key portions) in rows, columns or a combination of both.

[0026] Accordingly, for a grouped selection to exist, said grouped selection must comprise of at least two actuator portions. Each actuator portion that makes up the grouped selection is assigned to provide the said common output. In the above-mentioned embodiment, where the key unit comprises of five actuator portions, all five actuator

portions may provide said common output, for example. However, not all actuator portions may be assigned to provide said common output.

[0027] In an exemplary embodiment, at least one actuator portion of a first key unit may
5 be assigned to provide said common output. In further examples of said exemplary
embodiment, the corresponding actuator portions of any neighboring key unit may also be
assigned to provide said common output. The arrangement of corresponding actuating
portions of adjacent key units along the same row (or column, i.e. collinear) as the at least
one actuator portion of the first key unit may provide for said grouped selection.
10 Accordingly, the subsequent corresponding actuator portions that are arranged in a
collinear arrangement, for example, may also be assigned to provide the said common
output.

[0028] In any of the above-mentioned embodiments of the keypad input device, the main
15 actuator portion may be adapted to provide a numeric output when actuated. However,
other variations of such an embodiment may include adapting the main actuator to
provide a symbolic output, a functional variance output or alphabetic output as well.

[0029] Essentially, the function of the main actuator portion and the sub-actuator portions
20 is to provide for an alphanumeric output. In other exemplary embodiments, the main
actuator may simply provide a predefined function that has been mapped onto said main
actuator portion of a given key unit. Accordingly, in any of the preceding embodiments,
each sub-actuator portion of any key unit may also be assigned and adapted to provide a
first alphabetical output, a symbolic output or a functional variance output.

25

[0030] In a further embodiment, at least one sub-actuator portion of a key unit may be
assigned and adapted to provide the functional variance output. The result of said
functional variance output is that at least one other sub-actuator portion may provide a
second alphabetical output, symbolic or functional variance output. This may allow for
30 essentially double the number of outputs that was originally available, for example.

[0031] In one embodiment, the keypad input device is such that the actuator portions of each key unit are each arranged and assigned at least one alphabetic character. The assignment and arrangement of actuator portions of each key unit may be according to an order of arrangement and assignment of characters that corresponds to the keys of a conventional 'Qwerty' keyboard. In this respect, the first row of actuator portions of the keypad input device may be assigned and adapted to provide the output of characters corresponding to the first row of the 'Qwerty' keyboard, for example. Accordingly, the first and second row of actuator portions may provide the following outputs in the stated order:

10

- 'Q', 'W', 'E', 'R', 'T', 'Y', 'U', 'I', 'O' and 'P' – 1ST ROW
- 'A', 'S', 'D', 'F', 'G', 'H', 'J', 'K', 'L' and ';' – 2ND ROW

[0032] Therefore, it follows from the above-mentioned example that the third and subsequent rows of actuator portions provide an output that corresponds to the third and subsequent rows of a 'Qwerty' keyboard in terms of arrangement and output as well. Furthermore, the arrangement of keys may not be restricted to just alphanumeric inputs but may also include all symbols and function keys such as 'Shift', 'Tab', 'Delete' and 'Caps Lock', for example.

20

[0033] The above-mentioned arrangement of keys provides a data input system with a familiar layout, such as the 'Qwerty' keyboard or standard telephone keypad format. This is advantageous, as current users will not be alienated. Furthermore, the said arrangement allows the input device to be less cumbersome than a full-sized 'Qwerty' keyboard. However, it also ensures that it will not be too small, as that would result in slow and inconvenient data entry for a user.

[0034] In any of the preceding embodiments, each key portion may be of regular shape. The regular shape of the key portion may be triangular, circular, rectangular or polygonal. In addition, the key portions that make up the key units, in any of the above-mentioned embodiments, may include contoured surfaces adapted to conform to the finger of a user.

[0035] In each of the above-mentioned embodiments, the key unit may be made from materials such as, but not limited to, elastomers, thermoplastics and metal alloys. For the material class of elastomers, materials such as, but not limited to, polyurethane, polyisobutylene and polyisoprene may be utilized. For the material class of thermoplastics, materials such as, but not limited to, polyethylene, polyvinylchloride (PVC) and polycarbonate may be used, and for the material class of metal alloys, stainless steel, and aluminum alloys and magnesium alloys may be used.

10 [0036] The keypad, as described thus far in the various embodiments may be used in any device that requires alphanumeric input, including but not limited to a communication device, a portable device or a home appliance. Examples of such communication devices may be, but are not limited to, a videophone, a standard telephone or a mobile phone. Examples of portable devices may be, but are not limited to, a Personal Digital Assistant
15 (PDA), a video game console or a mobile phone. Examples of home appliances include, but are not limited to, a refrigerator, a freezer, a microwave oven, a television controller, and any type of remote controller.

[0037] The following figures serve to better illustrate certain embodiments of the present
20 invention in order to aid in the understanding of the device.

[0038] **Figure 1A** illustrates the layout of a standard Qwerty keyboard as is commonly utilized in many computer systems presently and **Figure 1B** illustrates the layout of a standard telephone keypad and the assignment of the various alphanumeric characters to
25 each key;

[0039] **Figures 2A – 2D** illustrate an embodiment of a key unit where the key unit is formed as individual actuating portions (key elements);

30 [0040] **Figures 3A – 3D** illustrate an embodiment of a key unit where the actuating portions of the key unit are formed as a single key element;

[0041] Figures 4A – 4D illustrates a key unit having a main actuator portion of various designs;

5 [0042] Figure 5 is an illustration of a contoured key unit;

[0043] Figures 6A – 6F are illustrations of the various embodiments of the shape that the key unit may assume;

10 [0044] Figure 7 is an illustration of an exemplary embodiment of the keypad layout;

[0045] Figure 8 illustrates an embodiment with an extended telephone keypad, wherein a Qwerty-styled keyboard is incorporated onto the respective key portions.

15 [0046] Figure 9 illustrates an embodiment of the invention with a standard telephone keypad having key units, wherein the key portions of the key units are assigned with alphabetic characters.

[0047] Figure 10 illustrates another embodiment having a standard telephone keypad
20 including key units, wherein the key portions of the key units are assigned alphabet characters according to the Qwerty-styled keyboard.

[0048] Figure 11 illustrates a further embodiment of the invention showing the inclusion of a media player key unit, a basic mathematical operations key unit and function keys.

25

[0049] Figure 12 illustrates an embodiment of the invention implemented in the form of a touch-screen input device.

[0050] Figure 1A illustrates the layout of a standard Qwerty keyboard 100 as is
30 commonly utilized in many present computer systems. The name Qwerty is derived from the fact that the first six letters of the first row of alphabet keys spells 'Qwerty'. Such a

name is common in the computer industry in referring to a keyboard that adopts such a layout with respect to the alphabet character arrangement. It should be noted that the spacebar 102 input key is substantially bigger than any other key on a Qwerty keyboard 100. As this key is the most heavily utilized key during the typing process, designers of 5 Qwerty keyboards 100 often enlarge the spacebar key 102 to increase the surface area available for actuation. This serves to facilitate the actuation of the most heavily used key on the keyboard.

[0051] Figure 1B illustrates the layout of a standard telephone keypad 200 and the 10 assignment of the various alphanumeric characters to each key. The standard twelve-key layout is found, albeit in adapted forms, on most conventional telephones, mobile phones and communication devices. In this common embodiment of the prior art, each key may be assigned to provide up to four character inputs in a text-messaging mode. This requires the actuation of one key several times before the desired character may be inputted into a 15 messaging system.

[0052] Figure 2A illustrates an embodiment of the under side of a key unit 300 wherein the actuator elements 302 are shown to be individual elements. The actuation of any given actuator portion, such as the main actuator portion 306, for example, results in only 20 the corresponding actuator element 333 being actuated. The remaining four actuator elements do not move. Accordingly, in the aforesaid actuation example, the actuation of the main actuation portion correspondingly results in the main actuation element 333 producing an output signal.

25 [0053] Figure 2B illustrates an embodiment of a key unit 350 where the actuator portions 306 and 352 of the key unit 350 are formed as separate individual key elements 306 and 352, i.e. in this particular embodiment, each actuation portion is equivalent to one key element. Accordingly, combinations of key elements, in this embodiment, make up one key unit. The actuation of any one key element does not result in the movement of any of 30 the other key elements within the same key unit 350. Each key element 306 and 352 may therefore be independently actuated with respect to the other key element 306 and 352 of

the same key unit 350. Accordingly, in this embodiment, the key elements 306 and 352 are depressible.

[0054] Figure 2C illustrates an embodiment of a key unit 370 where the sub-actuator portions 304 are formed as individual key elements, each having their own sub-actuator element 302. The main actuator portion 306 is designed such that the four sub-actuator elements 302 lie on the periphery of said main actuator portion 306. Such an arrangement allows the main actuator portion 306 to utilize the sub-actuator elements 302 by functioning as a logical actuator. In this regard, should the main actuator portion be depressed, up to four sub-actuator elements 302 may also be depressed to provide the output assigned to the main actuator portion 306. In an alternative embodiment, the device may be programmed to recognize that when at least two sub-actuator elements 302 create an output signal, that should equate with an actuation of the main actuator portion 306 and the respective output of the main actuator portion should be generated.

15

[0055] Figure 2D illustrates the top-side 380 of the embodiment of Figure 2C wherein where the actuator portions 306, 352 of the key unit 380 are formed as separate individual key elements 306, 352. In this particular embodiment, each actuator portion is equivalent to one key element. Accordingly, combinations of the five key elements 306, 352, in this embodiment, make up one key unit. The actuation of any one key element does not result in the movement of any of the other key elements within the same key unit 380. Each key element 306, 352 may therefore be independently actuated with respect to the other key element 306, 352 of the same key unit 380. As mentioned above, the main actuator portion 306 is designed to actuate the sub-actuator elements shared by the sub-actuator portions 352 therefore functioning as a logical actuator.

[0056] Figure 3A illustrates an embodiment of the underside of a key unit 400 wherein the actuator elements 402 are formed as a single integrated part 406. This allows the key unit 400 to also be formed as a single key element 404. The actuation, in such an embodiment, may be achieved by having the key unit 402 to be depressible or tiltable about a pivot point 408.

