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(54) **Title**: TOUCH SENSITIVE INPUT

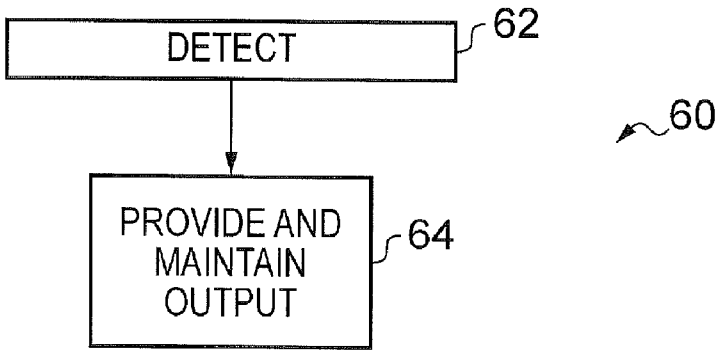

FIG. 11

(57) **Abstract**: An apparatus comprising: a touch sensitive input responsive to manual actuation; a display output associated with the touch sensitive input; and a controller configured to provide and maintain, in response to a manual actuation at a user selected location of the touch sensitive input, an output at the user selected location to facilitate additional manual actuation via the touch sensitive input in the region of the user selected location.

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TITLE

Touch sensitive input.

TECHNOLOGICAL FIELD

Embodiments of the present invention relate to touch sensitive input. In particular, they relate to a user interface comprising: a touch sensitive input responsive to manual actuation and a display output associated with the touch sensitive output.

BACKGROUND

Apparatuses that have a user interface comprising a touch sensitive input responsive to manual actuation and a display output associated with the touch sensitive output, are not always easy to use compared to a dedicated keyboard.

BRIEF SUMMARY

According to various, but not necessarily all, embodiments of the invention there is provided an apparatus comprising:

a touch sensitive input responsive to manual actuation;

a display output associated with the touch sensitive input; and

a controller configured to provide and maintain, in response to a manual actuation at a user selected location of the touch sensitive input, an output at the user selected location to facilitate additional manual actuation via the touch sensitive input in the region of the user selected location.

According to various, but not necessarily all, embodiments of the invention there is provided a method comprising:

detecting manual actuation at a user selected location of a touch sensitive input,

providing and maintaining an output at the user selected location to facilitate additional manual actuation via the touch sensitive input in the region of the user selected location.

According to various, but not necessarily all, embodiments of the invention there is provided a computer program product comprising computer program instructions which when loaded into a processor enable the processor to provide and maintain, in response to an input indicative of a manual actuation at a user selected location of a touch sensitive input, an output at the user selected location to facilitate additional manual actuation via the touch sensitive input in the region of the user selected location.

According to various, but not necessarily all, embodiments of the invention there is provided an apparatus comprising:

a user interface comprising:

a touch sensitive input responsive to manual actuation; and

a display output associated with the touch sensitive input; and

a controller configured to provide and maintain, in response to a manual actuation at a user selected location of the touch sensitive input, a haptic output at the user selected location via the user interface in the region of the user selected location.

According to various, but not necessarily all, embodiments of the invention there is provided an apparatus comprising:

a proximity sensitive input responsive to a manual actuation;

a display output associated with the proximity sensitive input; and

a controller configured to provide, in response to a manual actuation at a user selected location of the proximity sensitive input, deformation feedback at the user selected location that enables user perception of a deformation in the user interface at the user selected location.

Some, but not necessarily all, embodiments of the invention may make it apparent to a user whether an effective manual actuation has been made.

Some, but not necessarily all, embodiments of the invention may make it apparent to a user how manual actuations should be made.

Some, but not necessarily all, embodiments of the invention may physically facilitate additional manual actuations by, for example, changing a physical configuration of the apparatus.

Some, but not necessarily all, embodiments of the invention may facilitate additional manual actuations by, for example, changing visual content on the display output.

BRIEF DESCRIPTION

For a better understanding of various examples of embodiments of the present invention reference will now be made by way of example only to the accompanying drawings in which:

Fig. 1 schematically illustrates an apparatus comprising a user interface and a controller;

Fig. 2 schematically illustrates an apparatus comprising a user interface and a controller, where the user interface provides haptic feedback;

Fig. 3 schematically illustrates an apparatus comprising a user interface and a controller, where the user interface comprises an upper passive deformable layer;

Fig 4 schematically illustrates how a touch sensitive input may overlie a display output;

Figs 5A, 5B and 5C schematically illustrate examples of joy-stick directional control icons;

Fig 5D schematically illustrates an example of a one-dimensional directional control icon;

Fig 6 schematically illustrates an example in which the icon provides visual representations of physical deformations of the touch sensitive input;

Figs 7A, 7B and 7C schematically illustrate in perspective view, lateral cross-section and longitudinal cross-section examples of an apparatus in which a local three-dimensional feature is produced in the form of a protrusion;

Figs 8A, 8B and 8C schematically illustrate in perspective view, lateral cross-section and longitudinal cross-section examples of an apparatus in which a local three-dimensional feature is produced in the form of a depression;

Fig 9 schematically illustrates that a user digit may be placed on a three-dimensional feature and rocked to provide additional manual actuations;

Fig 10 schematically illustrates an example of a controller; and

Fig 11 schematically illustrates a method.

