

A casing part (18) is adapted to enclose the components related to the control system (10).

The light source (20) is illustrated in the form of a fluorescent lamp and is adapted to extend across the full width of the casing.

Light is able to pass through a number of "windows" (24) in the panel (22) and is reflected through 90 degrees by a mirror surface (26).

The light shall then pass a transparent casing-wall portion (28), and then through the sunken surface portion (14), and thereafter through an opposite wall portion (32), so as to be reflected onto the light detector or light receiver (36) by a mirror surface (34).

Figure 1 of this patent publication shows that when a fingertip (49) is placed within the sunken surface (14), a number of light rays are shadowed within a defined area (48a), enabling this area to be detected.

Figure 8 shows a system in which light sources and light detectors or light receivers are orientated in perpendicular co-ordinates.

#### **US-A-4,880,969**

This patent publication describes and illustrates a programmable touch screen.

Figures 3 and 4 in particular illustrate an optical keyboard (12) which includes an IR-adapted light source (32), a light receiver (34) and optical "prism" or mirror surfaces (36, 38).

In this regard, Figure 3 shows that these mirror surfaces (36, 38) are related to mutually opposite edge portions of a window surface (22).

#### **EP-A1-0 330 767**

This publication illustrates and describes a touch screen, which is adapted to create control signals by means of which a function can be selected in response to the movement and displacement of an operator's fingertip relative to the screen (1).

More particularly, this publication is concerned with the activation of a time circuit immediately a finger or a fingertip touches the touch screen, where a

particular movement direction and a particular distance of movement are detected and an electronic unit or the like is activated in response to these parameters.

The touch screen or touch panel (1) is provided along its four sides with light-emitting diodes (LED) (101-114) and light receiving devices in the form of phototransistors or photodiodes (201-214), as illustrated in Figure 2.

The finger or the fingertip shadows one or more light beams orientated in a right-angled co-ordinate system, wherein shadowed light receiving devices and detected changes in shaded devices constitute magnitudes from which desired functions are evaluated and initiated.

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### ***Summary of the invention***

#### Technical problems

When taking into consideration the technical deliberations that a person skilled in this particular art must make in order to provide a solution to one or more technical problems that he/she encounters, it will be seen that it is necessary, on the one hand, to realise initially the measures and/or the sequence of measures that must be undertaken to this end, and on the other hand to realise which means is/are required to solve one or more of said problems. On this basis, it will be evident that the technical problems listed below are highly relevant to the development of the present invention.

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When considering the earlier standpoint of techniques, as presented in the afore going, it will be seen that a technical problem resides in the ability to create conditions which enable a mobile telephone apparatus, or cell phone, to be provided with a touch screen that includes edge-related light-emitting units and oppositely located edge-related light receiving units together with associated circuits while retaining the small external dimensions of said apparatus, so that a geographical surface section and a function corresponding to said surface section can be established through the medium of a calculating unit, or computing unit, when certain light pulse receiving units do not indicate the reception of expected light pulses.

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Another technical problem resides in the ability to create construction instructions that will provide conditions for reducing the space required by such a touch screen and for adapted planning and placement of said screen within the external confines of a mobile telephone.

5 A further technical problem resides in the ability to create conditions, with the aid of simple means, that enable energy consumption and power requirements to be kept low, with regard to the mobile telephone being battery powered, by generating short light pulses and by allowing the units to be activated sequentially in a chosen order.

10 In the case of this latter application, it will be seen that a technical problem resides in allowing the use of a number of pulse generating circuits, each connected to a respective light pulse emitting unit, and a number of light pulse receiving units, each connected to a respective pulse receiving circuit, and in the ability to establish, via a calculating unit, the geographic position of a user's fingertip, or thumb tip, on a front surface part, positioned so as to shadow one or more parallel, related light pulses and therewith indicate the absence of light pulses in one or more light pulse receiving units and unit-related pulse-receiving  
15 circuits.

When considering the earlier standpoint of techniques as described above, it will also be seen that a technical problem resides in the provision of structural changes in a touch screen, such as to enable the screen to be significantly thinner than prior art screens, so as to adapt said screen directly onto a mobile telephone.

20 A further technical problem resides in the ability to provide a touch screen, with which, in respect of other external dimensions of said screen, it is possible to create conditions which enable the external measurements of a mobile telephone unit to be reduced while, nevertheless, enabling the width of the display surface of a display unit to be made larger than the display surface of known mobile  
25 telephone units.

A further technical problem resides in the ability to realise the significance of and the advantages associated with allowing an inventive touch screen to be used as an alternative, not solely for a typical keypad but also for a standard display surface of a mobile telephone.

30 Another technical problem resides in the ability to realise the significance of and the advantages afforded by utilising a display unit in the form of an LCD unit, so as to enable each "key" to be included on the screen in the form of a graphic, so that when a pen, pencil, finger or a fingertip is placed on the same location or

surface section where a key is presented, a chosen function and/or application corresponding to said graphic is activated and generated.

5 Still another technical problem resides in the ability to realise the significance of and the advantages afforded by using an LCD unit, whose upper surface can be allocated different information carrying structures according to a chosen menu, for different sequences within an information transmitting mode.

10 Another technical problem resides in the ability to realise the significance of and the advantages associated with orientating said light pulse emitting units and said light pulse receiving units adjacent said display unit, with the transmitting and receiving directions of the light pulses being perpendicular to, or at least generally perpendicular to, a flat upper surface of the display unit.

15 Yet another technical problem resides in the ability to realise the significance of and the advantages associated with placing at least two, normally four, pulse-deflecting devices close to the display unit and to its mutually opposite edge portions.

Another technical problem resides in the ability to realise the significance of and the advantages associated with using as a supportive substrate a mobile telephone printed circuit board, that is capable of carrying an LCD unit or the like.

20 A further technical problem resides in the ability to realise the significance of enabling a substrate to support not only said display unit but also said light pulse emitting and light pulse receiving units, where said light pulses have a frequency within the infrared range (IR range).

25 Another technical problem resides in the ability to realise the significance of and the advantages afforded by enabling said light pulse emitting units and said light pulse receiving units to be connected to corresponding pulse generating circuits and pulse receiving circuits included in said substrate, through the medium of connection wires or the like.

30 Another technical problem resides in the ability to realise the significance of and the advantages afforded by allowing the light deflecting devices or light pulse deflecting devices to consist of a plurality of mirror units, co-ordinated with the casing of the mobile telephone unit.

Another technical problem resides in the ability to realise the significance of and the advantages associated with allowing said light pulse deflecting devices to consist of four mirror units, with their mirror surfaces orientated at 45 degrees in

relation to the propagation direction of the light pulses, from said angled light pulse generating units and to said angled light pulse receiving units.

5 A further technical problem resides in the ability to realise the significance of and the advantages associated with allowing said light pulse deflecting devices to consist of a separate right-angled equilateral, three-sided and right-angled prism unit, having a light pulse deflecting mirror surface, or a corresponding means.

10 Another technical problem resides in the ability to realise the significance of and the advantages afforded by enabling a circuit board or a printed circuit board to carry electronic circuits and components adapted for carrying out functions related to the mobile telephone unit and/or to an associated mobile telephone network.

15 Another technical problem resides in the ability to realise the significance of and the advantages associated with allowing said light pulse emitting units and said light pulse receiving units to be orientated in respective rows and respective columns, with mutual perpendicular orientations and with a distance between said rows or columns that only slightly exceeds the dimensions chosen with respect to said display unit.

20 Another technical problem resides in the ability to realise the significance of and the advantages associated with allowing said circuit board carrying, *inter al*, said display unit, said light pulse emitting units, said light pulse receiving units and fixed components necessary to the function of the mobile telephone unit, to be adapted for attachment to a part of the complete casing of the mobile telephone unit.

25 Another technical problem resides in the ability to realise the significance of and the advantages afforded by fastening the edges of said light pulse deflecting devices along the raised rim portions of a recess in a casing part in the form of a replaceable lid, where said rim and said rim portions co-act with a transparent protective means, such as a plastic sheet.

30 In respect of certain conditions where a plurality of side-related light pulse receiving units and their associated pulse receiving circuits also indicate the absence of light pulses, another technical problem resides in the ability to realise the significance of and the advantages that are afforded by adapting the calculating unit to interpret this information, with the aid of internal computing circuits, as meaning that the intended geographical position shall be considered to be located

between outer points representative of said pulse receiving circuits that indicate the absence of light pulses.

In respect of certain conditions where a plurality of angled and side-related light pulse receiving units and associated pulse receiving circuits indicate, at the same time, the absence of light pulses, another technical problem resides in the ability to realise the significance of and the advantages afforded by adapting the calculating unit to interpret this information, with the aid of internal computing circuits, as meaning that the intended geographical position shall be considered to be located between outer points representative of said pulse receiving circuits that indicate the absence of light pulses.

Another technical problem resides in the ability to realise the significance of and the advantages afforded by allowing said light pulse emitting units to be activated, through the medium of associated pulse generating circuits, either sequentially or in chosen positions in a predetermined order, and by allowing the corresponding light pulse receiving units and their pulse receiving circuits to be also activated in said predetermined order.

A further technical problem resides in the ability to realise the significance of and the advantages afforded by adapting a plurality of light pulse emitting units to emit light pulses consecutively over a chosen time duration, and by adapting one single light pulse receiving unit to be activated, via its pulse receiving circuit, so as to receive expected light pulses during said chosen time duration and therewith allow registration of occurring light pulses and/or shadowed light pulses or the absence of light pulses.

Another technical problem resides in the ability to realise the significance of and the advantages afforded by adapting a plurality of light pulse receiving circuits so that light pulses emitted from a single light pulse emitting unit can be received consecutively during said time duration, and by adapting the light pulse receiving units so that said units will be active, via pulse receiving circuits, during said chosen time duration for receiving expected light pulses and therewith allow registration of occurring light pulses and/or shadowed light pulses or the absence of light pulses.

Solution

The present invention takes as its starting point the known technology, as it is described above, and is based on a touch screen arrangement, which is built on or rests on a supportive substrate, and which is adapted for a mobile telephone apparatus or set and incorporated in the apparatus with the aid of a known display unit.

With the intention of solving one or more of the aforesaid technical problems related directly to mobile telephone apparatus or sets, the invention proposes the use of an arrangement, constructed in principle in accordance with what is used and proposed within other technical fields, said arrangement comprising a number of light pulse emitting units together with a number of oppositely located light pulse receiving units, said units both being edge-related to the display unit of said mobile telephone.

The light pulse emitting units are adapted to send light pulses sequentially through a short distance over the upper surface of a display unit, via associated pulse generating circuits, said upper surface presenting a graphic, such as rows and columns of geographically disposed symbols, such as letters, numbers and/or corresponding graphics.

The light pulse receiving units are adapted to receive light pulses sequentially, and each of the pulse receiving circuits and pulse emitting circuits are coordinated and connected to a calculating or computing unit.

The calculating unit will include calculating circuits, that function to evaluate a position representative of the geographical position on the upper surface of the display unit where light rays, such as intersecting light rays, are shadowed by a pointer, such as the front surface part of a user's thumb, depending on the position of one or more co-ordinate orientated light pulse receiving units and their associated pulse receiving circuits that should indicate the presence of a light pulse.

By way of proposed embodiments, that lie within the scope of the present invention, it is particularly proposed that said light pulse emitting units and said light pulse receiving units are orientated adjacent said display unit, with the light pulse emitting and light pulse receiving directions being at right angles, or at least generally at right angles, to a planar upper surface of the display unit.

Also proposed is the use of a number of light pulse deflecting devices, such as four devices, that are orientated close to the display unit and that function to cause mutually intersecting light pulses to pass parallel across the upper surface of the display unit.

5 By way of proposed embodiments that lie within the scope of the inventive concept, it is also proposed that a supportive substrate is comprised of a circuit board or printed circuit board of the mobile telephone unit.

In addition to carrying the display unit, the substrate is also adapted to carry said light pulse emitting and light pulse receiving units.

10 The light pulse emitting units and the light pulse receiving units are connected to said pulse generating circuits and said pulse receiving circuits co-ordinated on the supportive substrate, by connecting wires or the like.

Each of the light pulse deflecting devices may comprise a mirror unit, or a mirror portion, carried by the casing to provide a corresponding effect.

15 The light pulse deflecting devices may comprise mirror units that have mirror surfaces or casing-carried mirror surfaces orientated at 45 degrees in relation to the direction of propagation of the light pulses emitted by said light pulse emitting units towards said light pulse receiving units.

20 The light pulse deflecting devices may also comprise a right-angled equilateral, three-sided and right-angled prism unit.

The circuit board or printed circuit board, that functions as a substrate, may also support electronic circuits and components adapted to perform functions related to the mobile telephone unit or set.

25 The light pulse emitting units and the light pulse receiving units are orientated in two rows and two columns of mutual perpendicular orientations, with a distance between said rows and columns that only slightly exceeds corresponding dimensions of said display unit.

30 It is also proposed that the circuit board or printed circuit board that includes, *inter al*, display units, light pulse emitting units, light pulse receiving units, and fixed components, necessary to carry out the normal functions of the mobile telephone unit, is adapted to enable it to be fastened to or against part of the casing of the mobile telephone unit.

The light pulse deflecting devices are fastened, edge-orientated, along the raised rims of a replaceable lid or cover, said rims, or parts of said rims, co-acting



with and supporting a transparent protective device, such as a plastic or glass sheet.

It is also proposed in accordance with the invention that conditions are provided whereby, when a plurality of side-related light pulse receiving units and their associated pulse receiving circuits indicate simultaneously the absence of light pulses, the calculating unit will interpret this information, with the aid of internal calculating circuits, as indicating that the intended geographical position shall be considered to be located at or between points representative of said light pulse receiving units, as an indication of the absence of light pulses.

In respect of conditions where a plurality of angled and side-related light pulse receiving units, and their associated pulse receiving circuits, simultaneously indicate the absence of light pulses, the calculating unit functions, with the aid of internal calculating circuits, to interpret this information to mean that the intended geographical position shall be considered to be located at one point or between points representative of said light pulse receiving units that indicate the absence of light pulses.

It is also proposed that when said light pulse emitting units are activated, via associated pulse generating circuits, either sequentially or positioned selectively in a predetermined order, the corresponding pulse receiving circuits shall also be capable of being activated in the same predetermined order.

A plurality of light pulse emitting units may be adapted to consecutively emit light pulses with the aid of said pulse generating circuits over a chosen time duration, wherein one single light pulse receiving unit is adapted to be activated to receive anticipated light pulses during said chosen time duration and therewith allow occurring light pulses and/or shaded light pulses or the absence of light pulses to be registered through the medium of an associated pulse receiving circuit.

A plurality of light pulse receiving units may be adapted to receive light pulses emitted from one single light pulse emitting unit consecutively during a chosen time period, wherein each of the light pulse receiving units is adapted to be activated, via associated pulse receiving circuits, to receive light pulses during said chosen time period and therewith allow occurring light pulses and shadowed light pulses and/or the absence of light pulses to be registered.

Advantages

Those advantages primarily characteristic of the present invention and the particular significant characteristics of said invention reside in the creation of conditions, which enable the creation of a touch screen arrangement for a mobile telephone apparatus or telephone unit or set on the basis of the technology described in the introduction, wherein edge-related light pulse emitting units and light pulse receiving units adjacent associated light pulse deflecting devices may be mounted adjacent the edge surfaces of a display unit or an LCD unit, and also in that the touch screen can thereby be given a particularly thin design, with low energy consumption and a limited power input.

More particularly, the invention makes possible clear evaluation of a small chosen surface section of a small display surface with the aid of the front surface part of a thumb, said surface part covering a surface section that greatly exceeds the small chosen surface section.

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 The primary characteristic features of the present invention are set forth in the characterising clause of the accompanying Claim 1.  
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**Brief description of the drawings**

An embodiment at present preferred and including significant characteristic features of the present invention will now be described in more detail by way of example and with reference to the accompanying drawings, in which;

**Figure 1** is an exploded perspective view of a touch screen constructed in accordance with the invention and placed in a mobile telephone set;

**Figure 2** illustrates in side view and in a section, taken on the line II-II in Figure 1, a mobile telephone set and a touch screen assembly;

**Figure 3** is a section view, according to Figure 2, and shows a narrow pointer resting on the upper surface of a display unit for shadowing a light pulse;

**Figure 4** illustrates an example of pulse-form activation of the light pulse emitting and light pulse receiving units used, through the medium of pulse generating and pulse receiving circuits belonging to said units;

**Figure 5** is a horizontal view of a mobile telephone set that uses a touch screen in accordance with the present invention, and shows a narrow pointer

positioned to rest on a surface section of the display unit, said section corresponding to a graphic symbol in the form of the number "3";

**Figure 6** is a schematic view of a planar display unit which is surrounded by a number of light pulse emitting and light pulse receiving units disposed in right-angle co-ordinates, in which a well-defined geographic point is shown to give a pronounced pulse shadow or the absence of light pulses in respect of two mutually perpendicular light pulse receiving units;

**Figure 7** illustrates an embodiment in which a large and diffuse geographic point creates a pulse shadow for at least two light pulse receiving units orientated at right angles and in pairs;

**Figure 8** illustrates an alternative embodiment for evaluating a geographic position valid for a geographic point;

**Figure 9** illustrates a practical application of the principles indicated in Figure 6 for activating a "key" or "button"; and

**Figure 10** illustrates a further practical application of the principles indicated in Figure 6 for activating another key or button for activation of a mobile telephone function.

***Description of embodiments at present preferred***

It is pointed out initially that we have chosen to use in the following description of embodiments at present preferred and including significant characteristic features of the invention and illustrated in the figures of the accompanying drawings special terms and terminology with the intention of illustrating the inventive concept more clearly.

However, it will be noted that the expressions chosen here shall not be seen as limited solely to the chosen terms used in the description, but that each term chosen shall be interpreted as also including all technical equivalents that function in the same or at least essentially the same way so as to achieve the same or essentially the same intention and/or technical effect.

Figure 1 thus illustrates schematically an embodiment and an application of the present invention, said figure concretising generally the significant properties of the embodiment described in more detail below.

Thus, Figure 1 is a perspective exploded view of a mobile telephone apparatus T whose casing parts 10, 11 enclose a touch screen arrangement 1, that rests on a supportive "substrate" 2, among other things.

5 The supportive substrate 2 of the illustrated embodiment has the form of a printed circuit board or a circuit board 2' of known design.

Figure 1 is an exploded view of a mobile telephone apparatus T that includes a display unit 3 and edge-orientated light pulse emitting units 4 and oppositely located edge-orientated light pulse receiving units 5, which extend along respective sides of said display unit 3.

10 Although not shown, the "substrate" 2 may include edges that are raised from a display unit 3, in the form of a known LCD unit.

It is obvious that the basic principles of the present invention can be implemented solely with the use of rows or columns of light pulse emitting units 4 and oppositely located rows or columns of light pulse receiving units 5 with  
15 respective associated circuits 4a and 5a, at least with respect to the activation of certain functions.

It will be understood, from the following description of the illustrated embodiment, that the touch screen 1 belonging to the mobile telephone T is built around the display unit 3, with a number of light pulse emitting units 4, 4' orientated at  
20 right angles, and a number of light pulse receiving units 5, 5' orientated at right angles, said units being edge-related and surrounding said display unit 3 resting on the substrate 2.

For the sake of simplicity, requisite devices and connections to the substrate 2, and requisite functions for driving the LCD unit 3 in a known manner are not  
25 shown.

The units 4, 4' that emit pairs of mutually intersecting light pulses are adapted to emit short IR light pulses through the medium of pulse-generating circuits 4a, 4a'. One such IR light pulse is referenced 40 in Figure 2, where it is shown orientated at a very small distance over the upper surface 3a of the display unit 3.

30 Figure 2 shows three light pulse paths 40, 41 and 42, although for the sake of simplicity only the light pulse path 40 will be described in the following description.

The upper surface 3a shall be capable of presenting a number of graphic symbols in a known manner.

In the illustrated embodiment, this graphic display is chosen to comply with a chosen menu of a mobile telephone apparatus T.

Although these graphic symbols are shown to consist of digits (Figure 5) orientated in rows and columns in the case of the illustrated embodiment, it will be understood that a display unit 3 in the form of an LCD unit can be caused to present a number of other symbols, such as digits/letters, words, sentences or corresponding graphic symbols, depending on the menu chosen.

Figure 6 illustrates schematically a number of pulse receiving circuits 5a, 5a' co-ordinated in right angle orientations, said circuits being adapted to receive signals from light pulses detected by the light pulse receiving units 5, 5', said units being referenced 5S, 5R, 5Q ..... 5J, 5I in one column, and 5'A, 5'B ..... 5'G, 5'H in one row.

A number of pulse emitting units 4, 4' in right angle orientation are adapted to emit light pulses via the control from co-ordinated pulse generating circuits 4a, 4a', said column-related pulse emitting units 4 being referenced 4I, 4J, 4K .... 4R, 4S, while the row-related units 4' have been referenced 4'H, 4'G, 4'F ... 4'B, 4'A.

The pulse receiving circuits 5a, 5a' are of a known kind and each circuit is adapted to generate current pulses or voltage pulses corresponding to the light pulses that are received by corresponding light pulse receiving units 5, 5', and to transpose these pulses into signal information sent to a calculating unit 6.

More specifically, the calculating unit 6, shown in Figure 4, functions to activate each of the row-orientated units 4'H to 4'A and each of the column-orientated units 4I to 4S in a chosen order and, at the same time, open the oppositely located pulse receiving circuits 5a' and 5a.

This means that when the calculating unit 6 activates a light pulse emitting unit 4P during a time slot, the calculating unit 6 will expect said light pulse to be detected by the light pulse receiving unit 5L during the same time slot.

In such case, the calculating unit 6 allows associated calculating circuits, such as circuit 6a, to take an inactive state.

On the other hand, if the expected light pulse fails to arrive, e.g. is shadowed by a pointer 9, the calculating circuit 6a is activated.

The calculating unit 6 thus includes a plurality of calculating circuits, of which a calculating circuit 6a is adapted to allow the geographic position of the point P1 and its related row to be evaluated, depending on the position and the row (or

column) of one or more co-ordinate orientated, light pulse receiving column-related units 5S - 5I, one of which is referenced 5P in Figure 6 in connection with the circuits 5a, and therewith activate a function that corresponds to this position in a chosen menu, via a function-related output signal generated on a conductor 6d.

5 An output signal of this kind is, of course, more complex than solely an output signal. Despite this, the output signal is not shown for the sake of simplicity.

The calculation performed in the calculating circuit 6a can be performed more precisely in order to be able to establish the two co-ordinates of a chosen geographical position of the point P1. This calculation can be based on the orientation of the light pulse receiving unit 5'C and its connection to circuit 5a'C, by taking into account also the light pulse receiving unit 5'G, which receives no light pulse or which indicates a light pulse deficiency, meaning in practice that both units 5'C and 5P as shadowed by one single pointer 9 placed at the point or surface section P1.

15 The calculating unit 6 includes a further calculating circuit 6b that keeps an account of the activation of and the sequence assigned to respective circuits within the co-ordinations 4a and 4a' respectively and a light pulse emission from each of the column-related units 4I - 4S and the row-related units 4'H to 4'A respectively, and emission-dependent activation of the individual circuits within the co-ordinations 5a and 5a' respectively and an anticipated reception of a light pulse in each of the units 5S - 5I and 5'A - 5'H respectively within their allotted time slots.

On the basis of information as to which of the units 5S - 5I and the units 5'A-5'H should indicate the presence of a light pulse within its time slot but fails to do so, it is possible to evaluate a position that is representative of the two-dimensional geographic position P1 on the upper surface 3a of the display unit 3 where mutually intersecting light rays from the light pulse emitting unit 4L on the one hand and the light pulse from the light pulse emitting unit 4'F on the other hand, via respective circuits 4aL and 4a'F, is shadowed by a narrow pointer 9 in point P1, whereby solely those light pulse receiving units 5P and 5'C in connection with said circuits 5aP and 5a'C are shadowed, which is thus read in the calculating circuit 6 and causes activation of the calculating circuit 6a.

Returning to Figure 2, it will be seen that the light pulse emitting units, such as the unit 4L, and the light pulse receiving units, such as the unit 5P, shall be orientated adjacent said display unit 3, with the directions of respective light pulses

40a and 40b from the pulse emitting and pulse receiving units are at right angles, or at least generally at right angles, to a plane 3a' orientated to coincide with the planar upper surface 3a of the display unit 3.

The invention also relates to the use of at least two pairs of mutually opposite light pulse deflecting devices 7, 8 and 7', 8', in practice four pairs of such devices, said devices being positioned very close to the display unit 3 and around the edges of said unit, in accordance with the Figure 2 illustration.

It will also be seen that the supporting substrate 2 shall not only support a display unit 3 but also the series-orientated light pulse emitting units 4, 4' and the series-orientated light pulse receiving units 5, 5' in the form of a plurality of row-related light pulse emitting and mutually identical units 4, 4', and a plurality of row-orientated light pulse receiving and mutually identical units 5, 5' in mutually equal numbers on both sides of the display unit 3 for direct correspondence with each other.

The supportive substrate 2 may consist of the telephone circuit board 2' carrying discrete components (not shown).

The substrate 2 is thus not only adapted to support the display unit 3 centrally thereon, but also edge-related light pulse emitting units 4, 4' and the oppositely located light pulse receiving units 5, 5' disposed around all four edges of the substrate, and also the four mutually opposite devices 7, 8 and 7', 8' respectively.

The units 4, 4' emitting said mutually crossing light pulses and said units 5, 5' receiving said mutually crossing light pulses may conveniently be connected to said pulse generating circuits 4a, 4a' and said pulse receiving circuits 5a, 5a' by means of connecting wires or the like (not shown), said circuits conveniently being attached to or included as components in the circuit board 2'.

As will be seen particularly from Figure 2, the light pulse deflecting devices 7, 8 may each consist of a mirror unit that has an angled mirror surface, where, in such case, the mirror surfaces 7", 8" of said mirror units will preferably be orientated at an angle of 45 degrees in relation to a vertical direction of propagation allocated to the light pulses 40a, 40b, to a horizontal direction of propagation 40 over the upper surface 3a of the display unit 3.

However, Figure 2 shows that each light pulse deflecting device 7, 8 shall consist of a right-angled equilateral and three-sided and right-angled prism-formed unit, where respective mirror surfaces 7" and 8" of said prism units will obtain the

orientation disclosed in the introduction and extend along two rows and two columns of the units 4, 4' and 5, 5'.

The circuit board 2' may also carry electronic circuits and components adapted to perform functions related to a mobile telephone unit and a telephone network to which said unit is connected.

Figures 1 and 6 show that said light pulse emitting units 4 are column orientated and that said light pulse receiving units 5 are also column orientated, and that the light pulse emitting units 4' and the light pulse receiving units 5' are row-orientated and extend at right angles to said columns.

Thus, said units are orientated directly in opposing columns and rows with right-angled orientations there between and at a distance between said rows and columns that only slightly exceeds the dimensions of the display unit 3, as made evident in Figure 2.

As shown in Figure 2, the light pulse emitting units, such as the unit 4L, and the light pulse receiving units, such as the unit 5P, are positioned on the sides of the display unit 3 and closely adjacent the mutually opposite edges of said display unit, so as to provide a compact construction.

As will be seen from Figure 1, the substrate 2, in the form of a circuit board 2' carrying, *inter al*, a display unit 3, light pulses emitting units 4, 4', light pulse receiving units 5, 5' and fixed components necessary to the function of the mobile telephone unit T, is adapted for fastening to a first casing part 10 of the telephone unit T intended for co-action with a second casing part 11. The mutually co-acting state of said casing parts is shown in Figure 2.

The light pulse deflecting devices 7, 8, with their respective mirror surfaces 7", 8", and the light pulse deflecting devices 7', 8' with their mirror surfaces are disposed along a rectangular raised edge or rim 11a, included in the second casing part 11 as a replaceable lid or cover, where said rim 11a is able to co-act with and completely cover an opening with a transparent protective element 11b, such as a plastic sheet or glass sheet, positioned immediately above the display surface 3a.

Figure 3 illustrates more specifically a proposed application of the present invention, where it is assumed that a pointer 9, a pencil, pen or the tip of an index finger, is brought to a position (P1) corresponding to a position P1 on the display unit 3, in accordance with Figure 6, and that light pulses 40a emitted by the light



pulse emitting unit 4L are shadowed (40) by the tip 9a of the pointer, whereby the light pulse receiving unit 5P will not receive any light pulses (40b) and will indicate, via a pulse receiving circuit 5aP, to the calculating unit 6 a light pulse absence within its allocated time slot and cause activation of the calculating circuit 6a.

5 In accordance with the Figure 6 illustration, the calculating unit 6 is thereby able to ascertain that light pulses have been emitted within one and the same time slot not only by the unit 4L but also by the unit 4'F, and that no light pulse has been received either in the unit 5P or in the unit 5'C within said time slot, thereby enabling the geographic two-dimensional position of P1 to be calculated and  
10 evaluated and therewith enabling corresponding information to be sent to the circuit board 2' via the conductor 6d.

Figure 5 is a schematic plan view illustrating the function shown in Figure 3, and also shows activation of a surface section 12 in the same way as that earlier described with reference to a narrow pointer 9 and its tip 9a.

15 The surface section 12 is represented by the number 3, and the display unit 3 has been allocated a first display surface section 31, represented by the keypad of the mobile telephone apparatus T with its rows and columns of keys or buttons, and a second display surface section 32, represented by the presentation surface of said mobile telephone apparatus T.

20 Thus, the possibility of co-ordinating both the first display surface section 31 and the second display surface section 32 within one and the same display unit 3 lies within the concept of the invention.

It should be noted in this respect, with reference to Figure 7, that a marked surface section, such as a number-presenting surface section 12', may be diffuse  
25 and cover two or more light pulse receiving units, for instance units 5'B, 5'C, 5'D and 5'E, and four light pulse receiving units 5Q, 5P, 5O and 5N active against opposing light pulse emitting units 4'G, 4'F, 4'E, 4'D and 4K, 4L, 4M, 4N respectively, and that a correct indication may also be obtained even though all of said receivers indicate the absence of light pulse related signals or shadows within their  
30 respective time slots.

In this case, the calculating unit 6 is able to sort out peripheral units, in the present case the units 5Q, 5N and 5'B, 5'E respectively, with the aid of a calculating circuit 6c, and therewith deliver a clearer evaluation of the position P1 via the units 5P, 5O and 5'C, 5'D, in accordance with the spot markings in Figure 7.

Figure 4 shows a pulse plan applicable to the time-wise distribution of the light pulses, said plan being adapted to save energy and to increase intensity and light strength.

As a result of this pulse structure, each of the light pulse emitting and angled units 4 and 4' respectively will be actuated solely for a short period of time and within an allocated time slot.

During the short time slot  $t_0 - t_1$ , in which a light pulse emitting unit, such as the unit 4L, is actuated, the calculating unit 6 ascertains, via an associated pulse receiving circuit 5aP, whether or not a light pulse has been received on an oppositely located receiver 5P. The time point for said evaluation is referenced  $t_1$ .

Immediately after the status of the receiver 5P has been read, the light pulse emitting unit 4L concerned is extinguished at the end of a time slot  $t_0 - t_1$ .

Disturbances that may be caused from ambient light can be suppressed, by temporarily increasing the intensity of each of the selected light pulse emitting units 4, 4'.

Thus, as will be seen from Figure 6 in combination with Figure 7, in respect of conditions where two or more side-related light pulse receiving units 5Q, 5P, 5O, 5N and associated pulse receiving circuits indicate simultaneously the absence of light pulses, the calculating unit 6 functions, with the aid of internal calculating circuits, such as circuit 6c, to interpret this information to mean that the intended geographical position P1 shall be considered to be located between the points, or consist of the most probable points, that are representative via said corresponding pulse receiving circuits.

Thus, Figure 4 shows that each light pulse emitting unit shall be ignited over only a short time slot or pulse time, e.g.  $10\mu\text{s}$ , with an electric current higher than 1A, with a subsequent pause to a time point  $t_2$ , which may be adapted to more than 100 times the chosen pulse time  $t_0 - t_1$ .

Also shown in Figure 4 is that the emission time or time slot  $t_0 - t_1$  for the unit 4L begins ( $t_0$ ) slightly before the activated reception time ( $t_1$ ) for the unit 5P, and that an idling time  $t_1 - t_3$  is caused to lapse prior to activation of an adjacent unit 4K within its time slot, where after the unit 5Q is immediately activated.

The same applies to the unit 4J and to the unit 5R and also remaining units, these latter units not being shown in Figure 4.

With the intention of saving energy, a lower idling time frequency ( $t_0 - t_2$ ) can be chosen and only one unit, 4L, used. When the light pulse is broken, the display unit 3 is activated via a circuit 62, in accordance with the Figure 4 pulse plan.