[0057] Figure 3B illustrates the top surface of the key unit 400 shown in Figure 3A. The key unit, although composed of several actuation portions, is formed as a single key element 404. Accordingly, it may be taken that in this specific embodiment, the key unit 5 is essentially made up of one key element (which still includes at least one main actuation portion and four sub-actuation portions). The main actuator portion 408, which is integrated with surrounding actuator portions 404, provides a numeric output while the surrounding actuator portions 402 provide a corresponding alphabet or symbolic output.

10 [0058] Figure 3C illustrates an embodiment of the underside of a key unit 450 wherein the actuator elements 402 are formed as a single integrated part 406. This allows the key unit 450 to also be formed as a single key element 404. The actuation, in such an embodiment, may be achieved by having the key unit 402 to be depressible or tiltable about a pivot point 408. In the embodiment of Figure 3C, the main actuator portion 408 15 does not have any actuator element beneath it. Accordingly, said main actuator portion 408 functions as a logical actuator by actuating between two to four sub-actuator elements 402 when tilted or depressed respectively.

[0059] Figure 3D illustrates the top surface of the key unit 480 shown in Figure 3C. The 20 key unit 480, although composed of several actuator portions, is formed as a single key element 404. Accordingly, it may be taken that in this specific embodiment, the key unit is essentially made up of one key element (which still includes at least one main actuation portion and four sub-actuation portions). The main actuator portion 408, which is integrated with surrounding actuator portions 404, provides a numeric output by 25 functioning as a logical actuator, as mentioned above, while the surrounding actuator portions 402 provide a corresponding alphabet or symbolic output.

[0060] Figure 4A – 4D illustrates key units having a main actuator portion 1, 4, and 6. The key unit 1001 has a main actuator portion 1 that is circular.

[0061] In the example of **Figure 4A**, the main actuator portion **1** is concave in shape and further sub-divided into four sections **3**. In the implementation of the device using the key unit of **Figure 4A**, each section of the main actuator may have its own actuator element located beneath said section **3**. Accordingly, the actuation of any one of said sections **3** results in the output associated with the main actuator portion **1**.

[0062] Alternatively, the main actuator **1** of **Figure 4A** may be implemented based on the aforesaid logical actuator. In implementing the logical actuator, at least two sections **3** of the main actuator portion **1** must be actuated in order for the generation of the required output. In this respect, the actuator portion **1** may not require any actuator elements beneath said sections **3**. Instead, the actuation of any two sections **3** results in the actuator elements of any two sub-actuator portions **2** generating said output signal.

[0063] **Figure 4B** illustrates a key unit **1002** having a flat, circular main actuator portion **4** and four sub-actuator portions **5** surrounding the main actuator portion **4**. The implementation of the present exemplary key unit may be by a first method of having individual actuator elements beneath each portion **4, 5** or by a second method of having means of the logical actuation. However, as the main actuator portion is independent of the sub-actuator portions, unlike the example of **Figure 4A**, it may be more practical to utilize the first method preferable.

[0064] **Figure 4C** illustrates a key unit **1003** having a convex, circular main actuator portion **6** being surrounded by four sub-actuator elements **8**. The main actuator portion **6** slightly elevated via a step **50** over the sub-actuator elements **8**. As in **Figure 4A**, the main actuator portion **6** is further sub-divided into four sections **7**. In this example, the implementation is substantially similar to that as described for the key unit of **Figure 4A**.

[0065] The key unit **1004** of **Figure 4D** is substantially similar to that of **Figure 4C** except that the main actuator portion **6** is located within a recess **52** and is hence lower with respect to the surrounding sub-actuator portions **8**. Again, as above, the main

actuator portion is sub-divided into four sections 7. The implementation options for the present example are the same as those described above.

[0066] Figure 5 illustrates an embodiment of the present invention wherein the key unit 5 88 is shown having contoured surfaces or step-like surfaces to provide for sensory-touch typing. Each key portion is shown to have a depressed or step-like appearance, which serves as a partition between each key portion. The contoured surface also allows a user to determine if the correct key is being actuated via the sense of touch of the user.

10 [0067] Figures 6A – 6F are illustrations of various embodiments of the shape that the main actuator portion 350 may assume. The shape of the main actuator portion may be of, but is not limited to, a triangular 500, a rectangular 502, a circular 504, an elliptical 506 or a polygonal 508 shape.

15 [0068] The dashed lines indicate that the various sub-actuator portions 510, as mentioned above, are formed as a single key element as shown in Figure 3B. Essentially, the main actuator portion 512 in all the various embodiments may provide, but is not limited to, a numeric output when actuated. The surrounding sub-actuator portions 510 of each key unit may provide either an alphabet output or a symbolic output as shown in Figure 6D.
20 In Figure 6D, the top right actuator portion 516 provides for the '@' output commonly used in e-mail addresses, for example.

[0069] Figure 6A illustrates an embodiment of a key unit having a main actuator portion 506 and only two surrounding sub-actuator portions 516. In this embodiment, the right
25 sub-actuator portion provides a shortcut to connect to the Internet denoted by the symbol 'i'. It is obvious that the various symbols, short cuts and alphanumeric characters may be interchangeably assigned between the main and sub-actuator portions.

[0070] Figure 7 illustrates one exemplary embodiment of the present device. The
30 exemplary embodiment is a combination of two overlapping grid pattern arrangements. The first grid arrangement is the three by four (3 x 4) arrangement 912. Accordingly, said

embodiment has at least twelve key units. The key units are arranged in a substantially grid-like manner for providing a telephonic input. The second grid arrangement is a five by two (5 x 2) grid pattern **915** that is directed towards a 'Qwerty' keyboard layout. The two grid patterns substantially overlap such that surrounding the grid of key units **912**, are
5 four key units, two key units disposed on either side of the grid of key units **912**. In addition, this embodiment also includes, on one side of said grid, a Graphic User Interface (GUI) menu navigation key unit **950**. Each of the above-mentioned key units includes a main actuator portion **908** and at least four sub-actuator portions **906**. In the first row of key units, the upper row of sub-actuator portions form function keys F1 – F6
10 **902**. The lower row of sub-actuator portions **904**, with the exception of the first portion, caters to a media playback/record functions. The keypad implemented in the embodiment of **Figure 7**, for example, has key units spaced generously so that the fingers of the user are comfortably matched to it. Similarly, when typing, the distances between actuator portions with alphabets, for example, are also maximized to ensure comfort for the
15 fingers of the user.

[0071] **Figure 8** illustrates an embodiment with an extended telephone keypad **600**, wherein a Qwerty-style keyboard is incorporated onto the respective key portions **606**. The keypad includes twenty key units. A first set of twelve key units (3x4) **604** provides
20 an output similar to that as found in a standard telephone keypad. The main actuator portions **608** of the twelve-key unit set **604** provide a numeric output. The numeric output may be used during the dialing phase during the initiation of a telephone call. A second set of eight-key units (2x4) **602** provides for at least eight function keys. The main actuators **612** of the second set of eight-key units **602** may be mapped to provide a
25 designated function such as a short-cut key to a text editor, to save, download or retrieve messages or telephone calls.

[0072] In the embodiment shown in **Figure 8**, the two sets of key units **602,604** provide sufficient key portions **606**, when combined together, allow for the incorporation of a
30 Qwerty keyboard within the shown layout. The essential characters of the Qwerty keyboard (such as the alphabets and punctuation marks, for example) are situated on the

respective key portions such that the layout as shown in **Figure 8** resembles that of the Qwerty keyboard.

[0073] In addition, the shaded row of six key portions **610**, is actually six individual key portions that have been assigned to provide a singular output when any one of the six key portions is actuated. The output provided by the six key portions **610** in this particular embodiment is that of a space output, similar to that as provided by the spacebar in a Qwerty keyboard. Thus, the effective area available for the actuation to achieve a desired output is increased six-fold. This is in line with the general concept of the present invention of providing the user with a keyboard layout, similar to one that he is probably familiar with, within the framework of a numeric keypad that may be found on telephone pads, for example.

[0074] **Figure 9** illustrates another embodiment having a standard telephone keypad **700** including key units **706**, wherein the key portions **702** of the key units are assigned alphabet characters according to the Qwerty-styled keyboard. In this embodiment, each key unit **706** includes five individual key portions, the five being one main actuator portion **704** and four sub-actuator portions **702**. Each key portion **702** is separated by a spacer **708**. The separation of each actuation portion, via an intermediate spacer **708**, provides for sufficient distance between each adjacent neighboring actuation portion **702**. This reduces the risk that a user may accidentally actuate the wrong key during a keying in process.

[0075] The assignment of the various alphabet characters is similar to that of a standard Qwerty keyboard, as shown in **Figure 1**. Each row of characters of the Qwerty keyboard has been substantially adapted to fit onto a row of key units **706**. For example, the letters Q to P of the Qwerty keyboard (all within the same row, cf. **Figure 1**) are arranged in such a manner that they are all situated within the same row of key units **706** of the embodiment of **Figure 9**. Similarly, the second and third rows of the keypad input device are also adapted to include the corresponding characters as found in the Qwerty keyboard.

In addition, the present embodiment includes in one sub-actuation portion **710**, the means for providing a functional variance (shift key) to each of the other keys.

[0076] The embodiment of **Figure 9** further includes four key portions **706** (shaded), each 5 having been assigned the same input function. In this embodiment, the input function assigned to each of the four key portions **706** is that of the 'spacebar' as found in the Qwerty keyboard. As mentioned above, the arrangement of the keys corresponds to that of a Qwerty keyboard and the 'spacebar' is implemented in the present device by providing for the four key portions **706**, arranged in a row, to have the same output. This 10 in effect, causes the surface area available for the actuation of a 'spacebar' input to be increased nearly four-fold over the surface area available for the actuation of any other key portion.

[0077] **Figure 10** is an exemplary embodiment of **Figure 9** wherein the keypad input 15 device **750** also includes all the features as shown in **Figure 9** with the exception that the key portions **702** of the key units are assigned with alphabetic characters that run in alphabetical order. The Qwerty layout is not followed in this embodiment.

[0078] **Figure 11** illustrates a further embodiment of the invention showing the inclusion 20 of a media player key unit **804**, a basic mathematical operations key unit **802** and function keys **806**. In this embodiment, the key portions **810**, for each key unit, and the main key portion **812**, of each key unit, are formed as an integral part. In other words, the key units, though able to provide several outputs, are each formed as a single portion. A detailed illustration of said single portion is shown in **Figures 3A** and **3B**.

