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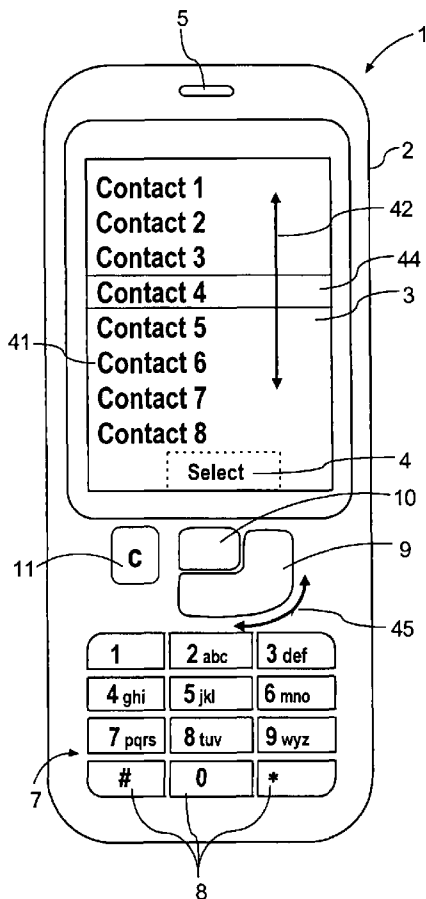
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(54) Title: USER INTERFACE WITH SELECT KEY AND CURVED SCROLL BAR



(57) Abstract: A user interface including a multifunctional select key and a curved scroll bar of the touch sensitive type. The select key and the curved scroll bar are in close physical proximity. The select key can be provided with a soft label on a display screen just above the select key. The curved scrollbar can be used for input of a one-dimensional or two-dimensional control parameter. The control parameter can e.g. be used to scroll objects displayed on the display screen or to navigate an object displayed on the display screen by moving an object over the touch sensitive surface. Particular functions such as a clear/back can be associated with a nonmoving contact of an object at particular positions of the curved scroll bar.

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USER INTERFACE WITH SELECT KEY AND CURVED SCROLL BARFIELD OF THE INVENTION

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The present invention relates to user interfaces for electronic apparatus, in particular to user interfaces that include a combination of a select key and a navigational device. The invention also relates to an apparatus with a user interface including a combination of a select key and a navigational device, a method of operating a user interface and to a software product relating to a user interface.

15 BACKGROUND OF THE INVENTION

US 7,046,230 discloses a portable/mobile media player having a touchpad with an annular shape. The input from the touchpad in the form of a fingertip being moved over the touchpad is e.g. used for controlling a scrolling function. In this device a swirling fingertip movement is transformed into a linear scrolling movement of information or objects shown on a display screen. Alternatively, a radial or tangential finger movement is transformed into a linear scrolling movement.

An advantage of the swirling based finger movement control is that a user is able to easily and rapidly transverse a lengthy list of media items in a scrolling function.

However, an annular touchpad consumes a relatively large amount of space on the operating face of the apparatus in

which it is used. For mobile devices effective use of the available space is often crucial for their success.

Further, when a user is holding the device in one hand and operating in the annular touchpad with his/her thumb, the movement that needs to be made with the thumb to describe a circle over the touchpad is ergonomically undesirable since it requires a substantial extension of the thumb.

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Thus, there is a desire for a user interface that provides a good control for a scrolling function that is ergonomic and occupies little space.

## 15 DISCLOSURE OF THE INVENTION

On this background, it is an object of the present invention to provide a user interface that at least partially fulfills the above desire. This object is achieved by providing an apparatus including a housing with an operating face, a processor disposed in the housing, a select key, and a curved scroll bar with a touch sensitive surface, the select key and the scroll bar being supported by the housing and disposed on the operating face, the select key and the scroll bar being operatively coupled to the processor.

The curved scroll bar provides for a very effective navigational input device that requires relatively little space. Further, the scrollbar can be positioned such that the curve that needs to be described is ergonomic and user-friendly.

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The select key may also have a touch sensitive surface. Preferably, the apparatus also includes a display screen operatively coupled to the processor.

5 The processor may be configured to associate a function to be performed with the select key. The processor may also be configured to display a soft label indicating the present function associated with the select key on the display screen. The processor may be configured to  
10 interpret a movement of an object over the touch sensitive surface of the scrollbar as an input variable.

Further, the processor may be configured to use the input variable in a control function for controlling the  
15 various applications associated with the device.

The processor may be configured to interpret a movement of an object over the touch sensitive surface of the scrollbar as a one-dimensional input variable. The  
20 control function can correspond to a change of a setting function that allows the value of a setting of the apparatus to be changed.

The control function may also correspond to a scrolling  
25 function that allows content displayed on the display to be moved across the display and out of sight on one side of the screen as new content is added on the opposite side of the screen. Alternatively, the control function may correspond to a function of moving a string of  
30 information items over the display along a path. The control function can correspond to a navigation function.

The processor can also be configured to interpret a movement of an object over the touch sensitive surface of the curved scrollbar as a two dimensional input variable.

5 The processor can be configured to associate a portion of the length of the curved scroll bar with a first component of the two dimensional signal and configured to associate another portion of the length of the curved scroll bar with a second component of the two dimensional  
10 signal.

Preferably, the display screen has a substantially rectangular contour, with a substantially parallel top and bottom edge and a substantially parallel left and  
15 right edge and wherein the processor is configured to associate a movement of an object over the touch sensitive surface of the curved scroll bar in a direction substantially parallel with the top and bottom edge as a navigational input in a direction parallel with the top  
20 and bottom edge of the display screen and wherein the process is configured to associate a movement of an object over the touch sensitive surface of the curved scroll bar as a navigational input in a direction parallel with the left and right edge of the display  
25 screen.

The processor can also be configured to determine the time that has elapsed between a point in time at which an object moving over the touch sensitive surface towards a  
30 first of the two extremities of the curved scroll bar disengages the touch sensitive surface and the point in time at which the subject touches the touch sensitive surface of the curved scroll bar again near the opposite of said two extremities of the curved scroll bar, and

wherein the processor is also configured to interpret the input signal from the user and input signal that corresponds to a complete rotation

5 Preferably, the curved scroll bar has first and second longitudinal extremities that are mutually offset vertically and horizontally, wherein the first extremity is to the right of the second projection and closer to the top of the handset such that a user holding the  
10 handset in a right hand can depress the first and second portions with a thumb of the right hand by merely pivotally moving the thumb in an arc about a socket of the thumb and without significant unnatural extension of the thumb.

15

It is another object of the present invention to provide a method for navigating in a graphical user interface of an electronic apparatus, comprising using a signal created by an object moving over a curved scroll bar with  
20 a touch sensitive surface as an input variable.

The method may further comprise using a signal from a key with a touch sensitive surface to activate a function.

25 The method may also comprise using a signal created by an object statically touching the curved scroll bar to activate a function.