5 The light pulse emitting units are activated, via associated pulse generating circuits 4a, 4a', sequentially in a consecutive order or are selectively positioned in a predetermined order, and the corresponding light pulse detecting units 5, 5' can also be activated in said predetermined order, via the circuits 5a, 5a'.

10 Figure 8 shows that a plurality of light pulse emitting units, referenced 4J, 4K and 4L, are adapted to send light pulses during a chosen time duration and during respective time slots, and that only one light pulse receiving unit 5R is adapted to be activated in this respect, so as to allow anticipated or expected light pulses to be received during said chosen time duration and within said time slots, and there-  
with allow occurring light pulses and shadowed light pulses to be registered so as to enable the geographical position of a more diffuse point, such as the point P1,  
15 to be evaluated.

Although not shown, it is obvious that a plurality of light pulse receiving units 5P, 5Q, 5R could be adapted to receive consecutively during a chosen time duration a plurality of light pulses emitted in time slots from solely one light pulse emitting unit, for instance the unit 4L, and to adapt the light pulse receiving units to  
20 be activated to receive anticipated light pulses during said chosen time duration and therewith allow occurring light pulses and shadowed light pulses to be registered.

Figure 9 shows a more realistic and practical application of the principles for activating a "key" or "button" indicated in Figure 6.

25 Figure 10 illustrates a further practical application of the principles indicated in Figure 6 for activation of another key or button for actuation of another mobile telephone function.

In this case, the display unit 3 with its upper surface 3a is actuated by a surface section of the thumb of the user, namely the thumb surface that faces  
30 inwards towards the palm of the user's hand, said surface therewith covering a large part of the surface section of the upper surface 3a.

In this regard, Figure 9 shows that the surface section of the thumb 90 will shadow the column-related units 5R, 5Q, 5P and 5O and also the row-related units

5'C, -5'E, -5'G, and that the calculating circuit 6c functions to establish the key or button (8) that has been actuated, from this pattern of shadowed light pulses.

In this respect, Figure 10 shows that the surface section of the thumb 90 will shadow the column-related units 5S, 5R and 5Q and also the row-related units 5'D to 5'H, and that the calculating circuit 6e is adapted to establish which button or key (6) has been actuated, from the pattern of shadowed light pulses.

The invention has been described with reference to sending short light pulses in the IR range.

The pulse technique enables stronger or weaker signals to be generated with the aid of a calculating circuit 6f so as to allow energy consumption and power output to be adapted to special ambient circumstances, such as sunlight or darkish surroundings.

Because the light pulse emitting units 4, 4' are ignited during a time slot of short duration, these units can be overloaded for higher light intensities without being destroyed.

In the case of a touch screen 1, constructed in accordance with the invention, it is solely the optical positioning P1 that is measured (no pressure requirement) thereby enabling movement of the thumb along the upper surface 3a of the display unit 3 to be determined in a calculating circuit 6g, such as determination of a sign or activation of a telephone function.

For example, the thumb 90 may be moved in a direction from right to left, so as to activate the "finish/close" function.

The proposed technique provides absolute positioning. This obviates the need to calibrate the unit.

By setting conditions for what shall be estimated as the measured position P1, the technique can be readily applied with a small display (restricted to said surface) as a keyboard.

Because no functional component is required over the display unit 3, there can be used a conventional plastic cover that can be changed when scratched.

The calculating unit 6c need not necessarily be adapted to calculate a centre of the pointer, e.g. of the thumb 90. It may, at times, be convenient to allow the outermost edge or outermost edges of the covered surface section to be read.

As will be evident from Figure 9, orientation of the position P1 can be derived by the units 5'B and 5'H indicating light pulses, whereby the unit 5'E can be considered the most likely in this regard.

The position P1 is derived from the fact that the unit 5O does not indicate light pulses, but that the unit 5N does so.

This is interpreted as meaning that the key or button (8) located at a corresponding height shall be activated.

Correspondingly, Figure 10 shows that the orientation of position P1 can be determined by ascertaining that the row-related units 5'D - 5'H and the column-related units 5S, 5R and 5Q are extinguished.

This can be interpreted by the calculating unit 6c as meaning that the key or button (6) located on a row or at a height shall be activated.

The calculating unit 6 also provides a switch between an inactive state and an active state, wherein the inactive state provides a light pulse frequency of about 10Hz, while the active state provides a time slot of 5 - 20 $\mu$ s.

A time circuit 6h provides an automatic switch between these states or functions, such that a switch to the inactive state is carried out in the event of a waiting time of 2 - 5 sec. after an active state and in the absence of any actuation.

It will be understood that the invention is not restricted to the afore described exemplifying embodiments thereof, and that modifications can be made within the scope of the inventive concept illustrated in the accompanying Claims.

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## CLAIMS

1. A touch screen built onto or resting on a substrate and adapted for a mobile  
5 telephone apparatus or set that includes a display unit (3), **characterised** in that a  
number of light pulse emitting units (4L) and a number of light pulse receiving units  
(5P) are edge-related to said display unit (3), wherein said light pulse emitting  
units (4L) are adapted to send light pulses (40) through a distance over an upper  
10 surface (3a) of said display unit, either sequentially or in groups, through the  
medium of pulse generating circuits, wherein said upper surface is able to present  
in rows and columns graphic symbols, such as letters, numbers and/or correspon-  
ding graphics; in that said light pulse receiving units (5P) are adapted to receive  
said light pulses, either sequentially or in groups, via pulse receiving circuits,  
15 wherein each of the pulse generating circuits and the pulse receiving circuits is  
connected to a calculating unit (6) in a co-ordinated fashion, wherein said  
calculating unit is allocated calculating circuits (6a), which function to evaluate a  
position representative of the geographic position on the upper surface (3a) of the  
display unit, depending on the position of one or more light pulse receiving units  
(5P), which include associated pulse receiving circuits (5aP) and which are co-  
20 ordinate orientated, wherein said pulse receiving circuits are expected to indicate  
the presence of a light pulse but fail to do so, therewith enabling a position  
representative of the geographic position on the upper surface (3a) of the display  
unit at which light pulses are shadowed by a pointer (9) and generate a  
corresponding signal (6d).

25

2. A touch screen according to Claim 1, **characterised** in that the light pulse  
emitting units (4L) and the light pulse receiving units (5P) are orientated adjacent  
said display unit (3) such as to send and receive the light pulses (40a, 40b) in  
directions perpendicular to, or at least generally perpendicular to, a planar surface  
30 (3a) on the display unit (3); and in that mutually opposing light pulse deflecting  
devices (7, 8) are placed close to the display unit (3).

3. A touch screen according to Claim 1, **characterised** in that said substrate is comprised of a circuit board or printed circuit board adapted to the mobile telephone apparatus.
- 5 4. A touch screen according to Claim 1, **characterised** in that said substrate is adapted to carry said light pulse emitting and light pulse receiving units, in addition to carrying said display unit.
- 10 5. A touch screen according to Claim 3, **characterised** in that said light pulse emitting units and said light pulse receiving units are connected to the pulse generating circuits and to the pulse receiving circuits by means of connecting wires or corresponding means.
- 15 6. A touch screen according to Claim 2, **characterised** in that the light pulse deflecting device is comprised of a number of mirror units or a number of mirror surfaces.
- 20 7. A touch screen according to Claim 2 or 6, **characterised** in that said light pulse deflecting device is comprised of four mirror units that have mirror surfaces orientated at 45 degrees in relation to a light pulse propagation direction from said light pulse emitting units.
- 25 8. A touch screen according to Claim 2, **characterised** in that said light pulse deflecting device is comprised of at least one right-angled equilateral three-sided and right-angled prism-formed unit.
- 30 9. A touch screen according to Claim 3, **characterised** in that said circuit board or printed circuit board also includes electronic circuits and components adapted to carry out functions related to the mobile telephone apparatus.
10. A touch screen according to Claim 1, **characterised** in that said light pulse emitting units and said light pulse receiving units are orientated in opposing rows and columns and in mutually perpendicular orientations, wherein the distance

between said units only slightly exceeds the dimensions allocated to said display unit.

5 11. A touch screen according to Claim 3, **characterised** in that said circuit board or printed circuit board including, *inter al*, said display unit, light pulse emitting units, light pulse receiving units and fixed components necessary for said mobile telephone apparatus is adapted to be fastened to a part of the telephone casing.

10 12. A touch screen according to Claim 2, **characterised** in that four light pulse deflecting devices are disposed along the edge of a raised rim for co-action with a replaceable lid or cover, wherein said raised rim co-acts with a transparent protective element, such as a plastic or glass sheet.

15 13. A touch screen according to Claim 1, **characterised** in that in the case of conditions, in which two or more side-related light pulse receiving units and their associated pulse receiving circuits indicate simultaneously the absence of expected light pulses, the calculating unit functions to interpret this information, with the aid of internal calculating circuits, as meaning that the intended geographical position shall be considered to be located between points or the like  
20 representative of said pulse receiving circuits.

25 14. A touch screen according to Claim 13, **characterised** in that when two or more angled and side-related light pulse receiving units, with their associated pulse receiving circuits, simultaneously indicate the absence of light pulses, the calculating unit functions to interpret this information, with the aid of internal calculating circuits, as meaning that the intended two-dimensional geographical position shall be considered to be located between points or the like representative of said pulse receiving circuits.

30 15. A touch screen according to Claim 1, **characterised** in that said light pulse emitting units are activated, via associated pulse generating circuits, sequentially or are selectively positioned in a predetermined order and during selected time slots; and in that the corresponding pulse detecting circuits are also activatable in said predetermined order and during said selected time slots.

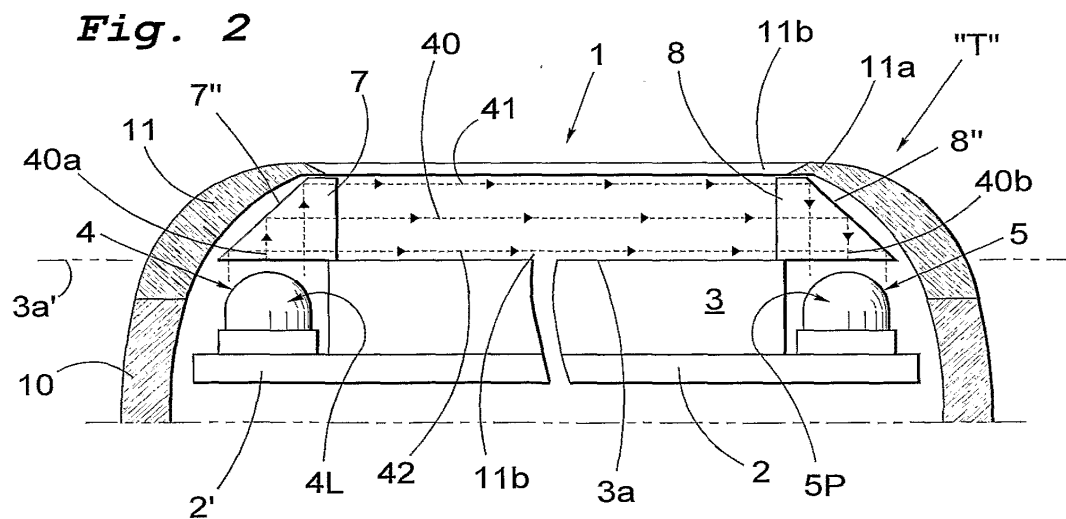
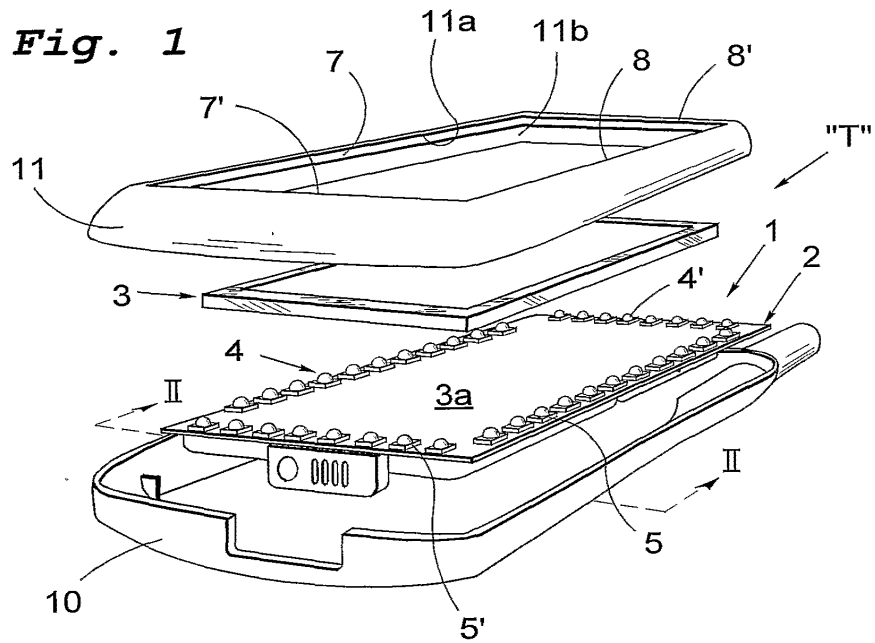


16. A touch screen according to Claim 1, **characterised** in that a plurality of light pulse emitting units are adapted to send light pulses consecutively during a selected time duration and with the aid of said pulse generating circuits; and in that  
5 one light pulse receiving unit is adapted to be activated to receive expected light pulses during said selected time duration and therewith allow registration of occurring light pulses and/or the absence of light pulses via associated pulse receiving circuits.

10 17. A touch screen according to Claim 1, **characterised** in that a plurality of light pulse receiving units function to receive consecutively emitted light pulses from a light pulse emitting unit during a selected time duration; and in that each of said light pulse receiving units is adapted to be activated, via associated receiving  
15 circuits, to receive expected light pulses during said chosen time duration and therewith allow registration of occurring light pulses and/or the absence of light pulses.

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Fig. 3

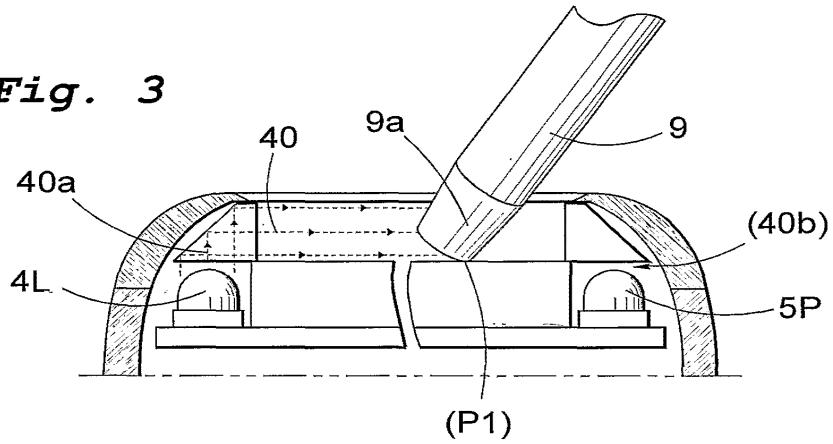


Fig. 4

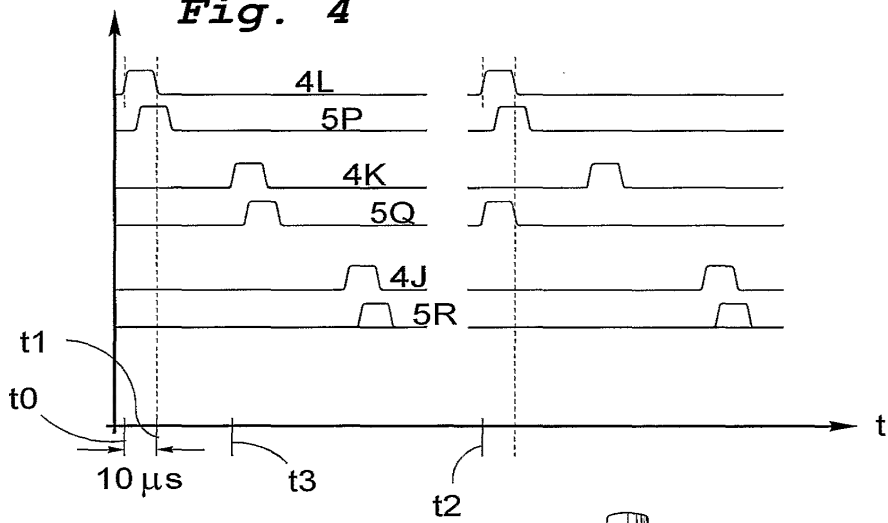
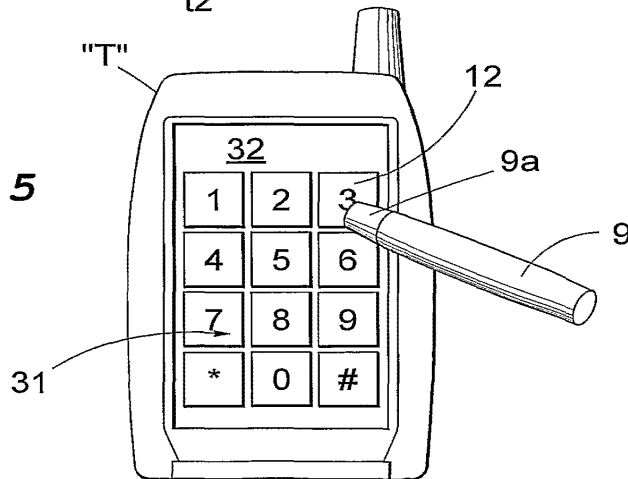


Fig. 5



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Fig. 6

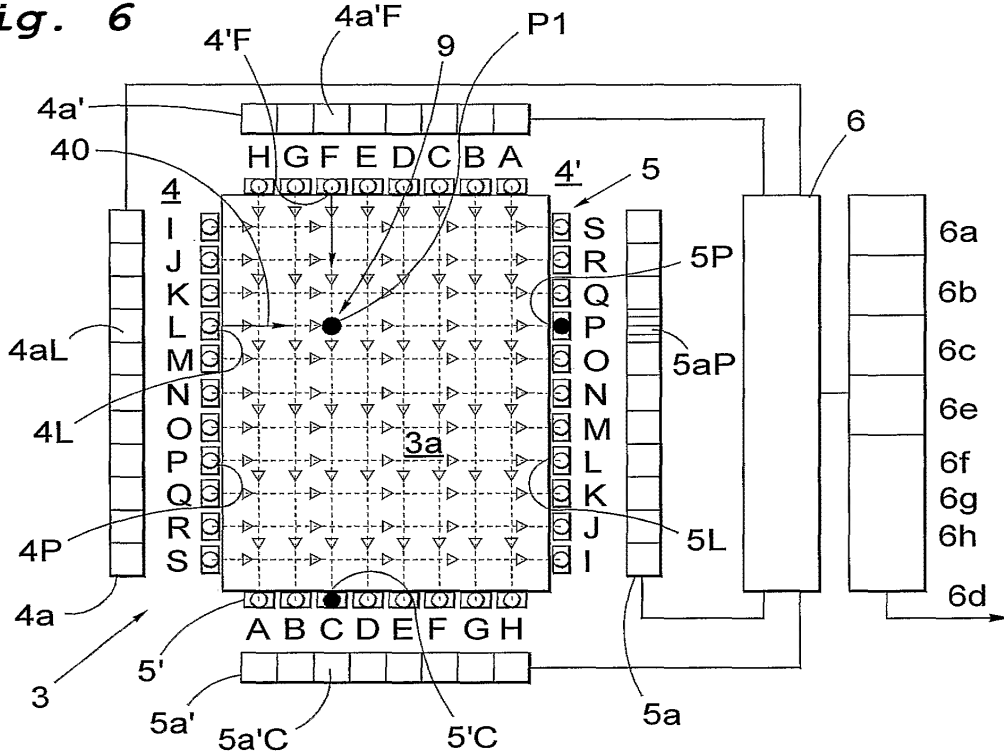
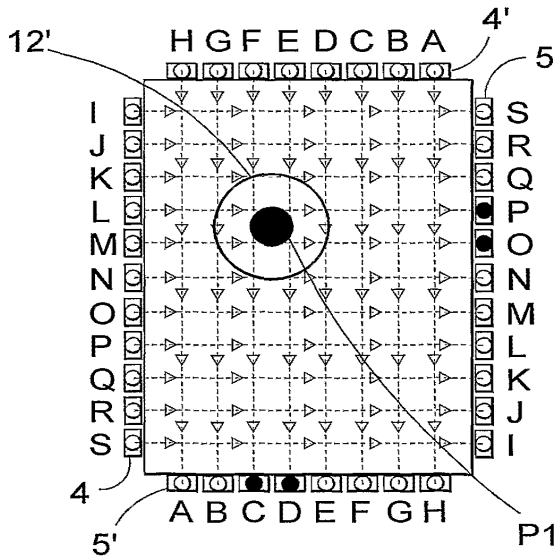


Fig. 7



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Fig. 8

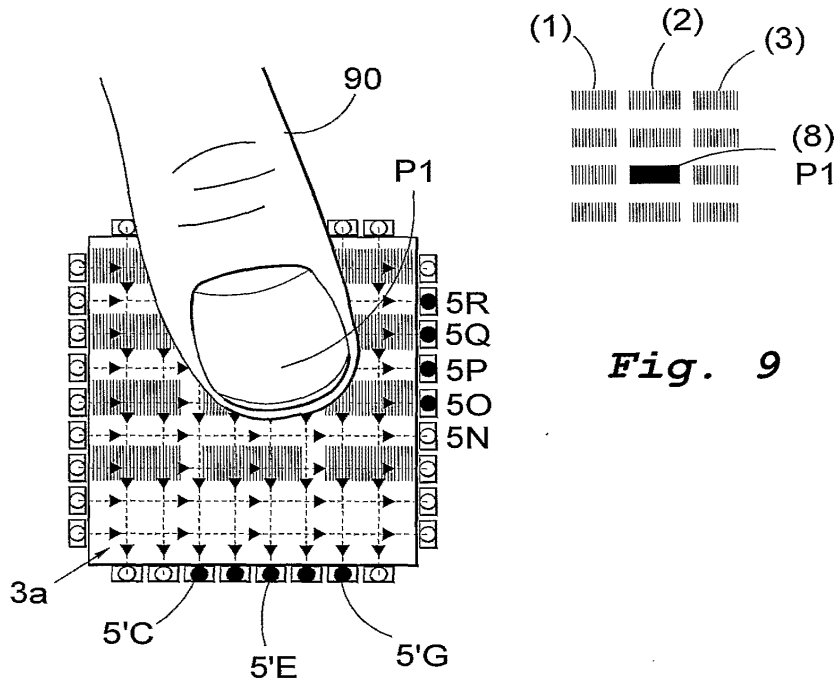
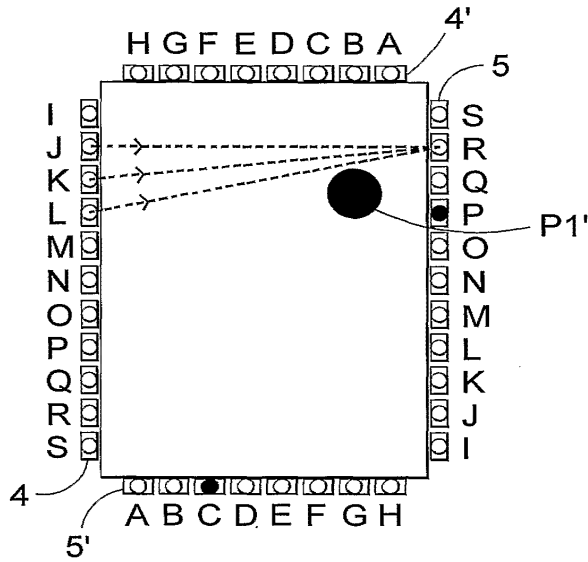


Fig. 9

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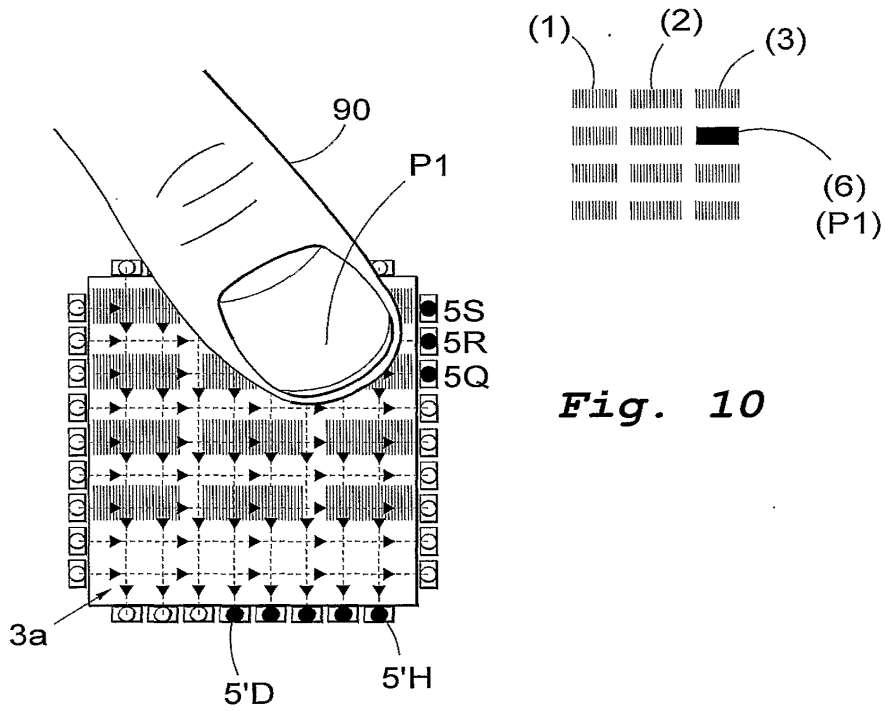


Fig. 10

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## INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER		
IPC7: G06F 3/33, G06K 11/08, H04Q 7/32 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
IPC7: H04Q, G06K, 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, WPI DATA, PAJ, COMPENDEX, INSPEC		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4880969 A (LAWRIE, G.S.), 14 November 1989 (14.11.89), column 2, line 61 - column 3, line 69, figures 3,4	1-13
Y	--	14-17
X	US 4847606 A (BEISWENGER, J.L.), 11 July 1989 (11.07.89), column 1, line 22 - column 4, line 34, figure 2, claim 24, abstract	1,2,4,5,8-13
Y	--	14-17
Y	EP 0330767 A1 (PIONEER ELECTRONIC CORP), 6 Sept 1989 (06.09.89), column 1, line 1 - column 2, line 55, figure 5	14-17
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<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"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</p> <p>"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</p> <p>"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</p> <p>"&amp;" document member of the same patent family</p>		
Date of the actual completion of the international search		Date of mailing of the international search report
26 February 2003		27-02-2003
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86		Authorized officer Marianne Engdah1/LR Telephone No. +46 8 782 25 00

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GOOGLE EXHIBIT 1043

GOOGLE v. NEONODE

IPR2021-01041

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 02/02000

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 0102949 A1 (LI, C.), 11 January 2001 (11.01.01), page 6, line 4 - page 7, line 30  --	1-17
A	US 5579035 A (BEISWENGER, J.L.), 26 November 1996 (26.11.96), column 7, line 8 - line 21  -- -----	1-17

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

30/12/02

International application No.

PCT/SE 02/02000

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US 4847606 A	11/07/89	AT 102720 T	15/03/94
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- (71) Applicant (for all designated States except US): APPLE COMPUTER, INC. [US/US]; 1 Infinite Loop, Cupertino, California 95014 (US).
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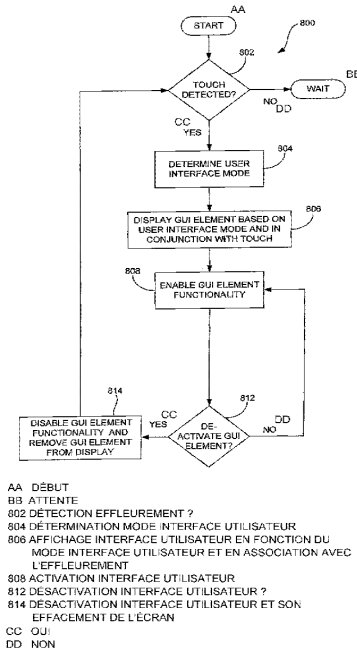
- HUPPI, Brian, Q. [US/US]; 101#2 28th Street, San Francisco, California 94131 (US). KERR, Duncan, Robert [GB/US]; 2600 18th Street, #15, San Francisco, California 94110 (US). CHAUDHRI, Imran [US/US]; 2713 Sacramento Street, No. 3, San Francisco, California 94115 (US). CHRISTIE, Greg [US/US]; 1112 Kelly Drive, San Jose, California 95129 (US). IVE, Jonathan, P. [GB/US]; 196 Twin Peaks Blvd, San Francisco, California 94114 (US). ORDING, Bas [NL/US]; 1119 Dolores Street, #4, San Francisco, California 94110 (US).
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[Continued on next page]

(54) Title: MODE-BASED GRAPHICAL USER INTERFACES FOR TOUCH SENSITIVE INPUT DEVICES

(57) Abstract: A user interface method is disclosed. The method includes detecting a touch and then determining a user interface mode when a touch is detected. The method further includes activating one or more GUI elements based on the user interface mode and in response to the detected touch.

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SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC,  
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**MODE-BASED GRAPHICAL USER INTERFACES FOR TOUCH  
SENSITIVE INPUT DEVICES**

**BACKGROUND OF THE INVENTION**

**Field of the Invention**

[0001] The present invention relates generally to gesturing associated with touch sensitive devices.

**Description of the Related Art**

[0002] There exist today many styles of input devices for performing operations in a computer system. The operations generally correspond to moving a cursor and making selections on a display screen. The operations may also include paging, scrolling, panning, zooming, etc. By way of example, the input devices may include buttons, switches, keyboards, mice, trackballs, touch pads, joy sticks, touch screens and the like. Each of these devices has advantages and disadvantages that are taken into account when designing the computer system.

[0003] Buttons and switches are generally mechanical in nature and provide limited control with regards to the movement of the cursor and making selections. For example, they are generally dedicated to moving the cursor in a specific direction (e.g., arrow keys) or to making specific selections (e.g., enter, delete, number, etc.).

[0004] In mice, the movement of the input pointer corresponds to the relative movements of the mouse as the user moves the mouse along a surface. In trackballs, the movement of the input pointer corresponds to the relative movements of a ball as the user moves the ball within a housing. Mice and trackballs also include one or more buttons for making selections. Mice may also include scroll wheels that allow a user to move through the GUI by simply rolling the wheel forward or backward.

[0005] With touch pads, the movement of the input pointer corresponds to the relative movements of the user's finger (or stylus) as the finger is moved along a surface of the touch pad. Touch screens, on the other hand, are a type of display screen that has a touch-sensitive transparent panel covering the screen. When using a touch screen, a user makes a selection on the display screen by pointing directly to GUI objects on the screen (usually with a stylus or finger).

[0006] In order to provide additionally functionality, gestures have been implemented with some of these input devices. By way of example, in touch pads, selections may be made when one or more taps are detected on the surface of the touch pad. In some cases, any portion of the touch pad may be tapped, and in other cases a dedicated portion of the touch pad may be tapped. In addition to selections, scrolling may be initiated by using finger motion at the edge of the touch pad.

[0007] U.S. Patent 5,612,719 and 5,590,219, assigned to Apple Computer, Inc. describe some other uses of gesturing. U.S. Patent 5,612, 719 discloses an onscreen button that is responsive to at least two different button gestures made on the screen on or near the button. U.S. Patent 5,590, 219 discloses a method for recognizing an ellipse-type gesture input on a display screen of a computer system.

[0008] In recent times, more advanced gestures have been implemented. For example, scrolling may be initiated by placing four fingers on the touch pad so that the scrolling gesture is recognized and thereafter moving these fingers on the touch pad to perform scrolling events. The methods for implementing these advanced gestures, however, has several drawbacks. By way of example, once the gesture is set, it cannot be changed until the user resets the gesture state. In touch pads, for example, if four fingers equals scrolling, and the user puts a thumb down after the four fingers are recognized, any action associated with the new gesture including four fingers and the thumb will not be performed until the entire hand is lifted off the touch pad and put back down again (e.g., reset). Simply put, the user cannot change gesture states midstream. Along a similar vein, only one gesture may be performed at any given time. That is, multiple gestures cannot be performed simultaneously.

[0009] Based on the above, there is a need for improvements in the way gestures are performed on touch sensitive devices.

#### **SUMMARY OF THE INVENTION**

[0010] The invention pertains to gestures and methods of implementing gestures with touch sensitive devices. Examples of touch sensitive devices include touch screens and touch pads. The invention also pertains to user interfaces and methods of implementing user interfaces with displays.