25

[0079] In the present embodiment, each sub-actuation portion **810** is assigned an alphabet or symbolic character output. The main actuation portions **812** of the various key units provide the standard output of various numerals, the asterisk **816** and the hex **818** outputs. With respect to the media player key unit **804**, the surrounding actuator portions provide 30 the record **814**, stop **820**, forward **824** and reverse **822** functions. The main actuator portion of the media player **826** provides the playback and pause functions. The present

embodiment also includes a mathematical key unit **802** for providing basic mathematical operations such as addition, subtraction, multiplication and division. In addition, the present embodiment includes a mode key unit **808**.

5 [0080] The mode key unit **808** allows for the switching between the input of capital and non-capital alphabet character input. Sub actuation portion **828** is adapted to provide a mode of input that only permits the main actuator portions **812** that provide numeric inputs to be active. That is, should any other actuator portion **810** other than those that provide a numeric input be actuated, no output will be generated. Such a mode may be
10 useful during the dialing phase when placing a telephone or videophone call as non-essential keys for dialing are disabled. Alternatively, should the telephone number consist of both numerals and alphabets, as in the case of some toll-free numbers, all the keys may be made available to the user. As a further alternative, the sub-actuation portion **828** may be used to switch into a calculator mode wherein the mathematical key unit **802** would be
15 made functionally available to the user.

[0081] **Figure 12** shows a touch-screen **1200** wherein the keypad of **Figure 7** is displayed. The key units shown in the touch-screen are capable of producing the same output results as the embodiment shown in **Figure 7**. In other words, the functionality is substantially
20 the same with the exception that instead of physical keys units key units displayed are virtual in that they are formed by the pixels of said touch-screen display. However, the arrangement and principle behind the virtual keypad is the same as that in all the above-mentioned embodiments of the present invention. The touch-screen having the keypad as described herein may be implemented in any display that is adapted to receive touch-
25 screen input.

[0082] The above-mentioned embodiments and their accompanying description merely serve to aid in the understanding of the present device. It should not be construed to mean that the present device is only limited to the aforesaid embodiments.

30

CLAIMS

What is claimed is:

1. A keypad input device comprising:
 - a keypad,
 - a plurality of key units being arranged in said keypad in a spaced apart relationship,
 - wherein each key unit comprises
 - a main actuator portions, and
 - a plurality of sub-actuator portions
 - wherein the sub-actuator portions are arranged along the periphery of the main actuator portion.
2. The keypad input device according to Claim 1, wherein the main actuator portion comprises at least one main actuator element and the sub-actuator portion comprises at least one sub actuator element.
3. A keypad input device according to Claim 1 or 2, wherein the key units are arranged on the keypad in a regular grid having a plurality of rows and columns.
4. A keypad input device according to any of Claims 1 – 3, wherein the main actuator portion and the plurality of sub-actuator portions of each key unit are each formed as individual key elements.
5. A keypad input device according to Claim 4, wherein the individual key elements of the key unit are supported in the keypad in a depressible manner.
6. A keypad input device according to any of Claims 1 – 3, wherein the main actuator portion and the plurality of sub-actuator portions of each key unit are formed as integrated parts of a single key element.

7. A keypad input device according to Claim 6, wherein the single key element is supported in said keypad in a tiltable and/or depressible manner to actuate the main and sub-actuator elements by tilting and/or depressing the single key element.
8. A keypad input device according to Claims 45, wherein intermediate spacers are arranged between the individual key elements of a key unit.
9. A keypad input device according to any one of the preceding claims, wherein the key unit comprises
 - four sub-actuator portions being arranged around the periphery of the main actuator portion such that each sub-actuator portion extends along approximately one quadrant of the periphery of the main actuator portion.
10. The keypad input device according to Claim 9, wherein the main actuator element comprises at least two sections.
11. The keypad input device according to Claim 9, wherein the main actuator element comprises four sections.
12. A keypad input device according to any one of the preceding claims, wherein the keypad comprises a five by two (5x2), a five by four (5x4) or a three by four (3x4) arrangement of key units.
13. A keypad input device according to any one of the preceding claims, wherein the keypad comprises a five by two (5x2), a three by four (3x4) arrangement of key units, or a combination thereof.
14. A keypad input device according to any of the preceding claims, wherein a selection of key units from the plurality of key units is grouped so as to provide a common output upon actuation of any of said selection of key units thereby increasing the operable surface area available for actuation to achieve said common output.

15. A keypad input device according to Claim 14, wherein the grouped selection of key units comprises
 - at least two neighboring key units being arranged along a row,
 - wherein at least two actuator portions of one of the key units are arranged in a row, and the corresponding actuator portions of the neighboring key unit are arranged along the same row, and
 - wherein each of the actuator portions arranged in the same row, of the neighboring key units is assigned and adapted to provide a common output.
16. A keypad input device according to any of the preceding claims, wherein the main actuator portion is adapted to provide a numeric output.
17. A keypad input device according to any of the preceding claims, wherein each sub-actuator portion of any key unit is adapted to provide a first alphabetical output, symbolic output or functional variance output.
18. A keypad input device according to any of the preceding claims, wherein at least one sub-actuator portion of a key unit is assigned and adapted to provide the functional variance to at least one other sub-actuator portion of any key unit such that said at least one other sub-actuator portion provides a second alphabetical, symbolic or functional variance output.
19. A keypad input device according to any of the preceding claims, wherein the main and sub-actuator portions of each key unit are each arranged and assigned at least one alphabetic character according to an order of arrangement and assignment of characters that corresponds to the keys of a conventional 'Qwerty' keyboard.
20. A keypad input device according to any of the preceding claims, wherein each key unit is of regular shape.

21. A keypad input device according to Claim 20, wherein the regular shape is a triangle, a circle, a square or a rectangle.
22. A keypad input device according to any of the preceding claims, wherein each main actuator portion and each sub-actuator portion comprises contoured surfaces adapted to conform to the finger of a user.
23. A keypad input device according to any of the preceding claims, wherein the key unit is from a material selected from the group consisting elastomers, thermoplastics and metal alloys.
24. A keypad input device according to Claim 23, wherein the group elastomers comprises polyurethane, polyisobutylene and polyisoprene.
25. A keypad input device according to Claim 23, wherein the group thermoplastics comprises polyethylene, polyvinylchloride (PVC) and polycarbonate.
26. A keypad input device according to Claim 23, wherein the group metal alloys comprises stainless steel, aluminum alloys and magnesium alloys.
27. A keypad input device according to Claim 1, implemented in the form of a touch-screen apparatus.
28. An apparatus comprising the keypad input device according to any of the preceding claims, wherein said apparatus is a communication device, a portable device or a home appliance.
29. An apparatus according to Claim 28, wherein the communication device is a telephone.

30. An apparatus according to Claim 29, wherein the telephone is a videophone, a standard telephone, or a mobile phone.
31. An apparatus according to Claim 28, wherein the portable device is a Personal Digital Assistant (PDA), a video game console or a mobile phone.
32. An apparatus according to Claim 28, wherein the home appliance is a refrigerator, a freezer, a microwave oven, video game console, a remote controller or a television controller.