The method may further comprise using the signal created  
30 by a movement of an object over the touch sensitive surface of the scrollbar as a one-dimensional input variable.

Preferably, the method further comprises using a movement of an object over the touch sensitive surface of the scrollbar as a two dimensional input variable.

5 The method may also comprise operating the curved scrollbar with a Cartesian coordinate system. In such a coordinate system, a movement of an object over the touch sensitive surface of the curved scrollbar in a direction substantially parallel with the abscissa results in a  
10 horizontal navigational movement in the graphical user interface, and a movement of an object over the touch sensitive surface of the curved scrollbar in a direction substantially parallel with the ordinate results in vertical navigational movement in the graphical user  
15 interface.

It is another object of the present invention to provide a user interface comprising a select key and a curved scroll bar with a touch sensitive surface.

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The select key and the curved scroll bar can be in close spatial proximity.

Preferably, a major portion of the outline of the curved  
25 scroll bar is defined by an inner curve or L-shaped contour and by an outer curve or L-shaped contour and wherein the select key is placed adjacent to the inner curve or L-shaped contour.

30 The select key may have a touch sensitive surface.

The outline of the touch sensitive surface of the curved scroll bar may resemble an annular sector. The central angle of the annular sector can be approximately 90°.



Alternatively, the outline of the touch sensitive surface of the curved scroll bar may be substantially L-shaped.

5 The user interface may further include a clear key, preferably having a touch sensitive surface.

The user interface may also include an alphanumeric keypad.

10

The user interface may further include a display screen.

It is another object of the present invention to provide a software product comprising software code for using a  
15 signal created by an object moving over a curved scroll bar with a touch sensitive surface as an input variable.

The software product may further include software code for using the signal created by a movement of an object  
20 over the touch sensitive surface of the scrollbar as a one-dimensional input variable.

The software product may also include software code for using a movement of an object over the touch sensitive  
25 surface of the scrollbar as a two dimensional input variable.

Further objects, features, advantages and properties of the apparatus, user interface, software product and  
30 method according to the invention will become apparent from the detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following detailed portion of the present description, the invention will be explained in more detail with reference to the exemplary embodiments shown  
5 in the drawings, in which:

Fig. 1 is a front view of an apparatus according to an embodiment of the present invention including a first  
10 screenshot,

Fig. 2 is a front view of an apparatus according to another embodiment including a second screenshot,

Fig. 3 is a front view of an apparatus according to yet another embodiment including a third screenshot,

15 Fig. 4 is a block diagram illustrating the general architecture of a mobile phone in accordance with an embodiment of the present invention,

Fig. 5 is a diagrammatic illustration of a user interface according to an embodiment of the present invention,

20 Fig. 6 is a diagrammatic illustration of a user interface according to another embodiment of the present invention,

Fig. 7 is a diagrammatic illustration of a user interface according to yet another embodiment of the present invention, and

25 Fig. 8 is a flowchart illustrating an embodiment of a method according to the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

30 In the following detailed description, the device and the method according to the invention in the form of a personal computer, PDA, mobile terminal or a mobile communication terminal in the form of a cellular/mobile phone will be described by the preferred embodiments.

Fig. 1 illustrates a first embodiment of a mobile terminal according to the invention in the form of a mobile telephone by a front view. The mobile phone 1 comprises a user interface having a housing 2, a display screen 3, an on/off button (not shown), a speaker 5 (only the opening is shown), and a microphone 6 (not visible in Fig. 1). The phone 1 according to the first preferred embodiment is adapted for communication via a cellular network, such as the GSM 900/1800 MHz network, but could just as well be adapted for use with a Code Division Multiple Access (CDMA) network, a 3G network, or a TCP/IP-based network to cover a possible VoIP-network (e.g. via WLAN, WIMAX or similar) or a mix of VoIP and Cellular such as UMA (Universal Mobile Access).

The keypad 7 has in this embodiment a first group of keys 8 as alphanumeric keys, by means of which the user can enter a telephone number, write a text message (SMS), write a name (associated with the phone number), etc. Each of the twelve alphanumeric keys 8 is provided with a figure "0-9" or a sign "#" or "\*", respectively. In alpha mode each key is associated with a number of letters and special signs used in the text editing. The first group of keys is primarily used for entering data in the telephone (enter events). The alphanumeric keys can be push button keys, like keys with dome switches or be touch keys with a touch sensitive surface.

The keypad 2 has additionally a second group of keys comprising a multifunctional select key 10, a curved scroll bar 9 and a clear key 11. The curved scroll bar 9 can be used for navigation (up, down, left, right, etc.) as will be explained in further detail below. By means of the

curved scroll bar 9 the user can scroll selectively from one item to the preceding or the succeeding item in the menu loop or other array of information items shown on the display screen 3, while access to a highlighted information item is obtained by activation of the multifunctional select key 10.

The function of the alphanumeric keys 9 depends on the state of the phone, and navigation in the menu and in applications is performed by using the curved scroll bar 9. The present function of the multifunctional select key 10 is shown in a separate field (soft label) in a dedicated area 4 of the display 3, just above the multifunctional select key 10. The multifunctional select key 10 is also used for accepting incoming calls, initiating outgoing calls and for terminating ongoing calls.

The clear key 11 may be used e.g. for erasing the digit or letter entered last by brief depression, while depression of a longer duration will erase the entire number or word. The clear key 11 is also used for stepping back in the menu structure and for rejecting calls. Like the multifunctional select key 10, the functionality of the curved scroll bar 9 and the clear key 11 may advantageously be redefined in some states.

The multifunctional select key 10 is in an embodiment a touch key that is placed centrally on the front face (operating face) of the mobile phone 1 just below the lower edge of the display screen 3. The curved scroll bar 9 has a touch sensitive surface, and in an embodiment the touch sensitive surface is of the capacitive type. The curved scroll bar 9 is elongated and is curved or L-

shaped. The curved scroll bar 9 is placed on the front face in close spatial proximity to the multifunctional select key 10.

5 A major portion of the outline of the curved scroll bar 9 is defined by an inner curve or L-shaped contour 36 and by an outer curve or L-shaped contour 37 (cf. Fig. 5 to 7). The inner and outer contours 36,37 are connected by line sections 38 and 39 that may have a straight or  
10 curved shaped and form the longitudinal extremities of the curved scroll bar 9. According to the illustrated embodiments the multifunctional select key 10 is placed adjacent to said inner curve or L-shaped contour 36.

15 The positioning of the curved scroll bar 9 obliquely improves the ergonomics of the handset. Such positioning enables the curved scroll bar to be operated more comfortably by the user. It is particularly agreeable as the extend of the curved scroll bar 9 is within reach of  
20 the user's thumb as it moves naturally across the front face of the mobile phone 1. No substantial unnatural extension of the thumb along a vertical axis is required. Also, a movement over the touch sensitive surface of the curved scroll bar 9 only requires movement of the thumb  
25 from its socket and does not require any other hand movement. Hence, the mobile phone 1 can be held and the curved scroll bar 9 readily operated using the same hand.