[0011] The invention can be implemented in numerous ways, including as a method, graphical user interface, computing device, or a computer readable medium. Several embodiments of the invention are discussed below.

[0012] The invention relates, in one embodiment, to a user interface method. The method includes detecting a touch. The method also includes determining a user interface mode when a touch is detected. The method further includes activating one or more GUI elements based on the user interface mode and in response to the detected touch.

[0013] The invention relates, in one embodiment, to a user interface method. The method includes displaying a group of media items. The method also includes detecting a touch over the group of media items that are displayed. The method further includes activating a virtual scroll wheel when a touch is detected over the displayed media items. The activation of the virtual scroll wheel includes displaying and enabling the functionality of the virtual scroll wheel, the virtual scroll wheel providing a touch region where a user swirls their finger in order to traverse through the group of media items. The method additionally includes determining if a touch event is performed relative to the touch region of the virtual scroll wheel. Moreover, the method includes scrolling through the group of media items when a scrolling touch event is performed.

[0014] The invention relates, in one embodiment, to a method performed on a user operated electronic device having a display and a touch screen. The method includes determining if a touch is detected. The method also includes monitoring and analyzing the current operating conditions when a touch is detected. The method also includes activating a first GUI element for a first set of operating conditions. The method additionally includes activating a second GUI element for a second set of operating conditions.

[0015] The invention relates, in one embodiment, to a method performed on a computing device having a display and a touch sensing input device. The method includes sensing touches. The method also includes displaying and enabling a GUI element when a touch is detected. The GUI element is based on at least one of the following: (a) the application currently running on the computing device; (b) the current state of the application; and/or (c) one or more characteristics of the touch. The characteristics include, for example, touch location, touch ID, number of touches, and touch motion. The method further includes disabling and removing the GUI element from display when one of the following events occurs: (a) the touch is no longer detected, (b) a touch has not been detected for a preset amount of time, (c) a

certain amount of time has gone by since the step of displaying and enabling, (d) a user selection.

[0016] The invention relates, in another embodiment, to a computing system. The computing system includes a display device configured to display a graphical user interface. The system also includes a touch screen positioned over the display device. The touch screen is configured to detect touches that occur over the display device. The system further includes a processor operatively coupled to the display device and the touch screen. The processor instructs the display device to display one or more GUI elements in response to a touch, and performs actions associated with the GUI element when touch events are detected relative to the displayed GUI elements.

[0017] The invention relates, in another embodiment, to a computing device. The computing device includes a processor. The computing device also includes a touch screen capable of sensing touch events. The computing device further includes a display configured to simultaneously display a plurality of media items and a virtual scroll wheel. The virtual scroll wheel provides a region where touch events are performed in order to implement a scrolling action. The scrolling action allows a user to traverse through the plurality of media items.

[0018] Other aspects and advantages of the invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

The invention will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

Fig. 1 is a block diagram of a computer system, in accordance with one embodiment of the present invention.

Fig. 2 is a multipoint processing method, in accordance with one embodiment of the present invention.

Figs. 3A and B illustrate an image, in accordance with one embodiment of the present invention.

Fig. 4 illustrates a group of features, in accordance with one embodiment of the present invention.

Fig. 5 is a parameter calculation method, in accordance with one embodiment of the present invention.

Figs. 6A-6G illustrate a rotate gesture, in accordance with one embodiment of the present invention.

Fig. 7 is a diagram of a touch-based method, in accordance with one embodiment of the present invention.

Fig. 8 is a diagram of a touch-based method, in accordance with one embodiment of the present invention.

Fig. 9 is a diagram of a touch-based method, in accordance with one embodiment of the present invention.

Fig. 10 is a diagram of a zoom gesture method, in accordance with one embodiment of the present invention.

Figs. 11A-11H illustrates a zooming sequence, in accordance with one embodiment of the present invention.

Fig. 12 is a diagram of a pan method, in accordance with one embodiment of the present invention.

Figs. 13A-13D illustrate a panning sequence, in accordance with one embodiment of the present invention.

Fig. 14 is a diagram of a rotate method, in accordance with one embodiment of the present invention.

Figs. 15A-15C illustrate a rotating sequence, in accordance with one embodiment of the present invention.

Fig. 16 is a diagram of a GUI operational method, in accordance with one embodiment of the present invention.

Figs. 17A-17E illustrate a floating control sequence, in accordance with one embodiment of the present invention.

Fig. 18 is a diagram of a GUI operational method, in accordance with one embodiment of the present invention.

Figs. 19A-19D illustrate a zooming target sequence, in accordance with one embodiment of the present invention.

Fig. 20 is a diagram of a GUI operational method, in accordance with one embodiment of the present invention.

Figs. 21A-21D illustrate a page turning sequence, in accordance with one embodiment of the present invention.

Fig. 22 is a diagram of a GUI operational method, in accordance with one embodiment of the present invention.



Figs. 23A-23D illustrate an inertia sequence, in accordance with one embodiment of the present invention.

Fig. 24 is a diagram of a GUI operational method, in accordance with one embodiment of the present invention.

Figs. 25A-25D illustrates a keyboard sequence, in accordance with one embodiment of the present invention.

Fig. 26 is a diagram of a GUI operational method, in accordance with one embodiment of the present invention.

Figs. 27A-27D illustrates a scroll wheel sequence, in accordance with one embodiment of the present invention.

Fig. 28 is user interface method, in accordance with one embodiment of the present invention.

Figs. 29A-29D illustrate a transition effect, in accordance with one embodiment of the present invention.

Figs. 30A-30D illustrate a transition effect, in accordance with another embodiment of the present invention.

Figs. 31A-31D illustrate a transition effect, in accordance with another embodiment of the present invention.

Fig. 32 is a determination method, in accordance with one embodiment of the present invention.

Fig. 33 is a user interface method, in accordance with one embodiment of the present invention.

Fig. 34A-34F illustrates a sequence associated with the method shown in Fig. 33, in accordance with one embodiment of the present invention.

Fig. 35A-35F illustrates a sequence associated with the method shown in Fig. 33, in accordance with one embodiment of the present invention.

Figs. 36A-36C illustrate a user interface sequence, in accordance with one embodiment of the present invention.

Fig. 37 is a user interface method, in accordance with one embodiment of the present invention

Figs. 38A-38J illustrate a user interface sequence, in accordance with one embodiment of the present invention.

**DETAILED DESCRIPTION OF THE INVENTION**

[0019] The invention pertains to gestures and methods of implementing gestures with touch sensitive devices. Examples of touch sensitive devices include touch screens and touch pads. The invention also pertains to user interfaces and methods of implementing user interfaces with displays. One aspect of the invention relates to determining a user interface mode based on one or more conditions. Another aspect of the invention relates to activating one or more GUI elements based on the user interface mode (e.g., displaying a GUI element). Another aspect of the invention relates to a virtual scroll wheel.

[0020] These and other aspects of the invention are discussed below with reference to Figs. 1-38J. However, those skilled in the art will readily appreciate that the detailed description given herein with respect to these figures is for explanatory purposes as the invention extends beyond these limited embodiments.

[0021] Fig. 1 is a block diagram of an exemplary computer system 50, in accordance with one embodiment of the present invention. The computer system 50 may correspond to a personal computer system, such as a desktops, laptops, tablets or handheld computer. The computer system may also correspond to a computing device, such as a cell phone, PDA, dedicated media player, consumer electronic device, and the like.

[0022] The exemplary computer system 50 shown in Fig. 1 includes a processor 56 configured to execute instructions and to carry out operations associated with the computer system 50. For example, using instructions retrieved for example from memory, the processor 56 may control the reception and manipulation of input and output data between components of the computing system 50. The processor 56 can be implemented on a single-chip, multiple chips or multiple electrical components. For example, various architectures can be used for the processor 56, including *dedicated or embedded processor, single purpose processor, controller, ASIC, and so forth.*

[0023] In most cases, the processor 56 together with an operating system operates to execute computer code and produce and use data. Operating systems are generally well known and will not be described in greater detail. By way of example, the operating system may correspond to OS/2, DOS, Unix, Linux, Palm OS, and the like. The operating system can also be a special purpose operating system, such as may be used for limited purpose appliance-type computing devices. The operating system,

other computer code and data may reside within a memory block 58 that is operatively coupled to the processor 56. Memory block 58 generally provides a place to store computer code and data that are used by the computer system 50. By way of example, the memory block 58 may include Read-Only Memory (ROM), Random-Access Memory (RAM), hard disk drive and/or the like. The information could also reside on a removable storage medium and loaded or installed onto the computer system 50 when needed. Removable storage mediums include, for example, CD-ROM, PC-CARD, memory card, floppy disk, magnetic tape, and a network component.

[0024] The computer system 50 also includes a display device 68 that is operatively coupled to the processor 56. The display device 68 may be a liquid crystal display (LCD) (e.g., active matrix, passive matrix and the like). Alternatively, the display device 68 may be a monitor such as a monochrome display, color graphics adapter (CGA) display, enhanced graphics adapter (EGA) display, variable-graphics-array (VGA) display, super VGA display, cathode ray tube (CRT), and the like. The display device may also correspond to a plasma display or a display implemented with electronic inks.

[0025] The display device 68 is generally configured to display a graphical user interface (GUI) 69 that provides an easy to use interface between a user of the computer system and the operating system or application running thereon. Generally speaking, the GUI 69 represents, programs, files and operational options with graphical images. The graphical images may include windows, fields, dialog boxes, menus, icons, buttons, cursors, scroll bars, etc. Such images may be arranged in predefined layouts, or may be created dynamically to serve the specific actions being taken by a user. During operation, the user can select and activate various graphical images in order to initiate functions and tasks associated therewith. By way of example, a user may select a button that opens, closes, minimizes, or maximizes a window, or an icon that launches a particular program. The GUI 69 can additionally or alternatively display information, such as non interactive text and graphics, for the user on the display device 68.

[0026] The computer system 50 also includes an input device 70 that is operatively coupled to the processor 56. The input device 70 is configured to transfer data from the outside world into the computer system 50. The input device 70 may for example be used to perform tracking and to make selections with respect to the GUI 69 on the

display 68. The input device 70 may also be used to issue commands in the computer system 50. The input device 70 may include a touch sensing device configured to receive input from a user's touch and to send this information to the processor 56. By way of example, the touch-sensing device may correspond to a touchpad or a touch screen. In many cases, the touch-sensing device recognizes touches, as well as the position and magnitude of touches on a touch sensitive surface. The touch sensing means reports the touches to the processor 56 and the processor 56 interprets the touches in accordance with its programming. For example, the processor 56 may initiate a task in accordance with a particular touch. A dedicated processor can be used to process touches locally and reduce demand for the main processor of the computer system. The touch sensing device may be based on sensing technologies including but not limited to capacitive sensing, resistive sensing, surface acoustic wave sensing, pressure sensing, optical sensing, and/or the like. Furthermore, the touch sensing means may be based on single point sensing or multipoint sensing. Single point sensing is capable of only distinguishing a single touch, while multipoint sensing is capable of distinguishing multiple touches that occur at the same time.

[0027] The input device 70 may be a touch screen that is positioned over or in front of the display 68. The touch screen 70 may be integrated with the display device 68 or it may be a separate component. The touch screen 70 has several advantages over other input technologies such as touchpads, mice, etc. For one, the touch screen 70 is positioned in front of the display 68 and therefore the user can manipulate the GUI 69 directly. For example, the user can simply place their finger over an object to be controlled. In touch pads, there is no one-to-one relationship such as this. With touchpads, the touchpad is placed away from the display typically in a different plane. For example, the display is typically located in a vertical plane and the touchpad is typically located in a horizontal plane. This makes its use less intuitive, and therefore more difficult when compared to touch screens. In addition to being a touch screen, the input device 70 can be a multipoint input device. Multipoint input devices have advantages over conventional singlepoint devices in that they can distinguish more than one object (finger). Singlepoint devices are simply incapable of distinguishing multiple objects. By way of example, a multipoint touch screen, which can be used herein, is shown and described in greater detail in copending and commonly assigned U.S. Patent Application No.: 10/840,862, which is hereby incorporated herein by reference.

[0028] The computer system 50 also includes capabilities for coupling to one or more I/O devices 80. By way of example, the I/O devices 80 may correspond to keyboards, printers, scanners, cameras, speakers, and/or the like. The I/O devices 80 may be integrated with the computer system 50 or they may be separate components (e.g., peripheral devices). In some cases, the I/O devices 80 may be connected to the computer system 50 through wired connections (e.g., cables/ports). In other cases, the I/O devices 80 may be connected to the computer system 80 through wireless connections. By way of example, the data link may correspond to PS/2, USB, IR, RF, Bluetooth or the like.

[0029] In accordance with one embodiment of the present invention, the computer system 50 is designed to recognize gestures 85 applied to the input device 70 and to control aspects of the computer system 50 based on the gestures 85. In some cases, a gesture is defined as a stylized interaction with an input device that is mapped to one or more specific computing operations. The gestures 85 may be made through various hand, and more particularly finger motions. Alternatively or additionally, the gestures may be made with a stylus. In all of these cases, the input device 70 receives the gestures 85 and the processor 56 executes instructions to carry out operations associated with the gestures 85. In addition, the memory block 58 may include a gesture operational program 88, which may be part of the operating system or a separate application. The gestural operation program 88 generally includes a set of instructions that recognizes the occurrence of gestures 85 and informs one or more software agents of the gestures 85 and/or what action(s) to take in response to the gestures 85.

[0030] When a user performs one or more gestures, the input device 70 relays gesture information to the processor 56. Using instructions from memory 58, and more particularly, the gestural operational program 88, the processor 56 interprets the gestures 85 and controls different components of the computer system 50, such as memory 58, a display 68 and I/O devices 80, based on the gestures 85. The gestures 85 may be identified as commands for performing actions in applications stored in the memory 58, modifying GUI objects shown on the display 68, modifying data stored in memory 58, and/or for performing actions in I/O devices 80. By way of example, the commands may be associated with zooming, panning, scrolling, paging, rotating, sizing, and the like. As further examples, the commands may also be associated with launching a particular program, opening a file or document, viewing a menu, making

a selection, executing instructions, logging onto the computer system, permitting authorized individuals access to restricted areas of the computer system, loading a user profile associated with a user's preferred arrangement of the computer desktop, and/or the like.

[0031] A wide range of different gestures can be utilized. By way of example, the gestures may be single point or multipoint gestures; static or dynamic gestures; continuous or segmented gestures; and/or the like. Single point gestures are those gestures that are performed with a single contact point, e.g., the gesture is performed with a single touch as for example from a single finger, a palm or a stylus. Multipoint gestures are those gestures that can be performed with multiple points, e.g., the gesture is performed with multiple touches as for example from multiple fingers, fingers and palms, a finger and a stylus, multiple styli and/or any combination thereof. Static gestures are those gestures that do not include motion, and dynamic gestures are those gestures that do include motion. Continuous gestures are those gestures that are performed in a single stroke, and segmented gestures are those gestures that are performed in a sequence of distinct steps or strokes.

[0032] In one embodiment, the computer system 50 is configured to register multiple gestures at the same time, i.e., multiple gestures can be performed simultaneously. By way of example, a zoom gesture may be performed at the same time as a rotate gesture, or a rotate gesture may be performed at the same time as a pan gesture. In one particular implementation, zoom, rotate and pan gestures can all occur simultaneously in order to perform zooming, rotating and panning at the same time.

[0033] In another embodiment, the system is configured to immediately recognize the gestures so that actions associated with the gestures can be implemented at the same time as the gesture, i.e., the gesture and action simultaneously occur side by side rather than being a two-step process. By way of example, during a scrolling gesture, the screen moves with the finger motion.

[0034] In another embodiment, an object presented on a display 68 continuously follows the gesture occurring on a touch screen. There is a one to one relationship between the gesture being performed and the objects shown on the display 68. For example, as the gesture is performed, modifications simultaneously occur to the objects located underneath the gesture. For example, during a zooming gesture, the fingers may spread apart or close together in order to cause the object shown on the display 68 to zoom in during the spreading and zoom out during the closing. During

this operation, the computer system 50 recognizes the user input as a zoom gesture, determines what action should be taken, and outputs control data to the appropriate device, in this case the display 68.

[0035] In another embodiment, the computer system 50 provides region sensitivity where gestures mean different things when implemented over different areas of the input device 68. For example, a rotation gesture over a volume knob causes volume increase/decrease, whereas a rotation gesture over a photo causes rotation of the photo.

[0036] In another embodiment, the number of fingers in contact with the touch screen may indicate an input mode. For example, a single touch as for example by a single finger may indicate the desire to perform tracking, i.e., pointer or cursor movements, or selections, whereas multiple touches as for example by a group of fingers may indicate the desire to perform gesturing. The number of fingers for implementing gesturing may be widely varied. By way of example, two fingers may indicate a first gesture mode, three fingers may indicate a third gesture mode, etc. Alternatively, any number of fingers, i.e., more than one, may be used for the same gesture mode, which can include one or more gesture controls. The orientation of the fingers may similarly be used to denote the desired mode. The profile of the finger may be detected to permit different modal operations based on whether the user has used his thumb or index finger, for example.

[0037] In another embodiment, an input can be changed while making a continuous stroke on the input device without stopping the stroke (e.g., lifting off the touch sensitive surface). In one implementation, the user can switch from a tracking (or selection) mode to gesturing mode while a stroke is being made. For example, tracking or selections may be associated with a single finger and gesturing may be associated with multiple fingers; therefore, the user can toggle between tracking/selection and gesturing by picking up and placing down a second finger on the touch screen. In another implementation, the user can switch from one gesture mode to another gesture mode while a stroke is being made. For example, zooming may be associated with spreading a pair of fingers and rotating may be associated with rotating the pair of fingers; therefore, the user can toggle between zooming and rotating by alternating the movement of their fingers between spreading and rotating. In yet another implementation, the number of gesture inputs can be changed while a stroke is being made (e.g., added or subtracted). For example, during zooming where

the fingers are spread apart, the user may further rotate their fingers to initiate both zooming and rotation. Furthermore during zooming and rotation, the user can stop spreading their fingers so that only rotation occurs. In other words, the gesture inputs can be continuously input, either simultaneously or consecutively.

**[0038]** In one particular embodiment, a single finger initiates tracking (or selection) and two or more fingers in close proximity to one another initiates scrolling or panning. Two fingers is generally preferred so as to provide easy toggling between one and two fingers, i.e., the user can switch between modes very easily by simply picking or placing an additional finger. This has the advantage of being more intuitive than other forms of mode toggling. During tracking, cursor movement is controlled by the user moving a single finger on the touch sensitive surface of a touch sensing device. The sensor arrangement of the touch sensing device interprets the finger motion and generates signals for producing corresponding movement of the cursor on the display. During scrolling, screen movement is controlled by the user moving dual fingers on the touch sensitive surface of the touch sensing device. When the combined fingers are moved in the vertical direction, the motion is interpreted as a vertical scroll event, and when the combined fingers are moved in the horizontal direction, the motion is interpreted as a horizontal scroll event. The same can be said for panning although panning can occur in all directions rather than just the horizontal and vertical directions.

**[0039]** The term “scrolling” as used herein generally pertains to moving displayed data or images (e.g., text or graphics) across a viewing area on a display screen so that a new set of data (e.g., line of text or graphics) is brought into view in the viewing area. In most cases, once the viewing area is full, each new set of data appears at the edge of the viewing area and all other sets of data move over one position. That is, the new set of data appears for each set of data that moves out of the viewing area. In essence, the scrolling function allows a user to view consecutive sets of data currently outside of the viewing area. The viewing area may be the entire viewing area of the display screen or it may only be a portion of the display screen (e.g., a window frame).

**[0040]** As mentioned above, scrolling may be implemented vertically (up or down) or horizontally (left or right). In the case of vertical scrolling, when a user scrolls down, each new set of 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. Similarly, when a user scrolls up, each new set of data appears at the top of the viewing area and all other sets of data move down one position. If the viewing area is full, the bottom set of data moves out of the viewing area.

[0041] By way of example, the display screen, during operation, may display a list of media items (e.g., songs). A user is able to linearly scroll through the list of media items by moving his or her finger across a touch screen. As the finger moves across the touch screen, the displayed items from the list of media items are varied such that the user is able to effectively scroll through the list of media items. In most cases, the user is able to accelerate their traversal of the list of media items by moving his or her finger at greater speeds. Some embodiments, which may be related to the above example, are described in greater detail below. See for example Figs. 6, 23, 27.

[0042] Fig. 2 is a multipoint processing method 100, in accordance with one embodiment of the present invention. The multipoint processing method 100 may for example be performed in the system shown in Fig. 1. The multipoint processing method 100 generally begins at block 102 where images are read from a multipoint input device, and more particularly a multipoint touch screen. By way of example, the multipoint touch screen may generally correspond to the multipoint touch screen disclosed in copending U.S. Patent Application No.: 10/840,862, which is hereby incorporated herein by reference. Although the term "image" is used it should be noted that the data may come in other forms. In most cases, the image read from the touch screen provides magnitude ( $Z$ ) as a function of position ( $x$  and  $y$ ) for each sensing point or pixel of the touch screen. The magnitude may, for example, be reflect the capacitance measured at each point.

[0043] Following block 102, multipoint processing method 100 proceeds to block 104 where the image is converted into a collection or list of features. Each feature represents a distinct input such as a touch. In most cases, each feature includes its own unique identifier (ID),  $x$  coordinate,  $y$  coordinate,  $Z$  magnitude, angle  $\theta$ , area  $A$ , and the like. By way of example, Figs. 3A and 3B illustrate a particular image 120 in time. In image 120, there are two features 122 based on two distinct touches. The touches may for example be formed from a pair of fingers touching the touch screen. As shown, each feature 122 includes unique identifier (ID),  $x$  coordinate,  $y$  coordinate,  $Z$  magnitude, angle  $\theta$ , and area  $A$ . More particularly, the first feature 122A is represented by  $ID_1$ ,  $x_1$ ,  $y_1$ ,  $Z_1$ ,  $\theta_1$ ,  $A_1$  and the second feature 122B is

represented by  $ID_2, x_2, y_2, Z_2, \theta_2, A_2$ . This data may be outputted for example using a multitouch protocol.

[0044] The conversion from data or images to features may be accomplished using methods described in copending U.S. Patent Application No.: 10/840,862 which is hereby incorporated herein by reference. As disclosed therein, the raw data is received. The raw data is typically in a digitized form, and includes values for each node of the touch screen. The values may be between 0 and 256 where 0 equates to no touch pressure and 256 equates to full touch pressure. Thereafter, the raw data is filtered to reduce noise. Once filtered, gradient data, which indicates the topology of each group of connected points, is generated. Thereafter, the boundaries for touch regions are calculated based on the gradient data, i.e., a determination is made as to which points are grouped together to form each touch region. By way of example, a watershed algorithm may be used. Once the boundaries are determined, the data for each of the touch regions are calculated (e.g.,  $x, y, Z, \theta, A$ ).

[0045] Following block 104, multipoint processing method 100 proceeds to block 106 where feature classification and groupings are performed. During classification, the identity of each of the features is determined. For example, the features may be classified as a particular finger, thumb, palm or other object. Once classified, the features may be grouped. The manner in which the groups are formed can widely varied. In most cases, the features are grouped based on some criteria (e.g., they carry a similar attribute). For example, the two features shown in Figs. 3A and 3B may be grouped together because each of these features is located in proximity to each other or because they are from the same hand. The grouping may include some level of filtering to filter out features that are not part of the touch event. In filtering, one or more features may be rejected because they either meet some predefined criteria or because they do not meet some criteria. By way of example, one of the features may be classified as a thumb located at the edge of a tablet PC. Because the thumb is being used to hold the device rather than being used to perform a task, the feature generated therefrom is rejected, i.e., is not considered part of the touch event being processed.

[0046] Following block 106, the multipoint processing method 100 proceeds to block 108 where key parameters for the feature groups are calculated. The key parameters may include distance between features, x/y centroid of all features, feature rotation, total pressure of the group (e.g., pressure at centroid), and the like. As shown in Fig.

4, the calculation may include finding the centroid C, drawing a virtual line 130 to each feature from the centroid C, defining the distance D for each virtual line ( $D_1$  and  $D_2$ ), and then averaging the distances  $D_1$  and  $D_2$ . Once the parameters are calculated, the parameter values are reported. The parameter values are typically reported with a group identifier (GID) and number of features within each group (in this case three). In most cases, both initial and current parameter values are reported. The initial parameter values may be based on set down, i.e., when the user sets their fingers on the touch screen, and the current values may be based on any point within a stroke occurring after set down. As should be appreciated, blocks 102-108 are repetitively performed during a user stroke thereby generating a plurality of sequentially configured signals. The initial and current parameters can be compared in later steps to perform actions in the system.

[0047] Following block 108, the process flow proceeds to block 110 where the group is or associated to a user interface (UI) element. UI elements are buttons boxes, lists, sliders, wheels, knobs, etc. Each UI element represents a component or control of the user interface. The application behind the UI element(s) has access to the parameter data calculated in block 108. In one implementation, the application ranks the relevance of the touch data to the UI element corresponding there to. The ranking may be based on some predetermine criteria. The ranking may include producing a figure of merit, and whichever UI element has the highest figure of merit, giving it sole access to the group. There may even be some degree of hysteresis as well (once one of the UI elements claims control of that group, the group sticks with the UI element until another UI element has a much higher ranking). By way of example, the ranking may include determining proximity of the centroid (or features) to the GUI object associated with the UI element.

[0048] Following block 110, the multipoint processing method 100 proceeds to blocks 112 and 114. The blocks 112 and 114 can be performed approximately at the same time. From the user perspective, in one embodiment, the blocks 112 and 114 appear to be performed concurrently. In block 112, one or more actions are performed based on differences between initial and current parameter values as well as the UI element to which they are associated. In block 114, user feedback pertaining to the one ore more action being performed is provided. By way of example, user feedback may include display, audio, tactile feedback and/or the like.

[0049] Fig. 5 is a parameter calculation method 150, in accordance with one embodiment of the present invention. The parameter calculation method 150 may, for example, correspond to block 108 shown in Fig. 2. The parameter calculation method 150 generally begins at block 152 where a group of features is received. Following block 152, the parameter calculation method 150 proceeds to block 154 where a determination is made as to whether or not the number of features in the group of features has changed. For example, the number of features may have changed due to the user picking up or placing an additional finger. Different fingers may be needed to perform different controls (e.g., tracking, gesturing). If the number of features has changed, the parameter calculation method 150 proceeds to block 156 where the initial parameter values are calculated. If the number stays the same, the parameter calculation method 150 proceeds to block 158 where the current parameter values are calculated. Thereafter, the parameter calculation method 150 proceeds to block 160 where the initial and current parameter values are reported. By way of example, the initial parameter values may contain the average initial distance between points (or Distance (AVG) initial) and the current parameter values may contain the average current distance between points (or Distance (AVG) current). These may be compared in subsequent steps in order to control various aspects of a computer system.

[0050] The above methods and techniques can be used to implement any number of GUI interface objects and actions. For example, gestures can be created to detect and effect a user command to resize a window, scroll a display, rotate an object, zoom in or out of a displayed view, delete or insert text or other objects, etc. Gestures can also be used to invoke and manipulate virtual control interfaces, such as volume knobs, switches, sliders, handles, knobs, doors, and other widgets that may be created to facilitate human interaction with the computing system.

[0051] To cite an example using the above methodologies, and referring to Figs. 6A-6G, a rotate gesture for controlling a virtual volume knob 170 on a GUI interface 172 of a display 174 of a tablet PC 175 will be described. In order to actuate the knob 170, the user places their fingers 176 on a multipoint touch screen 178. The virtual control knob may already be displayed, or the particular number, orientation or profile of the fingers at set down, or the movement of the fingers immediately thereafter, or some combination of these and other characteristics of the user's interaction may invoke the virtual control knob to be displayed. In either case, the

computing system associates a finger group to the virtual control knob and makes a determination that the user intends to use the virtual volume knob. This association may also be based in part on the mode or current state of the computing device at the time of the input. For example, the same gesture may be interpreted alternatively as a volume knob gesture if a song is currently playing on the computing device, or as a rotate command if an object editing application is being executed. Other user feedback may be provided, including for example audible or tactile feedback.

**[0052]** Once knob 170 is displayed as shown in Fig. 6A, the user's fingers 176 can be positioned around the knob 170 similar to if it were an actual knob or dial, and thereafter can be rotated around the knob 170 in order to simulate turning the knob 170. Again, audible feedback in the form of a clicking sound or tactile feedback in the form of vibration, for example, may be provided as the knob 170 is "rotated." The user may also use their other hand to hold the tablet PC 175.

**[0053]** As shown in Fig. 6B, the multipoint touch screen 178 detects at least a pair of images. In particular, a first image 180 is created at set down, and at least one other image 182 is created when the fingers 176 are rotated. Although only two images are shown, in most cases there would be many more images that incrementally occur between these two images. Each image represents a profile of the fingers in contact with the touch screen at a particular instant in time. These images can also be referred to as touch images. It will be understood that the term "image" does not mean that the profile is displayed on the screen 178 (but rather imaged by the touch sensing device). It should also be noted that although the term "image" is used, the data may be in other forms representative of the touch plane at various times.

**[0054]** As shown in Fig. 6C, each of the images 180 and 182 is converted to a collection of features 184. Each feature 184 is associated with a particular touch as for example from the tips each of the fingers 176 surrounding the knob 170 as well as the thumb of the other hand 177 used to hold the tablet PC 175.

**[0055]** As shown in Fig. 6D, the features 184 are classified, i.e., each finger/thumb is identified, and grouped for each of the images 180 and 182. In this particular case, the features 184A associated with the knob 170 are grouped together to form group 188 and the feature 184B associated with the thumb is filtered out. In alternative arrangements, the thumb feature 184B may be treated as a separate feature by itself (or in another group), for example, to alter the input or operational mode of the

system or to implement another gesture, for example, a slider gesture associated with an equalizer slider displayed on the screen in the area of the thumb (or other finger).

[0056] As shown in Fig. 6E, the key parameters of the feature group 188 are calculated for each image 180 and 182. The key parameters associated with the first image 180 represent the initial state and the key parameters of the second image 182 represent the current state.

[0057] Also as shown in Fig. 6E, the knob 170 is the UI element associated with the feature group 188 because of its proximity to the knob 170. Thereafter, as shown in Fig. 6F, the key parameter values of the feature group 188 from each image 180 and 182 are compared to determine the rotation vector, i.e., the group of features rotated five (5) degrees clockwise from the initial to current state. In Fig. 6F, the initial feature group (image 180) is shown in dashed lines while the current feature group (image 182) is shown in solid lines.

[0058] As shown in Fig. 6G, based on the rotation vector the speaker 192 of the tablet PC 175 increases (or decreases) its output in accordance with the amount of rotation of the fingers 176, i.e., increase the volume by 5% based on rotation of 5 degrees. The display 174 of the tablet PC can also adjust the rotation of the knob 170 in accordance with the amount of rotation of the fingers 176, i.e., the position of the knob 170 rotates five (5) degrees. In most cases, the rotation of the knob occurs simultaneously with the rotation of the fingers, i.e., for every degree of finger rotation the knob rotates a degree. In essence, the virtual control knob follows the gesture occurring on the screen. Still further, an audio unit 194 of the tablet PC may provide a clicking sound for each unit of rotation, e.g., provide five clicks based on rotation of five degrees. Still yet further, a haptics unit 196 of the tablet PC 175 may provide a certain amount of vibration or other tactile feedback for each click thereby simulating an actual knob.

[0059] It should be noted that additional gestures can be performed simultaneously with the virtual control knob gesture. For example, more than one virtual control knob can be controlled at the same time using both hands, i.e., one hand for each virtual control knob. Alternatively or additionally, one or more slider bars can be controlled at the same time as the virtual control knob, i.e., one hand operates the virtual control knob, while at least one finger and maybe more than one finger of the opposite hand operates at least one slider and maybe more than one slider bar, e.g., slider bar for each finger.

[0060] It should also be noted that although the embodiment is described using a virtual control knob, in another embodiment, the UI element can be a virtual scroll wheel. As an example, the virtual scroll wheel can mimic an actual scroll wheel such as those described in U.S. Patent Publication Nos.: 2003/0076303A1, 2003/0076301A1, 2003/0095096A1, which are all herein incorporated by reference. For example, when the user places their finger on the surface of the virtual scroll wheel and makes a swirling, rotational or tangential gesture motion, a scrolling action can be performed with respect to a list of items displayed in a window.