Figure 1A
PRIOR ART

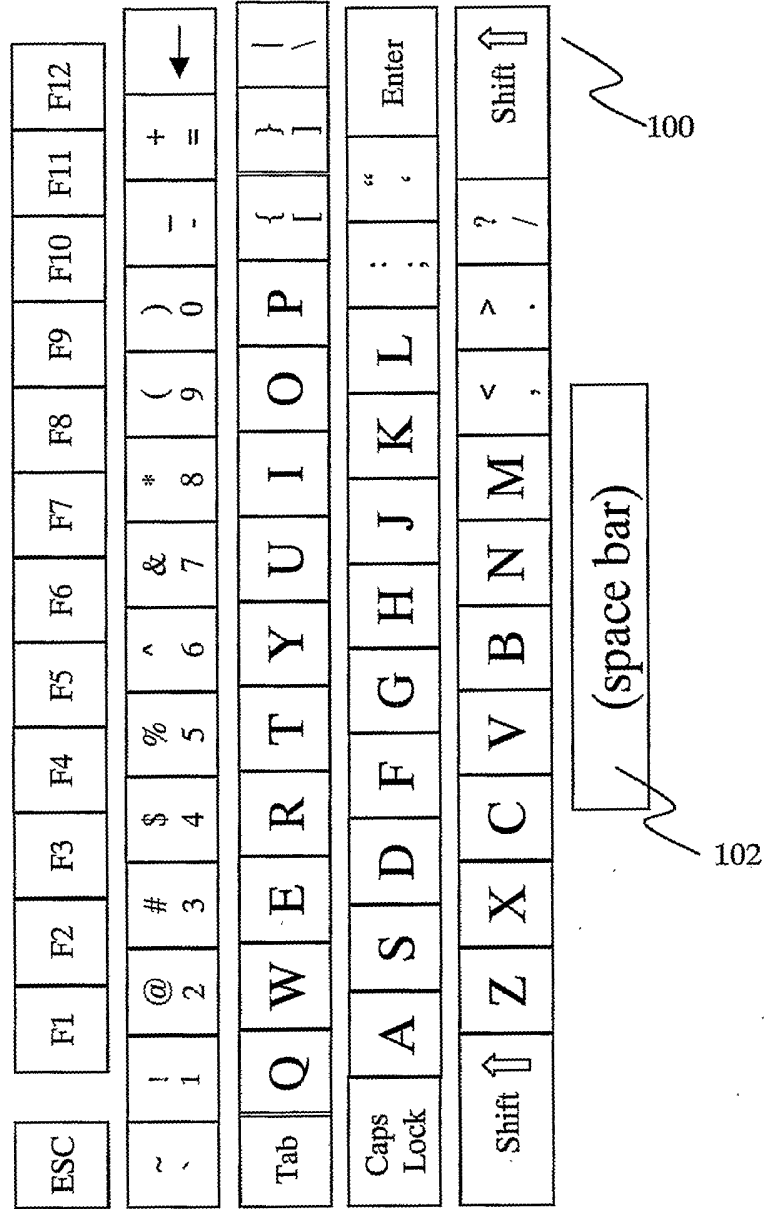


Figure 1B

PRIOR ART

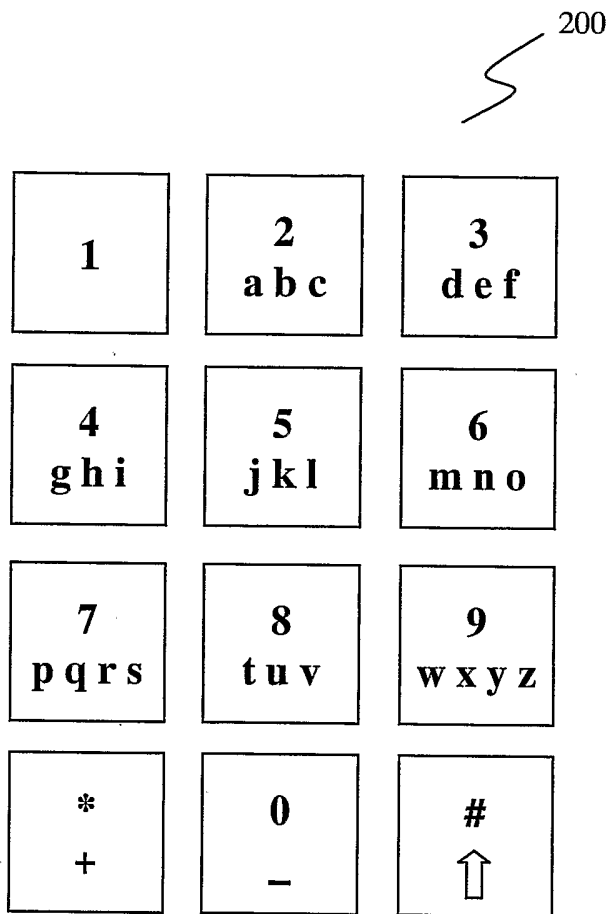


Figure 2A

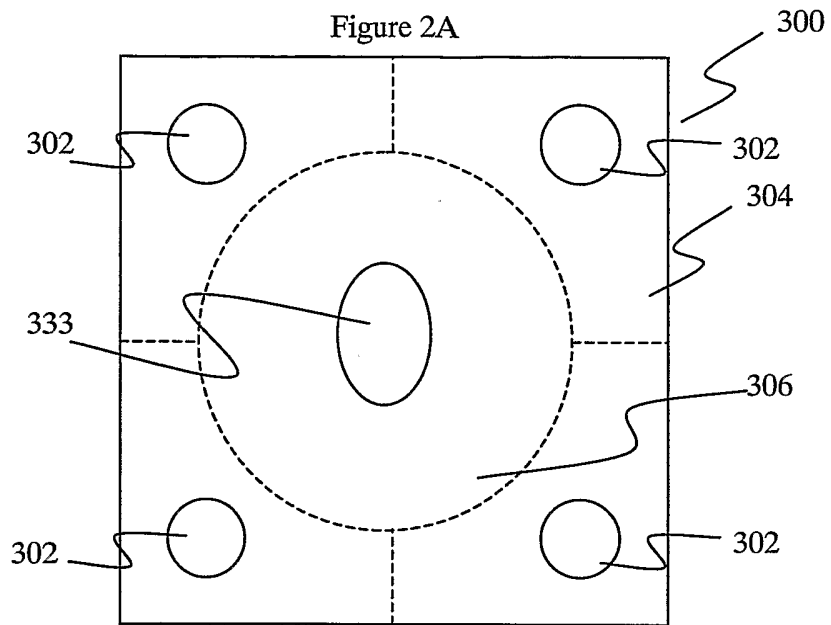
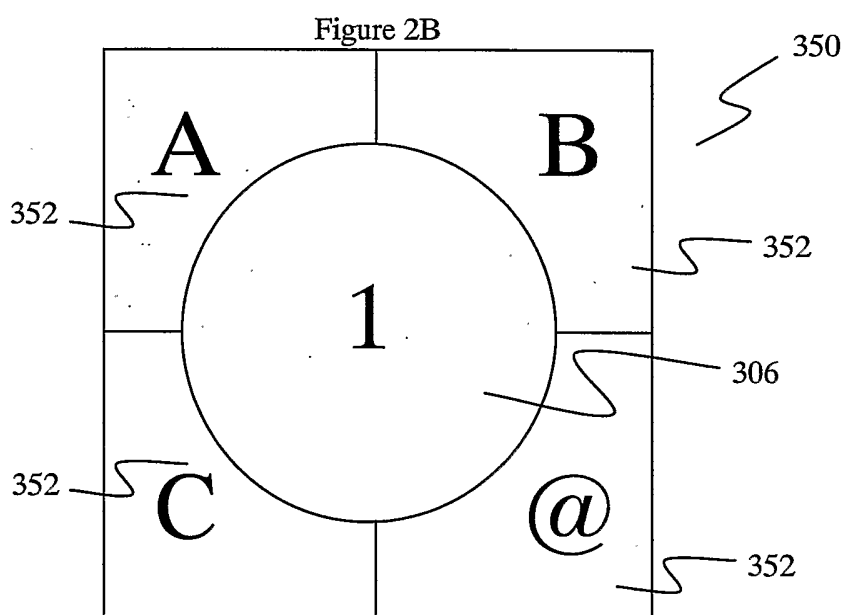


Figure 2B



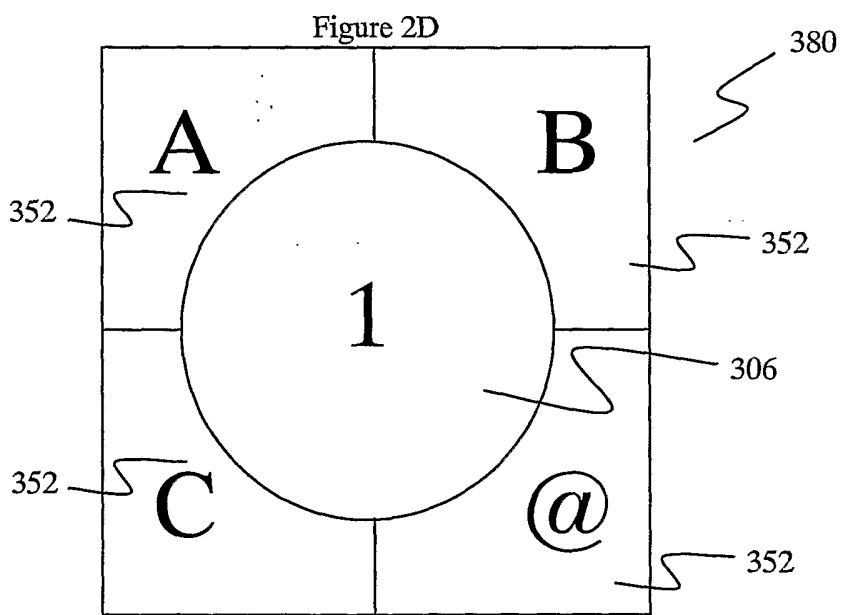
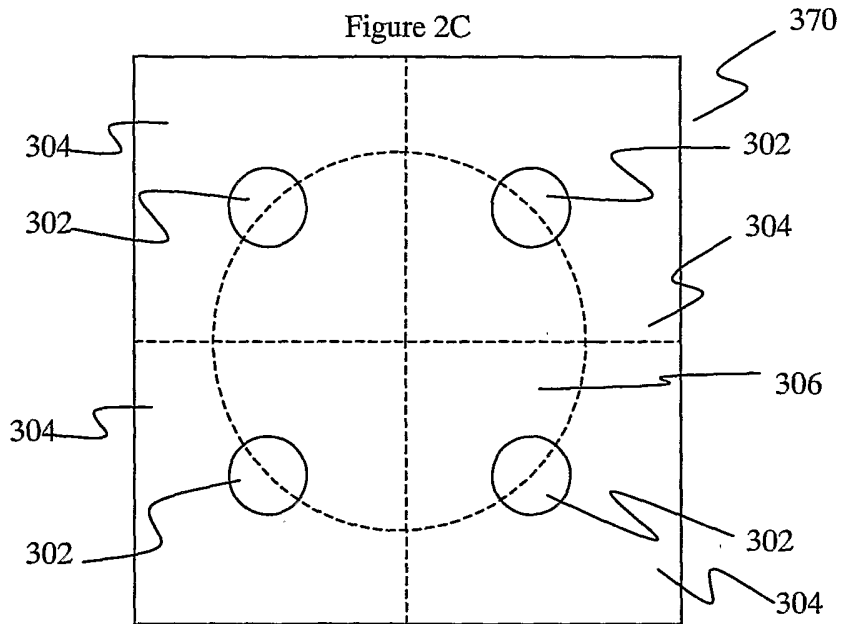


Figure 3A

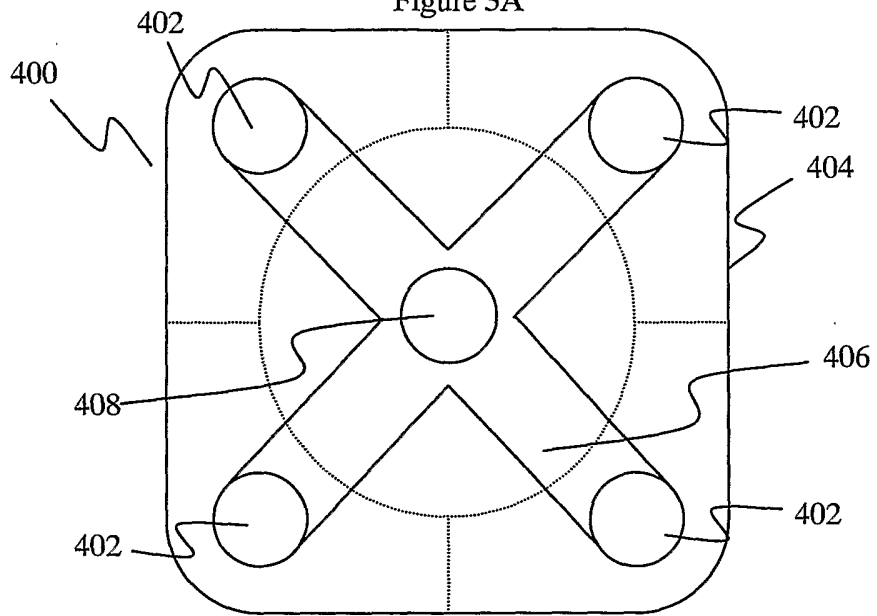
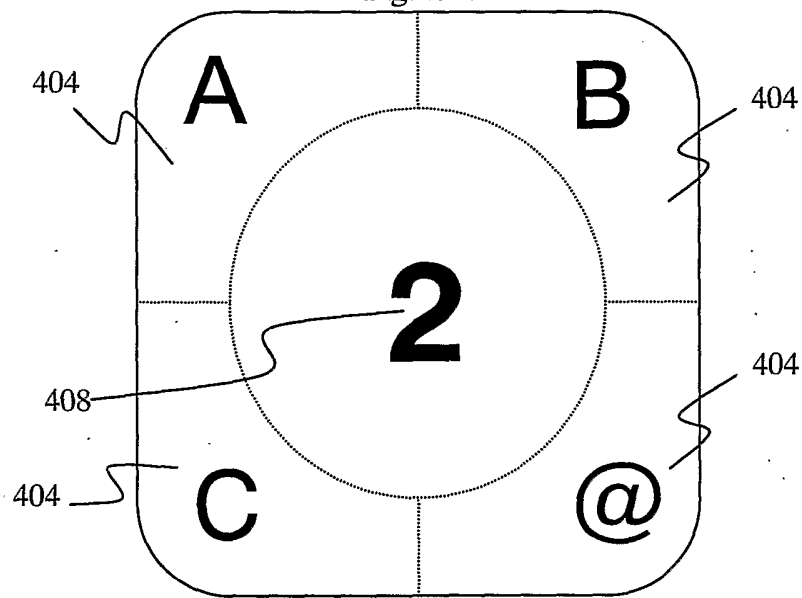