DETAILED DESCRIPTION

The Figures illustrate an apparatus 2 comprising: a user interface 4 comprising: a touch sensitive input 6 responsive to manual actuation; and a display output 8 associated with the touch sensitive input; and a controller 10 configured to provide and maintain, in response to a manual actuation 20 at a user selected location 22 of the touch sensitive input, an output at the user selected location to facilitate additional manual actuation 20 via the touch sensitive input 6 in the region of the user selected location 22.

Fig. 1 schematically illustrates an apparatus 2 comprising: a user interface 4 and a controller 10.

The user interface 4 comprises a touch sensitive input 6 responsive to manual actuation; and a display output 8 associated with the touch sensitive input 6.

As illustrated in Fig 4, a touch sensitive input 6 may overlie the display output 8. In this illustrated example, a planar touch sensitive input 6 overlies a planar display output 8. The touch sensitive input 6 presents an actuation surface 24 for manual actuation 20.

The touch sensitive input 6 is a device that detects a touch on the actuation surface 24 by a user controlled instrument such as, for example, a user's digit or a stylus. It may additionally operate as a proximity detector detecting a proximal presence of a user's digit or a stylus. The term touch sensitive input 6 should be considered to encompass not only touch actuated devices but also proximity (near touch) actuated devices.

The touch sensitive input 6 may use any suitable technology to sense a touch or near touch. For example, the touch sensitive input may be capacitive, resistive, or optical.

The display output 8 may be any suitable display device that is capable of rendering images. It may, for example, be a liquid crystal display or an organic light emitting diode display.

The controller 10 is configured to provide control outputs to the display output 8 and to receive control inputs from the touch sensitive input 6.

The controller 10 is configured to provide and maintain, in response to a manual actuation 20 at a user selected location 22 of the touch sensitive input 6, an output at the user selected location to facilitate additional manual actuation 20 via the touch sensitive input 6.

In the example of Fig 1, the output provided and maintained in the region of the user selected location 22 by the controller 10 is an output 30 in the display output 8 (see Figs 5A-D, 6).

Figs 5A, 5B, 5C and 5D schematically illustrate examples of different icons 30 which are provided and maintained as an output 30 in the display output 8 in the region of the user selected location 22 by the controller 10. Each icon 30 facilitates additional user actuation in the region of the user selected location 22.

The icons 30 in Figs 5A, 5B and 5C are examples of joy-stick control icons that are useful for controlling objects, particularly small objects, presented in the display output 8. A joy-stick control icon may, for example, be a two-dimensional control icon with four degrees of freedom (e.g. up, down, left, right) or may, for example, be a three-dimensional control icon with six degrees of freedom (e.g. up, down, left, right, zoom-in, zoom-out) The user is able to enter different commands by actuating different portions of the icon 30. For example actuating an uppermost potion of the icon generates an 'up' directional command, actuating a lowermost potion of the icon generates a 'down' directional command, actuating a leftmost potion of the icon generates a 'left' directional command and actuating a rightmost potion of the icon generates a 'right' directional command. The icon has different visual indications at it uppermost, lowermost, leftmost and rightmost portions that disambiguate the different user commands available.

The icon 30 in Fig 5D is an example of a slider joy-stick or one-dimensional directional control icon. The user is able to enter different commands by actuating different portions of the icon. For example actuating an uppermost potion of the icon 30 generates an 'up' directional command, actuating a lowermost potion of the icon generates a 'down' directional command. The icon has visual indications at it uppermost and lowermost, portions that disambiguate the different user commands available by manually actuating them.

The controller 10, depending upon the nature of the input required from a user, can provide and maintain the appropriate icon 30 to facilitate user input.

The controller 10 may be configured to dynamically vary the icon 30 in response to an additional manual actuation. For example, the color, shape, size or background of the icon may be changed in dependence upon the force applied to the icon.

Fig 6 schematically illustrates an example in which the icon 30 has visual representations 32 of physical deformations of the touch sensitive input 6. In this example, the visual representations on the display output 8 give the illusion that the actuation surface 22 of the touch sensitive input 6 is deformed in the region of the icon 30.