[0061] Fig. 7 is a diagram of a touch-based method 200 in accordance with one embodiment of the present invention. The method generally begins at block 202 where a user input that occurs over a multipoint sensing device is detected. The user input includes one or more touch inputs, with each touch input having a unique identifier. Following block 202, the touch-based method 200 proceeds to block 204 where the user input is classified as a tracking or selection input when the user input includes a single unique identifier (one touch input), or is classified as a gesture input when the user input includes at least two unique identifiers (more than one touch input). If the user input is classified as a tracking input, the touch-based method 200 proceeds to block 206 where tracking is performed corresponding to the user input. If the user input is classified as a gesture input, the touch-based method 200 proceeds to block 208 where one or more gesture control actions are performed corresponding the user input. The gesture control actions are based at least in part on changes that occur with or between the at least two unique identifiers.

[0062] Fig. 8 is a diagram of a touch-based method 250 in accordance with one embodiment of the present invention. The touch-based method 250 generally begins at block 252 where an initial image is captured during an input stroke on a touch sensitive surface. Following block 252, the touch-based method 250 proceeds to block 254 where the touch mode is determined based on the initial image. For example, if the initial image includes a single unique identifier then the touch mode may correspond to a tracking or selection mode. On the other hand, if the image includes more than one unique identifier, then the touch mode may correspond to a gesture mode. Following block 254, the touch-based method 250 proceeds to block 256 where a next image is captured during the input stroke on the touch sensitive surface. Images are typically captured sequentially during the stroke and thus there may be a plurality of images associated with the stroke. Following block 256,

touch-based method 250 proceeds to block 258 where a determination is made as to whether the touch mode changed between capture of the initial image and capture of the next image. If the touch mode changed, the touch-based method 250 proceeds to block 260 where the next image is set as the initial image and thereafter the touch mode is again determined at block 254 based on the new initial image. If the touch mode stayed the same, the touch-based method 250 proceeds to block 262 where the initial and next images are compared and one or more control signals are generated based on the comparison.

**[0063]** Fig. 9 is a diagram of a touch-based method 300 in accordance with one embodiment of the present invention. The touch-based method 300 begins at block 302 where a GUI object is output. For example, a processor may instruct a display to display a particular GUI object. Following block 302, the touch-based method 300 proceeds to block 304 where a gesture input is received over the GUI object. For instance, a user may set or move their fingers in a gestural way on the surface of the touch screen and while over the displayed GUI object. The gestural input may include one or more single gestures that occur consecutively or multiple gestures that occur simultaneously. Each of the gestures generally has a particular sequence, motion, or orientation associated therewith. For example, a gesture may include spreading fingers apart or closing fingers together, rotating the fingers, translating the fingers, and/or the like.

**[0064]** Following block 304 the touch-based method 300 proceeds to block 306 where the GUI object is modified based on and in unison with the gesture input. By modified, it is meant that the GUI object changes according to the particular gesture or gestures being performed. By in unison, it is meant that the changes occur approximately while the gesture or gestures are being performed. In most cases, there is a one to one relationship between the gesture(s) and the changes occurring at the GUI object and they occur substantially simultaneously. In essence, the GUI object follows the motion of the fingers. For example, spreading of the fingers may simultaneously enlarge the object, closing of the fingers may simultaneously reduce the GUI object, rotating the fingers may simultaneously rotate the object, translating the fingers may allow simultaneous panning or scrolling of the GUI object.

**[0065]** In one embodiment, block 306 may include determining which GUI object is associated with the gesture being performed, and thereafter locking the displayed object to the fingers disposed over it such that the GUI object changes in accordance



with the gestural input. By locking or associating the fingers to the GUI object, the GUI object can continuously adjust itself in accordance to what the fingers are doing on the touch screen. Often the determination and locking occurs at set down, i.e., when the finger is positioned on the touch screen.

[0066] Fig. 10 is a diagram of a zoom gesture method 350, in accordance with one embodiment of the present invention. The zoom gesture may be performed on a multipoint touch screen. The zoom gesture method 350 generally begins at block 352 where the presence of at least a first finger and a second finger are detected on a touch sensitive surface at the same time. The presence of at least two fingers is configured to indicate that the touch is a gestural touch rather than a tracking touch based on one finger. In some cases, the presence of only two fingers indicates that the touch is a gestural touch. In other cases, any number of more than two fingers indicates that the touch is a gestural touch. In fact, the gestural touch may be configured to operate whether two, three, four or more fingers are touching, and even if the numbers change during the gesture, i.e., only need a minimum of two fingers at any time during the gesture.

[0067] Following block 352, the zoom gesture method 350 proceeds to block 354 where the distance between at least the two fingers is compared. The distance may be from finger to finger or from each finger to some other reference point as for example the centroid. If the distance between the two fingers increases (spread apart), a zoom-in signal is generated as shown in block 356. If the distance between two fingers decreases (close together), a zoom-out signal is generated as shown in block 358. In most cases, the set down of the fingers will associate or lock the fingers to a particular GUI object being displayed. For example, the touch sensitive surface can be a touch screen, and the GUI object can be displayed on the touch screen. This typically occurs when at least one of the fingers is positioned over the GUI object. As a result, when the fingers are moved apart, the zoom-in signal can be used to increase the size of the embedded features in the GUI object and when the fingers are pinched together, the zoom-out signal can be used to decrease the size of embedded features in the object. The zooming typically occurs within a predefined boundary such as the periphery of the display, the periphery of a window, the edge of the GUI object, and/or the like. The embedded features may be formed on a plurality of layers, each of which represents a different level of zoom. In most cases, the amount of zooming varies according to the distance between the two objects. Furthermore, the zooming

typically can occur substantially simultaneously with the motion of the objects. For instance, as the fingers spread apart or closes together, the object zooms in or zooms out at the same time. Although this methodology is directed at zooming, it should be noted that it may also be used for enlarging or reducing. The zoom gesture method 350 may be particularly useful in graphical programs such as publishing, photo, and drawing programs. Moreover, zooming may be used to control a peripheral device such as a camera, i.e., when the finger is spread apart, the camera zooms out and when the fingers are closed the camera zooms in.

[0068] Figs. 11A-11H illustrate a zooming sequence using the method described above. Fig. 11A illustrates a display presenting a GUI object 364 in the form of a map of North America with embedded levels which can be zoomed. In some cases, as shown, the GUI object is positioned inside a window that forms a boundary of the GUI object 364. Fig. 11B illustrates a user positioning their fingers 366 over a region of North America 368, particularly the United States 370 and more particularly California 372. In order to zoom in on California 372, the user starts to spread their fingers 366 apart as shown in Fig. 11C. As the fingers 366 spread apart further (distance increases), the map zooms in further on Northern California 374, then to a particular region of Northern California 374, then to the Bay area 376, then to the peninsula 378 (e.g., the area between San Francisco and San Jose Area), and then to the city of San Carlos 380 located between San Francisco and San Jose as illustrated in Figs. 11D-11H. In order to zoom out of San Carlos 380 and back to North America 368, the fingers 366 are closed back together following the sequence described above, but in reverse.

[0069] Fig. 12 is a diagram of a pan method 400, in accordance with one embodiment of the present invention. The pan gesture may be performed on a multipoint touch screen. The pan method 400 generally begins at block 402 where the presence of at least a first object and a second object are detected on a touch sensitive surface at the same time. The presence of at least two fingers is configured to indicate that the touch is a gestural touch rather than a tracking touch based on one finger. In some cases, the presence of only two fingers indicates that the touch is a gestural touch. In other cases, any number of more than two fingers indicates that the touch is a gestural touch. In fact, the gestural touch may be configured to operate whether two, three, four or more fingers are touching, and even if the numbers change during the gesture, i.e., only need a minimum of two fingers. Following block 402, the pan method 400

proceeds to block 404 where the position of the two objects when the objects are moved together across the touch screen is monitored. Following block 404, the pan method 400 proceeds to block 406 where a pan signal is generated when the position of the two objects changes relative to an initial position. In most cases, the set down of the fingers will associate or lock the fingers to a particular GUI object displayed on the touch screen. Typically, when at least one of the fingers is positioned over the image on the GUI object. As a result, when the fingers are moved together across the touch screen, the pan signal can be used to translate the image in the direction of the fingers. In most cases, the amount of panning varies according to the distance the two objects move. Furthermore, the panning typically can occur substantially simultaneously with the motion of the objects. For instance, as the fingers move, the object moves with the fingers at the same time.

**[0070]** Figs. 13A-13D illustrate a panning sequence based on the pan method 400 described above. Using the map of Fig. 11, Fig. 13A illustrates a user positioning their fingers 366 over the map. Upon set down, the fingers 366 are locked to the map. As shown in Fig. 13B, when the fingers 366 are moved vertically up, the entire map 364 is moved up thereby causing previously seen portions of map 364 to be placed outside the viewing area and unseen portions of the map 364 to be placed inside the viewing area. As shown in Fig. 13C, when the fingers 366 are moved horizontally sideways, the entire map 364 is moved sideways thereby causing previously seen portions of map 364 to be placed outside the viewing area and unseen portions of the map to be placed inside the viewing area. As shown in Fig. 13D, when the fingers 366 are moved diagonally, the entire map 364 is moved diagonally thereby causing previously seen portions of map 364 to be placed outside the viewing area and unseen portions of the map to be placed inside the viewing area. As should be appreciated, the motion of the map 364 follows the motion of the fingers 366. This process is similar to sliding a piece of paper along a table. The pressure the fingers exert on the paper locks the paper to the fingers and when the fingers are slid across the table, the piece of paper moves with them.

**[0071]** Fig. 14 is a diagram of a rotate method 450, in accordance with one embodiment of the present invention. The rotate gesture may be performed on a multipoint touch screen. The rotate method 450 generally begins at block 452 where the presence of a first object and a second object are detected at the same time. The presence of at least two fingers is configured to indicate that the touch is a gestural

touch rather than a tracking touch based on one finger. In some cases, the presence of only two fingers indicates that the touch is a gestural touch. In other cases, any number of more than two fingers indicates that the touch is a gestural touch. In fact, the gestural touch may be configured to operate whether two, three, four or more fingers are touching, and even if the numbers change during the gesture, i.e., only need a minimum of two fingers.

[0072] Following block 452, the rotate method 450 proceeds to block 454 where the angle of each of the finger is set. The angles are typically determined relative to a reference point. Following block 454, rotate method 450 proceeds to block 456 where a rotate signal is generated when the angle of at least one of the objects changes relative to the reference point. In most cases, the set down of the fingers will associate or lock the fingers to a particular GUI object displayed on the touch screen. Typically, when at least one of the fingers is positioned over the image on the GUI object, the GUI object will be associated with or locked to the fingers. As a result, when the fingers are rotated, the rotate signal can be used to rotate the object in the direction of finger rotation (e.g., clockwise, counterclockwise). In most cases, the amount of object rotation varies according to the amount of finger rotation, i.e., if the fingers move 5 degrees then so will the object. Furthermore, the rotation typically can occur substantially simultaneously with the motion of the fingers. For instance, as the fingers rotate, the object rotates with the fingers at the same time.

[0073] Figs. 15A-15C illustrate a rotating sequence based on the method described above. Using the map of Fig. 11, Fig. 15A illustrates a user positioning their fingers 366 over the map 364. Upon set down, the fingers 366 are locked to the map 364. As shown in Fig. 15B, when the fingers 366 are rotated in a clockwise direction, the entire map 364 is rotated in the clockwise direction in accordance with the rotating fingers 366. As shown in Fig. 15C, when the fingers 366 are rotated in a counterclockwise direction, the entire map 364 is rotated in the counter clockwise direction in accordance with the rotating fingers 366.

[0074] It should be noted that the methods described in Figs. 10-15 can be implemented during the same gestural stroke. That is, zooming, rotating and panning can all be performed during the gestural stroke, which may include spreading, rotating and sliding fingers. For example, upon set down with at least two fingers, the displayed object (map) is associated or locked to the two fingers. In order to zoom, the user can spread or close their fingers. In order to rotate, the user can rotate their

fingers. In order to pan, the user can slid their fingers. Each of these actions can occur simultaneously in a continuous motion. For example, the user can spread and close their fingers while rotating and sliding them across the touch screen.

Alternatively, the user can segment each of these motions without having to reset the gestural stroke. For example, the user can first spread their fingers, then rotate their fingers, then close their fingers, then slide their fingers and so on.

**[0075]** Fig. 16 is a diagram of a GUI operational method 500, in accordance with one embodiment of the present invention. The GUI operational method 500 is configured for initiating floating controls in a GUI. The GUI operational method 500 generally begins at block 502 where the presence of an object such as a finger or thumb is detected. This may for example be accomplished using a touch screen. Following block 502, the GUI operational method 500 proceeds to block 504 where the object is recognized (the identity of the object is found). The object may be recognized among a plurality of objects. For example, see block 104 of Fig. 2 above.

**[0076]** Following block 504, the GUI operational method 500 proceeds to block 506 where an image in the vicinity of the object is generated. The image is typically based on the recognized object . The image may include windows, fields, dialog boxes, menus, icons, buttons, cursors, scroll bars, etc. In some cases, the user can select and activate the image (or features embedded therein) in order to initiate functions and tasks. By way of example, the image may be a user interface element or a group of user interface elements (e.g., one or more buttons that open, close, minimize, or maximize a window). The image may also be one or more icons that launch a particular program or files that open when selected. The image may additionally correspond to non interactive text and graphics. In most cases, the image is displayed as long as the object is detected or it may be displayed for some preset amount of time, i.e., after a period of time it times out and is removed.

**[0077]** In one particular embodiment, the image includes one or more control options that can be selected by the user. The control options may include one or more control buttons for implementing various tasks. For example, the control option box may include music listening control buttons as for example, play, pause, seek and menu.

**[0078]** Figs. 17A-17E illustrate a floating control sequence using the method described above. As shown in Fig. 17A, a user 510 is using a tablet PC 512 and therefore is holding the tablet PC 512 with one hand 514 while navigating (e.g., tracking, gesturing) with the other hand 516. As shown in Fig. 17B, which is a close

up of the user holding the tablet PC 512, a portion of the thumb of the holding hand 514 is positioned over the touch screen 520. As shown in Fig. 17C, the tablet PC 512 recognizes the thumb and displays a control box 522 adjacent the thumb. The control box 522 includes various buttons 524, which can be selected by the user's thumb to initiate tasks in the tablet PC 512. As shown in Fig. 17D, while holding the tablet PC 512, the thumb is extended over one of the buttons 524 and subsequently tapped thereby selecting the task associated with the button 524. By way of example, the task may be associated with launching a program or gaining access to a network or changing the mode of operation of the device. The control box 522 and buttons 524 may be used to change the input mode of the touch screen 520 so that, for example, the identical gesture made with the fingers of the user's other hand may have multiple meanings depending on which of buttons 524 is selected. As shown in Fig. 17E, when the thumb is moved away from the touch screen 520, the control box 522 may time out and disappear. Alternatively, the control box may be closed using conventional close icons or buttons.

[0079] Fig. 18 is a diagram of a GUI operational method 550, in accordance with one embodiment of the present invention. The GUI operational method 550 is configured for initiating zooming targets. The GUI operational method 550 generally begins at block 552 where a control box GUI element is displayed. The control box contains one or more control buttons, which are somewhat close together, and which can be used to perform actions. The control box may, for example, include control buttons such as maximize, minimize, close, and the like. Following block 552, the GUI operational method 550 proceeds to block 554 where the control box is enlarged, or at least one of the control buttons is enlarged for a period of time when the presence of an object over the control box or one of the control buttons is detected. In the case where the control box is enlarged each of the control buttons is enlarged thereby making selection thereof much easier. In the case where only the control button is enlarged, the user would decide whether this is the correct button and if so select the enlarged control button, or restart the process so that the appropriate control button is presented. In most cases, the size of the control buttons corresponds to the size of the finger so that they may be easily selected by the object. Following block 554, the GUI operational method 550 proceeds to block 556 where a control signal associated with the selected control button is generated when the presence of the object over one of the enlarged control buttons is detected.

[0080] Figs. 19A-19D illustrate a zooming target sequence using the GUI operational method 550 described above. As shown in Fig. 19A, a user 510 places their finger 576 over a control box 578. Because the buttons 580 of the control box 578 included therein are smaller than the finger 576 and located close together, it is difficult for the user 510 to make a selection directly without possibly pressing an undesirable button 580, e.g., a button adjacent the desired button. By way of example, the finger 576 may cover two or more of the buttons 580. As shown in Fig. 19B, at least a portion of the control box 578 is enlarged including the buttons 580 included therein when the user places their thumb over the control box. As shown in Fig. 19C, once the control box has reached its enlarged state, the user can select one of the enlarged buttons, which is now closer to the size of the thumb. By way of example, the user may tap on the desired control button. As shown in Fig. 19D, the control box reduces to its initial size after the button is selected or after a predetermined time period in which no selection was made (e.g., times out) or when the user moves their finger away from the control box.

[0081] Fig. 20 is a diagram of a GUI operational method 600, in accordance with one embodiment of the present invention. The GUI operational method 600 is configured for initiating a page turn. The GUI operational method 600 generally begins at block 602 where a page from a multitude of pages is displayed in a GUI. By way of example, the pages may be associated with an electronic book. Following block 602, the GUI operational method 600 proceeds to block 604 where the presence of an object (or objects) in a predetermined region over the page is detected. The predetermined area may, for example, correspond to the area where the page number is displayed. Following block 604, the GUI operational method 600 proceeds to block 606 where a page turn signal is generated when the object (or objects) is translated in the predetermined region. The translation is configured to simulate a finger turning the page in an actual paper bound book. The direction of the translation indicates whether to go to the next page or previous page in the list of pages. For example, if the finger is swiped right to left, then a page back signal is generated, and if the finger is swiped left to right, then a page up signal is generated. This GUI operational method 600 may be enhanced several ways. For instance, if multiple fingers are swiped, then this may create a paging signal greater than one page. For example, a two finger swipe equals two page turns, three finger swipe

equals three page turns, etc. Or a two finger swipe equals ten page turns, three finger swipe equals 50 page turns, etc.

**[0082]** Figs. 21A-21D illustrate a page turning sequence using the GUI operational method 600 described above. As shown in Fig. 21A, which is a close up of a user 510 holding the tablet PC 512, the user swipes their finger over the page number in a direction to the left of the page 630. As shown in Fig. 21B, the tablet PC 512 recognizes the swipe and direction of the swipe in the area of the page number and therefore the tablet PC 512 displays the next page in a group of pages. This can be performed repeatedly to whisk through the group of pages. As shown in Fig. 21C, the user swipes their finger 576 over the page number in a direction to the right of the page 630. As shown in Fig. 21D, the tablet PC 512 recognizes the swipe and direction of the swipe in the area of the page number and therefore the tablet PC 512 displays the previous page in a group of pages. This can be performed repeatedly to whisk through the group of pages.

**[0083]** Fig. 22 is a diagram of a GUI operational method 650, in accordance with one embodiment of the present invention. The GUI operational method 650 is configured for initiating inertia typically during a scrolling or panning operation. Inertia is generally defined as the tendency of a body at rest to remain at rest or of a body in motion to stay in motion in a straight line unless disturbed by an external force. In this particular embodiment, the GUI or some portion thereof is associated with inertial properties, which is its resistance to rate of change in motion. For a GUI with high inertia characteristics, the acceleration of the GUI will be small for a given input. On the other hand, if the GUI has low inertia characteristics, the acceleration will be large for a given input.

**[0084]** The GUI operational method 650 generally begins at block 652 where a graphical image is displayed on a GUI. Following block 652, the GUI operational method 650 proceeds to block 654 where a scrolling or panning stroke on a touch sensitive surface is detected. By way of example, the stroke may be a linear or rotational stroke. During a linear stroke, the direction of scrolling or panning typically follows the direction of the stroke. During a rotational stroke (see Fig. 6), the rotational stroke is typically converted to a linear input where clockwise motion may correspond to vertical up and counterclockwise motion may correspond to vertical down. Following block 654 the process flow proceeds to block 656 where the speed and direction of the scrolling or panning stroke is determined. Following



block 656, the GUI operational method 650 proceeds to block 658 where the image is moved in accordance with the speed and direction of the scrolling or panning stroke as well as the associated inertial characteristics. Following block 658, the GUI operational method 650 proceeds to block 660 where the motion of the image continues even when the panning or scrolling stroke is no longer detected. For example, when the user picks up their finger from the touch sensitive surface, the scrolling or panning function continues as if the scrolling or panning stroke was still being made. In some cases, the motion of the image continues infinitely until some braking (stopping or slowing) control is performed. This particular methodology simulates zero gravity. In other cases, the motion of the image is slowed in accordance with the associated inertia GUI operational method 650. Metaphorically speaking, the image may correspond to a piece of paper moving over a desktop. In order to move the piece of paper, the user exerts a force on the paper in the desired direction. When the user lifts their finger off the paper, the paper will continue to slide along the desktop in the desired direction for some period of time. The amount it slides after lifting the finger generally depends on, among other things, its mass, the force applied by the finger, the friction force found between the paper and the desktop, etc. As should be appreciated, traditionally when scrolling and panning are implemented, the scrolling or panning stops when the fingers are picked up. In contrast, using the above mentioned methodology, the scrolling or panning continues to move when the fingers are picked up.

**[0085]** The GUI operational method 650 may additionally include blocks A and B. In block A, an object such as a finger is detected on the touch sensitive surface when the image is moving without the assistance of the object (block 660). In block B, the motion of the image is stopped when the object is detected, i.e., the new touch serves as a braking means. Using the metaphor above, while the piece of paper is sliding across the desktop, the user presses their finger on the paper thereby stopping its motion.

**[0086]** Figs. 23A-23D illustrate an inertia sequence using the method described above. Fig. 23A illustrates a display presenting a GUI 678 including a window 679 having a list 680 of media items 681. The window 679 and list 680 may for example correspond to a control window and music list found in iTunes® manufactured by Apple Computer, Inc of Cupertino, CA. As shown in Fig. 23B, when the user slides their finger or fingers 576 over the touch screen 520, vertical scrolling, which moves

media items up or down through the window, is implemented. The direction of scrolling may follow the same direction as finger movement (as shown), or it may go in the reverse direction. In one particular embodiment, a single finger is used for selecting the media items from the list, and two fingers are used to scroll through the list.

[0087] Scrolling generally pertains to moving displayed data or images (e.g., media items 681) across a viewing area on a display screen so that a new set of data (e.g., media items 681) is brought into view in the viewing area. In most cases, once the viewing area is full, each new set of data appears at the edge of the viewing area and all other sets of data move over one position. That is, the new set of data appears for each set of data that moves out of the viewing area. In essence, these functions allow a user to view consecutive sets of data currently outside of the viewing area. In most cases, the user is able to accelerate their traversal through the data sets by moving his or her finger at greater speeds. Examples of scrolling through lists can be found in U.S. Patent Publication Nos.: 2003/0076303A1, 2003/0076301A1, 2003/0095096A1, which are herein incorporated by reference.

[0088] As shown in Fig. 23C, the displayed data continues to move even when the finger is removed from the touch screen. The continuous motion is based at least in part on the previous motion. For example the scrolling may be continued in the same direction and speed. In some cases, the scrolling slow down over time, i.e., the speed of the traversal through the media items gets slower and slower until the scrolling eventually stops thereby leaving a static list. By way of example, each new media item brought into the viewing area may incrementally decrease the speed.

Alternatively or additionally, as shown in Fig. 23D, the displayed data stops moving when the finger 576 is placed back on the touch screen 520. That is, the placement of the finger back on the touch screen can implement braking, which stops or slows down the continuous acting motion. Although this sequence is directed at vertical scrolling it should be noted that this is not a limitation and that horizontal scrolling as well as panning may be performed using the methods described above.

[0089] Fig. 24 is a diagram of a GUI operational method 700, in accordance with one embodiment of the present invention. The method 700 is configured for simulating a keyboard. The method generally begins at block 702 where a keyboard is presented on the display. Following block 702, the process flow proceeds to block 704 where the presence of a first object over a first key and a second object over a second key at

the same time is detected on a touch screen. The touch screen is positioned over or in front of the display. By way of example, the display may be an LCD and the touch screen may be a multipoint touch screen. Following block 704, the process flow proceeds to block 706 where one or more simultaneous control signals are generated when the first object is detected over the first key and when the second object is detected over the second key at the same time.

[0090] In one embodiment, only a single control signal is generated when the first object is detected over the first key and when the second object is detected over the second key at the same time. By way of example, the first key may be a shift key and the second key may be a symbol key (e.g., letters, numbers). In this manner, the keyboard acts like a traditional keyboard, i.e., the user is allowed to select multiple keys at the same time in order to change the symbol, i.e., lower/upper case. The keys may also correspond to the control key, alt key, escape key, function key, and the like.

[0091] In another embodiment, a control signal is generated for each actuated key (key touch) that occurs at the same time. For example, groups of characters can be typed at the same time. In some cases, the application running behind the keyboard may be configured to determine the order of the characters based on some predetermined criteria. For example, although the characters may be jumbled, the application can determine that the correct order of characters based on spelling, usage, context, and the like.

[0092] Although only two keys are described, it should be noted that two keys is not a limitation and that more than two keys may be actuated simultaneously to produce one or more control signals. For example, control-alt-delete functionality may be implemented or larger groups of characters can be typed at the same time.

[0093] Figs. 25A-25D illustrates a keyboard sequence using the method described above. Fig. 25A illustrates a display presenting a GUI object 730 in the form of a keyboard. As shown in Fig. 25B, a user positions their fingers 576 over the multipoint touch screen 520 over the keyboard 730 to enter data into a word processing program. By way of example, the user may place one of their fingers 576A on the Q key in order to produce a lower case "q" in the word processing

program. As shown in Fig. 25C, when the user decides that a letter should be in upper case, the user places one finger 576B on the shift key and another finger 576A on the desired letter (as indicated by the arrows). As shown in Fig. 25D, in order to continue typing in lower case, the user simply removes their finger 576B from the shift key and places their finger 576A over a desired letter (as indicated by the arrow).

[0094] Fig. 26 is a diagram of a GUI operational method 750, in accordance with one embodiment of the present invention. The method 750 is configured for simulating a scroll wheel such as those described in U.S. Patent Publication Nos.:

2003/0076303A1, 2003/0076301A1, 2003/0095096A1, all of which are herein incorporated by reference. The method generally begins at block 752 where a virtual scroll wheel is presented on the display. In some cases, the virtual scroll wheel may include a virtual button at its center. The virtual scroll wheel is configured to implement scrolling as for example through a list and the button is configured to implement selections as for example items stored in the list. Following block 752, the method proceeds to block 754 where the presence of at least one finger and in some cases more than one finger, such as first and second fingers, over the virtual scroll wheel is detected on a touch screen. The touch screen is positioned over or in front of the display. By way of example, the display may be an LCD and the touch screen may be a multipoint touch screen. Following block 754, the method proceeds to block 756 where the initial position of the fingers on the virtual scroll wheel is set. By way of example, the angle of the fingers relative to a reference point may be determined (e.g., 12 o'clock, 6 o'clock, etc.). In most cases, the set down of the finger(s) associate, link or lock the fingers (or finger) to the virtual scroll wheel when the fingers are positioned over the virtual scroll wheel.

[0095] Following block 756, the method 750 proceeds to block 758 where a rotate signal is generated when the angle of the fingers change relative to the reference point. The rotate signal can be used to perform several actions including for example scrolling through a plurality of media items, and possibly moving the virtual scroll wheel with the finger(s). By way of example, the combination and frequency of the signals may be converted into distance, direction and speed necessary for moving a selector through the media items as well for moving the virtual scroll wheel around its axis. In most cases, the amount of scrolling and wheel rotation varies according to

the amount of finger rotation. By way of example, if the fingers move 5 degrees then so will the wheel. Furthermore, the scrolling and rotation of the wheel typically occurs substantially simultaneously with the motion of the fingers. For instance, as the fingers rotate, both scrolling and rotation of the wheel are performed at the same time. Moreover, although not a requirement, the direction of scrolling and rotation of the wheel is generally the same as the direction of the finger motion. For example, the virtual scroll wheel rotates in the direction of finger rotation (e.g., clockwise, counterclockwise, etc.)

[0096] In some cases, the principals of inertia as described above can be applied to the virtual scroll wheel. In cases such as these, the virtual scroll wheel continues to rotate when the fingers (or one of the fingers) are lifted off of the virtual scroll wheel and slowly comes to a stop via virtual friction. Alternatively or additionally, the continuous rotation can be stopped by placing the fingers (or the removed finger) back on the scroll wheel thereby braking the rotation of the virtual scroll wheel.

[0097] It should be pointed out that a rotating virtual scroll wheel is not a limitation, and in some cases, the virtual scroll wheel may remain stationary (e.g., does not rotate with the fingers) so as to simulate a touch surface rather than a mechanical rotating wheel.

[0098] Figs. 27A-27D illustrates a scroll wheel sequence using the method described above. Fig. 27A illustrates a display presenting a scroll wheel. The scroll wheel may be displayed automatically as part of a program or it may be displayed when a particular gesture is performed. By way of example, during the operation of a music program (such as iTunes® manufactured by Apple Computer Inc., of Cupertino, CA), the virtual scroll wheel may appear on the GUI of the music program when two fingers are placed on the touch screen rather than one finger which is typically used for tracking in the music program. In some cases, the virtual scroll wheel only appears when two fingers are placed on a predetermined area of the GUI. Alternatively, the appearance of the virtual scroll wheel may be based on something other than or in addition to the number of fingers. For example, the virtual scroll wheel may appear in response to any touch that occurs when the music program is running.

[0099] As shown in Fig. 27B, a user positions their fingers over the multipoint touch screen 520 over the scroll wheel. At some point, the fingers are locked to the scroll wheel. This can occur at set down for example. As shown in Fig. 27C, when the fingers are rotated in a clockwise direction, the scroll wheel is rotated in the clockwise direction in accordance with the rotating fingers. As shown in Fig. 27D, when the fingers are rotated in a counterclockwise direction, the virtual scroll wheel is rotated in the counter clockwise direction in accordance with the rotating fingers. Alternatively, rotation of the virtual scroll wheel may also be rotated with linear motion of the fingers in a tangential manner.

[00100] Fig. 28 is user interface method 800, in accordance with one embodiment of the present invention. The user interface method 800 may for example be performed on a computing device having a display and a touch sensitive input device such as a touch screen. The user interface method 800 begins at block 802 where a touch is detected. This may be accomplished with the touch sensitive input device when an object such as a stylus or one or more fingers, is placed on the touch sensitive surface of the touch sensitive input device.

[00101] Once a touch is detected, the user interface method 800 proceeds to block 804 where a user interface (UI) mode is determined in response to the touch. The user interface mode may be widely varied. The user interface mode may include navigation modes, scroll modes, data entry modes, edit modes, control modes, information modes, display modes, etc. Each mode typically has one or more GUI interface elements associated therewith. By way of example, a virtual scroll wheel (e.g., Fig. 27) or slider bar may be associated with a scroll mode, a keyboard (e.g., Fig. 25) or keypad may be associated with data entry mode, a tool bar such as a formatting tool bar or drawing tool bar may be associated with an edit mode, a control panel including buttons may be associated with a control mode, a window may be associated with an information mode, etc.

[00102] The user interface mode may be determined at block 804 based on one or more conditions including for example, one or more applications currently running on the computing device, the current state or mode of the one or more applications and/or the touch characteristics associated with the touch. In fact, determining the

user interface mode at block 804 may involve monitoring and analyzing one or more conditions.

[00103] The current applications may for example include operating systems (e.g., Mac OS), word processing programs, spreadsheet programs, draw editing programs, image editing programs, gaming programs, photo management programs (e.g., iPhoto), music management programs (e.g., iTunes), video editing programs (e.g., iMovie), movie management programs (e.g., QuickTime), music editing programs (e.g., GarageBand), Internet interface programs and/or the like.

[00104] The current state or mode of the applications may correspond to an active portion of the application (e.g., current window or windows within windows). For example, the active portion of a music management program may correspond to a music control mode, a playlist select mode, a menu mode, and/or the like. Further, the active portion of a photo management program may correspond to photo browsing mode or photo editing mode. Further still, the active portion of an internet interface program may correspond to a web mode or an email mode.

[00105] The touch characteristics on the other hand may, for example, correspond to touch location, touch ID, number of touches, etc, as described in many of the embodiments mentioned above.

[00106] With regards to applications, different applications may indicate different UI modes. For example, a word processing or spreadsheet application may indicate a data entry mode, while a music management program may indicate a control or scrolling mode. With regards to the current state of an application, different modes of the application may indicate different UI modes. For example, in a music management program, a menu window may indicate one UI mode, while a playlist window may indicate another UI mode.

[00107] With regards to the touch, the number of fingers may indicate different UI modes. For example, one finger may indicate a first mode while two fingers may indicate a second mode. In addition, the identity of the touch may indicate different UI modes. For example, a thumb may indicate a first UI mode and an index finger may indicate a second UI mode. Moreover, the location of the touch may indicate

different UI modes. For example, a first touch location may indicate a first UI mode, while a second touch location may indicate a second UI mode (if the touch is located over a border of a music program a first UI mode may be implemented, and if the touch is located over a playlist or list of songs in the music program a second UI mode may be implemented).