Figure 3B



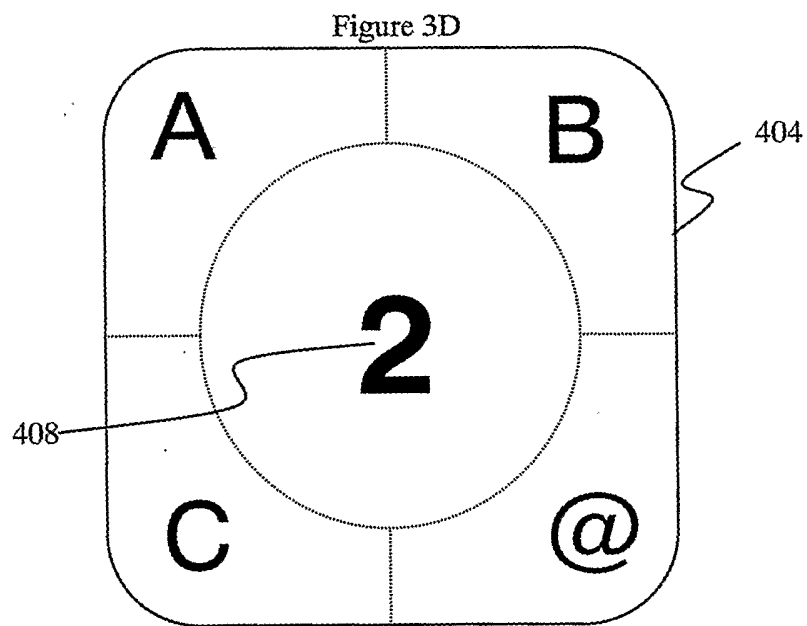
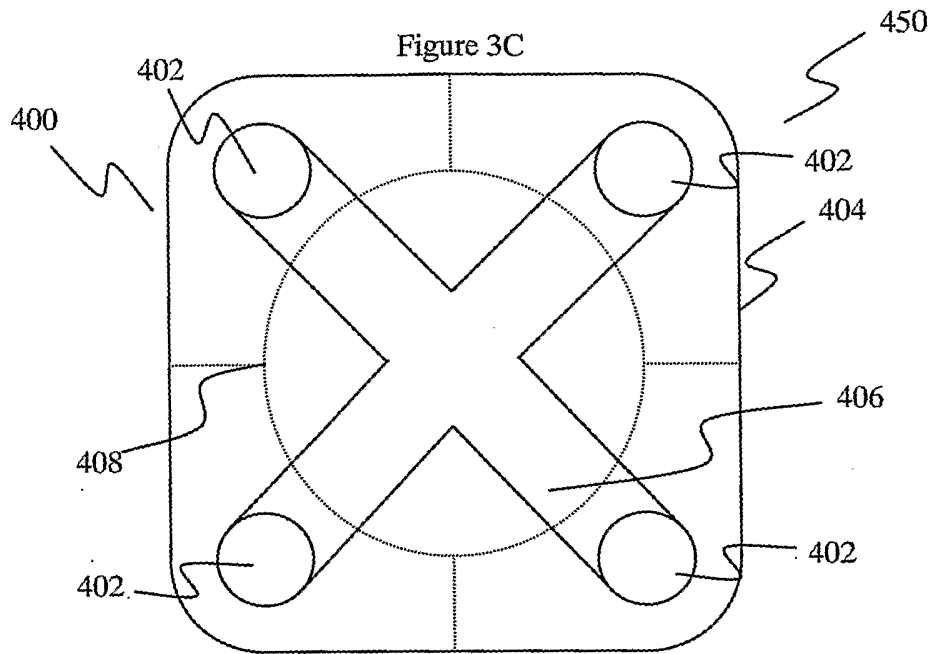