A releasable rear cover (not shown) gives access to the  
30 SIM card (not shown), and the battery pack (not shown) in the back of the phone that supplies electrical power for the electronic components of the mobile phone 1.

The mobile phone 1 has a flat display screen 3 with a substantially rectangular outline that is typically made of an LCD with optional back lighting, such as a TFT matrix capable of displaying color images. A touch screen  
5 may be used instead of a conventional LCD display.

Fig. 2 illustrates another embodiment of the invention that is essentially identical with the embodiment of Fig. 1, except that the clear key has been layered under the  
10 curved scroll bar 9, as indicated by the letter "C" on the curved scroll bar 9. When the user statically touches the curved scroll bar 9 at or near the position where the letter "C" is indicated, the user input will be interpreted as a "clear" in analogy with the function of  
15 the clear key 11 described with reference to Fig. 1.

Fig. 3 illustrates another embodiment of the invention that is essentially identical with the embodiment of Fig. 2, except that there is no alphanumerical keypad. In this  
20 embodiment, numerical or Alpha entry is performed via other methods that use the scroll bar 9 in combination with the multifunctional select key 10. One of such methods is for example the so-called "date stamp" method in which the curved scroll bar 9 is used to scroll and  
25 highlight a character in a list of characters shown on the display screen and the multifunctional select key 10 is used to input the highlighted character. The required amount of scrolling can be reduced by placing the characters in a multilevel menu structure, or the  
30 sequence of the characters in the list is rearranged after each entered character so the most likely characters are in the beginning of the list. Another method is these so-called "transparent user guided prediction" in which the characters are associated with

fixed positions along the curved scroll bar 9, and can be highlighted or entered by touching this area on the curved scroll bar 9. The prediction algorithm is used to select which character to highlight by default. In order to allow a complete alphabet to be associated with the relatively limited longitudinal extend of the curved scroll bar 9, the characters can be arranged in groups, similar to the groups of characters on the alphanumerical keys of Figs. 1 and 2. This method is then combined with a predictive editing algorithm for determining which of the characters in a subgroup the user intended to enter. Fig. 5 illustrates how the curved scroll bar 9 is divided into ten segments 40 that according to an embodiment each have either a digit or a group of characters associated therewith (a division into 10 segments is preferred in connection with the entry of numbers, although any other number of segments could be used).

The curved scroll bar 9 is configured to provide one more control functions for controlling various applications associated with the mobile phone 1 or other type of mobile electric device. For example, the touch initiated control function may be used to move an object or perform an action on the display screen 3 or to make selections or issue commands associated with operating the mobile phone or other mobile electric device. Normally, the curved scroll bar 9 is arranged to receive input from a finger moving over to the surface of the curved scroll bar in order to implement the touch initiated control function. By way of example, tapping a finger on the touch surface may initiate a control function, similar to the clear function of key 11 or similar to the multifunctional select key 10.

In one embodiment, the control function corresponds to a scrolling feature. For example, in case of a mobile phone the moving finger may initiate a control function for scrolling through a list of phone book entries displayed on the display 3. The term "scrolling" as used herein generally pertains to moving displayed data or images (e.g., text or graphics) across a display area of the display screen 3 and out of sight on one side of the display area as new content is added on the opposite side of the display area. It is noted that the new matter does not necessarily have to be added at the opposite side, for example than a matter could be added at the same side when the array of data moves along a "U-shaped" path. The array of data may be treated as an endless loop, so that it is possible to continue scrolling when the end of the data has been reached.

The viewing area may be the entire viewing area of the display screen 3 or it may be only a portion of the display screen 3 (e.g. a window frame).

The direction of scrolling may be widely varied. For example, scrolling may be implemented vertically (as up or down) or horizontally (as left or right). In the case of vertical scrolling, when the user scrolls down, each set of new data appears at the bottom of the viewing area and all other sets of data move up one position. If the viewing area is full, the top set of data moves out of the viewing area. In one implementation the scrolling feature may be used to move graphical user interface vertically or horizontally in order to bring more data into view on the display screen 3. By way of example, the scrolling feature may be used to help browse through files stored in the electronic device, through images



displayed on the display of the electronic device, a few songs stored in the electronic device or through phonebook entries stored in the device. The direction that the finger moves may be arranged to control the direction of scrolling. For example, the curved scroll bar 9 may be arranged to move the graphical user interface vertically up when the finger is moved anticlockwise and vertically down when the finger is moved clockwise.

10

The curved scroll bar 9 generally consists of a touchable outer surface for receiving a finger for manipulation on the scroll bar. Although not shown in the figures, beneath the touchable outer surface is a sensor arrangement. The scroll bar includes a plurality of sensors that are configured to be activated as the finger passes over them. In the simplest case, an electrical signal is produced each time the finger passes a sensor. The number of signals in a given timeframe may indicate the location, direction, speed and acceleration of the finger on the touchpad, i.e., the more signals, the more the user has moved his or her finger. In most cases, the signals are monitored by an electronic interface that converts the number, combination and frequency of the signals into location, direction, speed and exploration information. This information may then be used by the mobile phone 1 to perform the desired control function, for example on the display screen 3.

30

The position of the touchpad relative to the housing 2 may be widely varied. For example, the touchpad may be placed on any external surface (e.g. top, side, front or back) of the housing 2 that is accessible to the user during manipulation of the electronic device 1. In most

cases the touch sensitive surface of the touchpad is completely exposed to the user. In the illustrated embodiments, the touch sensitive surface of the touchpad is substantially flush with the external surface of the housing 2.

The shape of the curved scroll bar may also be widely varied. For example, the curved scroll bar may be L-shaped, or may resemble a sector of an annulus in which the annulus is either circular or oval or any other similar rounded shape. The central angle of the annular sector can be approximately  $90^\circ$ , although it is possible to have a larger or smaller central angle. In general, the outer perimeter of the curved scroll bar defines the working boundary of the curved scroll bar 9.

The extremities formed by the lines 38 and 39 of the curved scrollbar 9 according to the present invention are vertically and horizontally offset. The first extremity is to the right of the second projection and closer to the top of the apparatus. A line intersecting the two extremities may be at an angle of 20-70 degrees from the horizontal. More specifically, it may be at an angle of 30-60 degrees from the horizontal. Preferably, it is around 45 degrees from the horizontal. In such cases, for example, the curved scrollbar lies on an arc which follows the pivotal movement of the thumb about its socket when it naturally sweeps across the face of the apparatus. Hence, there is no strain on the thumb to reach the requisite portions of the scroll key to depress the projections.