In the example of Fig 2, the output provided and maintained in the region of the user selected location 22 by the controller 10 is a haptic output which may, for example, be a local deformation (see Figs 7A-7C, 8A-8C). In the example of Fig 2, the user interface 4 of the apparatus 2 additionally comprises an active haptic device 12 associated with at least part of an upper surface of the touch sensitive input 6. The haptic device 12 is active in the sense that it is controlled by the controller 10.

The haptic device 12 may, for example, comprise an electro-active polymer/gel between transparent electrodes, such as indium tin oxide electrodes. The application of a differential voltage across a pair of electrodes separated by the electro-active material in the region of the user selected location 22 results in a local physical deformation of the electro-active material to form, for example, a protuberance such as projection 40 illustrated in Figs 7A-7C or a depression such as indentation 42 illustrated in Figs 8A-8C.

The deformation creates a three-dimensional user input feature that facilitates additional user actuation in the region of the user selected location 22. As schematically illustrated in Fig 9, a user digit may be placed on the three-dimensional feature at the user selected location 22 and rocked to provide

additional manual actuations via the touch sensitive input 6 that are interpreted as joy-stick control commands. The deformation may remain fixed/static and typically does not dynamically vary in response to the facilitated additional manual actuation.

The apparatus 4 schematically illustrated in Fig 3 is similar to the apparatus 4 illustrated in Fig 1 except that it additionally comprises a passive deformable layer 14 that deforms in response to the manual actuation 20 at the user selected location 22 of the touch sensitive input. The deformable layer 14 is passive in the sense that it is not controlled by the controller 10 or any other device. The deformable layer 14 overlies the touch sensitive input 6 and the display output 8 associated with the touch sensitive input 6.

The deformable layer 14 is typically transparent so that the display output 8 is visible to a user through it.

The deformable layer 14 compresses and/or stretches and/or wrinkles locally around the user selected location 22 of the touch sensitive input. It may, for example, be a soft transparent elastomer such as the softest grade of Kuraray's LA-polymer and gels or a low modulus silicone such as Dow Corning's Sylgard elastomers.

The deformable layer 14 is resilient. When the manual actuation 20 that causes the deformation at the user selected location 22 of the touch sensitive input is removed, the deformation is also removed. While the manual actuation 20 that causes the deformation at the user selected location 22 of the touch sensitive input is present, the deformation is also present.

When the touch sensitive input 6 is a capacitive sensor, the deformable layer may be configured as a deformable dielectric. The input at the touch sensitive input 6 is dependent upon the area of the capacitor formed between the user's approaching digit and the touch sensitive input 6, the distance between

the user's approaching digit and the touch sensitive input 6, and the relative dielectric permittivity of the dielectric between the user's approaching digit and the touch sensitive input 6. The deformable layer 14 will resist, as it resiliently deforms, the movement of the user's approaching digit towards the touch sensitive input 6. Different levels of force applied by the user's approaching digit to deform the deformable layer 12 result in different deformations of the deformable layer and different inputs at the touch sensitive input 6. These different inputs may be distinguished by the controller 10 to determine, for example, an actuation intensity at the touch sensitive input 6, for example, whether the manual actuation is soft, or medium or hard. The controller 10 may use the intensity of the actuation as an input to determine an appropriate command.

In one embodiment, no (or little) contact at a position may result in the controller 10 interpreting this as a normal touch input that, for example, selects a graphical item at the position. However, if instead the actuation had been a medium intensity actuation, then the controller 10 provides and maintains, in response to the manual actuation 20 at a user selected location 22 of the touch sensitive input, an output at the user selected location to facilitate additional manual actuation 20 via the touch sensitive input 6 in the region of the user selected location 22. Additional manual actuations of a medium or light intensity may be interpreted as directional input controls. A high intensity actuation may, however, be interpreted as a different command.

In the preceding embodiments, the controller 10 is configured to provide and maintain, in response to a manual actuation 20 at a user selected location 22 of the touch sensitive input, an output at the user selected location to facilitate additional manual actuation 20 via the touch sensitive input 6 in the region of the user selected location 22.

According to one embodiment, the controller 10 creates a virtual origin (X, Y) at the user selected location 22.

An additional manual actuation at location (x, y) is then converted to relative displacements x-X, y-Y from the origin. The additional manual actuation may be as a consequence of a separate discrete actuation or as a result of continuing the manual actuation 20. The manual actuation 20 may, for example, be continued by tracing a user's digit or a stylus over the actuation surface or by stretching or deforming a deformable layer 14.

The relative displacements are associated with different commands (or no commands).

The controller 10 is therefore able to determine the appropriate command associated with the additional manual actuation based on the location (x, y) of the additional manual actuation from the virtual origin (X, Y).