Figure 4A

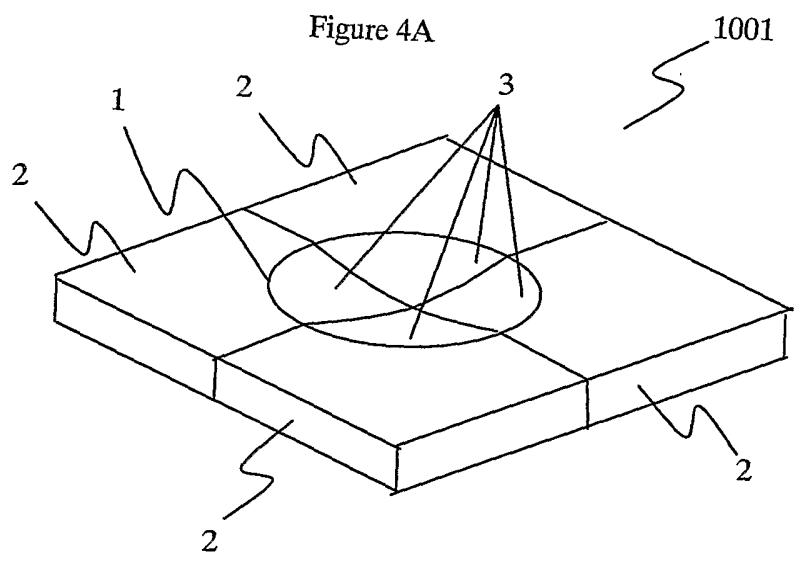


Figure 4B

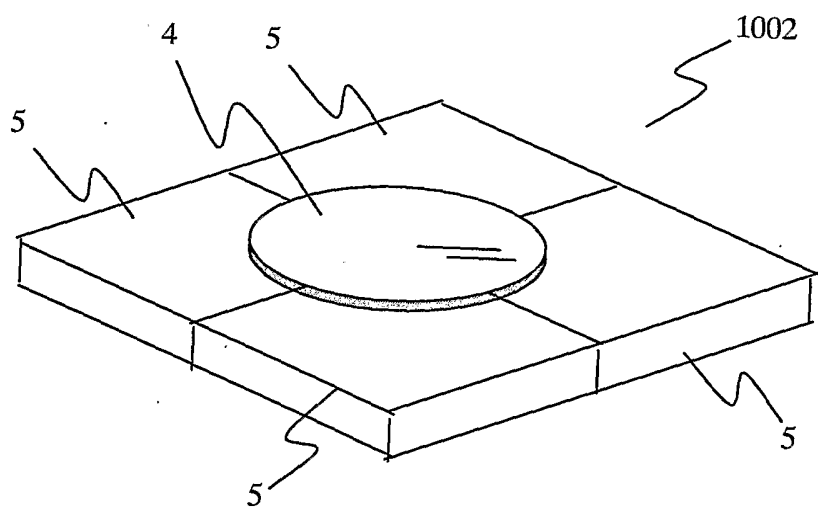


Figure 4C

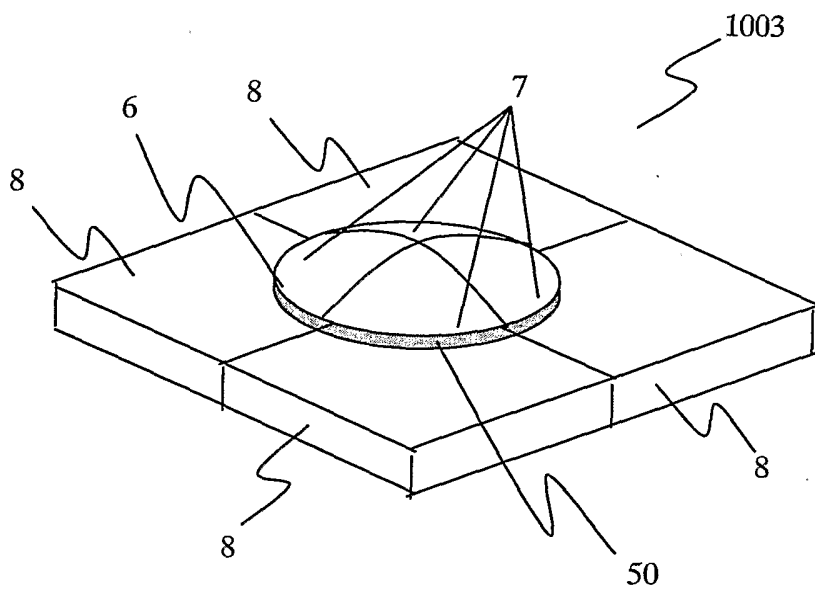


Figure 4D

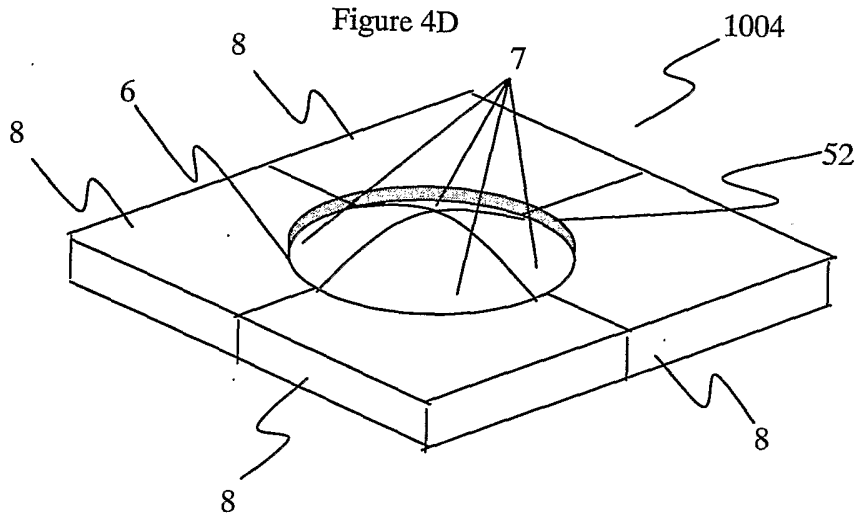
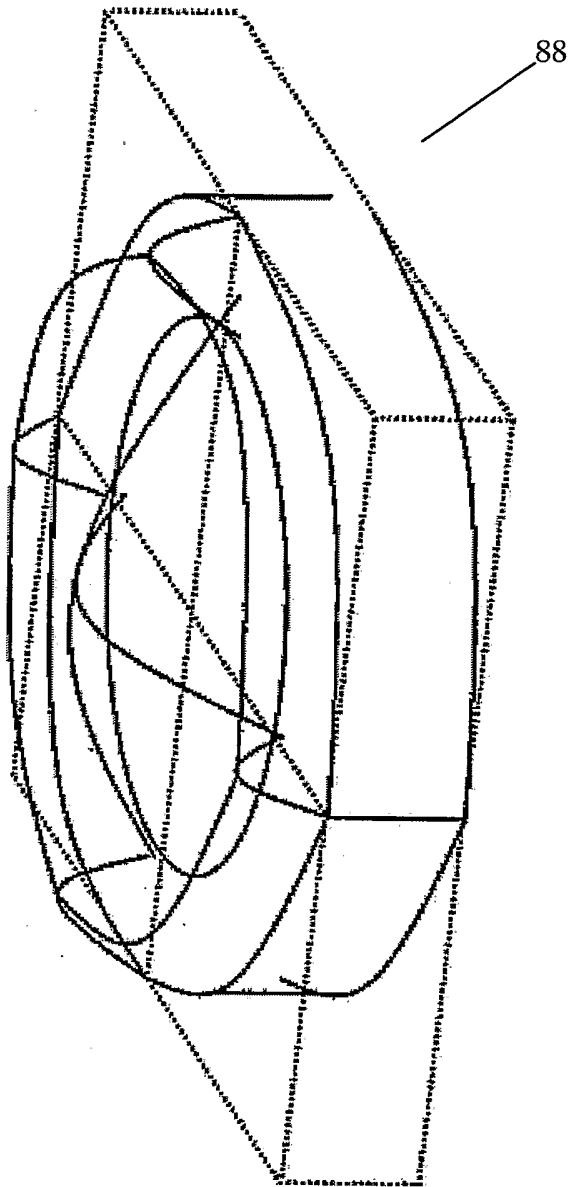