Fig. 4 illustrates in block diagram form the general architecture of a mobile phone 1 constructed in accordance

with the present invention. The processor 18 controls the operation of the terminal and has an integrated digital signal processor 17 and an integrated RAM 15. The processor 18 controls the communication with the cellular network via the transmitter/receiver circuit 19 and an internal antenna 20. A microphone 6 coupled to the processor 18 via voltage regulators 21 transforms the user's speech into analogue signals, the analogue signals formed thereby are A/D converted in an A/D converter (not shown) before the speech is encoded in the DSP 17 that is included in the processor 18. The encoded speech signal is transferred to the processor 18, which e.g. supports the GSM terminal software. The digital signal-processing unit 17 speech-decodes the signal, which is transferred from the processor 18 to the speaker 5 via a D/A converter (not shown).

The voltage regulators 21 form the interface for the speaker 5, the microphone 6, the LED drivers 91 (for the LEDs backlighting the keypad 7 and the display 3), the SIM card 22, battery 24, the bottom connector 27, the DC jack 31 (for connecting to the charger 33) and the audio amplifier 32 that drives the (hands-free) loudspeaker 25.

The processor 18 also forms the interface for some of the peripheral units of the device, including a (Flash) ROM memory 16, the graphical display 3, the keypad 7, a music player 37 and a music reproduction unit 38.

The screenshots in Figs. 1 to 3 illustrate the operation of the curved scroll bar in accordance with different embodiments of the invention. In the screenshot of Fig. 1 the operation of the device is explained with reference to a scrolling function. It is, however, understood that

the input signal from the curved scrollbar 9 can be used for any other control function in the apparatus, such as the changing of a setting, for example a volume setting, or other one-dimensional control parameter. In this embodiment, the user is linearly scrolling (as shown by arrow 42) a list of phonebook entries 41 displayed on the display screen 3 via a slider bar 44. In this screenshot the information items are by way of example contacts in a telephone book. In the information items could just as well be menu items in a menu layer in a menu structure, songs in the playlist or files in a folder, etc.

Referring to the screenshot illustrated in Fig. 1, and in accordance with one embodiment of the invention, the curved scroll bar 9 can be continuously actuated by a simple curved motion of the finger over the touch sensitive surface as shown by arrow 45. By curved, it is meant that the finger moves in an arcuate manner. This form of motion may produce continuous or incremental scrolling of the information items on the display screen 3.

Referring to the screenshot illustrated in Fig. 2, and in accordance with another embodiment of the invention, the curved scroll bar 9 can be actuated by a substantially vertical movement of the finger over the touch sensitive surface as shown by arrow 47 and can be actuated by a substantially horizontal movement of the finger over the touch sensitive surface as shown by arrow 48. The curved scroll bar 9 offers sufficient space in a horizontal direction and in the vertical direction for a scrolling movement in a horizontal and vertical direction, respectively. In this embodiment the control parameter is two-dimensional in that it has a vertical and a

horizontal component. By applying a horizontal finger movement to the curved scroll bar 9 the user can control a cursor 46 in a text editing application (a messaging application, in particular an e-mail application is shown in the screenshot of Fig. 2) in a horizontal direction and by applying a vertical finger movement to the scroll bar 9 the user can control the cursor 46 in a vertical direction.

10 Thus, the user can move the cursor 46 left and right through the entered text by moving his/her finger left and right over the curved scroll bar 9, and the user can move the cursor 46 up-and-down through the lines of the entered text by moving his/her finger up and down over  
15 the curved scroll bar 9.

The division of the control signal into two components can be obtained by distinguishing the direction of movement over the curved scrollbar or associating a portion of the length of the curved scroll bar with a first component of the two dimensional signal and associating another portion of the length of the curved scroll bar with a second component of the two-dimensional control signal.

25

Referring to the screenshot illustrated in Fig. 3, and in accordance with an embodiment of the invention, the curved scroll bar 9 can be actuated by a substantially swirling or circular finger movement over the touch sensitive surface as indicated by the arrow 49. In this screenshot the application is a gallery application that illustrates a plurality of thumbnails 50 of pictures stored in the mobile phone 1. The thumbnails 50 are  
30

arranged in a string that can be moved along a path 51 over the display screen 3. One of the thumbnails 50 is highlighted by a box 52. When the user makes a curved finger movement over the touch sensitive surface of the curved scroll bar 9 as illustrated by arrow 45, the string of thumbnails moves along the path 51 as indicated by arrow 55 (a movement along the arrow 45 in the opposite direction will result in a movement of the string of thumbnails in the opposite direction of arrow 55). When a user makes a swirling or circular finger movement as indicated by the arrow 49, and regains contact with the touch surface at or near the left lower extremity of the curved scroll bar 9 within a relatively short predetermined period of time, the user input will be interpreted as an input with a magnitude corresponding to a full rotation over a complete annular touchpad (imaginary since there is no complete annular touchpad). The large dimension of this input can facilitate the user in scrolling through long lists at high speed. In order to further support this method of scrolling at high speed, the scrolling movement (or similar movement) of the information items on the display is provided with a virtual "mass" or virtual "mechanical inertia", which means that the information items will continue to move after the user has removed his/her finger from the curved scrollbar 9. This movement will slowly lose momentum, and the items will eventually come to a stop. This allows a user to give the information items a virtual "swing" by a fast finger movement over the curved scroll bar 9, so that the items on the display start moving with a high speed that slowly reduces to a stop. For instantaneously stopping the moving information items the user simply touches the curved scrollbar again with a static (nonmoving) touch.

Figs. 5 to 7 illustrate various embodiments of the user interface according to the invention. In Fig. 5 an embodiment of a curved scrollbar 9 is illustrated with a shape that substantially corresponds to a quarter sector of an annulus. According to other embodiments (not shown) the sector could be larger, such as one third of a full annulus, or smaller such as 1/5 of a full annulus. The appropriate longitudinal extent to the curved scroll bar is selected in relation to the available space on the operating face of the apparatus and other requirements of the user interface.

In the illustrated embodiment the annulus is formed by two segments of concentric circles. In other embodiments the segments are not formed by circles but by other curved shapes, such as ovals or ellipses. In this embodiment the select key 10 is pie shaped. However, the pie shape is only exemplary and any other shape that is suitable to be placed in close vicinity of the curved scroll pad 9 can be used. Thus, it is desirable that the outer curve of the select key 10 matches or fits the inner curve of the curved scroll bar 9. The curved scroll bar is subdivided into a plurality of sectors 40. Various functions, letters, numbers or characters can be assigned to these sectors 40, depending on the state of the apparatus in which the curved scrollbar 9 and the select key 10 are used. In this embodiment the select 10 key has a touch sensitive surface. In other embodiments the select key 10 is a pushbutton switch.

Fig. 6 illustrates another embodiment of the curved scrollbar and select key combination in which the curved scrollbar 9 has a shape that substantially corresponds to

the letter "L" (without implying that one of the arms of the "L" is longer or shorter than the other arm). Accordingly, the shape of the select key 10 is substantially rectangular so as to match the inner  
5 contour 37 of the curved scroll bar 9.