It will therefore be appreciated that a user can selectively choose the location of the virtual origin where the output that facilitates additional manual actuation 20 is positioned.

The controller 10 may be implemented using instructions that enable hardware functionality, for example, by using executable computer program instructions in a general-purpose or special-purpose processor that may be stored on a computer readable storage medium (disk, memory etc) to be executed by such a processor.

Referring to Fig 10, the processor 50 is configured to read from and write to the memory 52. The processor 50 may also comprise an output interface via which data and/or commands are output by the processor 50 and an input interface via which data and/or commands are input to the processor 50.

The memory 52 stores a computer program 54 comprising computer program instructions that control the operation of the apparatus 2 when loaded into the

processor 50. The computer program instructions 54 provide the logic and routines that enables the apparatus to perform the methods described. The processor 50 by reading the memory 52 is able to load and execute the computer program 54.

The computer program 54 comprises computer program instructions which when loaded into a processor 50 enable the processor to provide and maintain, in response to an input indicative of a manual actuation at a user selected location of a touch sensitive input, an output at the user selected location to facilitate additional manual actuation via the touch sensitive input in the region of the user selected location.

The computer program may arrive at the apparatus 2 via any suitable delivery mechanism. The delivery mechanism may be, for example, a computer-readable storage medium, a computer program product, a memory device, a record medium such as a compact disc read-only memory (CD-ROM) or digital versatile disc (DVD), an article of manufacture that tangibly embodies the computer program 54. The delivery mechanism may be a signal configured to reliably transfer the computer program 54.
The apparatus 2 may propagate or transmit the computer program [REF] as a computer data signal.

Although the memory 54 is illustrated as a single component it may be implemented as one or more separate components some or all of which may be integrated/removable and/or may provide permanent/semi-permanent/ dynamic/cached storage.

References to 'computer-readable storage medium', 'computer program product', 'tangibly embodied computer program' etc. or a 'controller', 'computer', 'processor' etc. should be understood to encompass not only computers having different architectures such as single /multi- processor architectures and sequential (Von Neumann)/parallel architectures but also

specialized circuits such as field-programmable gate arrays (FPGA), application specific circuits (ASIC), signal processing devices and other processing circuitry. References to computer program, instructions, code etc. should be understood to encompass software for a programmable processor or firmware such as, for example, the programmable content of a hardware device whether instructions for a processor, or configuration settings for a fixed-function device, gate array or programmable logic device etc.

Fig 11 schematically illustrates a method 60.

At block 62, of the method 60, manual actuation at a user selected location of a touch sensitive input is detected.

Next at block 64, of the method 60, an output at the user selected location is provided and maintained to facilitate additional manual actuation via the touch sensitive input in the region of the user selected location.

As used here 'module' refers to a unit or apparatus that excludes certain parts/components that would be added by an end manufacturer or a user.

The user interface comprising the touch sensitive input responsive to manual actuation; and the display output associated with the touch sensitive input may be provided as a module. This module may additionally comprise a haptic device 12 and/or a deformable layer 14.

The user interface and the controller may be provided as a module. The user interface comprises the touch sensitive input responsive to manual actuation and the display output associated with the touch sensitive input. The module may additionally comprise a haptic device 12 and/or a deformable layer 14.

The controller may be provided as a module separate to the user interface 4.

The blocks illustrated in the Fig 11 may represent blocks in a method and/or sections of code in the computer program 54. The illustration of a particular order to the blocks does not necessarily imply that there is a required or preferred order for the blocks and the order and arrangement of the block may be varied. Furthermore, it may be possible for some blocks to be omitted.

Although embodiments of the present invention have been described in the preceding paragraphs with reference to various examples, it should be appreciated that modifications to the examples given can be made without departing from the scope of the invention as claimed. For example, although the passive deformable layer illustrated in Fig 3 is in combination with the embodiment described with reference to Fig 1, it may also be used in combination with the embodiment described with reference to Fig 2.

It should be appreciated that although Figs 1, 2 and 3 illustrate a particular order of components, the order illustrated may be varied and may be arranged in any order that works. For example, if the touch sensitive input 6 is capacitive then it can be below a top surface. A touch sensitive input 6 can be in any position that allows it to sense actuations directly or indirectly. For example, the haptic device 12 can be below the top surface. It can be in any position that allows it to provide haptic feedback directly or indirectly. For example, the display output 8 can be below the top surface. It can be in any position that allows it to be visible.