[00108] In one embodiment, the user interface mode is based on only one of the conditions. For example, the user interface mode is only based on the application, the current state of the application or one of the various touch characteristics as described above. In another embodiment, the user interface mode is based on multiple conditions. For example, the user interface mode may be based on a combination of at least two selected from the application, the current state of the application and the various touch characteristics. By way of example, the application combined with a first touch characteristic may indicate a first UI mode and the same application combined with a second touch characteristic may indicate a second UI mode.

[00109] To cite a few examples, if the application is a word processing or spreadsheet program then the mode may be determined to be a data entry mode so that data can be entered into the spreadsheet (e.g., keyboard). If the application is a music management program and a playlist is currently showing (active portion), the mode may be determined to be a scroll mode so that the items in the list may be scrolled through in order to find a desired item (e.g., scroll wheel). Alternatively, if a song is playing (active portion), the mode may be determined to be a control mode so that the manner in which songs are played can be controlled (e.g., play, stop, seek and volume control options). Further, if the application is a photo management program and a particular photo is displayed (active portion), the mode may be determined to be a control mode so that the photo can be modified (e.g., converting to black and white, removing red eye, and rotate options).

[00110] After determining the user interface mode 804, the user interface method 800 proceeds to block 806 where one or more GUI elements are displayed based on the user interface mode and in response to the touch(s). In some cases, only one GUI element is displayed and in other cases multiple GUI elements are displayed.



The GUI element is typically associated with a particular mode. For example, a slider bar or scroll wheel may be displayed in a scroll mode, a keyboard or keypad may be displayed in a data entry mode, a tool bar may be displayed in an edit mode, various buttons or a control panel may be displayed in a control mode, and information windows may be displayed in an information mode.

[00111] The GUI element may be displayed in a variety of ways. For example, it can be positioned over the currently displayed graphical images, or it can displace the currently displayed graphical images (e.g., minimize, shift, etc.). In some cases, the GUI element is made semi transparent so that the current graphical image disposed below the GUI element can be seen (thereby eliminating minimizing and shifting). This may be helpful when using a scroll wheel to traverse through a list disposed below the scroll wheel. Furthermore, the GUI element can be placed in the vicinity of the touch or it can be placed in some predetermined location. The predetermined location may be based on ergonomics, i.e., what is the best location for the user.

[00112] In addition to the above, the GUI element may be displayed using a transition effect such as growing, fading in, popping up, and in some cases may even pulsate, throb, etc. If the effect is popping up, the GUI element is immediately brought into view. If the effect is growing, as shown in Figs. 29A-29D, a small GUI element 820A (scroll wheel) is initially displayed, and thereafter the GUI element 820A continuously enlarges through various sizes 820B and 820 C until it reaches its desired size 820D. The speed of growth may be based on the pressure of the touch. For example, if the touch pressure is low, the GUI element may grow slowly and if the touch pressure is high, the GUI element may grow more rapidly. In addition, the final size of the GUI element may be based on the length of the touch. For example, the GUI element stops growing when the touch is no longer detected. Alternatively, the speed and size may be user adjustable as for example through a control panel. If the effect is fading, as shown in Figs. 30A-30D, the GUI element 822 is slowly brought into view from nothing, through various levels of distortion or transparency 822A-822C, to a final complete image 822D. The fading can be controlled similarly to growth. For example, the speed and level of fade may be controlled by the pressure and length of touch.

[00113] The transition effect may even carry over to the currently displayed images, i.e., the images currently displayed before the touch was detected. In one embodiment, the opposite effect happens to the currently displayed images. For example, as shown in Figs. 31A-31D, the currently displayed graphical images 826 are minimized smaller and smaller as the GUI element 820 grows larger and larger. Alternatively, if the GUI element immediately pops in, the currently displayed graphical images can immediately pop out or be immediately minimized.

[00114] Once the GUI element is displayed (806), the user interface method 800 proceeds to block 808 where the functionality of the GUI element is enabled. For example, touch event is monitored relative to the GUI element and actions associated with the touch event are performed. The enablement of the GUI element may occur simultaneously with the display of the GUI element so that a user can immediately start using the GUI element once displayed. By way of example, in a scroll mode, a virtual scroll wheel may be displayed and when enabled, the touch events are monitored relative to the scroll wheel. During monitoring, control signals associated with the position of the finger on the scroll wheel are generated as the finger swirls around the virtual scroll wheel. These signals can be used to perform scrolling. For example, the number, combination and frequency of the signals may be converted into distance, direction and speed necessary for moving a selection bar through a list. By way of example, see Figs. 6, 26 and 27 for more detailed descriptions of virtual scroll wheels and how they function.

[00115] At some point after enabling and displaying the GUI element, a determination 812 is made as to whether or not to deactivate the GUI element. The determination 812 can be made in a variety of ways including, for example: 1) the touch is no longer detected, 2) a touch has not been detected for a preset amount of time, 3) a time out occurs (a preset amount of time has gone by since the GUI element was first displayed/enabled), or 4) a user selection (e.g., a user selects a button that closes the GUI element).

[00116] If the determination indicates deactivation, then the method proceeds to block 814 where the GUI element is disabled and removed from display. Once disabled, actions will no longer be performed when a touch event occurs. The

removal of the GUI element from display may function similar to displaying the GUI element in that it can be removed using a transition effect such as slowly fading out, shrinking or immediately disappearing (popping out). The removal transition effect may work opposite the displaying transitioning effect. For example, the GUI element fades out similarly to fading in, shrinks similarly to growth or pops out similarly to popping in. Further, the GUI element can slowly recess and disappear from view while the displaced or shrunken current graphical images can slowly grow back to their original size and shape. If the determination does not indicate deactivation, then the method maintains the display of the GUI element as well as the enablement thereof.

[00117] Fig. 32 is a determination method 850 in accordance with one embodiment of the present invention. The determination method may, for example, correspond to the block 804 in Fig. 28. The determination method begins at block 852 where the current application is determined. The determination method proceeds to block 854 where the current state of the application is determined. Following block 854, the determination method proceeds to block 856 where the touch characteristics associated with the touch are determined. The determination method proceeds to block 860 where a UI mode is selected based on the results from blocks 852-858. By way of example, a set of rules may indicate appropriate UI modes for a particular set of conditions.

[00118] Fig. 33 is a user interface method 900 in accordance with one embodiment of the present invention. The method may, for example, be performed on a computing device having a display and a touch sensitive input device such as a touch screen. The interface method 900 begins at block 902 where a list of songs are displayed. Fig. 34A shows one example of a window 930A including a list of songs 932A, and Fig. 35A shows another example of a window 930B including a list of songs 932B. Fig. 34A may, for example, be a graphical user interface displayed on an iPod® manufactured by Apple Computer of Cupertino, CA, and Fig. 35A may for example be a graphical user interface associated with a music management program, such as iTunes® manufactured by Apple Computer of Cupertino, CA.

[00119] Following block 902, the user interface method 900 proceeds to block 904 where a touch is detected over the displayed list of songs (or window or entire GUI). This may be accomplished with the touch sensitive input device when an object such as a stylus or one or more fingers is placed on the touch sensitive surface of the touch sensitive input device such as a touch screen. Figs. 34B and 35B show a finger 925 placed over the window 930 including the list of songs 932.

[00120] Once a touch is detected, the user interface method 900 proceeds to block 906 where a virtual scroll wheel is activated. That is, a virtual scroll wheel is displayed in addition to the list of songs and its functionality is enabled. In essence, because the song list was touched, a scroll wheel that allows a user to traverse through the songs in the list of songs is provided. In some cases, the virtual scroll wheel displaces the media items, i.e., the media items are minimized or shifted to make room for the virtual scroll wheel. In other cases, the virtual scroll wheel is positioned or laid over the media items (the media items keep their current size, shape and position). The virtual scroll wheel can be made semi-transparent so that the media items can be viewed through the virtual scroll wheel. Figs. 34C and 35C show a transparent virtual scroll 936 wheel laid over the window 930 including the list of songs 932. Alternatively, a virtual slider bar may be displayed.

[00121] Once displayed, a determination 908 is made as to whether or not a scrolling touch event (or gesture) is performed relative to the virtual scroll wheel. For example, whether or not a finger is positioned over the scroll wheel and whether or not the finger is moved around the scroll wheel in a swirling fashion.

[00122] If a scrolling touch event is performed by the user, the user interface method 900 proceeds to block 910 where scrolling is implemented through the list of songs in accordance with the scrolling touch event. By way of example, a selector bar may be moved from one song to another as the finger is swirled around the virtual scroll wheel. Figs. 34D and 35D show the finger 925 swirling around the virtual scroll wheel 936, and a selector bar 938 moving linearly through the list of songs 932 in accordance with the swirling finger 925. In the illustrated embodiments, the selector bar is moved linearly up when the finger is swirled in a clockwise fashion and linearly down when the finger is swirled in a counterclockwise fashion. It should

be noted, however, that this is not a limitation. For example, the selector bar may moved linearly down when the finger is swirled in a clockwise fashion and linearly up when the finger is swirled in a counterclockwise fashion.

[00123] If a scrolling or select touch event is not performed, the user interface method 900 proceeds to block 916 where the virtual scroll wheel is deactivated. That is, the virtual scroll wheel is disabled and removed from the display. Figs. 34E and 35E show the display 928 without the virtual scroll wheel 936. Although the virtual scroll wheel 936 is removed, changes made to the list of songs, i.e., the position of the selector bar 938, typically remain.

[00124] In some cases, the virtual scroll wheel may include button zones across its surface or a virtual button at its center or around its sides. The buttons and button zones may for example correspond to menu, play, seek, pause, and/or the like. In this particular embodiment, the method described above may include additional steps that occur before block 416. For example, if a scrolling touch event is not performed, the user interface method 900 may include an additional block where a determination is made as to whether or not a selection touch event (or gesture) is performed relative to the virtual scroll wheel. The selection touch event may be implemented by tapping the button or by exerting increased or decreased pressure on the button rather than swirling around the surface of the virtual scroll wheel (see Figs. 34F and 35F). If the button is a song select or enter button, the method include another block where the song with the selector bar disposed thereover is selected. That is, when the virtual button is tapped, or otherwise selected, the song currently covered by the selector bar is played and outputted for the user's enjoyment.

[00125] It should be noted that the methods described above are not limited to scrolling through a list of songs. Any media item as well as any group of elements can be scrolled through using the aforementioned technique. For example, in photo layout 942 as shown in Figs. 36A-36C, the virtual scroll wheel 936 may appear when the user places their finger 925 over the photo layout 942 (or grouping), and thereafter it can be used to move a highlighter 944 through the various photos 943 in the layout 942. By way of example, the photos may be thumbnails images that make traversing through a large number of images easier.

[00126] Fig. 37 is a method 950, in accordance with one embodiment of the present invention. The method begins at block 952 where it is determined if a touch is detected. If a touch is detected, the method proceeds to block 954 where the current operating conditions are monitored and analyzed. The conditions may for example correspond to the current application, the state of the application and/or the touch characteristics associated with the touch.

[00127] If a first set of conditions are implemented, the method proceeds to block 956 where a first GUI element is activated. For example, as shown in Figs. 38A-B, in an active window 960 of a music management program, a scroll wheel 962 may be activated when a user touches a playlist portion 964 of the active window 960.

[00128] If a second set of conditions are implemented, the method proceeds to block 958 where a second GUI element is activated. For example, as shown in Figs. 38B-C, in the active window 960 of a music management program, a music control panel 966 may be activated when a user also touches a border 968 of the active window 960. Although they work independent of one another, the first and second GUI elements may be activated at the same time if the first and second conditions occur simultaneously (Fig. 34C).

[00129] Following block 956, the method proceeds to block 960 where it is determined if the first GUI element should be deactivated. If so, the method proceeds to block 962 where the GUI element is deactivated. For example, as shown in Fig. 38D, the first GUI element (scroll wheel 962) is disabled and removed from display when the finger 925 is no longer detected over the playlist 962. If not, the method maintains block 956.

[00130] Similarly but independently, following block 958, the method proceeds to block 964 where it is determined if the second GUI element should be deactivated. If so, the method proceeds to block 966 where the GUI element is deactivated. For example, as shown in Fig. 38E, the second GUI element (control

panel 966) is disabled and removed from display when the finger 925 is no longer detected over the border 968. If not, the method maintains block 958.

**[00131]** It should be noted that the method is not limited to only two GUI elements and that other GUI elements may be activated if other conditions are implemented. For example, a third GUI element may be activated when a third set of condition occurs and so on. By way of example, as shown in Fig. 38F, the user may slide their finger 925 from the border 968 to a menu portion 970 of the active window 960 thereby initiating a change from the control panel 966 to a scroll wheel 972 (e.g., while the second GUI element is being deactivated, the third GUI element is being activated).

**[00132]** Further, as shown in Fig. 38G, the user may add another finger 925 to the current touch thereby initiating a change from the first control panel 966 to a second control panel 982. The first control panel 966 may include a first set of control options such as play, stop, seek and volume options and the second control panel 982 may include a second set of control options such as song playing order, song information, light effect options.

**[00133]** Moreover, as shown in Fig. 38H, the user may place one finger 925A over the border 968, another finger 925B over a menu portion 970, and yet another finger 925C over the playlist portion 964 thereby initiating three different GUI elements, particularly, a control panel 966, a first scroll wheel 972 for scrolling through the menu 970, and a second scroll wheel 962 for scrolling through the playlist 964.

**[00134]** In addition, multiple GUI elements can be activated in the same portion. For example, as shown in Figs. 38I and 38J, if the user selects a particular box 990 in the playlist 964, a keyboard 992 may be activated so that the user can enter data associated with the song (e.g., title, artist, genre, etc.). If the scroll wheel 962 is active at the same time as the keyboard 992, the scroll wheel 962 may be minimized to accommodate the keyboard 992 as shown. Once the keyboard 992 is deactivated, the scroll wheel 962 reverts back to its original size.

[00135] The various aspects, embodiments, implementations or features of the invention can be used separately or in any combination.

[00136] The invention is preferably implemented by hardware, software or a combination of hardware and software. The software can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data which can thereafter be read by a computer system. Examples of the computer readable medium include read-only memory, random-access memory, CD-ROMs, DVDs, magnetic tape, optical data storage devices, and carrier waves. The computer readable medium can also be distributed over network-coupled computer systems so that the computer readable code is stored and executed in a distributed fashion.

[00137] While this invention has been described in terms of several preferred embodiments, there are alterations, permutations, and equivalents, which fall within the scope of this invention. For example, although the invention has been primarily directed at touchscreens, it should be noted that in some cases touch pads may also be used in place of touchscreens. Other types of touch sensing devices may also be utilized. It should also be noted that there are many alternative ways of implementing the methods and apparatuses of the present invention. It is therefore intended that the following appended claims be interpreted as including all such alterations, permutations, and equivalents as fall within the true spirit and scope of the present invention.



**What is claimed is:**

1. A user interface method, comprising:  
detecting a touch;  
determining a user interface mode when a touch is detected;  
displaying one or more GUI elements based on the user interface mode; and  
enabling the functionality of the GUI element.
2. The user interface method as recited in claim 1 wherein the user interface mode is based on one or more applications.
3. The user interface method as recited in claim 2 wherein different applications indicate different user interface modes.
4. The user interface method as recited in claim 1 wherein the user interface mode is based on a current state of an application.
5. The user interface method as recited in claim 5 wherein different states of the application indicate different user interface modes.
6. The user interface method as recited in claim 1 wherein the user interface mode is based on one or more touch characteristics of the detected touch.
7. The user interface method as recited in claim 6 wherein different characteristics of the touch indicate different modes.
8. The user interface method as recited in claim 1 wherein the user interface mode is based on only one condition, the condition being selected from application, a state of an application, a touch characteristic of the detected touch.
9. The user interface method as recited in claim 1 wherein the user interface mode is based on multiple conditions, the conditions being selected from one or more applications, one or more states of an application, one or more touch characteristics of the detected touch.
10. The user interface method as recited in claim 1-9 wherein only one GUI element is displayed.
11. The user interface method as recited in claim 1-9 wherein multiple GUI elements are displayed.
12. The user interface method as recited in claim 19 wherein the user interface mode is a scroll mode, and wherein the GUI element is a virtual scroll wheel.
13. The user interface method as recited in claim 1-9 wherein the user interface mode is a data entry mode, and wherein the GUI element is a virtual keyboard.

14. The user interface method as recited in claim 1-9 wherein the user interface mode is an edit mode, and wherein the GUI element is a tool bar or virtual keyboard.
15. The user interface method as recited in claim 1-9 wherein the user interface mode is a control mode, and wherein the GUI element is a control panel.
16. The user interface method as recited in claim 1-9 wherein the user interface mode is an information mode, and wherein the GUI element is a window.
17. The user interface method as recited in claim 1-9 wherein the GUI element is displayed over a previously existing graphical image.
18. The user interface method as recited in claim 17 wherein the GUI element is semitransparent so that the previously existing graphical image disposed underneath the GUI element can be seen through the GUI element.
19. The user interface method as recited in claim 1-9 wherein the GUI element is configured to displace a previously existing graphical image.
20. The user interface method as recited in claim 1-9 wherein the GUI element is presented in the vicinity of the detected touch.
21. The user interface method as recited in claim 1-9 wherein the GUI element is presented at a predetermined location.
22. The user interface method as recited in claim 1-9 wherein the displaying the GUI element includes implementing a transition effect that transitions the GUI element from a first state to a second state.
23. The user interface method as recited in claim 22 wherein the transitioning effect is selected from popping, growing, or fading in and out.
24. The user interface method as recited in claim 22 wherein the speed of the transition effect is based on the pressure of the touch.
25. The user interface method as recited in claim 1-9 wherein enabling the GUI element includes monitoring a touch event relative to the GUI element, and performing actions associated with the touch event.
26. The user interface method as recited in claim 1-9 further comprising:  
determining whether or not to deactivate the GUI element, deactivation including disabling the functionality of the GUI element and removing the GUI element from display.
27. The user interface method as recited in claim 26 wherein the GUI element is deactivated when a touch is no longer detected.

28. The user interface method as recited in claim 26 wherein the GUI element is deactivated when a touch has not been detected for a preset amount of time.
29. The user interface method as recited in claim 26 wherein the GUI element is deactivated after being activated for a preset amount of time.
30. The user interface method as recited in claim 26 wherein the GUI element is deactivated via a user selection.
31. The user interface method as recited in claim 1-9 wherein displaying the GUI element includes implementing a transition effect that transitions the GUI element from a first state to a second state, and wherein the step of removing the displayed GUI element includes implementing a reverse transition effect that transitions the GUI element from the second state to the first state.
32. The user interface method as recited in claim 1-9 wherein determining the user interface mode comprises:
- determining a current application;
  - determining a current state of the current application; and
  - determining touch characteristics associated with the detected touch.
33. A method for scrolling through media items, the method comprising:
- displaying a plurality of media items;
  - detecting a touch over at least one of the media items that are displayed;
  - activating a virtual scroll wheel when a touch is detected over the displayed media items,;
  - determining if a touch event is performed relative to the touch region of the virtual scroll wheel; and
  - scrolling through the group of media items when a scrolling touch event is performed.
34. The method as recited in claim 33 wherein activating the virtual scroll wheel includes displaying and enabling the functionality of the virtual scroll wheel, the virtual scroll wheel providing a touch region where a user swirls their finger in order to traverse through the group of media items
35. The method as recited in claim 34 further comprising:
- deactivating the virtual scroll wheel when a touch event is not performed, the deactivation of the virtual scroll wheel including disabling the functionality of the virtual scroll wheel and removing the virtual scroll wheel from display.

36. The method as recited in claim 35 wherein the display and the removal of the virtual scroll wheel from display are performed with a transition effect that transitions the virtual scroll wheel from a first state to a second state when displayed, and that transitions the virtual scroll wheel from the second state to the first state when removed.

37. The method as recited in claim 34 wherein the virtual scroll wheel is displayed with a transition effect that transitions the virtual scroll wheel from a first state to a second state.

38. The method as recited in claim 34 wherein the transition effect causes the virtual scroll wheel to grow, a small virtual scroll wheel being initially displayed, and thereafter the virtual scroll wheel continuously enlarging until the virtual scroll wheel reaches a final size.

39. The method as recited in claim 34, 37 and 38 wherein the virtual scroll wheel is displayed over the plurality of media items, and wherein the virtual scroll wheel is semitransparent so that the plurality of media items disposed underneath the virtual scroll wheel can be seen through the virtual scroll wheel.

40. The method as recited in claim 33-39 wherein scrolling includes moving a selector bar linearly through the group of media items in accordance with the touch event occurring on the virtual scroll wheel.

41. The method as recited in claim 33-40 wherein the virtual scroll wheel provides one or more virtual buttons, and wherein the method further comprises:  
determining if a selection touch event is performed relative to the one or more virtual buttons of the virtual scroll wheel; and  
implementing an action associated with a particular button when the selection touch event is performed on the particular button.

42. The method as recited in claim 41 wherein the one or more virtual buttons include at least a center button that is surrounded by the touch region.

43. The method as recited in claim 42 wherein the virtual scroll wheel is circular.

44. The method as recited in claim 33-40 wherein the step of determining if a touch event is performed relative to the touch region of the virtual scroll wheel comprises:

detecting the presence of at least one finger over the touch region;  
setting an initial position of the finger; and  
monitoring finger movement relative to the initial position.

45. The method as recited in claim 33-40 wherein the media items are a list of songs.
46. A method performed on a user operated electronic device having a display and a touch screen, the method comprising:  
determining if a touch is detected;  
monitoring and analyzing the current operating conditions when a touch is detected;  
activating a first GUI element for a first set of operating conditions; and  
activating a second GUI element for a second set of operating conditions.
47. A method performed on a computing device having a display and a touch sensing input device, the method comprising:  
sensing touches;  
displaying and enabling a GUI element when a touch is detected, the GUI element being based on at least one of the following:  
(a) the application currently running on the computing device;  
(b) the current state of the application;  
(c) one or more characteristics of the touch, the characteristics including,  
(i) touch location,  
(ii) touch ID  
(iii) number of touches,  
(iv) touch motion  
disabling and removing the GUI element from display when one of the following events occurs,  
(a) the touch is no longer detected,  
(b) a touch has not been detected for a preset amount of time,  
(c) a certain amount of time has gone by since the step of displaying and enabling,  
(d) a user selection.
48. A computing system, comprising:  
a display device configured to display a graphical user interface;  
a touch screen positioned over the display device, the touch screen being configured to detect touches that occur over the display device; and

a processor operatively coupled to the display device and the touch screen, the processor instructing the display device to display one or more GUI elements in response to a touch, and performing actions associated with the GUI element when touch events are detected relative to the displayed GUI elements.

49. The system as recited in claim 48 wherein the processor is configured to determine a user interface mode in response to the touch, the user interface mode having one or more GUI elements associated therewith that are capable of being displayed, the user interface modes being based on at least one of a current application, a state of the application and a touch characteristics associated with the touches.

50. A computing device, comprising:

a processor;

a touch screen capable of sensing touch events; and

a display configured to simultaneously display a plurality of media items and a virtual scroll wheel, the virtual scroll wheel providing a region where touch events are performed in order to implement a scrolling action, the scrolling action allowing a user to traverse through the plurality of media items.

51. A computer implemented method for initiating floating controls via a touch sensitive device, the method comprising:

detecting the presence of an object on the touch sensitive device;

recognizing the object; and

generating a user interface element on the touch screen in the vicinity of the object based on the recognized object.

52. The method as recited in claim 51, wherein the user interface element includes one or more control options that can be selected by a user of the touch sensitive device.

53. The method as recited in claim 52 further comprising generating a control signal when one of the control options is selected by the object.

54. The method as recited in claim 53 wherein the control signal modifies the functionality of the computer.

55. The method as recited in claim 53 wherein the control signal modifies a user interface element.

56. The method as recited in claim 51-55 wherein the object is a finger or a stylus.

57. A computer implemented method comprising:  
presenting a virtual wheel;  
detecting at least a first finger over the virtual wheel;  
associating the finger to the virtual wheel; and  
generating control signals when the finger is moved about the virtual wheel.
58. The method as recited in claim 57 further comprising:  
rotating the presented virtual wheel when the finger is moved about the virtual wheel.
59. The method as recited in claim 57 wherein the control signals implement scrolling on a display.

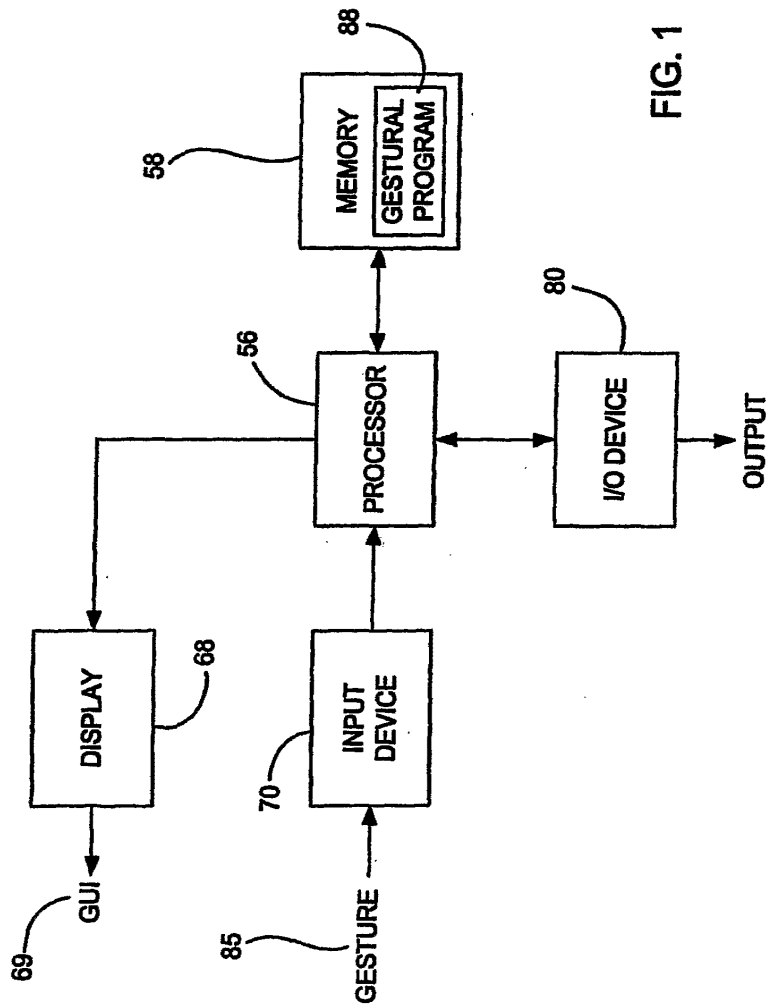


FIG. 1



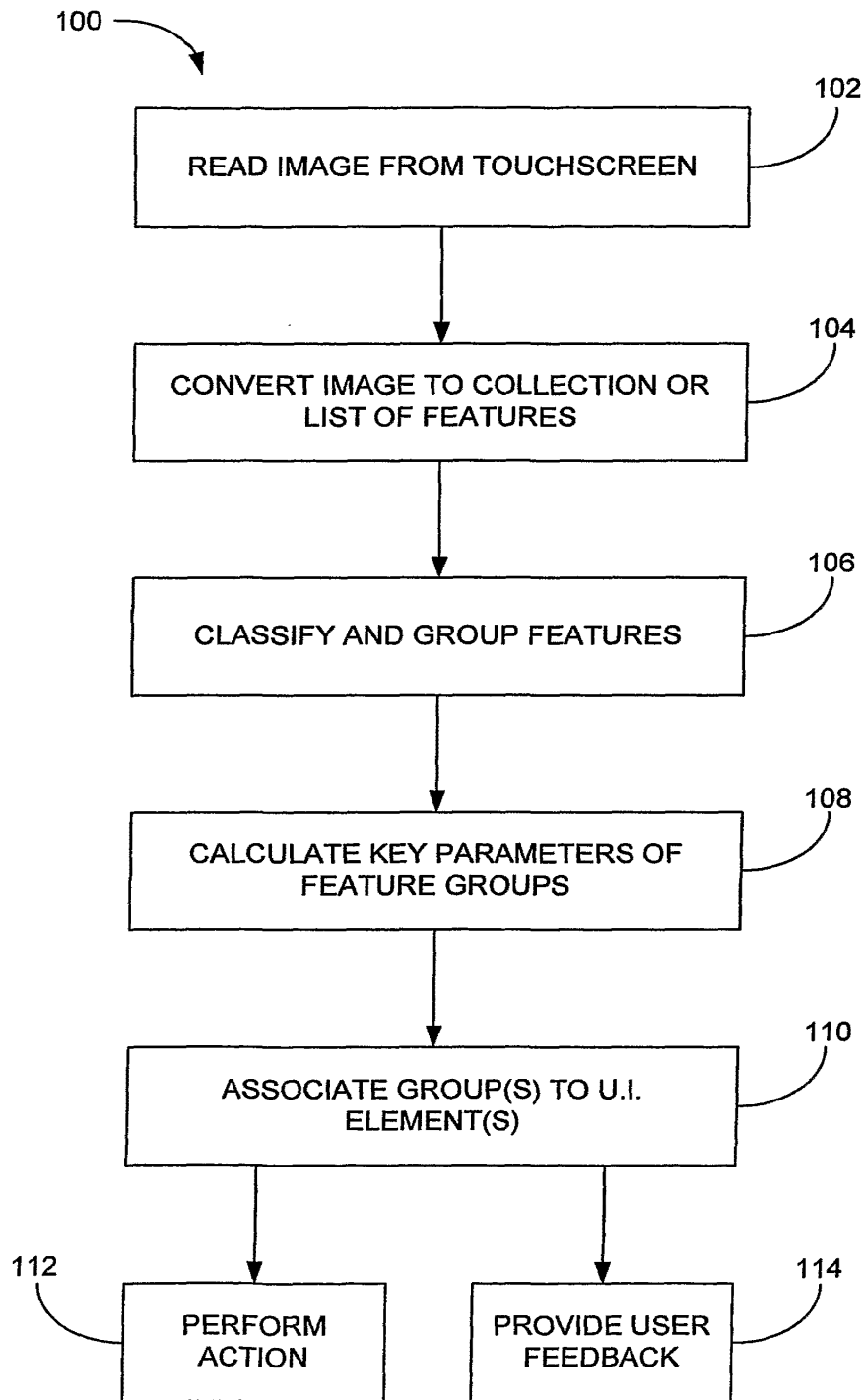


FIG. 2

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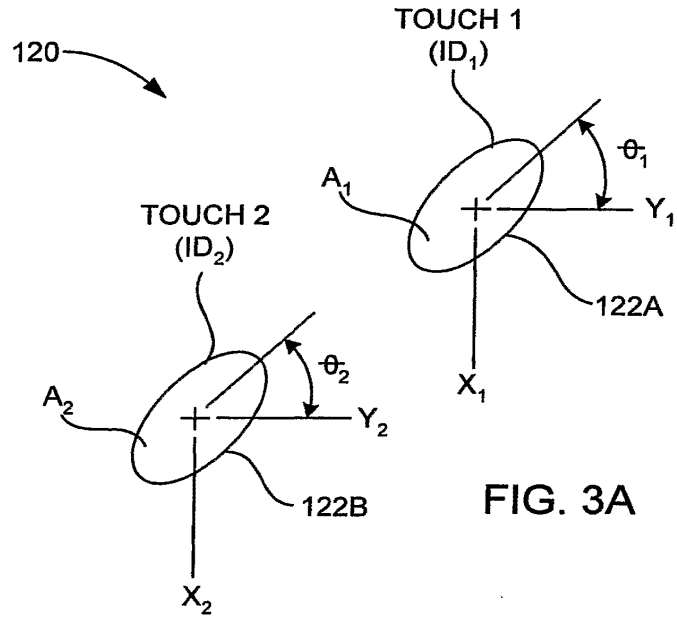