Figure 5



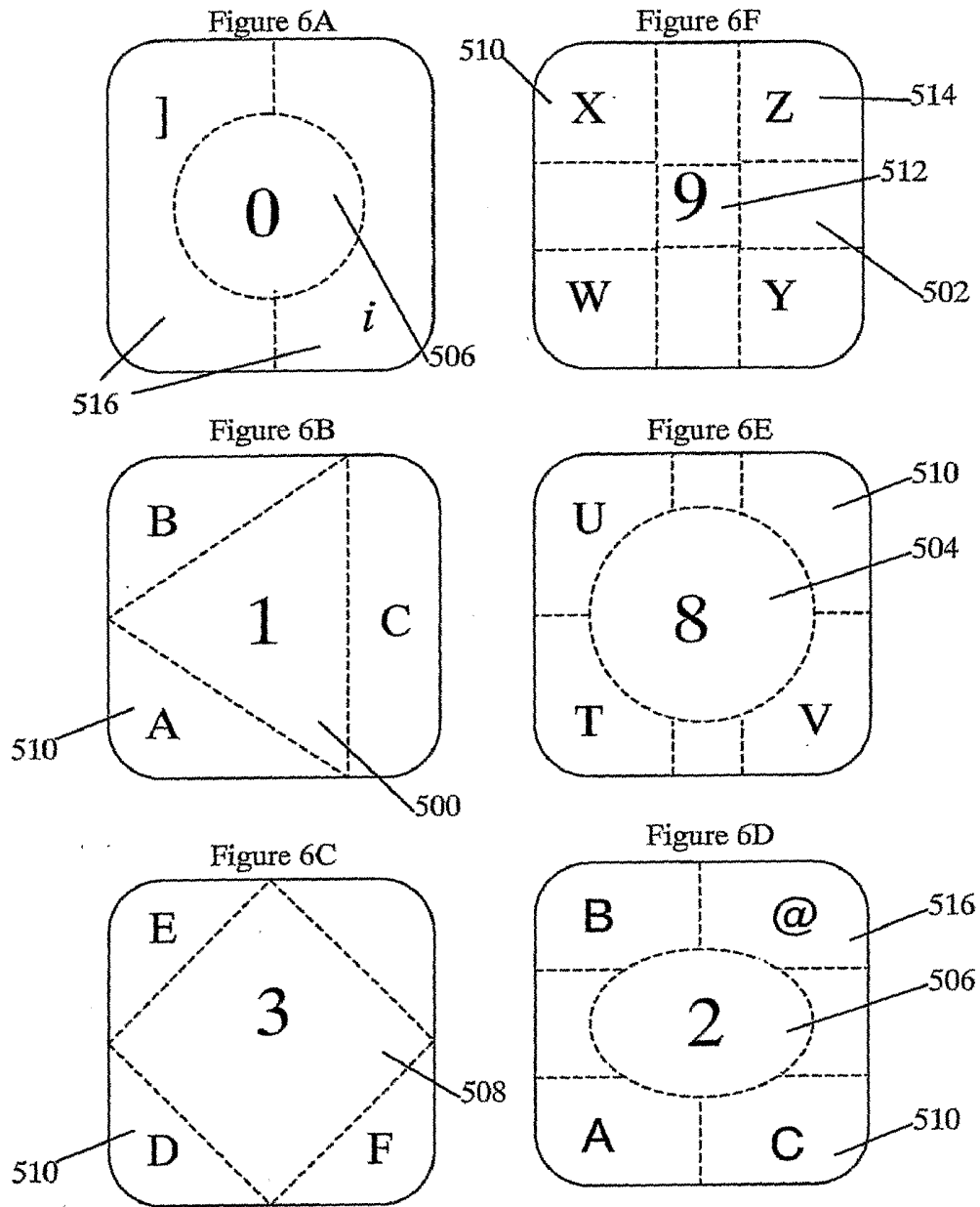


Figure 7

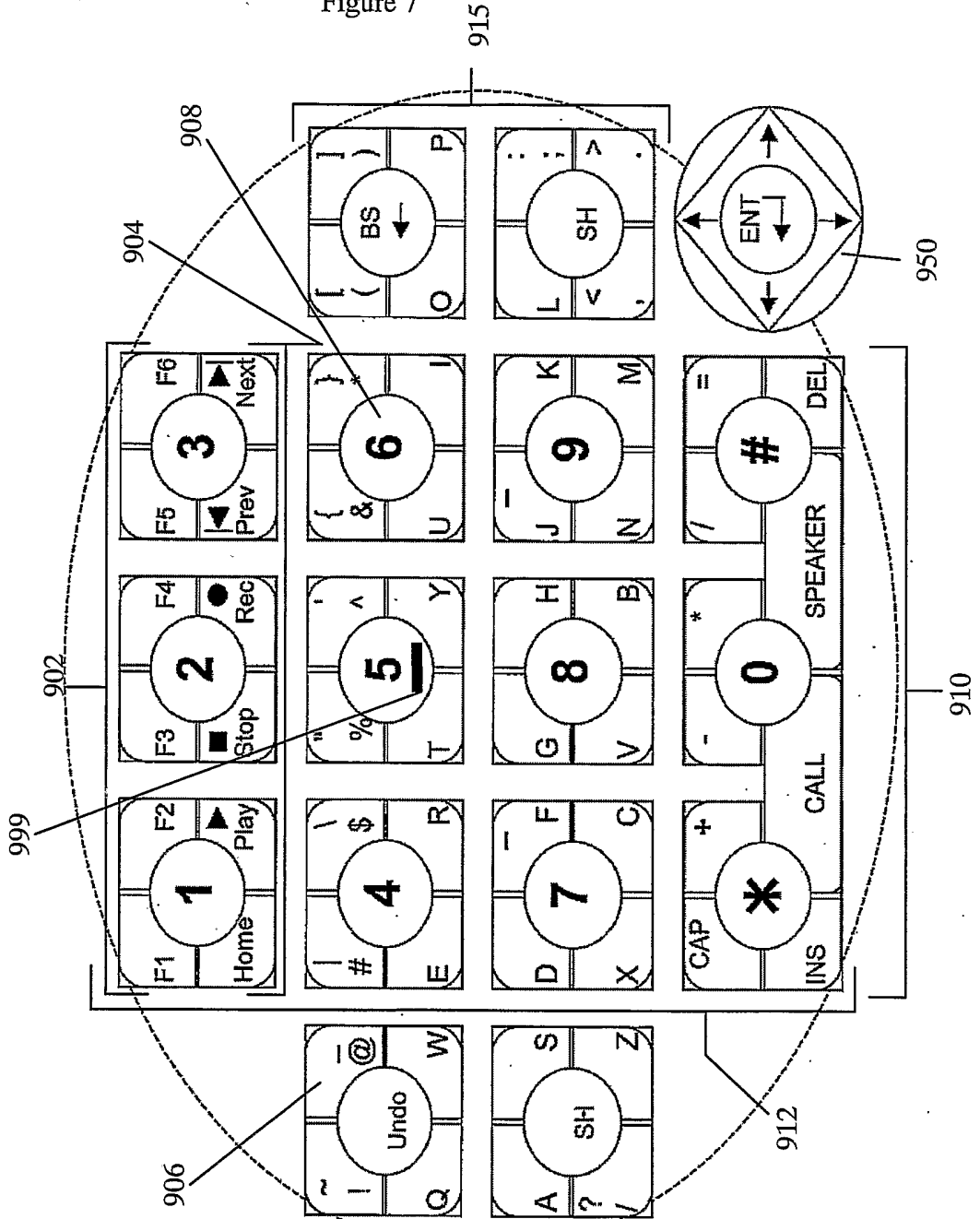


Figure 8

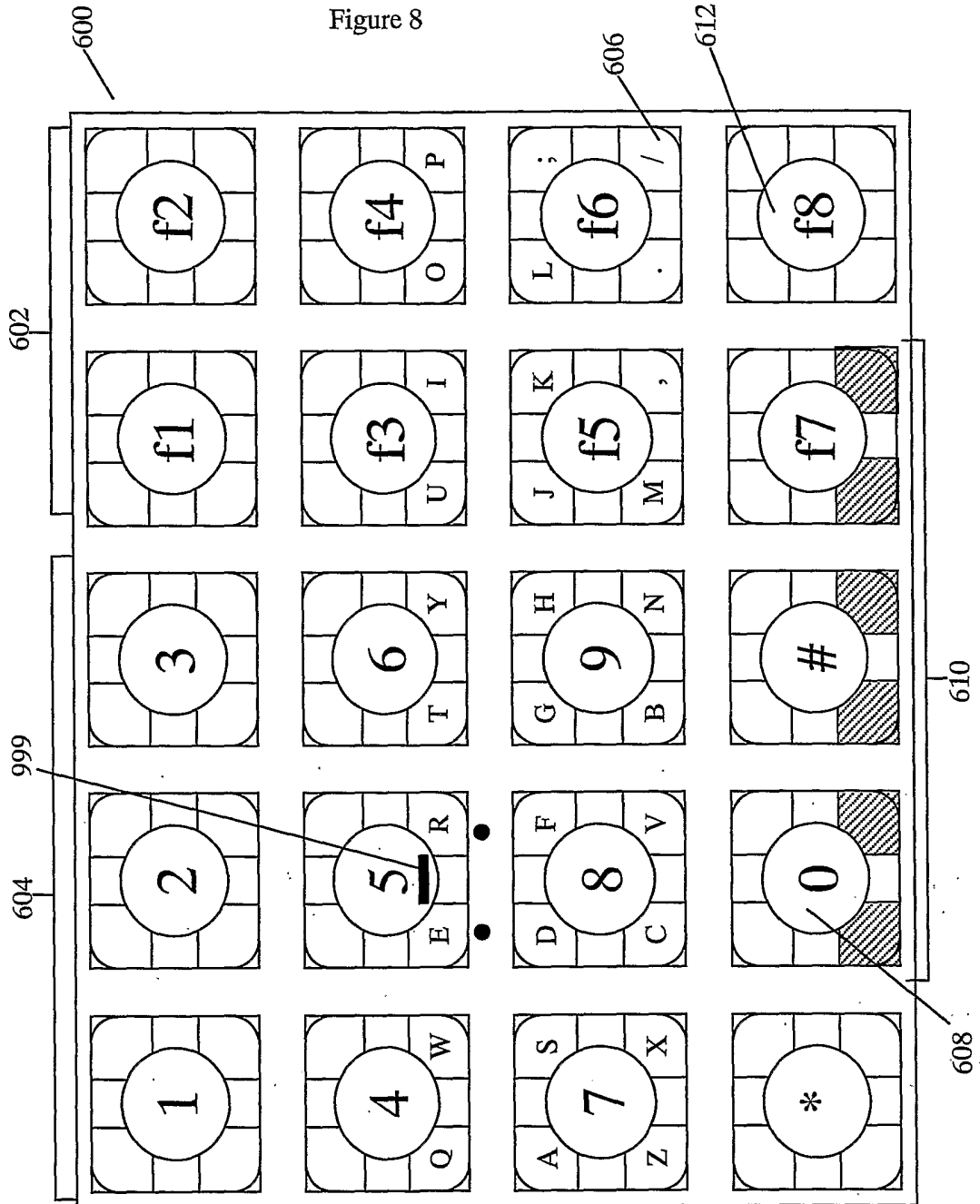


Figure 9

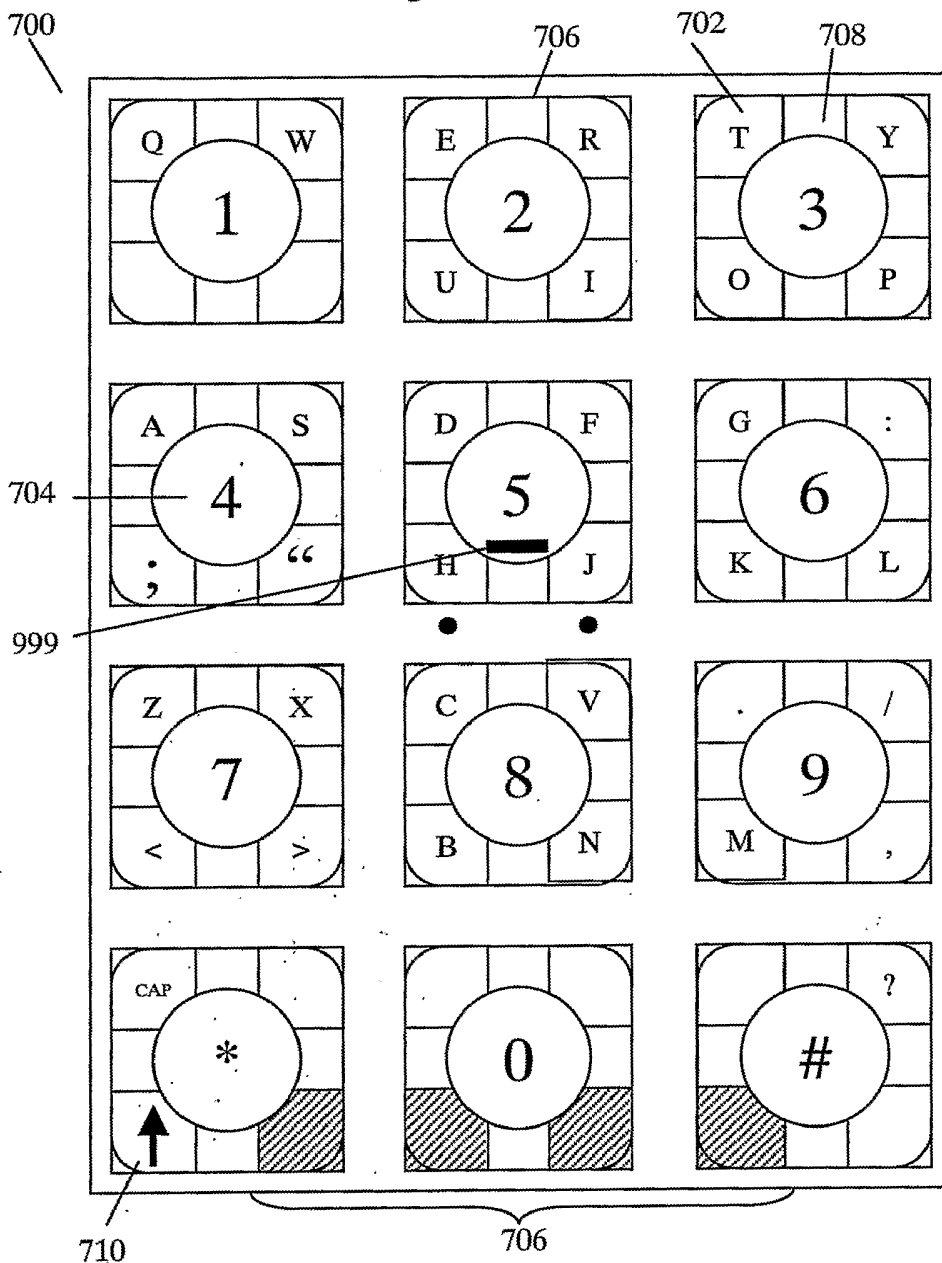


Figure 10

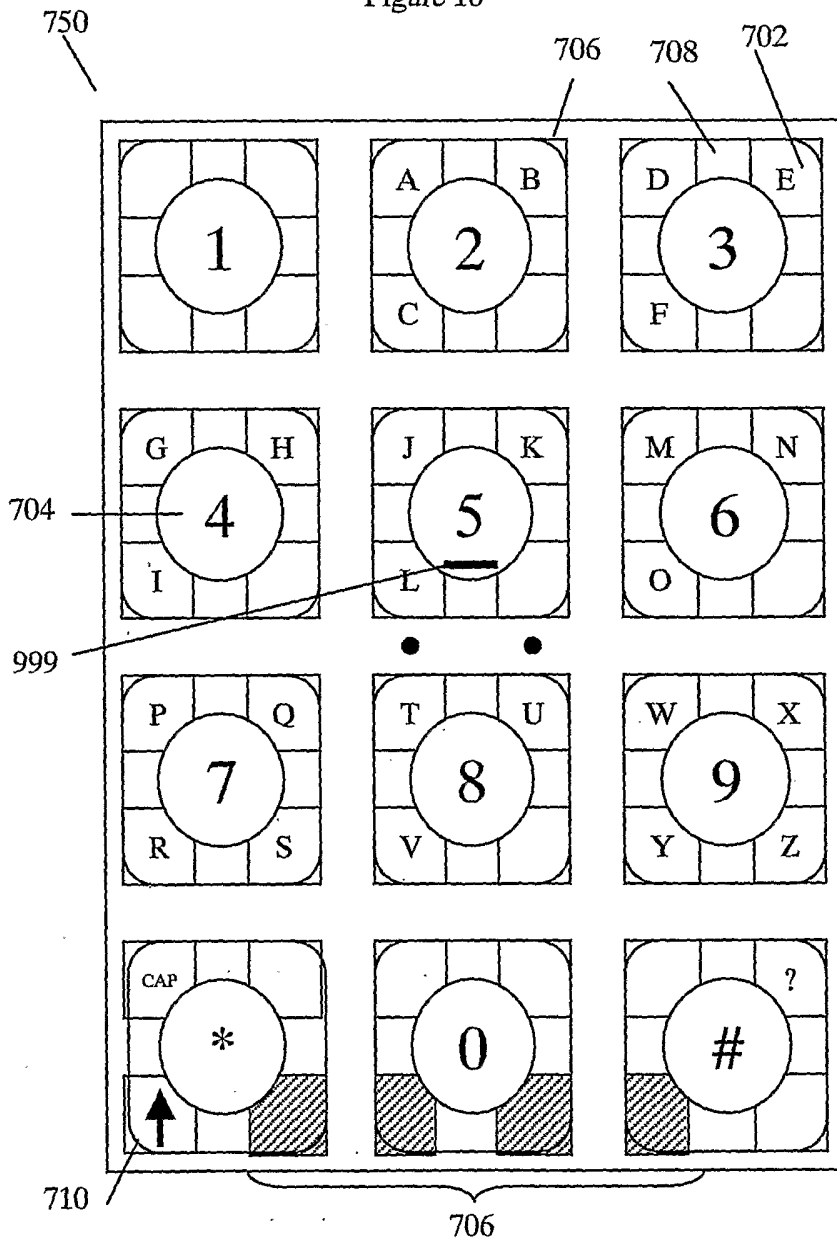


Figure 11

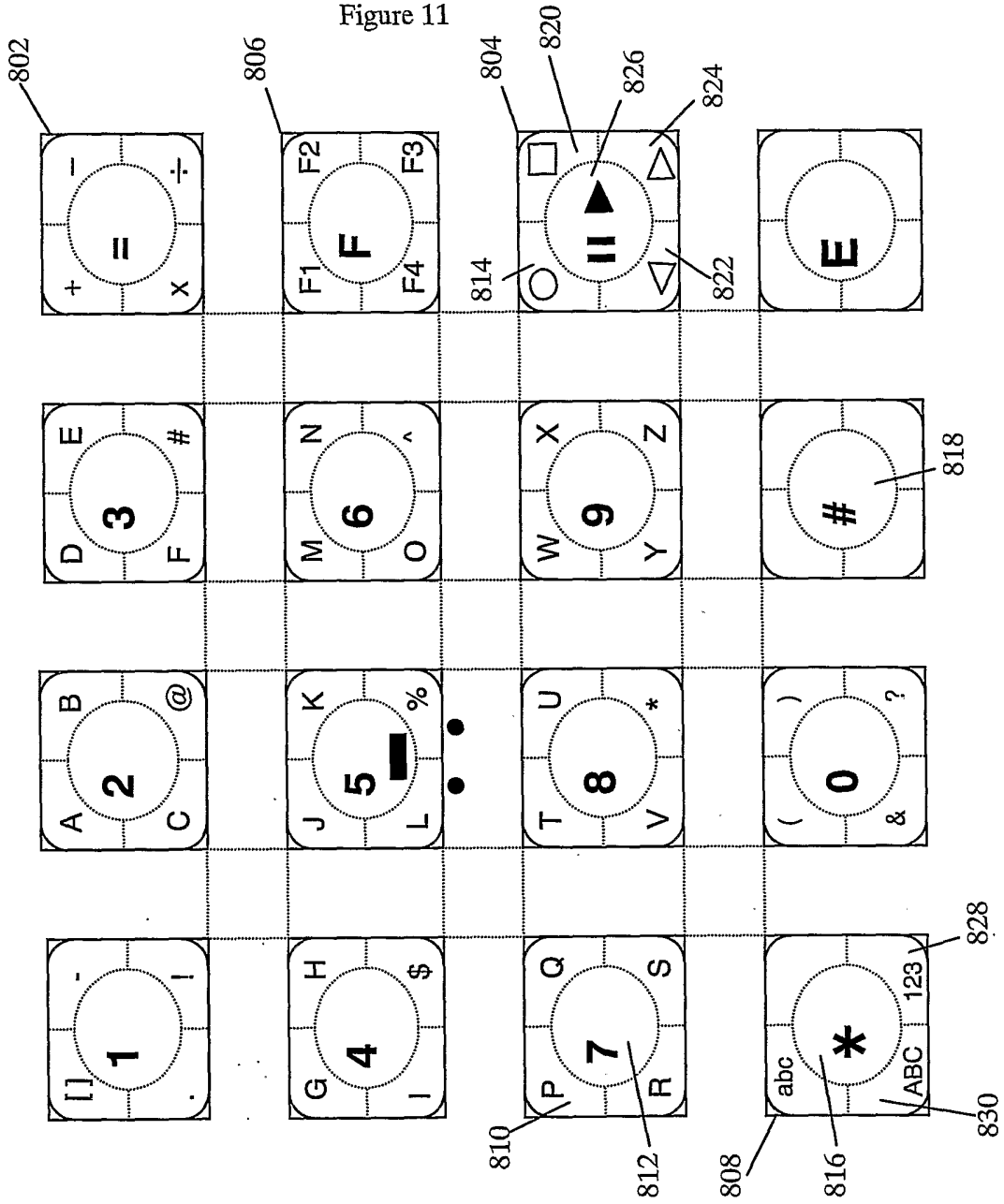
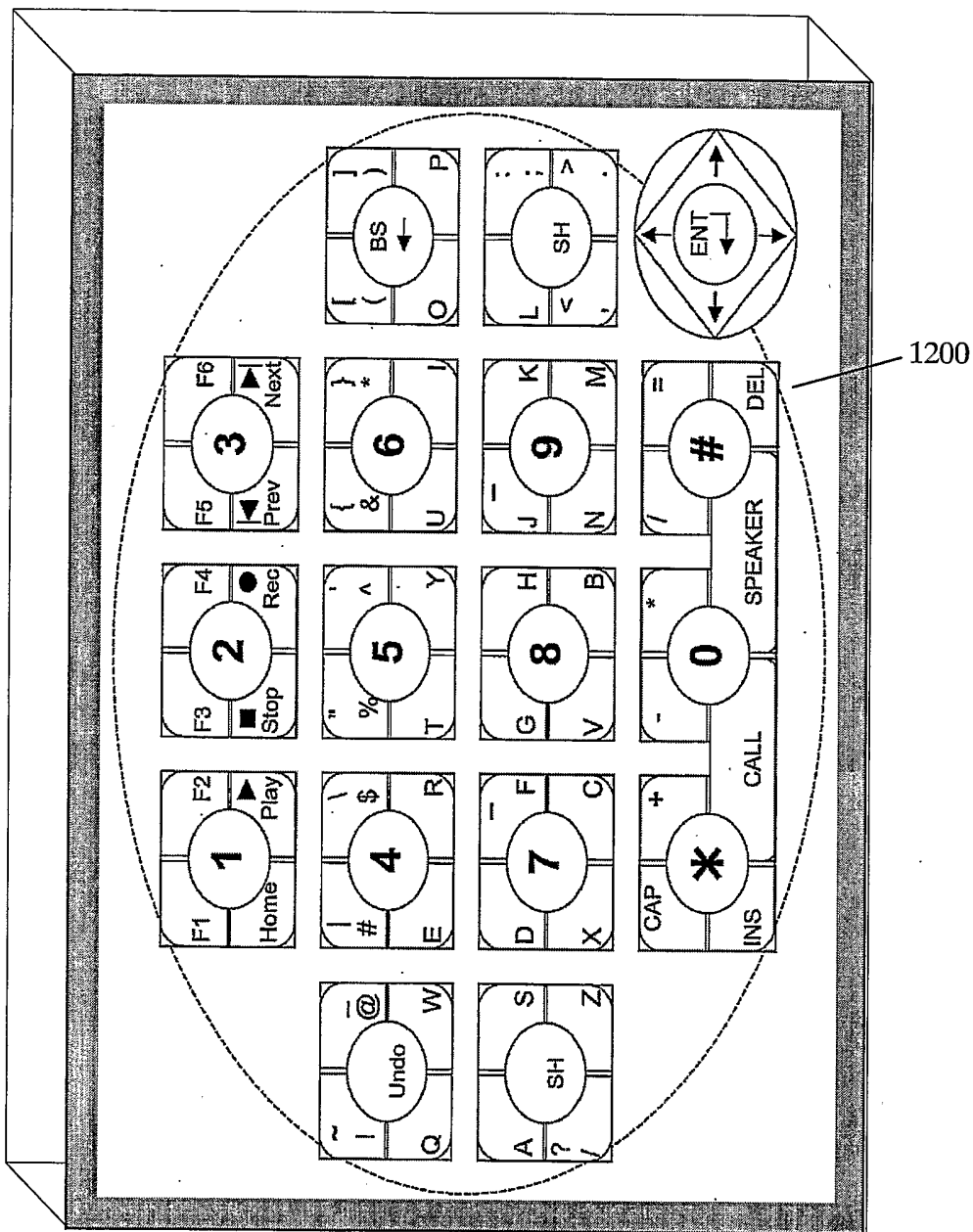


Figure 12



INTERNATIONAL SEARCH REPORT

International application No
PCT/SG2005/000193

A. CLASSIFICATION OF SUBJECT MATTER G06F3/023 H01H25/04				
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) G06F H01H				
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 practical, search terms used) EPO-Internal, WPI Data, PAJ				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X, Y	EP 1 538 648 A (NTT DOCOMO, INC) 8 June 2005 (2005-06-08) abstract paragraph '0001! - paragraph '0003! paragraph '0004! paragraph '0006! - paragraph '0019! paragraph '0075! - paragraph '0088! paragraph '0095! paragraph '0099! - paragraph '0101! paragraph '0126! - paragraph '0132! figures 1-5, 17-19 ----- -/--	1-32		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.				
<input checked="" type="checkbox"/> See patent family annex.				
* Special categories of cited documents :				
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> *A* document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed </td> <td style="width: 50%; border: none; vertical-align: top;"> *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. *&* document member of the same patent family </td> </tr> </table>			*A* document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. *&* document member of the same patent family
A document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. *&* document member of the same patent family			
Date of the actual completion of the international search <p style="text-align: center; font-size: 1.2em;">30 January 2006</p>		Date of mailing of the international search report <p style="text-align: center; font-size: 1.2em;">07/02/2006</p>		
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer <p style="text-align: center; font-size: 1.2em;">Valin, S</p>		

INTERNATIONAL SEARCH REPORT

International application No

PCT/SG2005/000193

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2002/050919 A1 (VANCE SCOTT LADELL) 2 May 2002 (2002-05-02) abstract paragraph '0001! paragraph '0006! - paragraph '0010! paragraph '0015! - paragraph '0016! paragraph '0032! - paragraph '0044! figures 1,2 -----	1-26, 28-32
Y	US 2002/027549 A1 (HIRSHBERG DAVID) 7 March 2002 (2002-03-07) the whole document -----	27
A	EP 1 182 677 A (THOMSON LICENSING S.A.) 27 February 2002 (2002-02-27) abstract the whole document -----	1-26, 28-32

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/SG2005/000193

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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			JP 2005190460 A	14-07-2005
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