The preceding paragraphs have described various examples of an apparatus 2 comprising: a user interface 4 comprising: a touch sensitive input 6 responsive to manual actuation; and a display output 8 associated with the touch sensitive input. Although the preceding descriptions have described a single manual actuation at a time, it should be appreciated that it is also possible to have two simultaneous manual actuations at different locations. In this example, controller 10 may be configured to provide and maintain, in response to a first manual actuation at a first user selected location of the

touch sensitive input, a first output at the first user selected location to facilitate additional manual actuation via the touch sensitive input 6 in the region of the first user selected location and/or may be configured to provide and maintain, in response to a second manual actuation at a second user selected location of the touch sensitive input (that is substantially simultaneous with the first manual actuation), a second output at the second user selected location to facilitate additional manual actuation via the touch sensitive input 6 in the region of the second user selected location.

Features described in the preceding description may be used in combinations other than the combinations explicitly described.

Although functions have been described with reference to certain features, those functions may be performable by other features whether described or not.

Although features have been described with reference to certain embodiments, those features may also be present in other embodiments whether described or not.

Whilst endeavoring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon.

I/we claim:

CLAIMS

1. An apparatus comprising:

a touch sensitive input responsive to manual actuation;

a display output associated with the touch sensitive input; and

a controller configured to provide and maintain, in response to a manual actuation at a user selected location of the touch sensitive input, an output at the user selected location to facilitate additional manual actuation via the touch sensitive input in the region of the user selected location.

2. An apparatus as claimed in claim 1, wherein the output comprises haptic output in the region of the user selected location.

3. An apparatus as claimed in claim 1 or 2, wherein the output comprises a local deformation of the touch sensitive input in the region of the user selected location to facilitate additional user actuation in the region of the user selected location.

4. An apparatus as claimed in claim 3, wherein the deformation is static and does not dynamically vary in response to the facilitated additional manual actuation.

5. An apparatus as claimed in claim 3 or 4, wherein the deformation creates a three-dimensional user input feature at the touch sensitive input

6. An apparatus as claimed in any preceding claim, wherein the output comprises an icon displayed on the display output at the user selected region to facilitate additional user actuation in the region of the user selected location.

7. An apparatus as claimed in claim 6, wherein the controller is configured to dynamically vary the icon in response to the additional manual actuation.

8. An apparatus as claimed in claim 6 or 7, wherein the icon is a visual indication disambiguating further additional manual actuations that provide different user control commands.

9. An apparatus as claimed in claim 8, wherein anyone of a plurality of different icons is provided dependent upon the available user control.

10. An apparatus as claimed in any of claims 6 to 9, wherein the icon visually represents physical deformation of the touch sensitive input.

11. An apparatus as claimed in any preceding claim, wherein the controller is configured to interpret a further additional manual actuation in the region of the user selected location as a user control command that is dependent upon a location of the additional manual actuation relative to the user selected location.

12. An apparatus as claimed in any preceding claim, wherein a user controlled instrument placed at the user selected location may be rocked to provide additional manual actuations via the touch sensitive input that are interpreted as joy-stick control commands.

13. An apparatus as claimed in any preceding claim, wherein the controller is configured to interpret a further additional manual actuation in the region of the user selected location as a user control command that is dependent upon an intensity of the manual actuation.

14. An apparatus as claimed in any preceding claim, further comprising a transparent deformable layer overlying the touch sensitive input.

15. A method comprising:

detecting manual actuation at a user selected location of a touch sensitive input,

providing and maintaining an output at the user selected location to facilitate additional manual actuation via the touch sensitive input in the region of the user selected location.

16. A method as claimed in claim 15, wherein providing and maintaining an output comprises providing and maintaining a haptic output in the region of the user selected location.

17. A method as claimed in claim 15 or 16, wherein providing and maintaining an output comprises providing and maintaining a local deformation of the touch sensitive input in the region of the user selected location to facilitate additional user actuation in the region of the user selected location.

18. A computer program product comprising computer program instructions which when loaded into a processor enable the processor to provide and maintain, in response to an input indicative of a manual actuation at a user selected location of a touch sensitive input, an output at the user selected location to facilitate additional manual actuation via the touch sensitive input in the region of the user selected location.

19. A computer program product as claimed in claim 18, comprising computer program instructions which when loaded into a processor enable the processor to provide and maintaining a haptic output in the region of the user selected location.

20. A computer program product as claimed in claim 18, comprising computer program instructions which when loaded into a processor enable the processor to provide and maintain a local deformation of the touch sensitive input in the region of the user selected location to facilitate additional user actuation in the region of the user selected location.

21. An apparatus comprising:

a user interface comprising:

a touch sensitive input responsive to manual actuation; and

a display output associated with the touch sensitive input; and

a controller configured to provide and maintain, in response to a manual actuation at a user selected location of the touch sensitive input, a haptic output at the user selected location via the user interface in the region of the user selected location.

22. An apparatus as claimed in claim 21, wherein the haptic output comprises a local deformation of the touch sensitive input in the region of the user selected location.