FIG. 3A

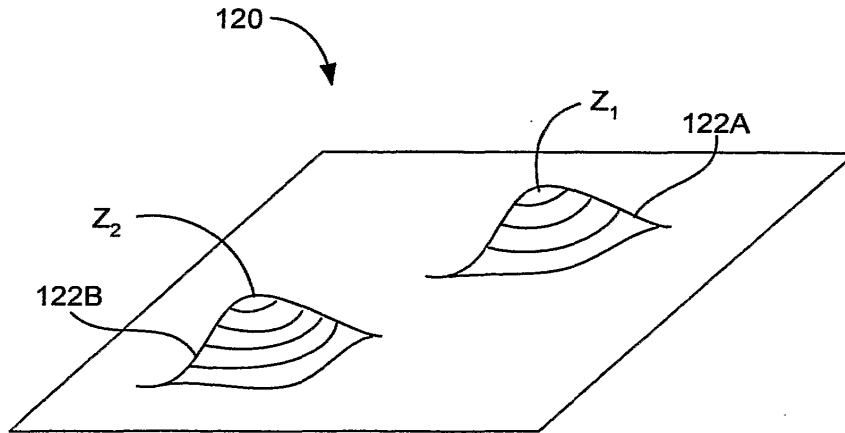


FIG. 3B

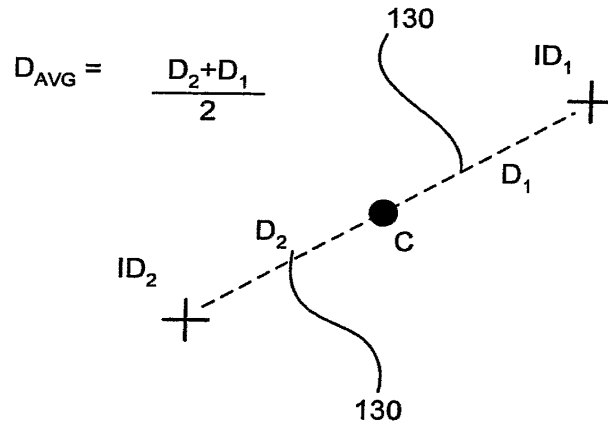


FIG. 4

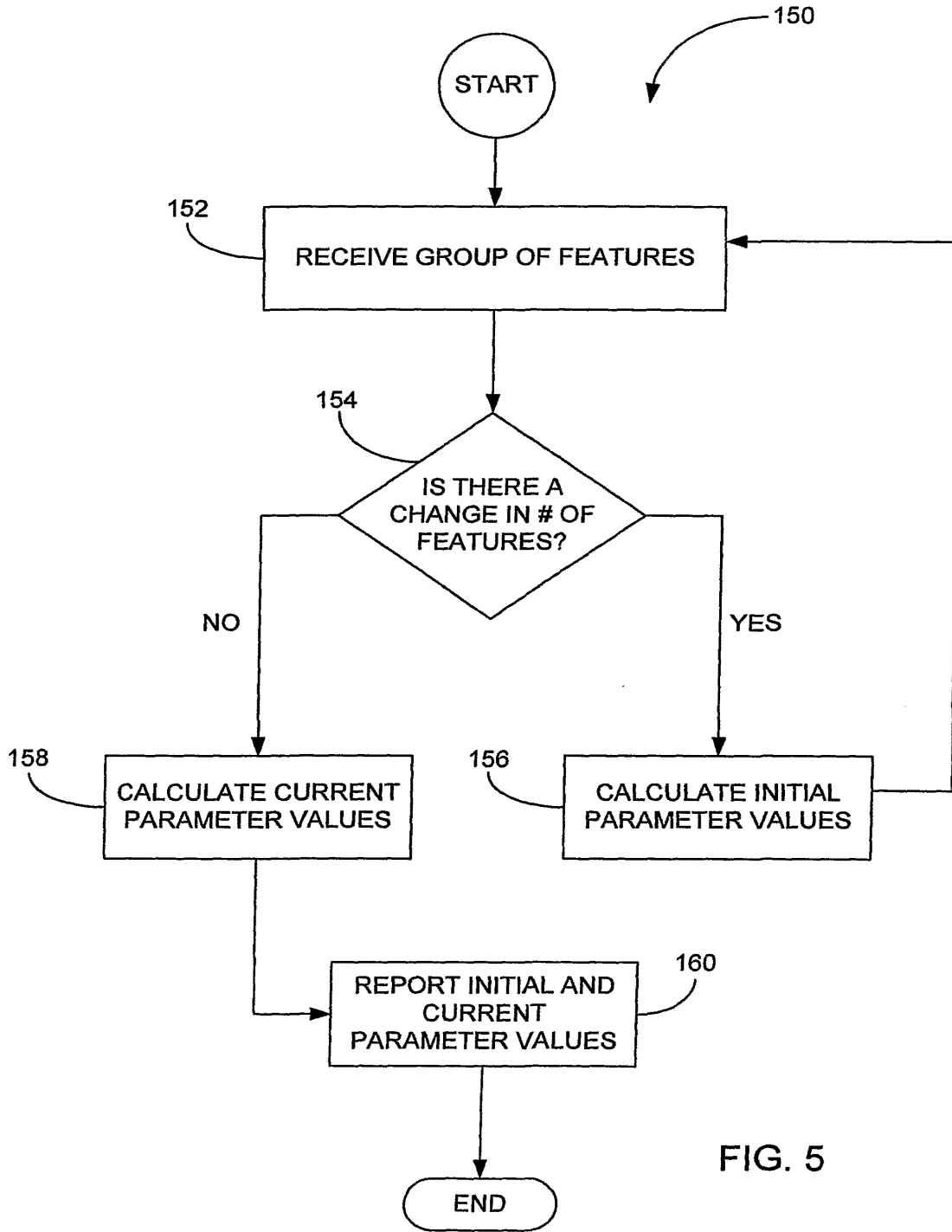


FIG. 5

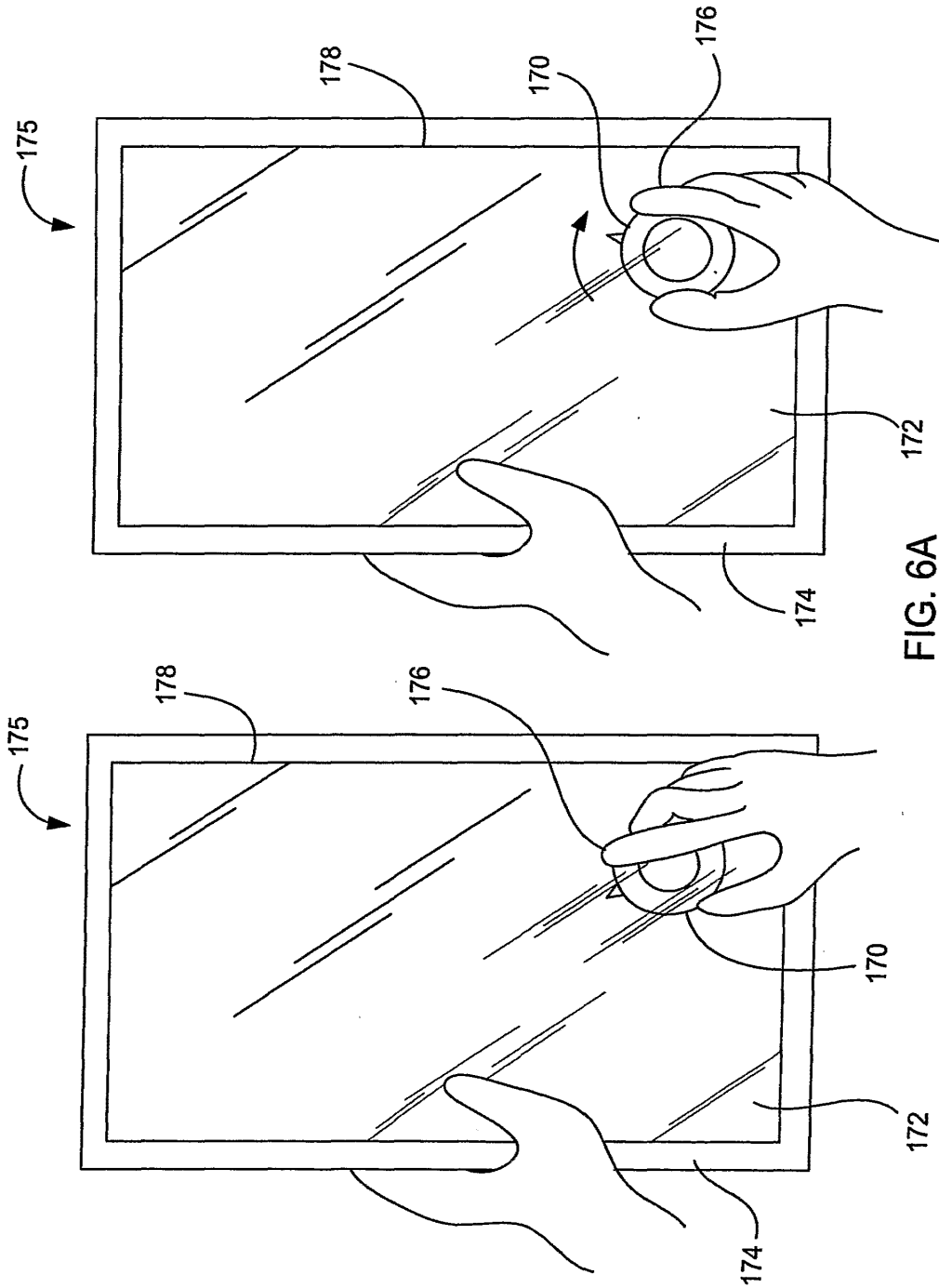


FIG. 6A

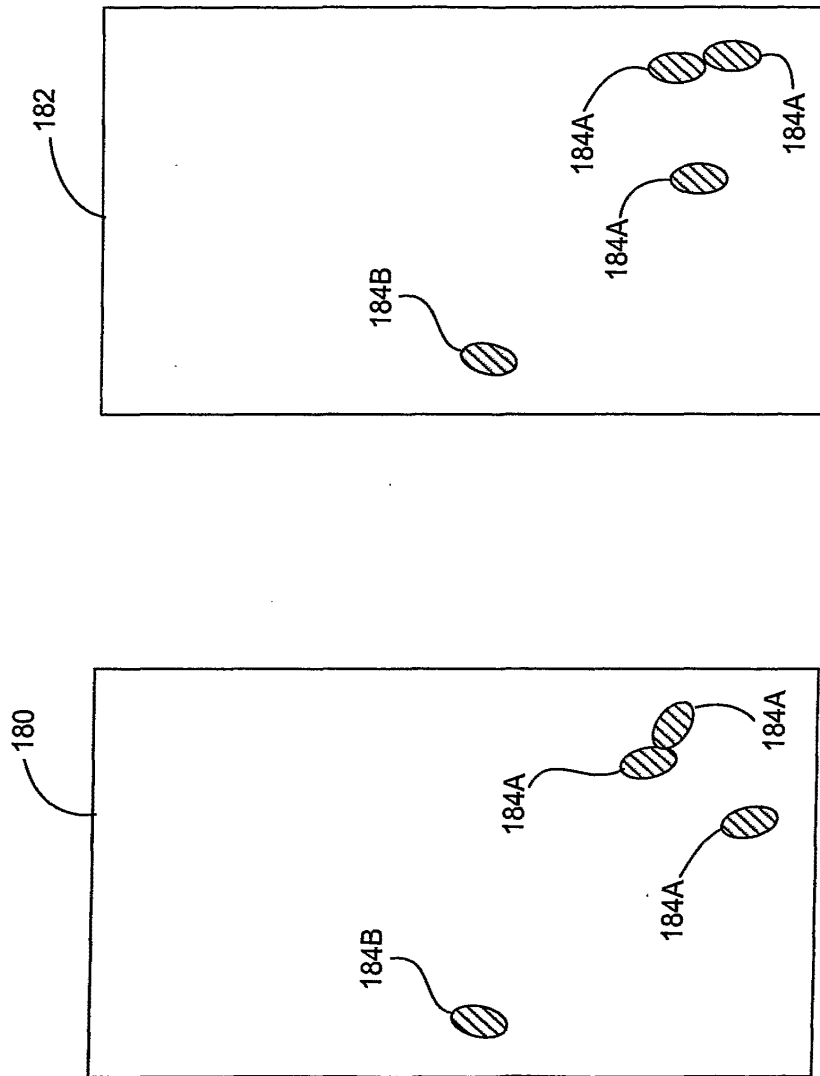


FIG. 6B

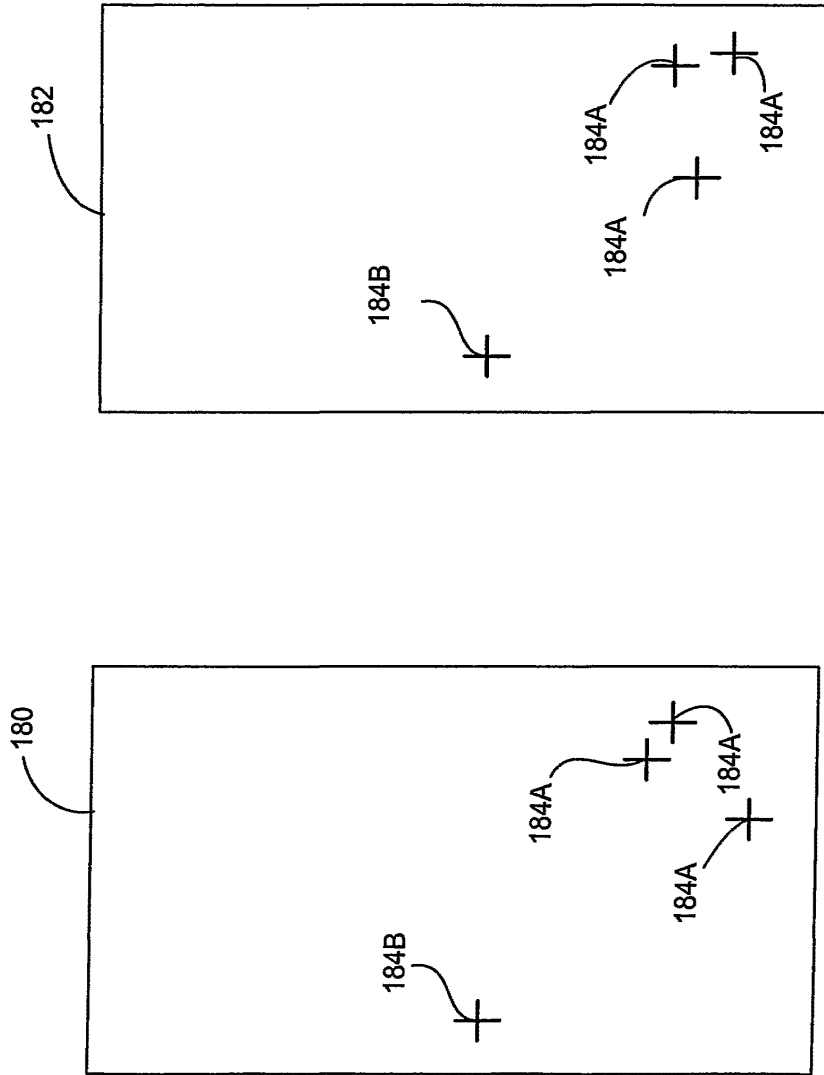


FIG. 6C

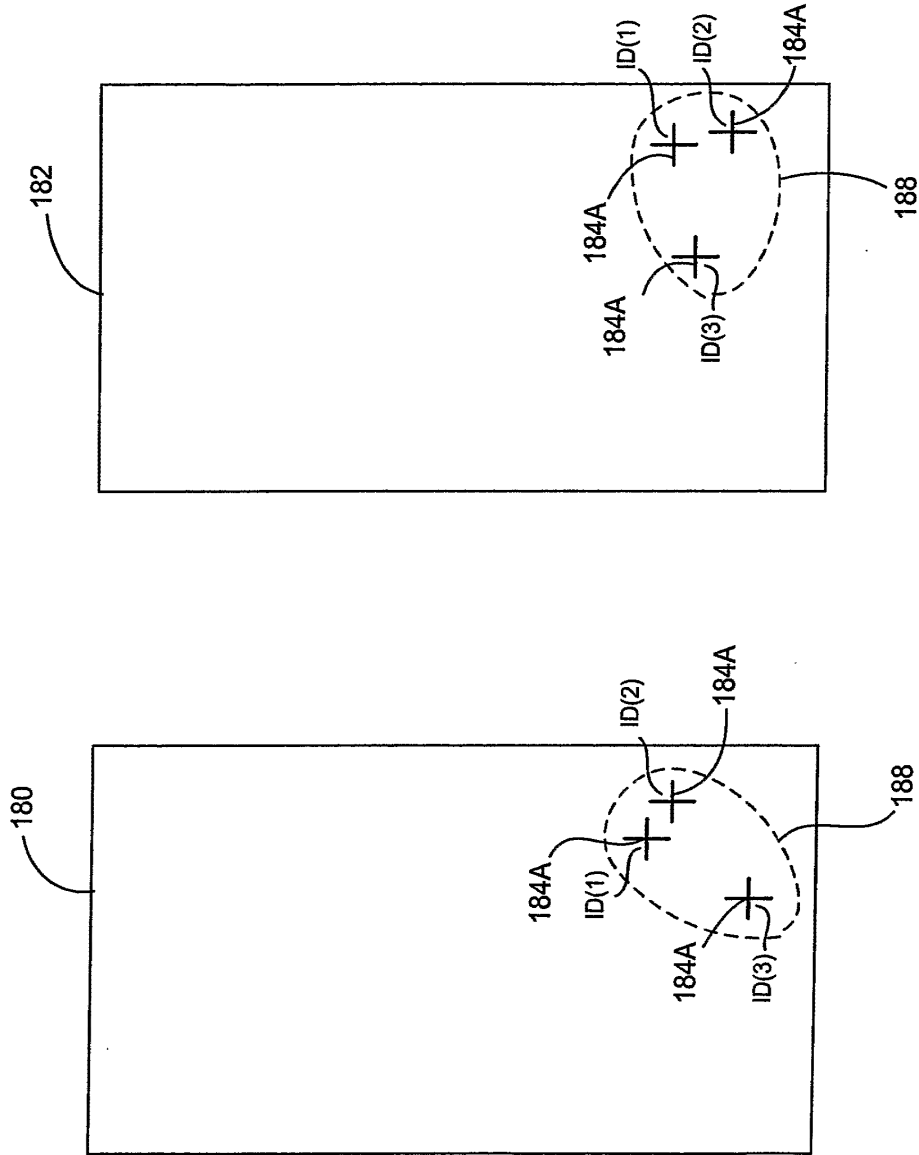


FIG. 6D



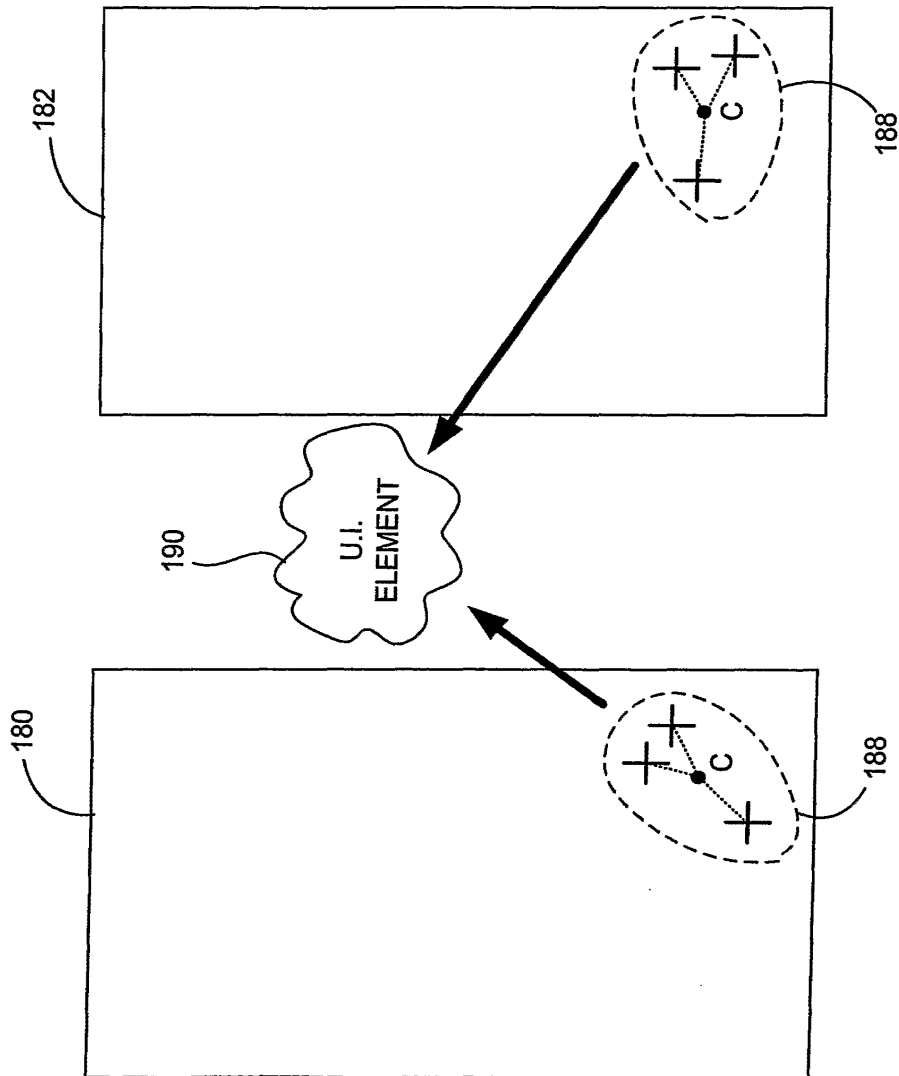


FIG. 6E

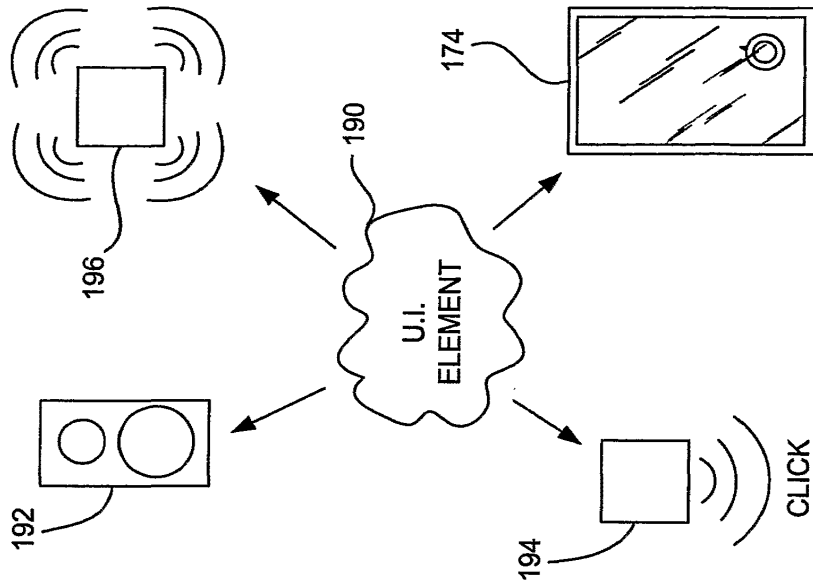


FIG. 6G

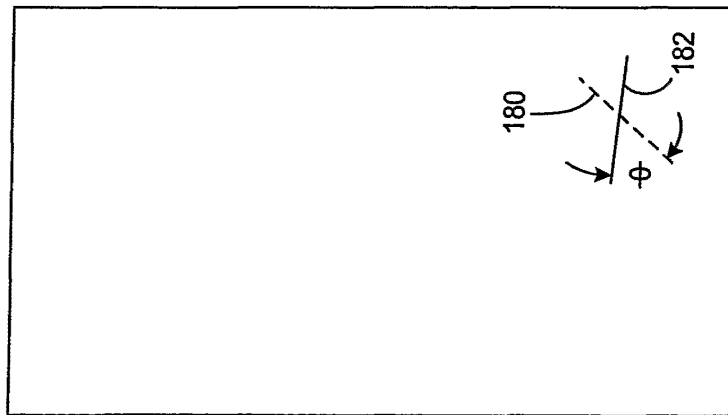


FIG. 6F

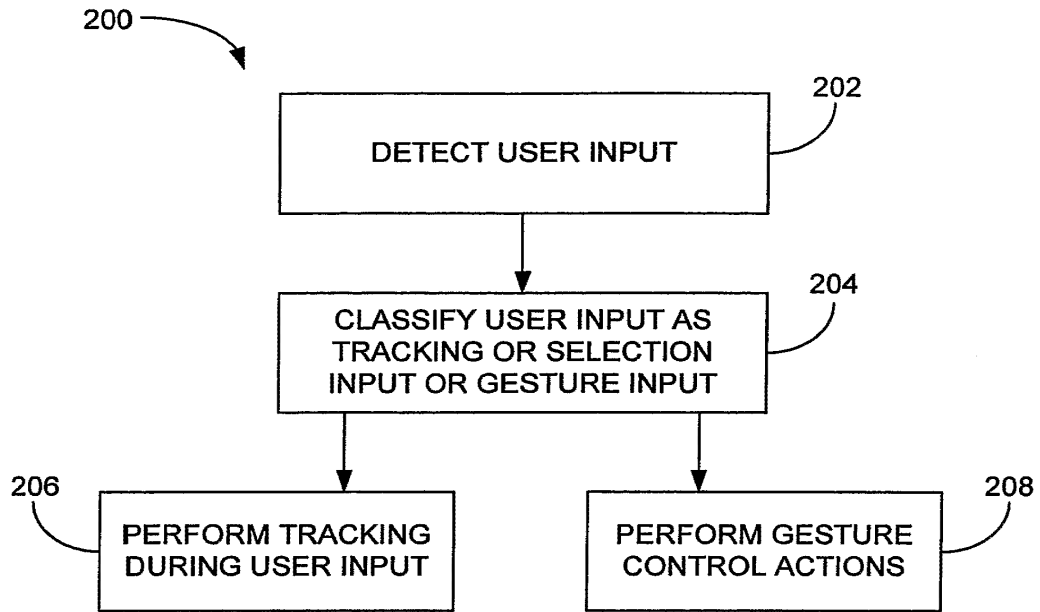


FIG. 7

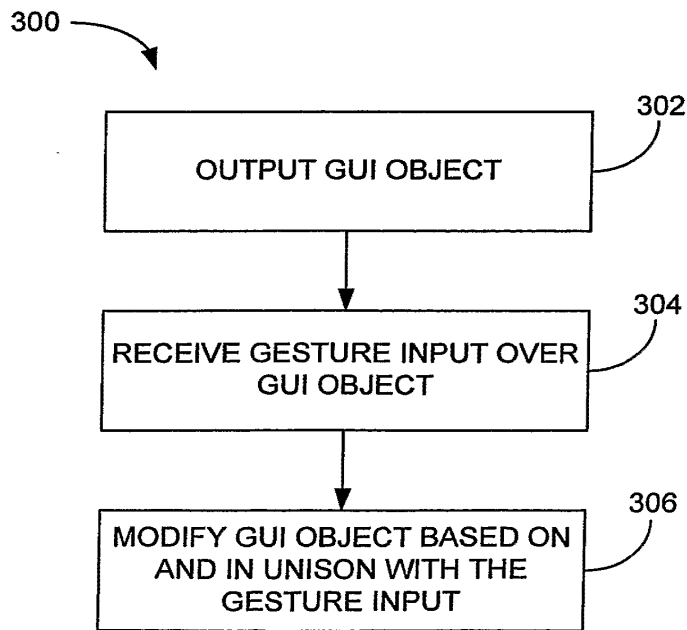


FIG. 9

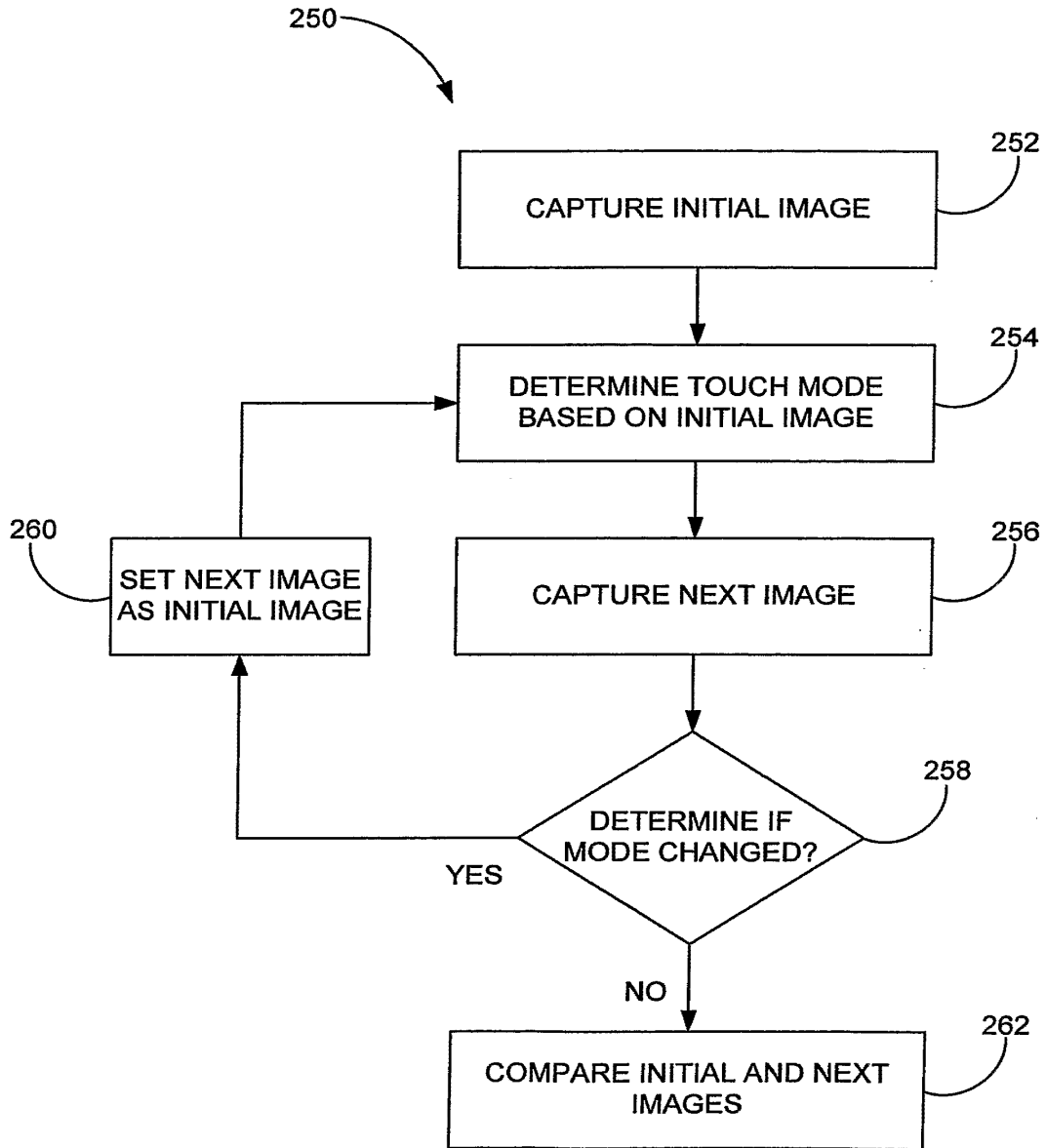


FIG. 8

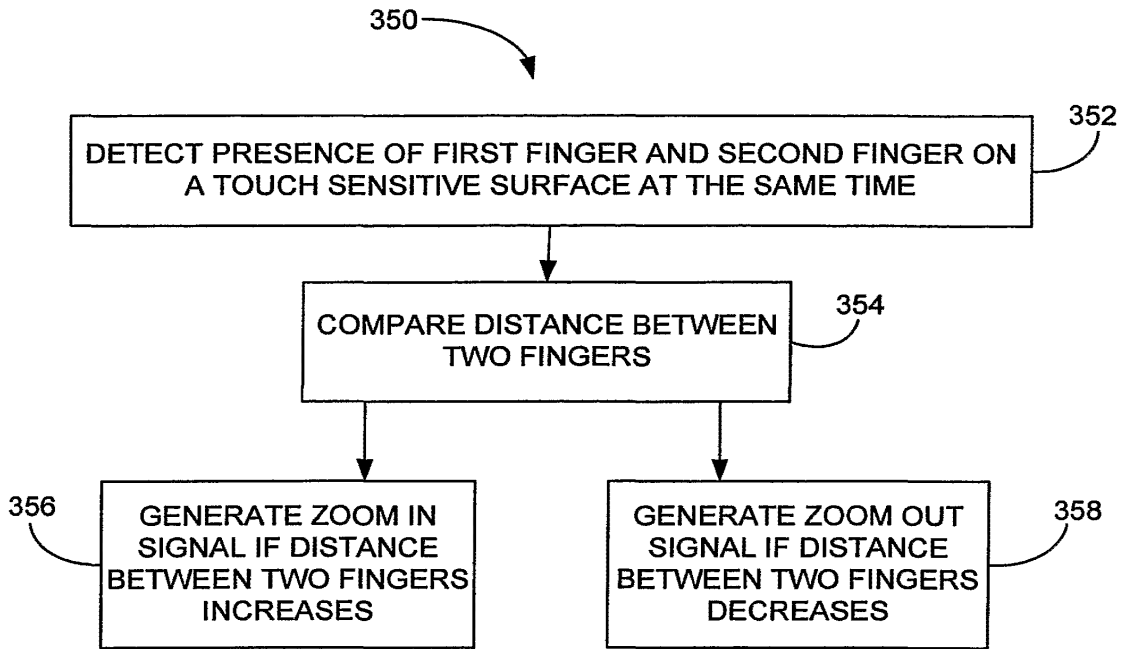


FIG. 10

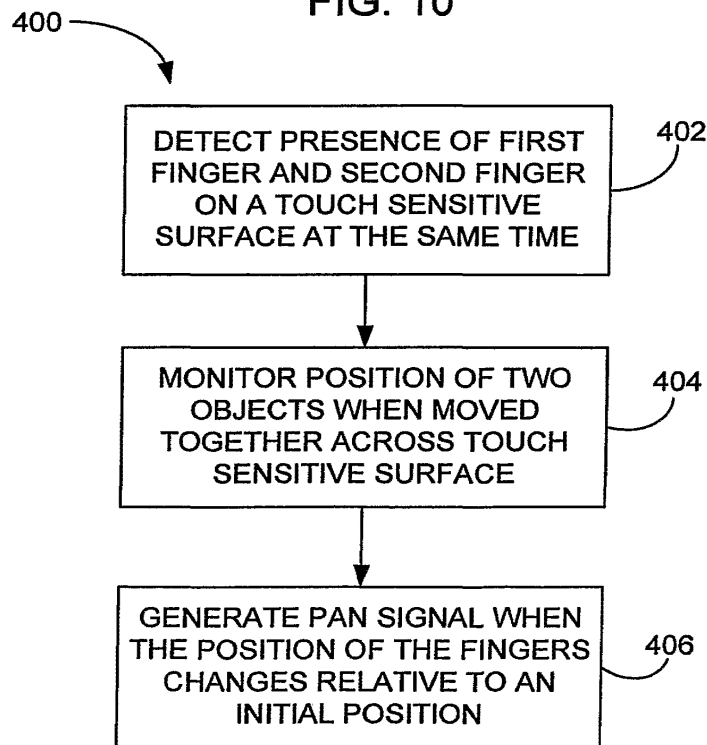


FIG. 12

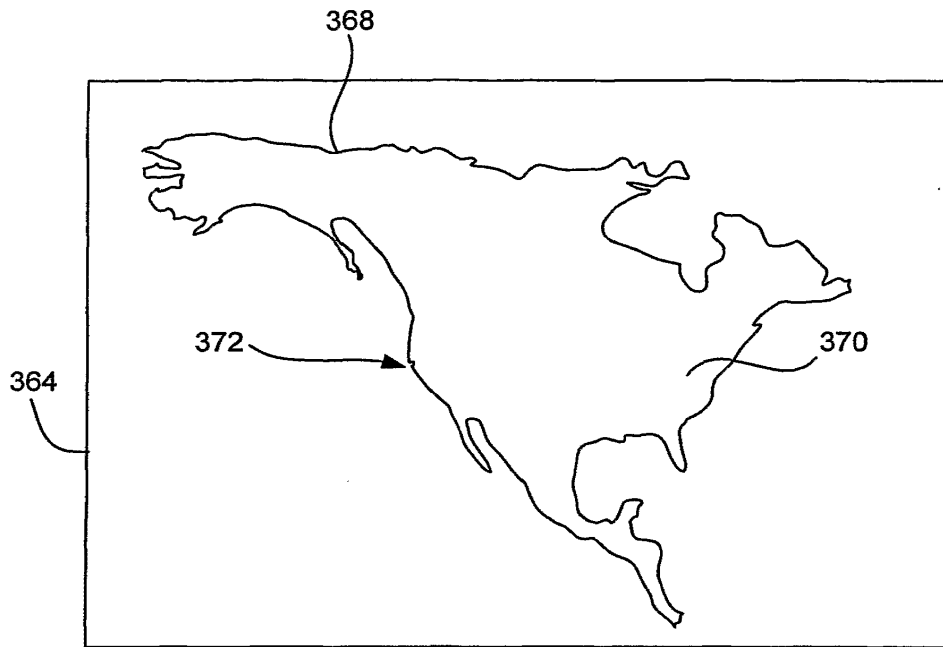


FIG. 11A

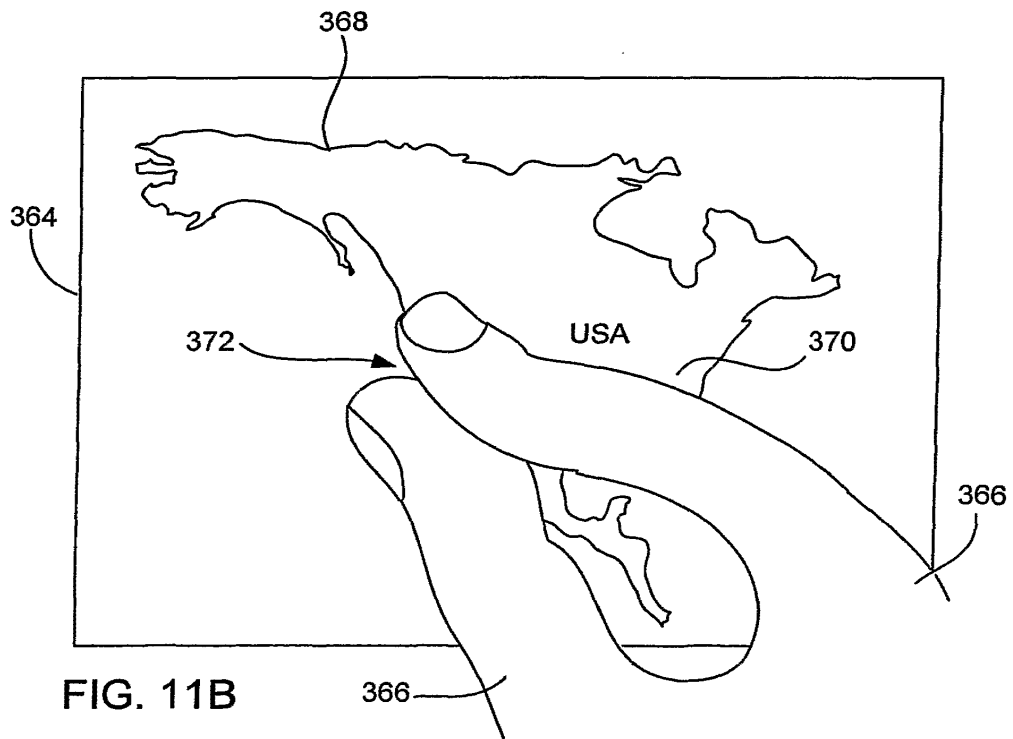
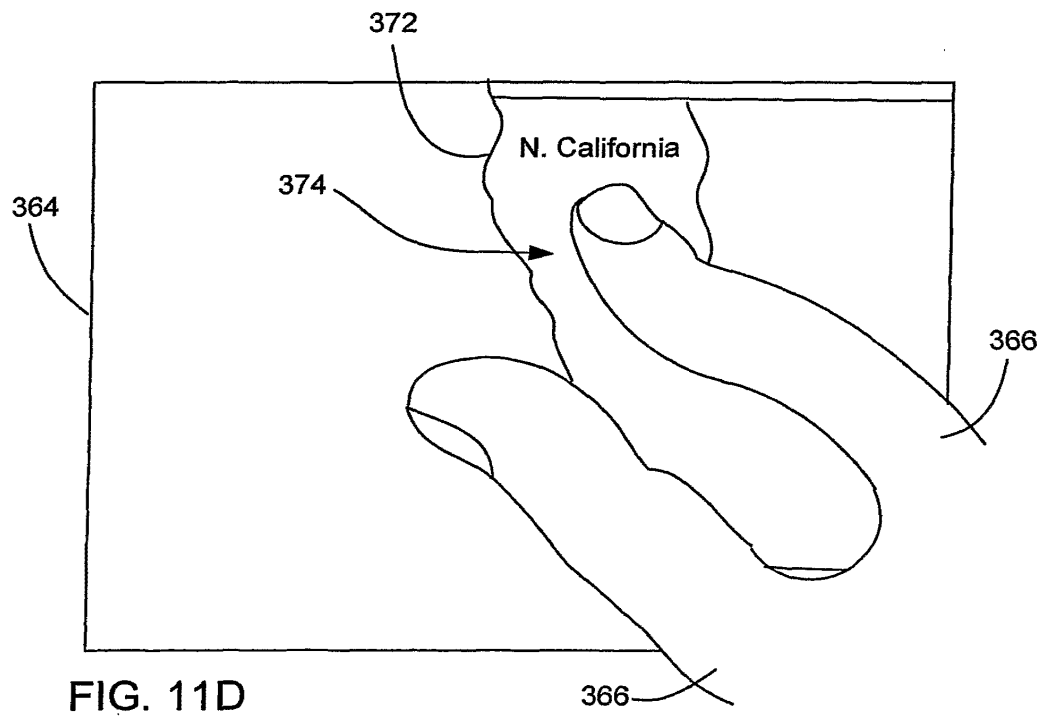
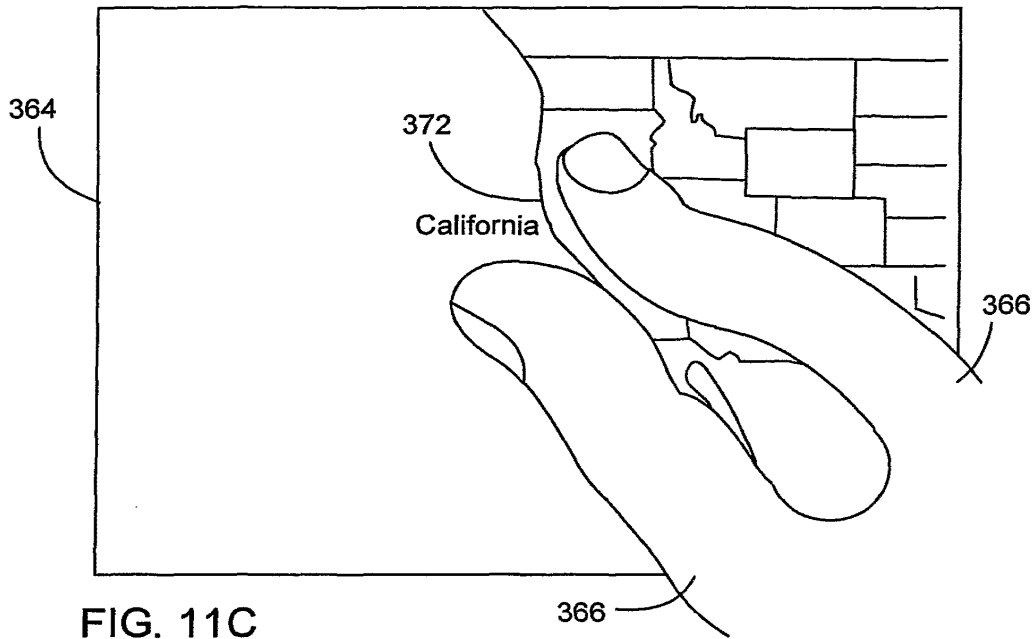