Fig. 7 illustrates another embodiment of the curved scrollbar 9 that is essentially identical to the embodiment shown in Fig. 6, except that the curved scroll  
10 bar 9 and the multifunctional select key 10 have been rotated 180°. In this embodiment the curved movement of a thumb over the curved scroll bar 9 corresponds closely to the curve described by the tip of the thumb without any substantial need for extending the thumb.

15

Fig. 8 is a flow chart of a scrollbar method in accordance with the one embodiment of the invention. The method allows a user to use a signal created by an object moving over a curved scroll bar with a touch sensitive  
20 surface as an input variable.

The touchpad method starts at step 8.1 with the processor 18 monitoring the input signal received from the curved scrollbar 9. Following step 8.1 the processor determines  
25 in step 8.2 if the sensed touch is static or moving. If the touch was static the method moves on to step 8.3 and the function associated with the position at which the curved scrollbar is statically touched is performed by the processor 18. Thereafter the method returns to step  
30 8.1. If the sensed touch was moving, the method moves on to step 8.3. In step 8.3 the processor determines if the active application operates with a one-dimensional or a two dimensional control parameter. If the process operates with a one-dimensional parameter the method



moves on to step 8.4 in which the sensed movement along the length of the curved scrollbar is applied in a control function in the active application.

- 5 If the process operates with a two dimensional parameter the method moves on to step 8.5 in which the detected movement is interpreted as a two dimensional signal by the processor 18, and the processor 18 applies the two-dimensional signal to the active application. The two-
- 10 dimensional signal from the touchpad may be dealt with in analogy with a Cartesian coordinate system. For example, if the detected movement over the curved scrollbar 9 is a horizontal movement, the processor 18 will apply a horizontal movement to an item or object that is shown on
- 15 the display screen 3, and if the detected movement over the curved scrollbar 9 is a substantially vertical movement, the processor 18 will apply a vertical movement to an item object that is shown on the display screen 3.
- 20 Following steps 8.4 and 8.5 the process returns to step 8.1 and the cycle starts again.

The various aspects of the invention described above can be used alone or in various combinations. The invention

25 is preferably implemented by a combination of hardware and software, but can also be implemented in hardware or software. The invention can also be embodied as computer readable code on a computer readable medium. Furthermore, although a scrolling feature is described, it should be

30 noted that a scrolling feature is not the limitation and that the curved scrollbar may be used to manipulate other features. For example, the curved scrollbar may be used to adjust the volume control in an audio application. In addition, the curved scrollbar may be used to advance to

frames in a movie editing application. The touchpad may also be used in video game applications.

The invention has numerous advantages. Different  
5 embodiments or implementations may yield one or more of  
the following advantages. It should be noted that this is  
not an exhaustive list and there may be other advantages  
which are not described herein. One advantage of the  
invention is that a user is able to easily and rapidly  
10 transverse a lengthy list of media items, Thus, the  
invention provides for an effective navigational input  
device. Another advantage of the invention is that the  
curved scroll bar uses relatively little space. Another  
advantage of the present invention is that the touchpad  
15 allows an ergonomic way to control an electronic device,  
since the path of the curved scrollbar can easily be  
adapted to the arc that is described by an angular  
movement of a user's thumb. Yet another advantage is that  
the present invention allows a touchpad to be used in a  
20 manner similar to mechanical control element that can be  
set into "swing" and exploit the effect of such imaginary  
mechanical inertia.

The term "comprising" as used in the claims does not  
25 exclude other elements or steps. The term "a" or "an" as  
used in the claims does not exclude a plurality. The  
single processor or other unit may fulfill the functions  
of several means recited in the claims.

Although the present invention has been described in detail for purpose of illustration, it is understood that such detail is solely for that purpose, and variations  
5 can be made therein by those skilled in the art without departing from the scope of the invention.

CLAIMS:

1. An apparatus comprising:

5 a housing with an operating face,

a processor disposed in said housing,

a select key, and

10

a curved scroll bar with a touch sensitive surface,

said select key and said scroll bar being supported  
by said housing and disposed on said operating face,

15

said select key and said scroll bar being  
operatively coupled to said processor.

2. An apparatus according to claim 1, wherein said select  
20 key has a touch sensitive surface.

3. An apparatus according to claim 1 or 2, further  
comprising a display screen operatively coupled to said  
processor.

25

4. An apparatus according to any of claims 1 to 3,  
wherein said processor is configured to associate a  
function to be performed with said select key.

30 5. An apparatus according to claim 4, wherein said  
processor is configured to display a soft label  
indicating the present function associated with said  
select key on said display screen.

6. An apparatus according to any of claims 1 to 5, wherein said processor is configured to interpret a movement of an object over the touch sensitive surface of the scrollbar as an input variable.

5

7. An apparatus according to claim 6, wherein said processor is configured to use the input variable in a control function for controlling the various applications associated with the device.

10

8. An apparatus according to claim 7, wherein said processor is configured to interpret a movement of an object over the touch sensitive surface of the scrollbar as a one-dimensional input variable.

15

9. An apparatus according to claim 8, wherein the control function corresponds to a change of a setting function that allows the value of a setting of the apparatus to be changed.

20

10. An apparatus according to claim 8, wherein the control function corresponds to a scrolling function that allows content displayed on the display to be moved across the display and out of sight on one side of the screen as new content is added on the opposite side of the screen.

25

11. An apparatus according to claim 8, wherein the control function corresponds to a function of moving a string of information items over the display along a path.

30

12. An apparatus according to claim 8, wherein the control function corresponds to a navigation function.

13. An apparatus according to claim 7, wherein said processor is configured to interpreted a movement of an object over the touch sensitive surface of the scrollbar  
5 as a two dimensional input variable.

14. An apparatus according to claim 13, wherein said processor is configured to associate a portion of the length of the curved scroll bar with a first component of  
10 said two dimensional signal and configured to associate another portion of the length of the curved scroll bar with a second component of said two-dimensional signal.

15. An apparatus according to claim 13, wherein said display screen has a substantially rectangular contour,  
15 with a substantially parallel top and bottom edge and a substantially parallel left and right edge and wherein said processor is configured to associate a movement of an object over the touch sensitive surface of the in a  
20 direction substantially parallel with the top and bottom edge as a navigational input in a direction parallel with the top and bottom edge of the display screen and wherein said process is configured to associate a movement of an  
25 scroll bar as a navigational input in a direction parallel with the left of the display screen and the right edge

16. An apparatus according to any of claims 1 to 15,  
30 wherein said processor is configured to determine the time that has elapsed between a point in time at which an object moving over the touch sensitive surface towards a first of the two extremities of the curved scroll bar disengages the touch sensitive surface and the point in

time at which said subject touches the touch sensitive surface of the curved scroll bar again near the opposite of said two extremities of the curved scroll bar, and wherein said processor is also configured to interpret  
5 the input signal from the user as an input signal that corresponds to a complete rotation on an imaginary complete annular shaped touchpad.