23. An apparatus comprising:

a proximity sensitive input responsive to a manual actuation;

a display output associated with the proximity sensitive input; and

a controller configured to provide, in response to a manual actuation at a user selected location of the proximity sensitive input, deformation feedback at the user selected location that enables user perception of a deformation in the user interface at the user selected location.

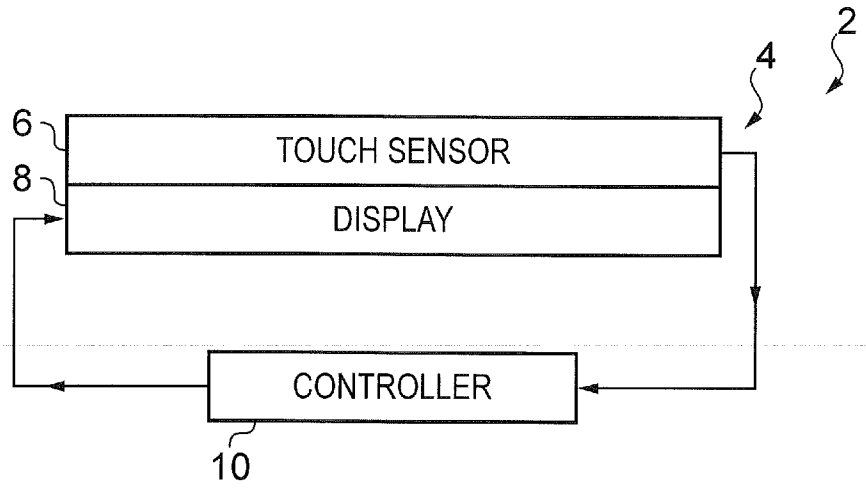
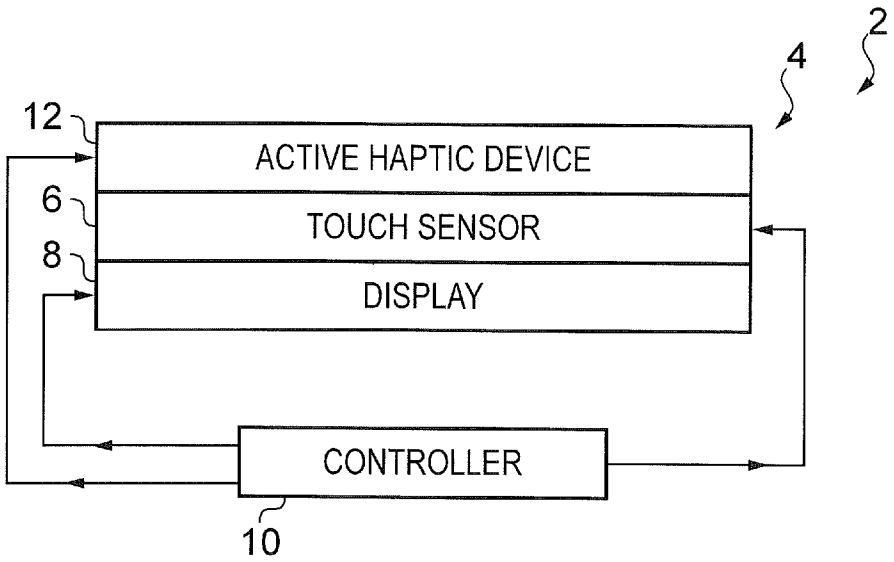