FIG. 11B



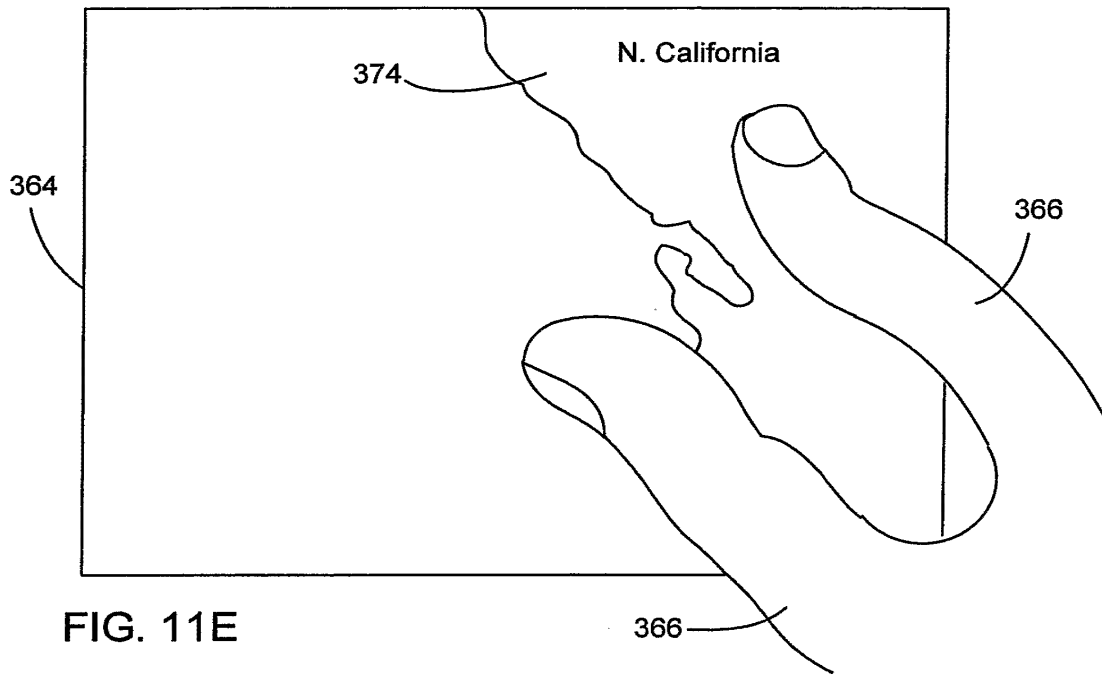


FIG. 11E

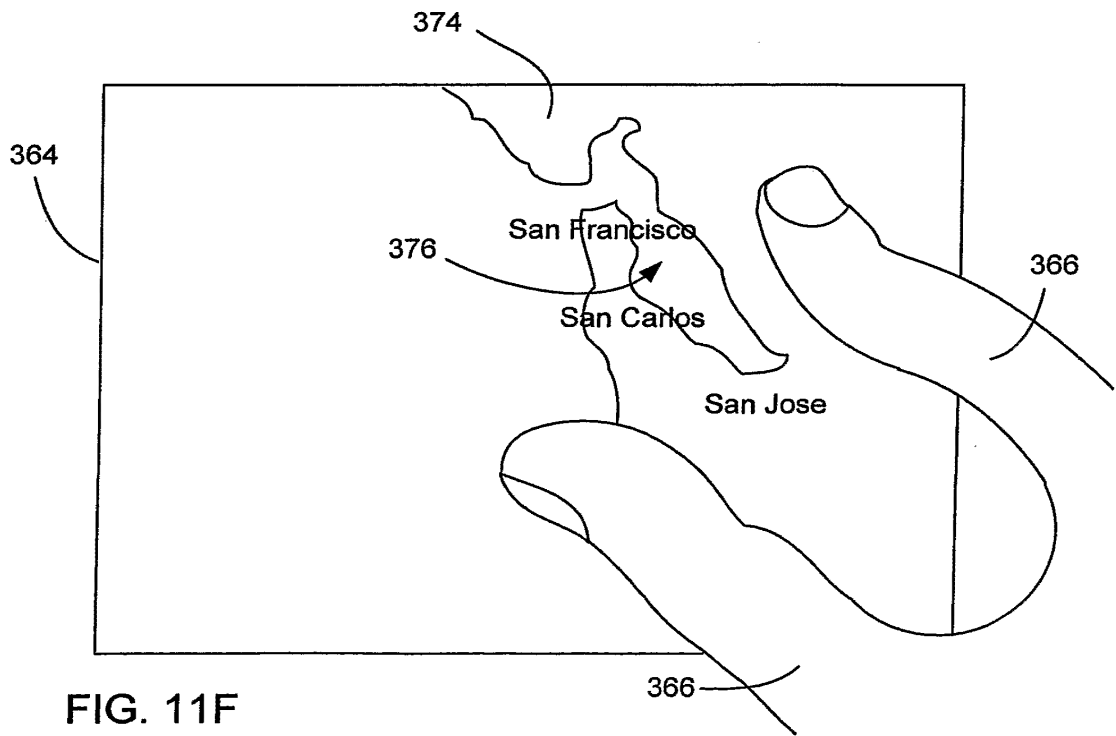


FIG. 11F



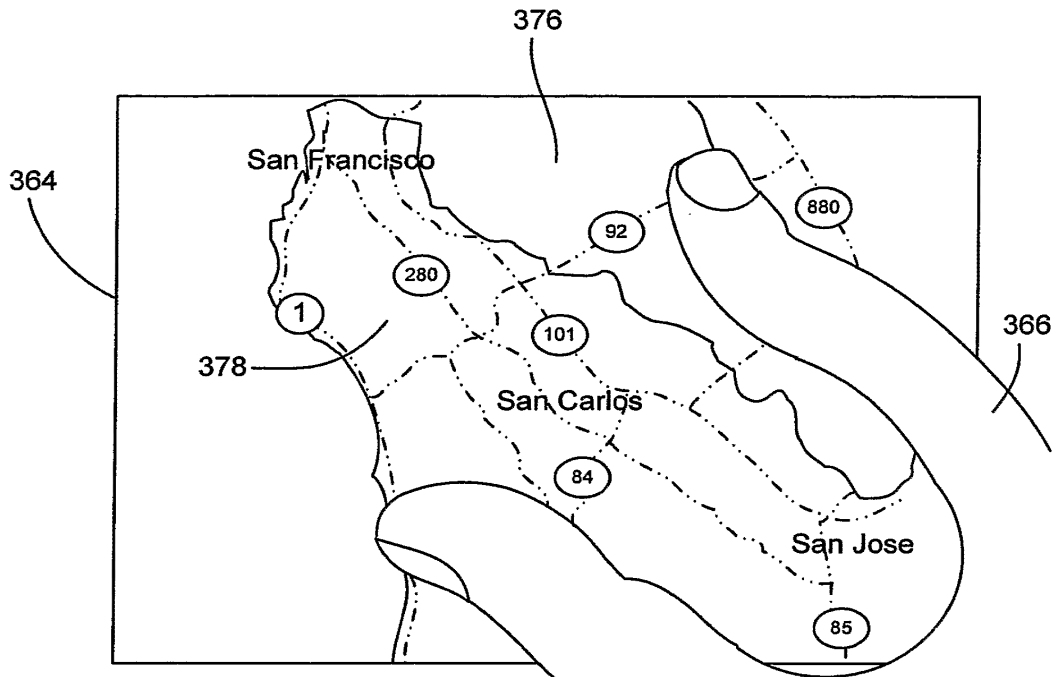


FIG. 11G

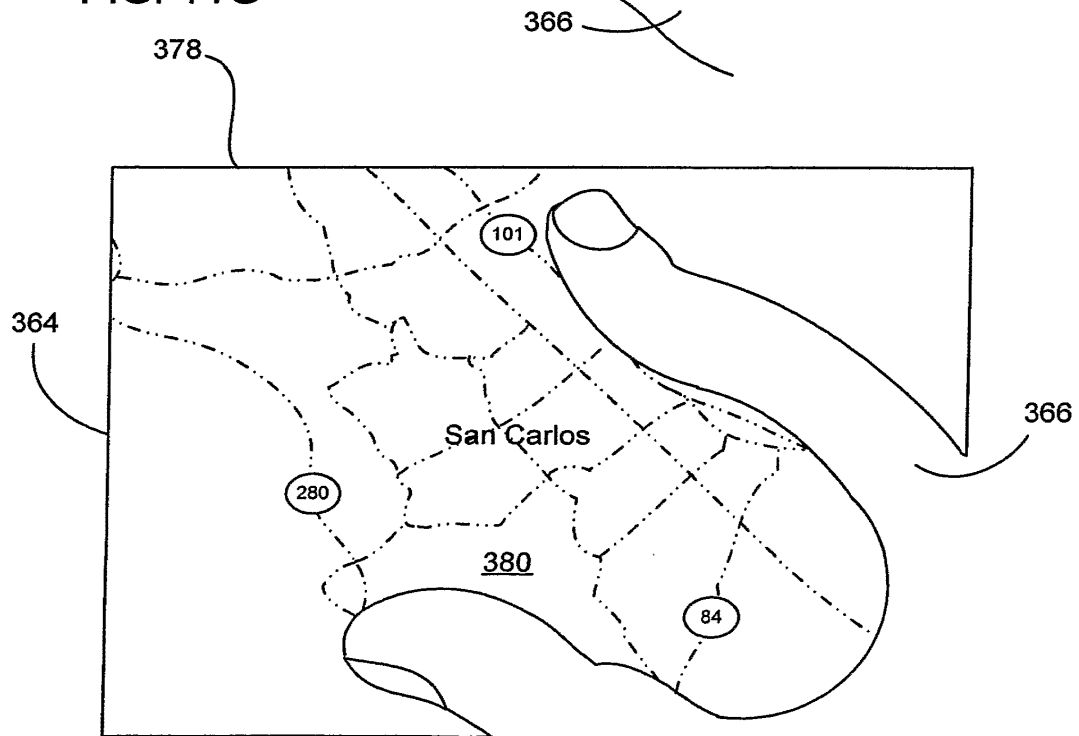


FIG. 11H

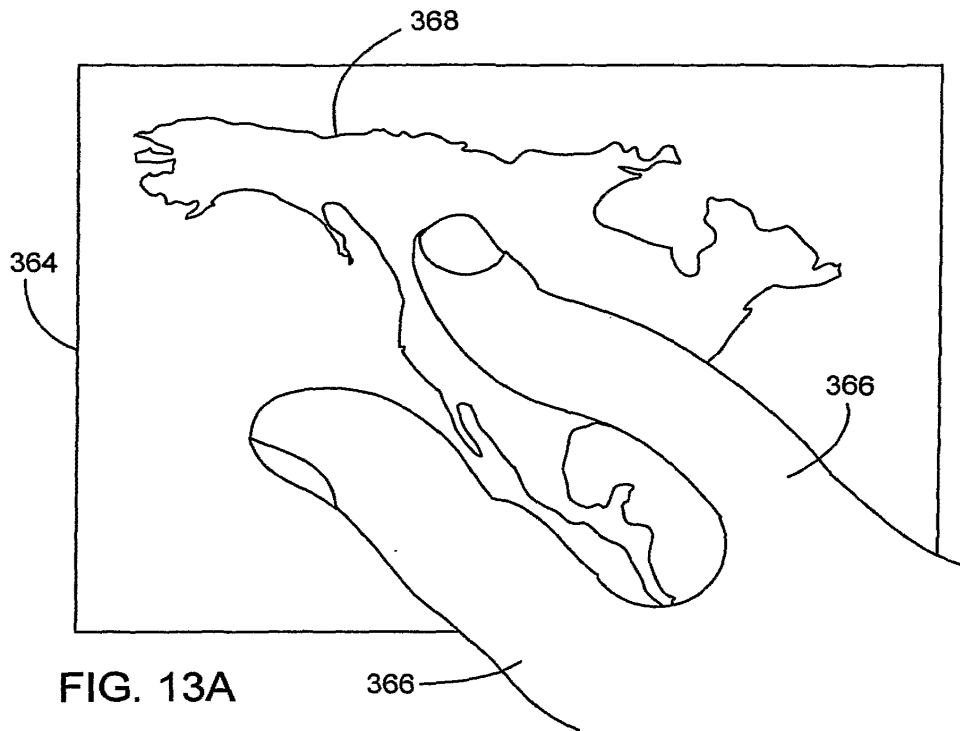


FIG. 13A

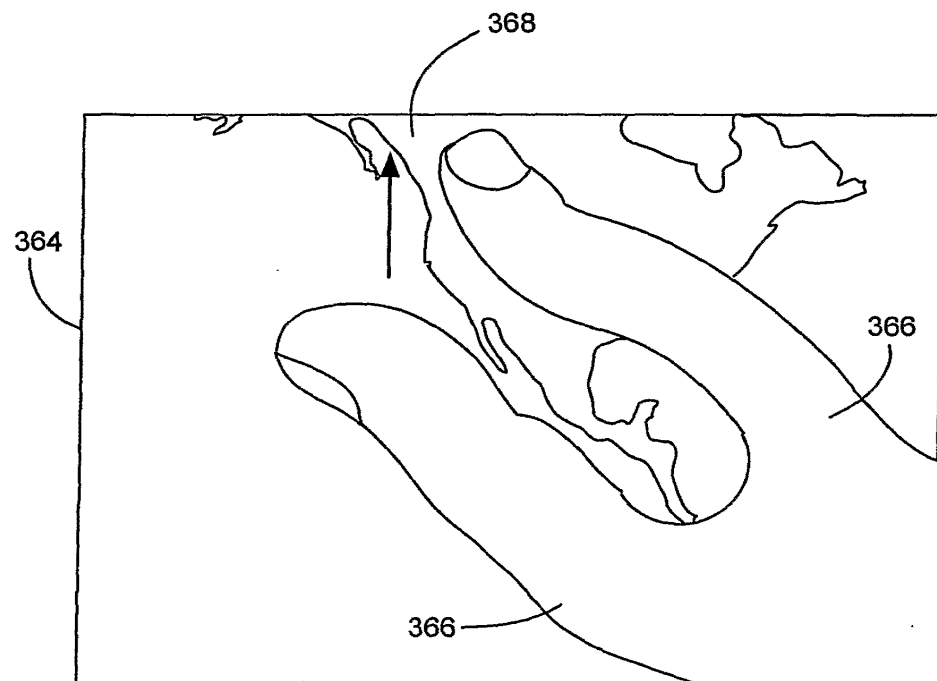


FIG. 13B

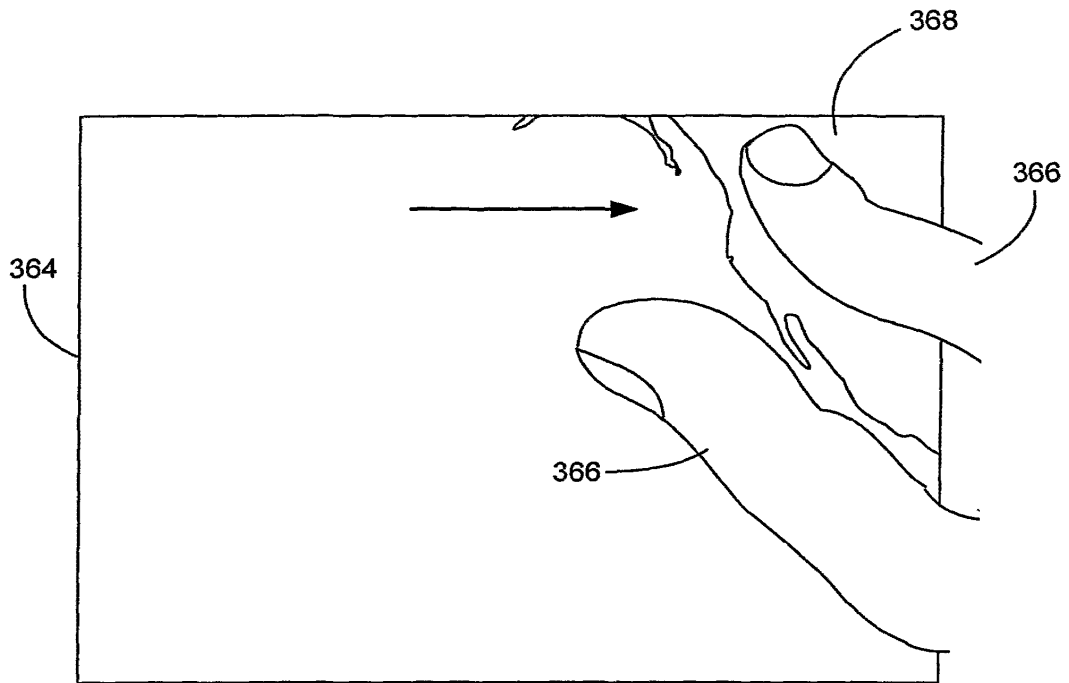


FIG. 13C

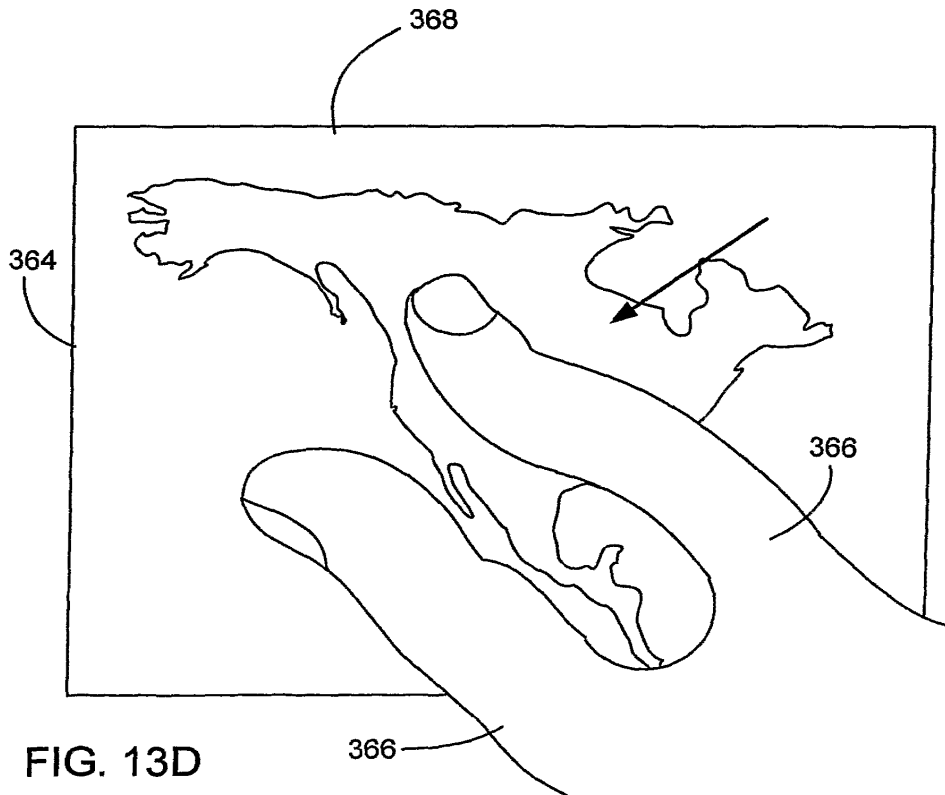


FIG. 13D

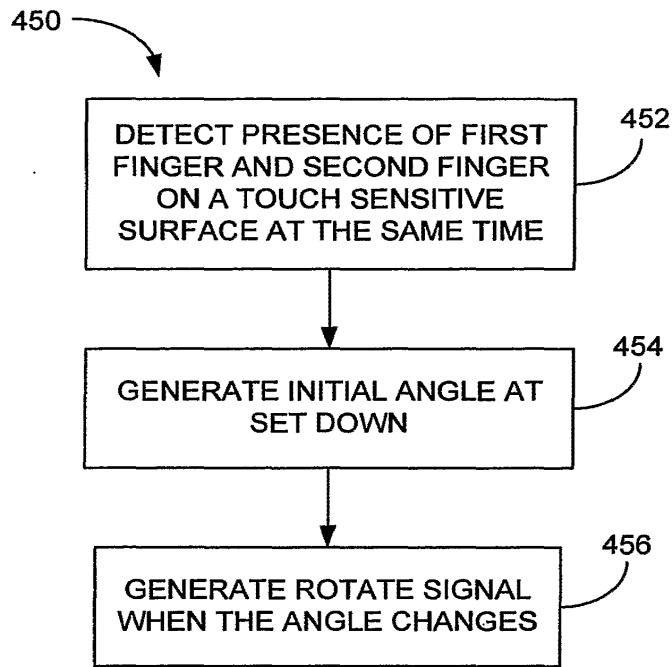


FIG. 14

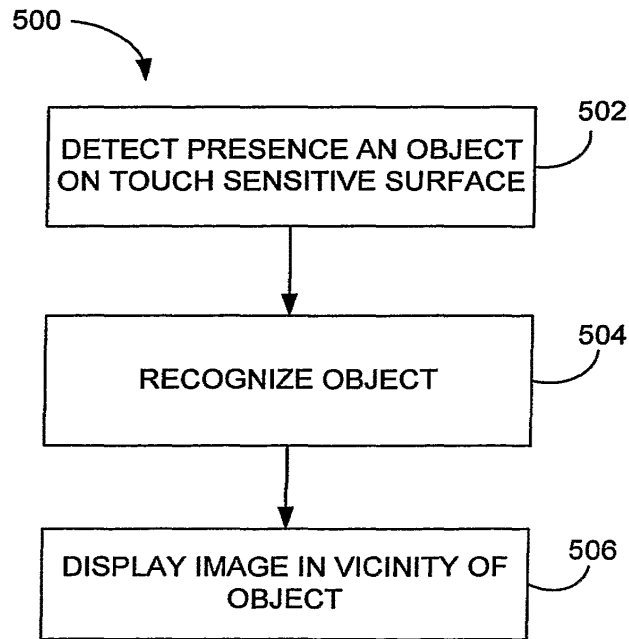
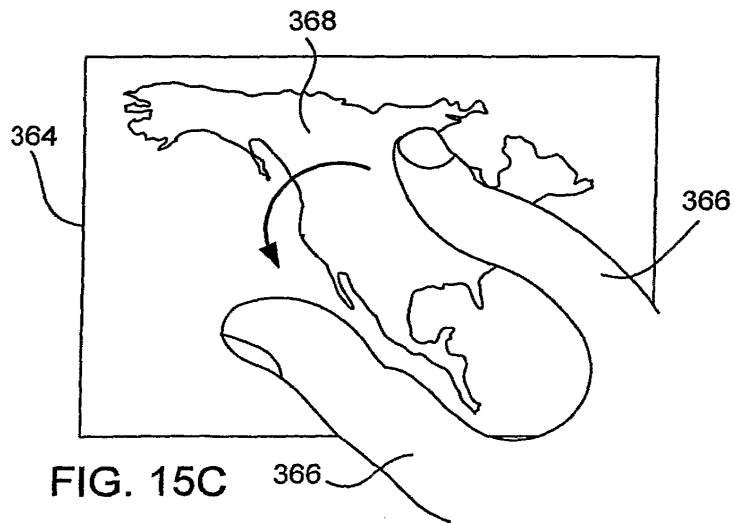
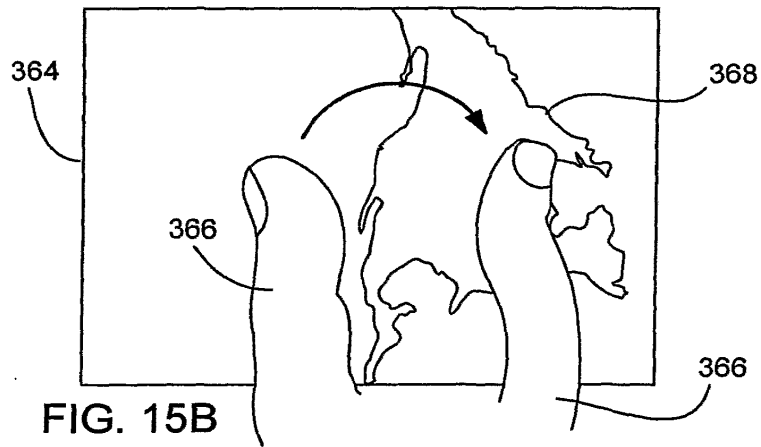
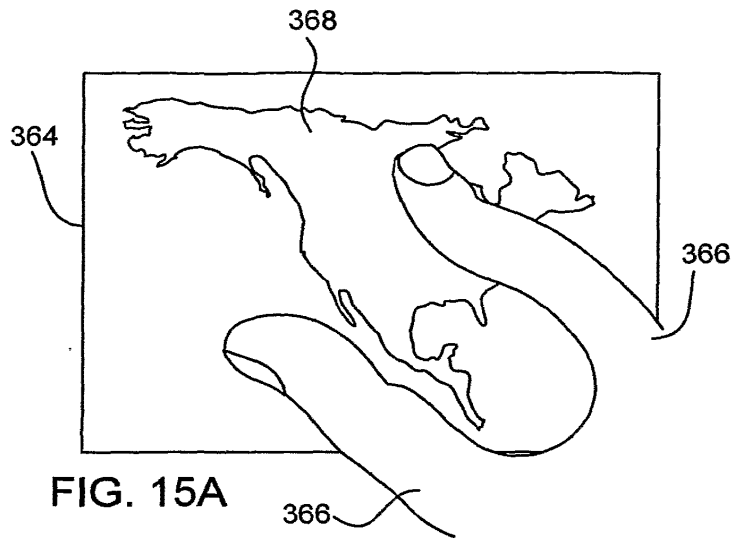
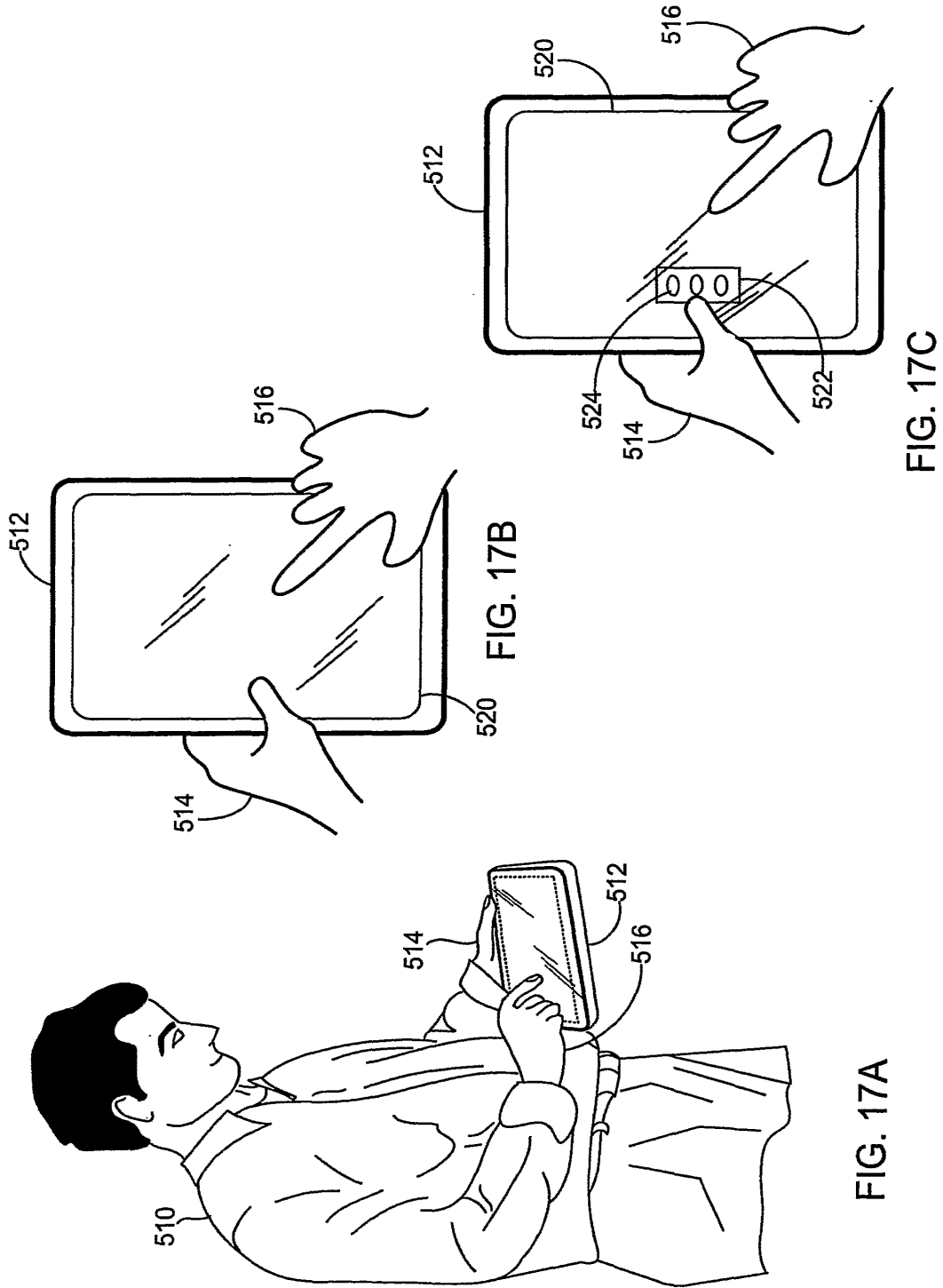


FIG. 16





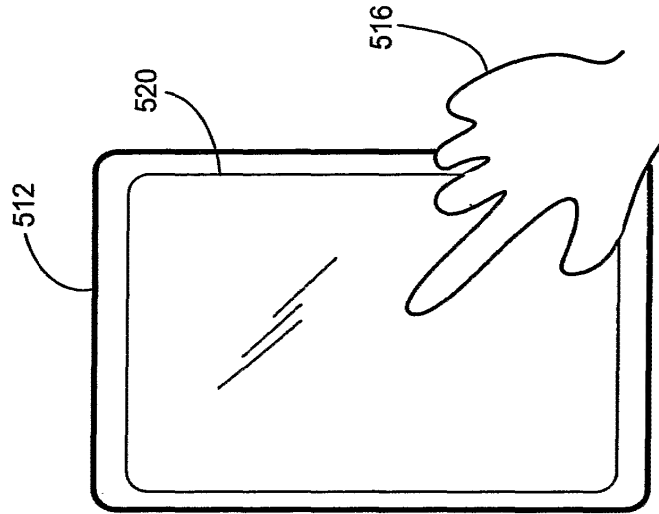


FIG. 17E