17. An apparatus according to any of claim 1 to 16,  
10 wherein said curved scroll bar has first and second longitudinal extremities that are mutually offset vertically and horizontally, wherein the first extremity is to the right of the second projection and closer to the top of the handset such that a user holding the  
15 handset in a right hand can depress the first and second portions with a thumb of the right hand by merely pivotally moving the thumb in an arc about a socket of the thumb and without significant unnatural extension of the thumb.

20

18. A method for navigating in a graphical user interface of an electronic apparatus, comprising:

25 using a signal created by an object moving over a curved scroll bar with a touch sensitive surface as an input variable.

19. A method according to claim 18, further comprising using a signal from a key with a touch sensitive surface  
30 to activate a function.

20. A method according to claim 18 or 19, further comprising using a signal created by an object statically touching the curved scroll bar to activate a function.

21. A method according to any of claims 18 to 20, further comprising using the signal created by a movement of an object over the touch sensitive surface of the scrollbar  
5 as a one-dimensional input variable.

22. A method according to any of claims 18 to 21, further comprising using a movement of an object over the touch sensitive surface of the scrollbar as a two dimensional  
10 input variable.

23. A method according to claim 22, further comprising operating said curved scrollbar with a Cartesian coordinate system.  
15

24. A method according to claim 23, wherein a movement of an object over the touch sensitive surface of the curved scrollbar in a direction substantially parallel with the abscissa results in a horizontal navigational movement in  
20 said graphical user interface, and a movement of an object over the touch sensitive surface of the curved scrollbar in a direction substantially parallel with the ordinate results in vertical navigational movement in said graphical user interface.  
25

25. A user interface comprising a select key and a curved scroll bar with a touch sensitive surface.

26. A user interface according to claim 25, wherein said  
30 select key and said curved scroll bar are in close spatial proximity.

27. A user interface according to claim 26, wherein a major portion of the outline of said curved scroll bar is



defined by an inner curve or L-shaped contour and by an outer curve or L-shaped contour and wherein said select key is placed adjacent to said inner curve or L-shaped contour.

5

28. A user interface according to any of claims 25 to 27, wherein said select key has a touch sensitive surface.

29. A user interface according to any of claims 25 to 28,  
10 wherein the outline of the touch sensitive surface of said curved scroll bar resembles an annular sector.

30. A user interface according to any of claims 25 to 29,  
15 wherein the central angle of said annular sector is approximately 90°.

31. A user interface according to any of claims 25 to 30,  
wherein the outline of the touch sensitive surface of said curved scroll bar is substantially L-shaped.

20

32. A user interface according to any of claims 25 to 31, further comprising a clear key, preferably having a touch sensitive surface.

25 33. A user interface according to any of claims 25 to 32, further comprising an alphanumeric keypad.

34. A user interface according to any of claims 25 to 33, further comprising a display screen.

30

35. A software product comprising software code for using a signal created by an object moving over a curved scroll bar with a touch sensitive surface as an input variable.

36. A software product according to claim 35, further comprising software code for using the signal created by a movement of an object over the touch sensitive surface of the scrollbar as a one-dimensional input variable.

5

37. A software product according to claim 35, further comprising software code for using a movement of an object over the touch sensitive surface of the scrollbar as a two-dimensional input variable.