2
4
6
TOUCH SENSOR
8
DISPLAY
CONTROLLER
10

FIG. 1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10

FIG. 2

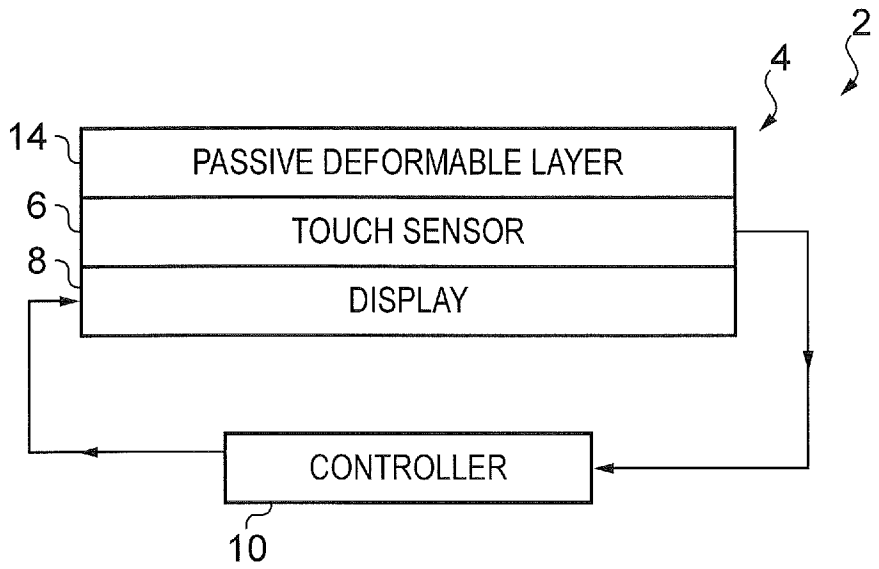

FIG. 3

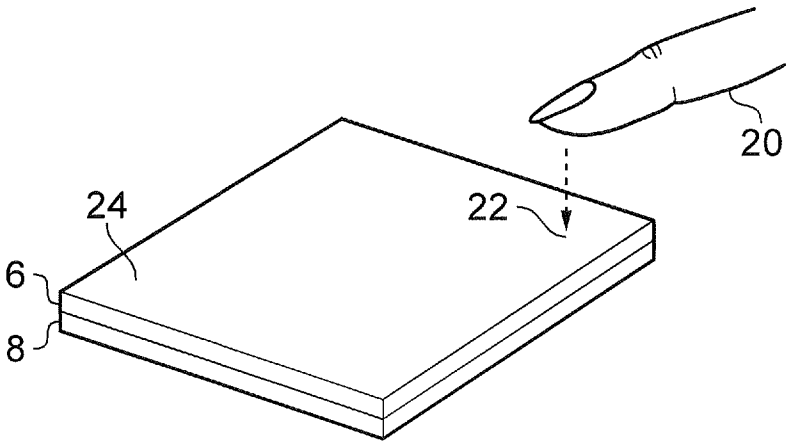

FIG. 4

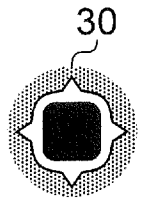

FIG. 5A

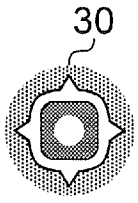

FIG. 5B

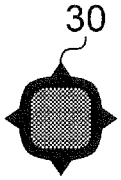

FIG. 5C

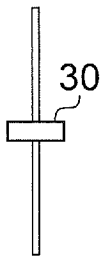

FIG. 5D

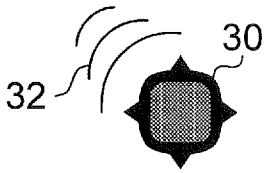

FIG. 6

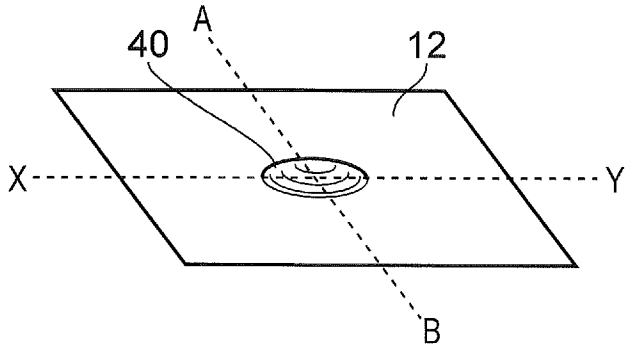

FIG. 7A

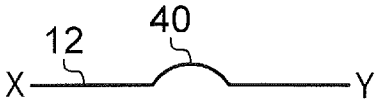

FIG. 7B

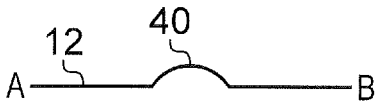

FIG. 7C

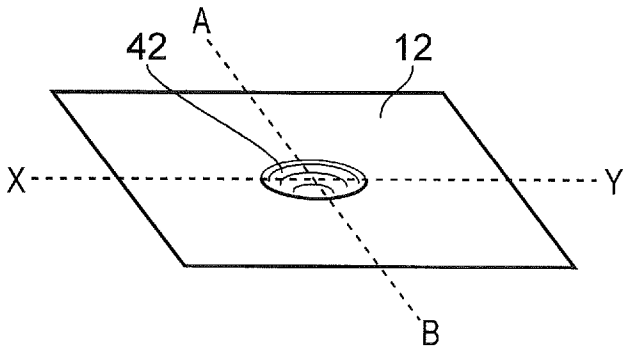

FIG. 8A

FIG. 8B

FIG. 8C

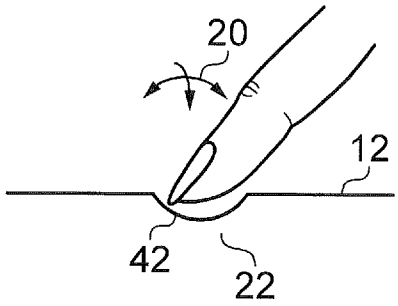

FIG. 9

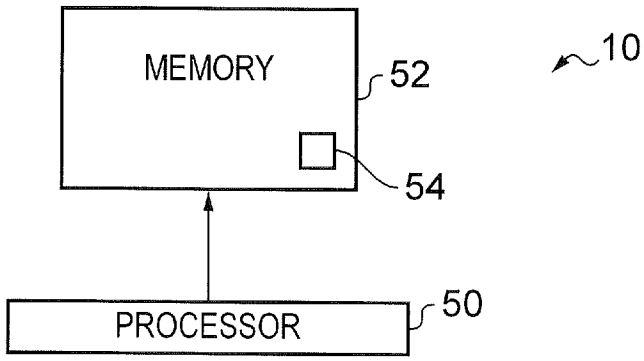

FIG. 10

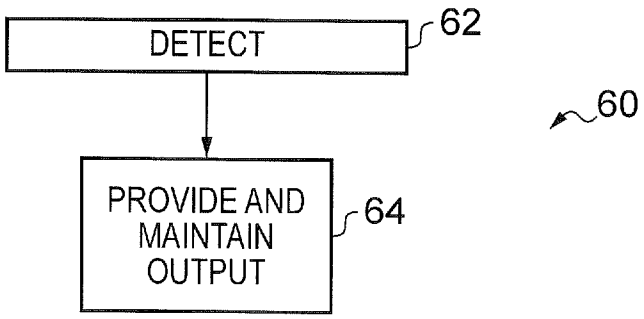

FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2011/054248

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: G06F

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

SE, DK, FI, NO classes as above

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

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 20020008691 A1 (HANAJIMA MITSURU ET AL), 24 January 2002 (2002-01-24); abstract; paragraphs [0037], [0048]-[0049], [0054]-[0055]; figures 5,6	1, 4-15, 18
Y		2, 3, 16, 17, 19, 20
	--	
X	WO 2009071750 A1 (NOKIA CORP ET AL), 11 June 2009 (2009-06-11); abstract; figures 1-3	1, 4-15, 18
Y		2, 3, 16, 17, 19, 20
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International application No.
PCT/IB2011/054248

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 20060132455 A1 (RIMAS-RIBIKAUSKAS EMILY ET AL), 22 June 2006 (2006-06-22); abstract; figures 3-7	1, 4-15, 18
Y	--	2, 3, 16, 17, 19, 20
X	US 20040021643 A1 (HOSHINO TAKESHI ET AL), 5 February 2004 (2004-02-05); abstract; figures 3-13	1, 4-15, 18
Y	--	2, 3, 16, 17, 19, 20
X	US 20060001654 A1 (SMITS GERARD D), 5 January 2006 (2006-01-05); figures 3,7,8	1, 4-15, 18
Y	--	2, 3, 16, 17, 19, 20
X	US 20060103634 A1 (KIM YOON S ET AL), 18 May 2006 (2006-05-18); abstract; figures 1,3,4	21, 22
Y	--	2, 3, 16, 17, 19, 20
X	WO 2009088985 A1 (TACTUS TECHNOLOGY INC ET AL), 16 July 2009 (2009-07-16); abstract; paragraph [0037]; page 15, line 23 - page 16, line 2; figure 2; claim 1	23
	--	

International application No.
PCT/IB2011/054248

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International Patent Classification (IPC)

G06F 3/041 (2006.01)
G06F 3/01 (2006.01)
G06F 3/048 (2006.01)

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US	20020008691	A1	24/01/2002	JP	11203044	A	30/07/1999
				US	6392638	B2	21/05/2002
WO	2009071750	A1	11/06/2009	CN	101889258	A	17/11/2010
				EP	2217990	A4	11/05/2011
				US	20090167507	A1	02/07/2009
US	20060132455	A1	22/06/2006	US	20100153879	A1	17/06/2010
US	20040021643	A1	05/02/2004	JP	2004070492	A	04/03/2004
				JP	4115198	B2	09/07/2008
				US	7245293	B2	17/07/2007
				US	6940494	B2	06/09/2005
				US	20050259087	A1	24/11/2005
US	20060001654	A1	05/01/2006	DE	112005001549	T5	16/05/2007
				JP	2008505404	A	21/02/2008
				KR	20070030294	A	15/03/2007
				WO	2006004983	A3	06/04/2006
US	20060103634	A1	18/05/2006	KR	100682901	B1	15/02/2007
				KR	20060053769	A	22/05/2006
				US	20100127999	A1	27/05/2010
WO	2009088985	A1	16/07/2009	CN	101971124	A	09/02/2011
				EP	2250544	A1	17/11/2010
				JP	2011508935	A	17/03/2011
				KR	20100136446	A	28/12/2010
				US	20090174673	A1	09/07/2009