10

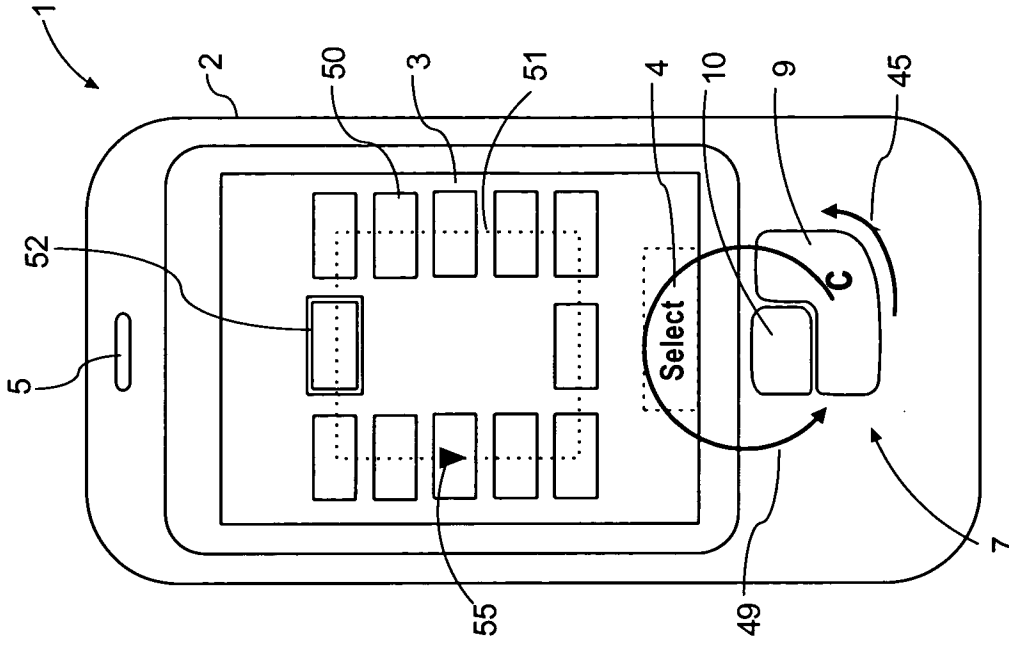


FIG. 1

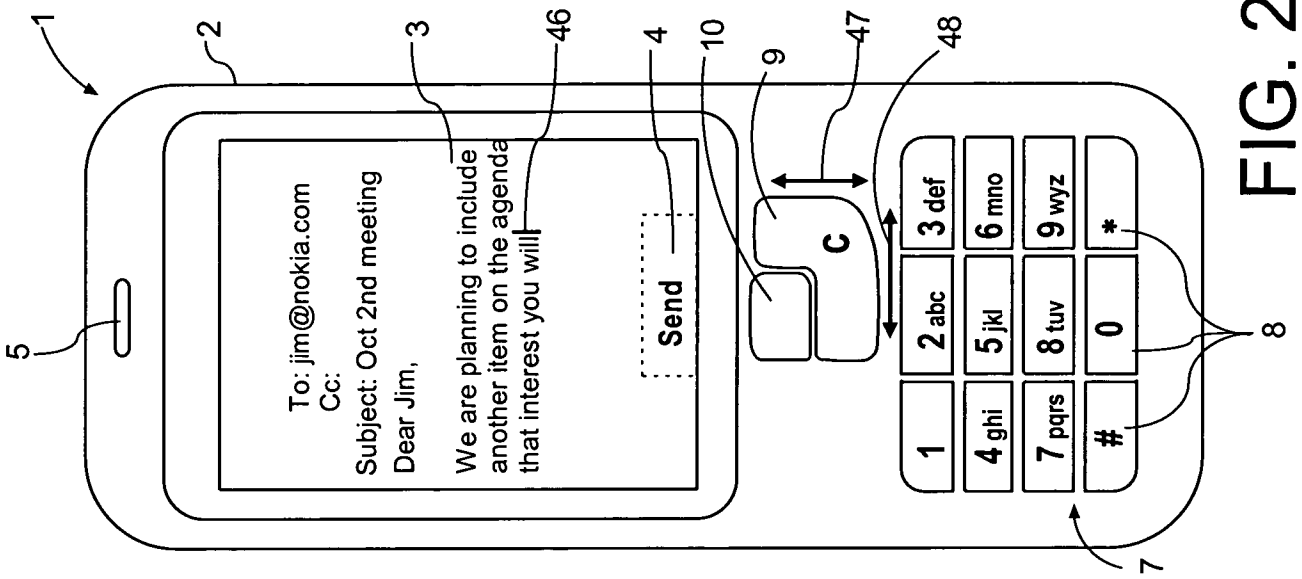


FIG. 2

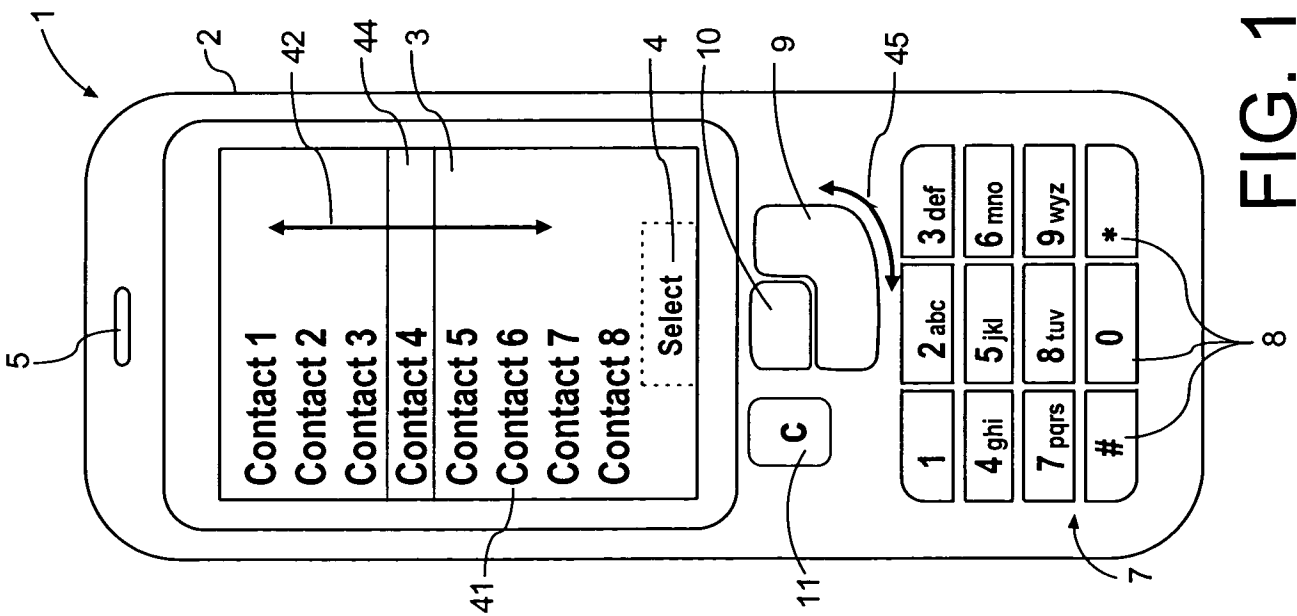


FIG. 3

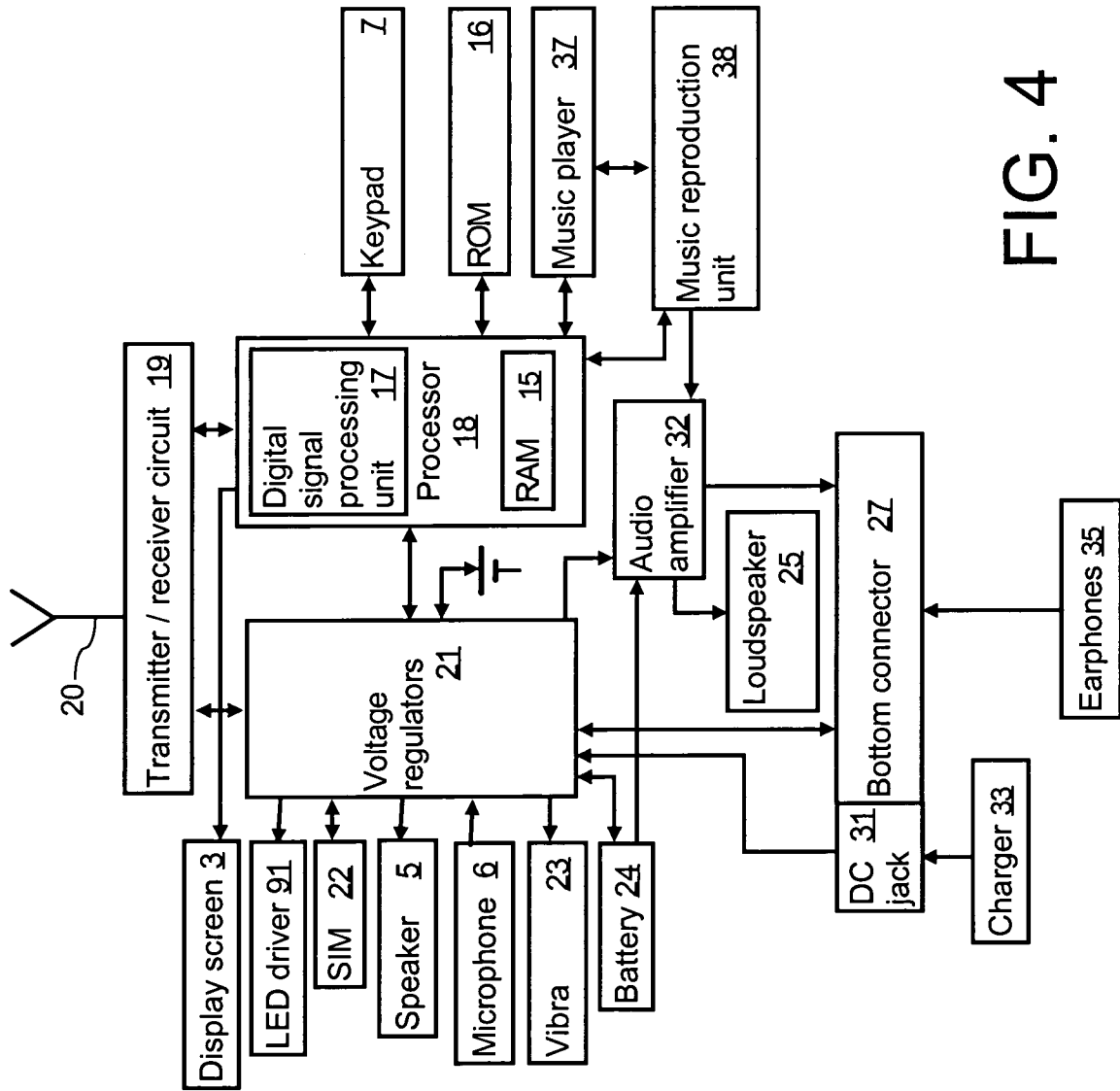
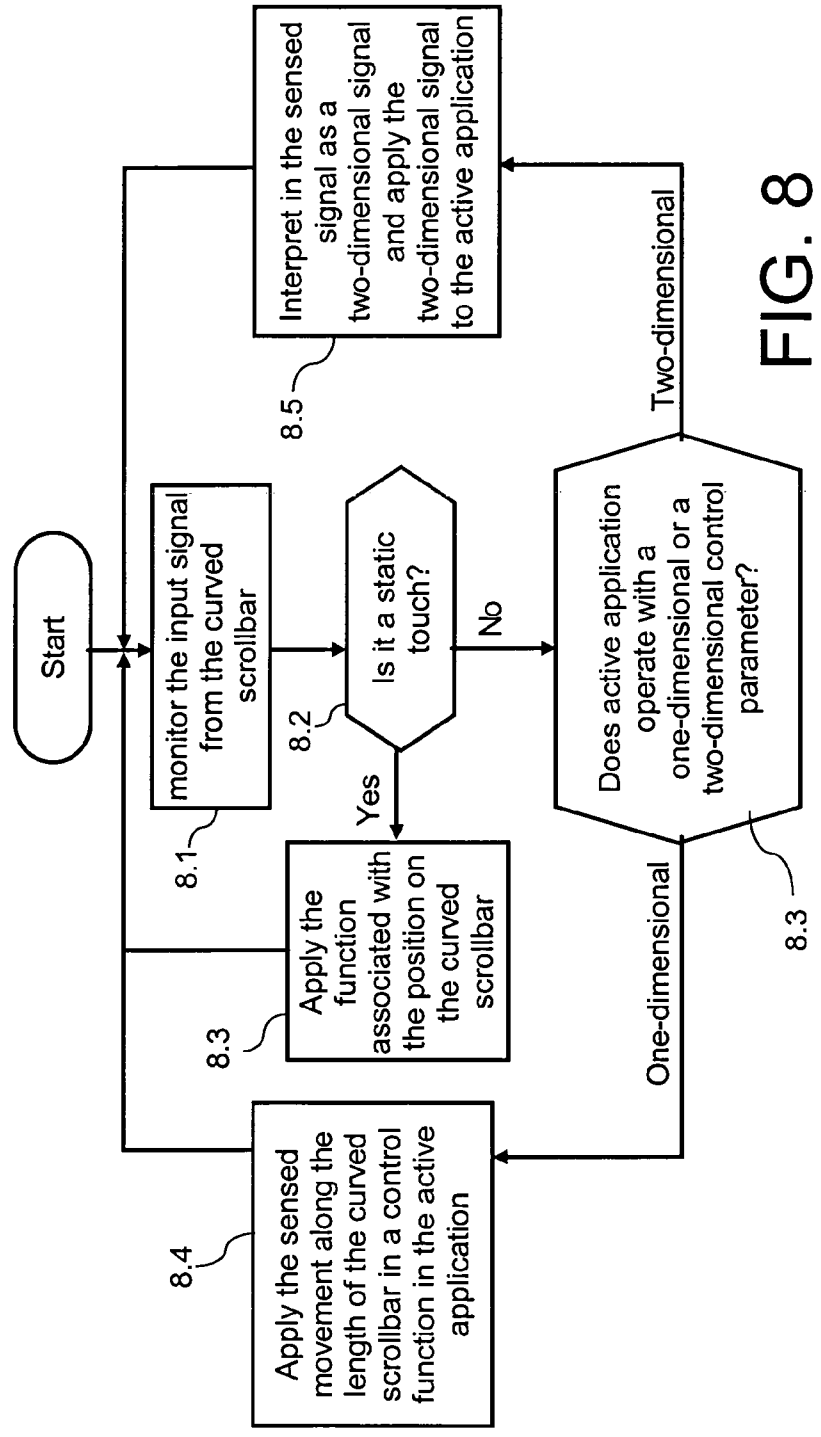
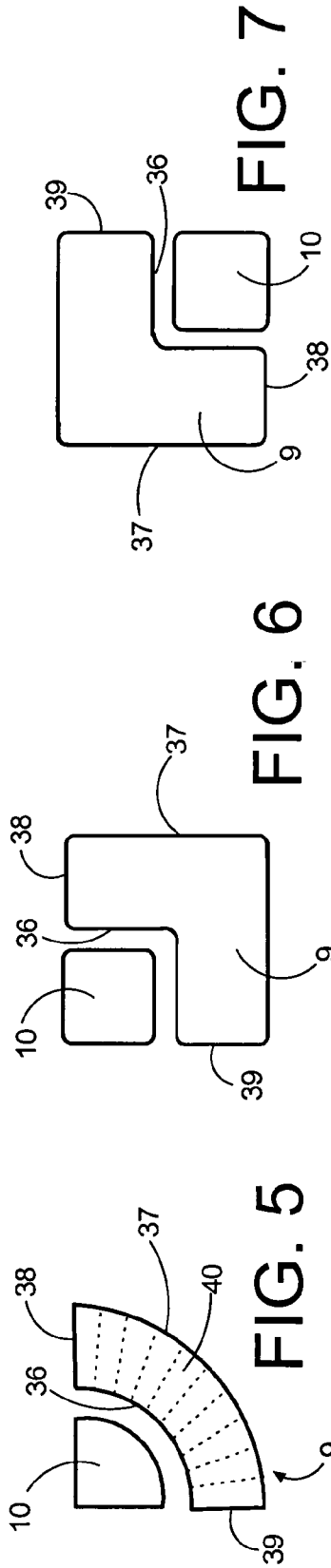


FIG. 4



## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2006/010602A. CLASSIFICATION OF SUBJECT MATTER  
INV. G06F3/033

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

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

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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 2002/176016 A1 (MISAWA TAKESHI [JP] ET AL) 28 November 2002 (2002-11-28) figures 4,7,8A	1-37
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A	US 5 859 629 A (TOGNAZZINI BRUCE [US]) 12 January 1999 (1999-01-12) figure 5	1-37
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 Further documents are listed in the continuation of Box C. See patent family annex.

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Date of the actual completion of the international search

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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