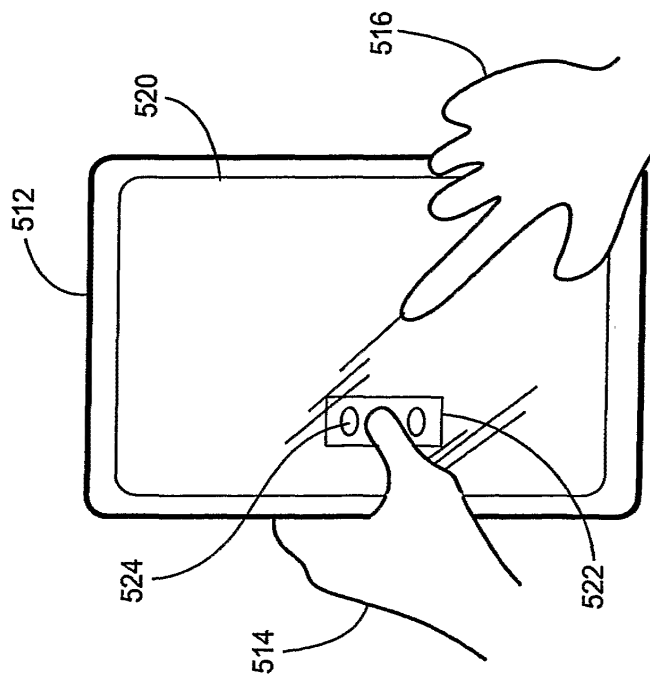


FIG. 17D

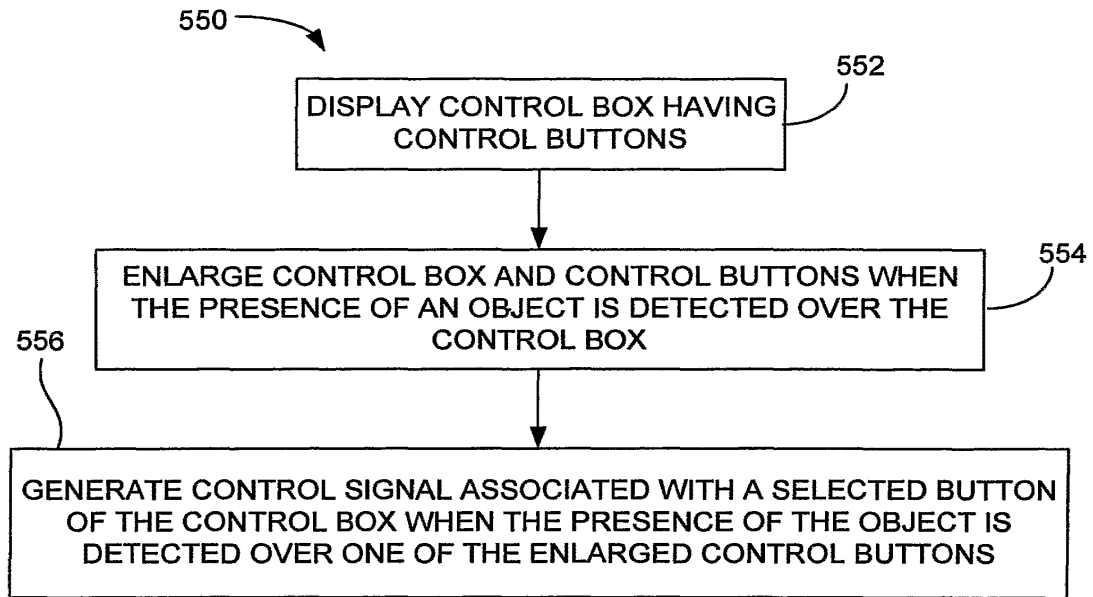


FIG. 18

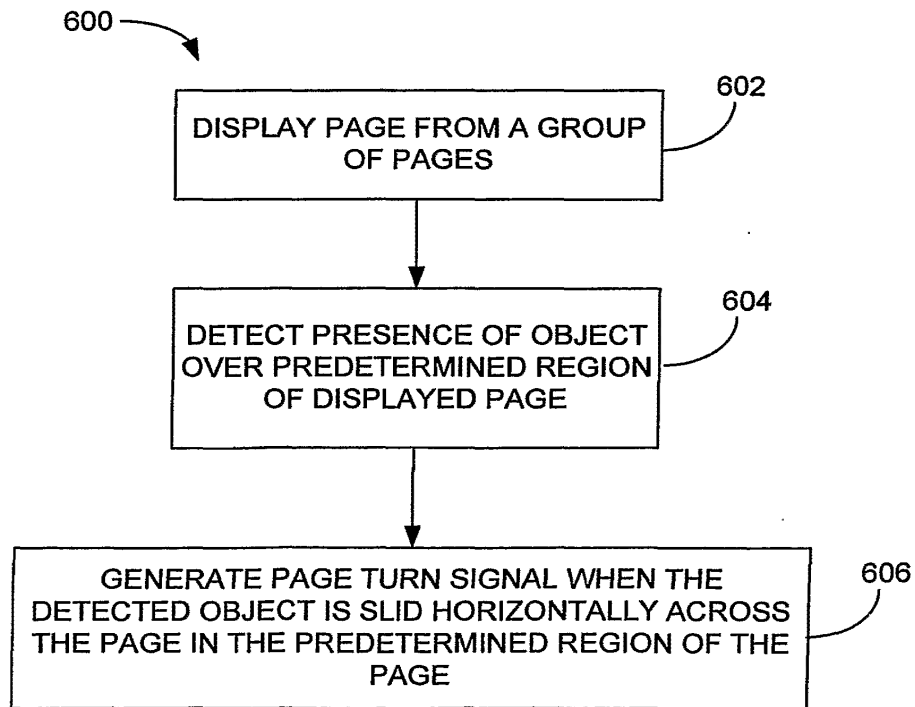


FIG. 20



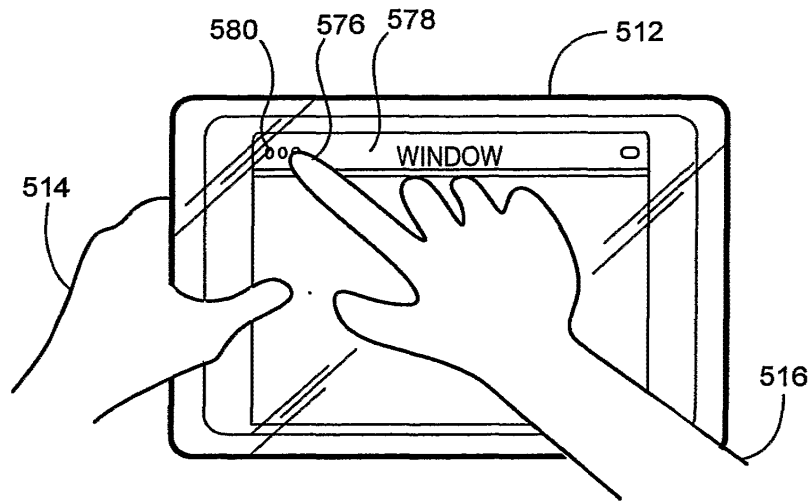


FIG. 19A

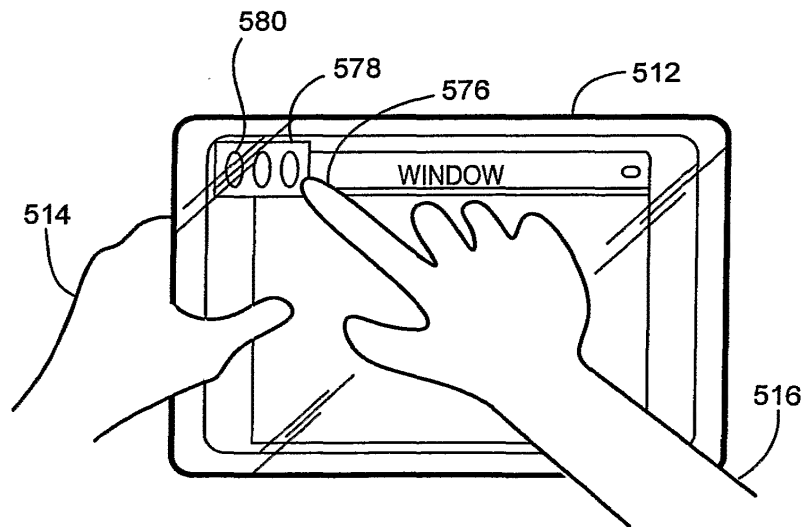


FIG. 19B

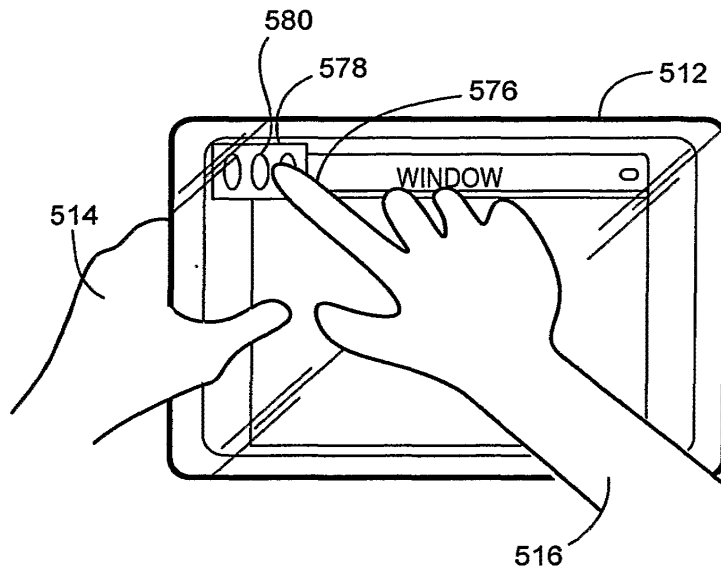


FIG. 19C

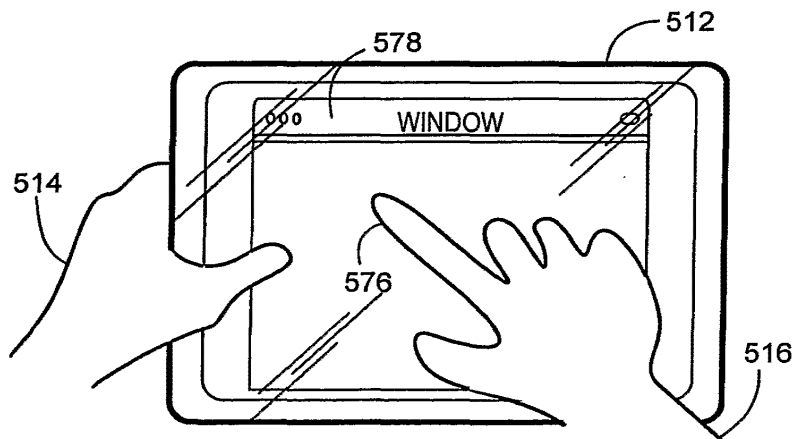
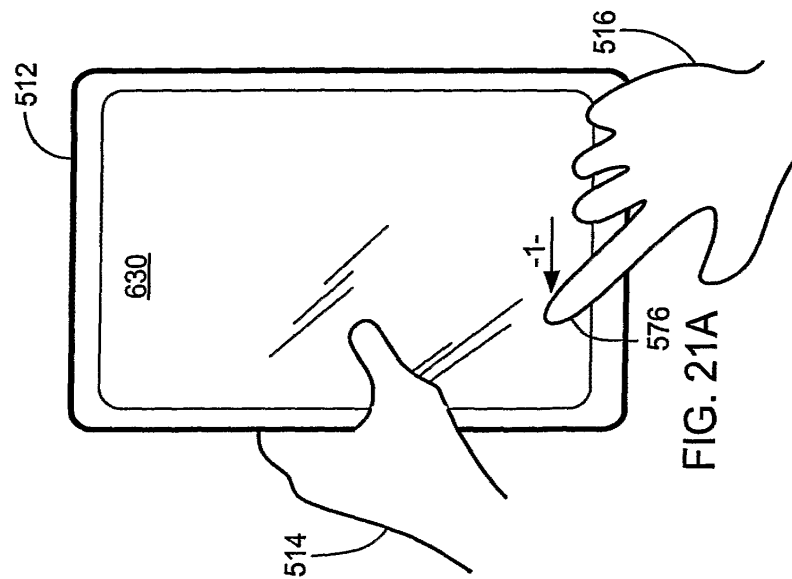
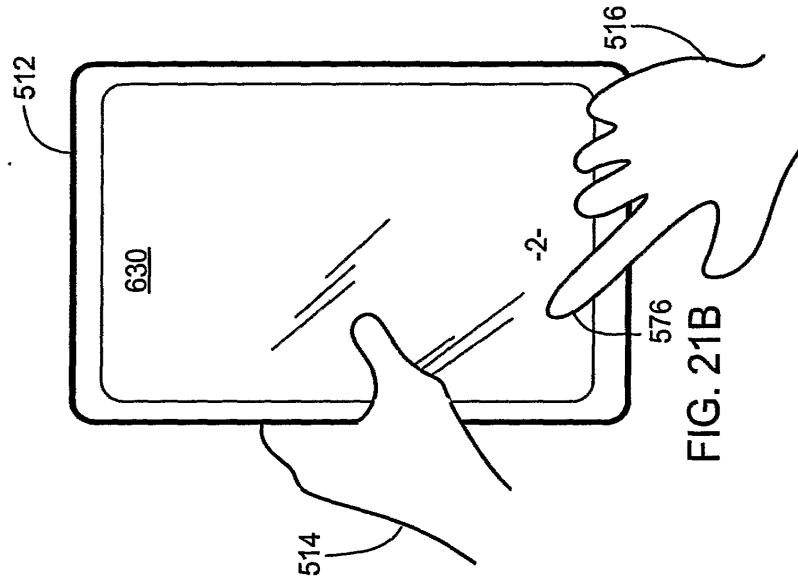


FIG. 19D

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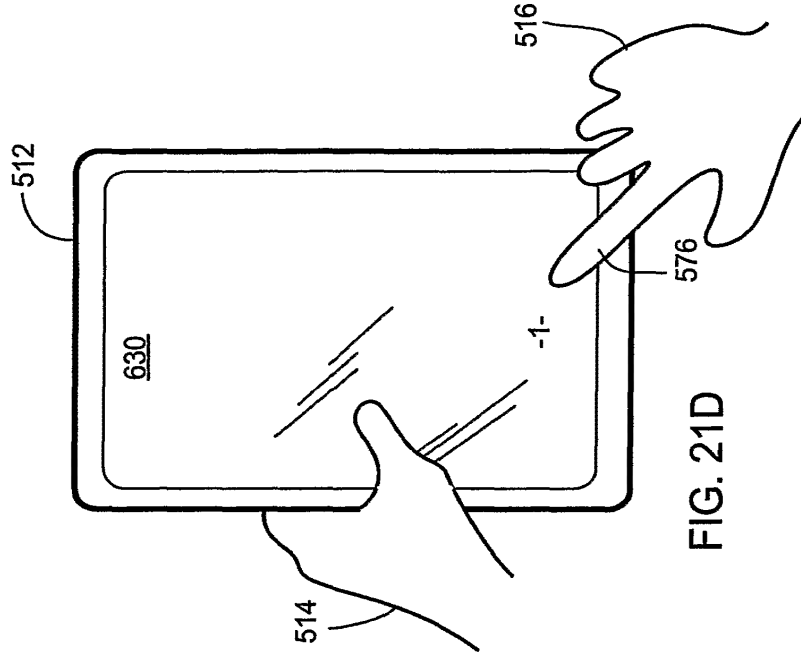


FIG. 21D

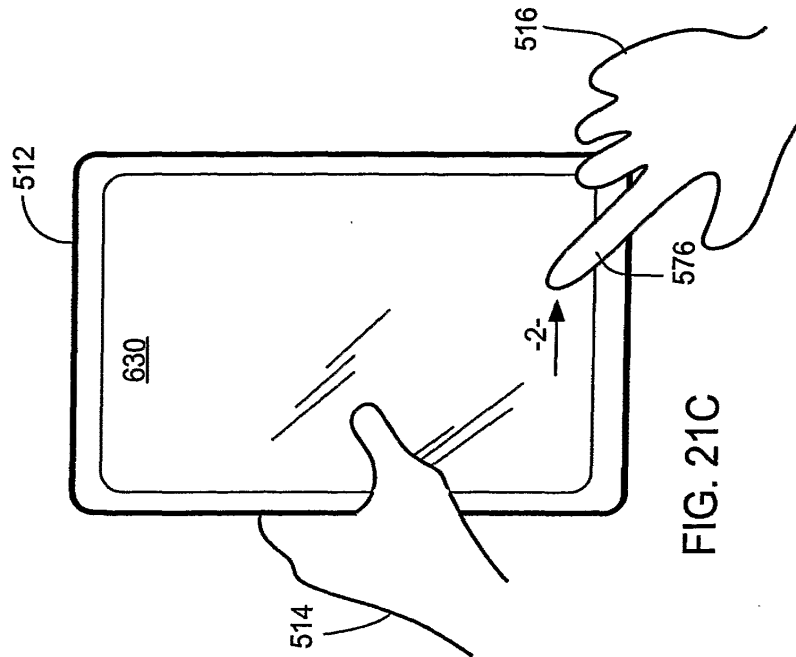


FIG. 21C

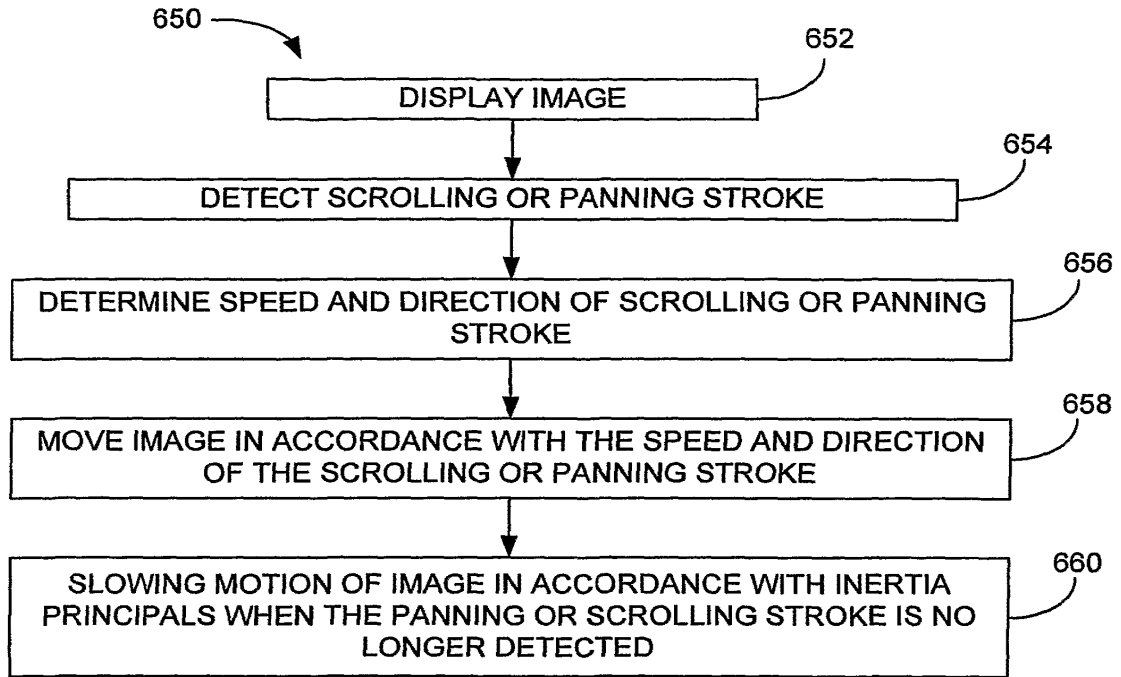


FIG. 22

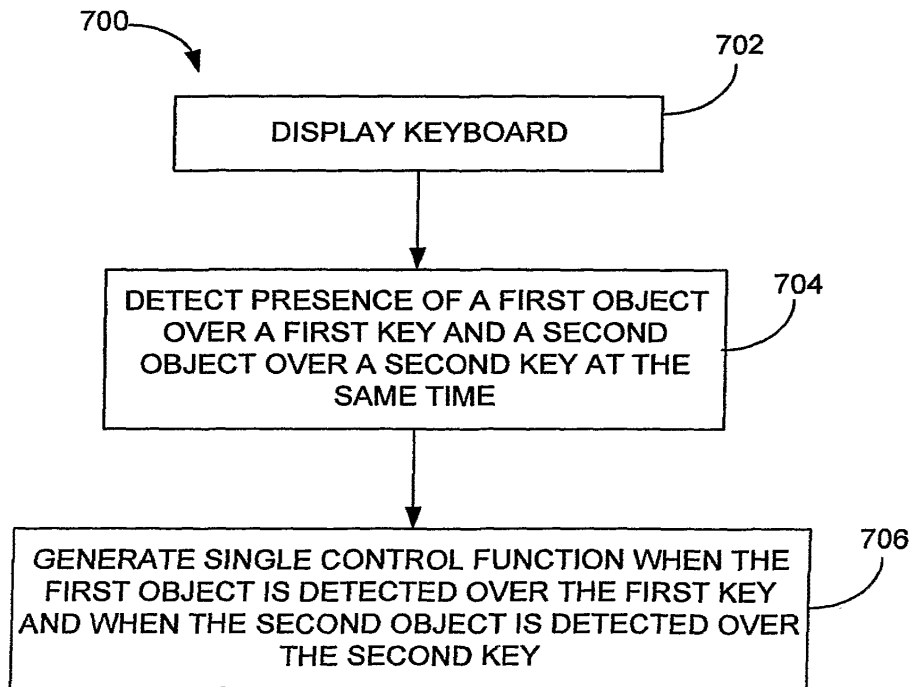


FIG. 24

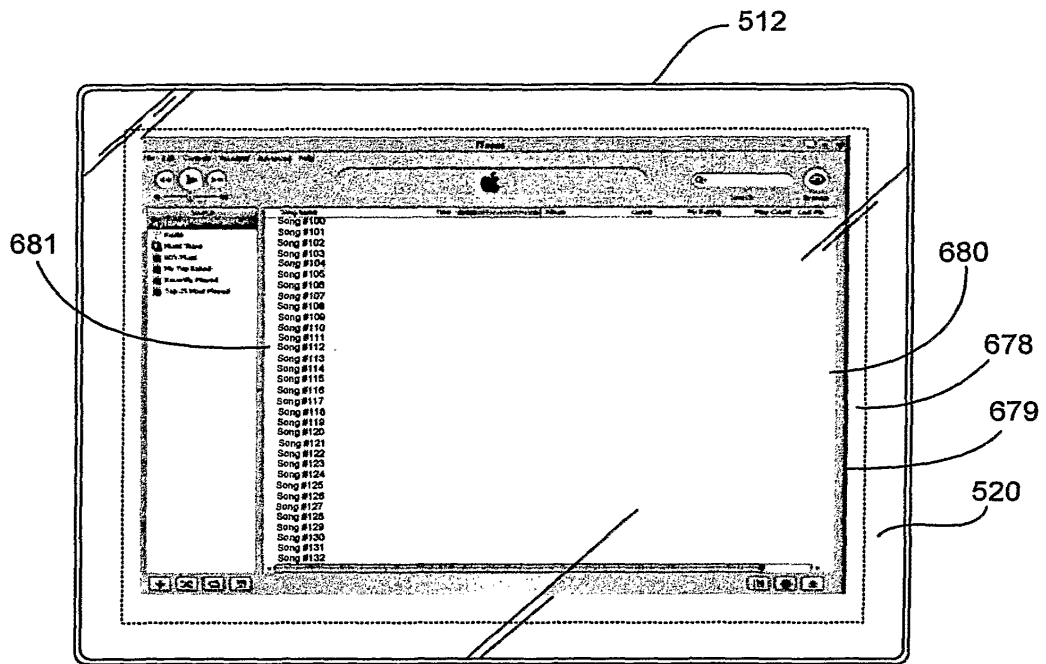


FIG. 23A

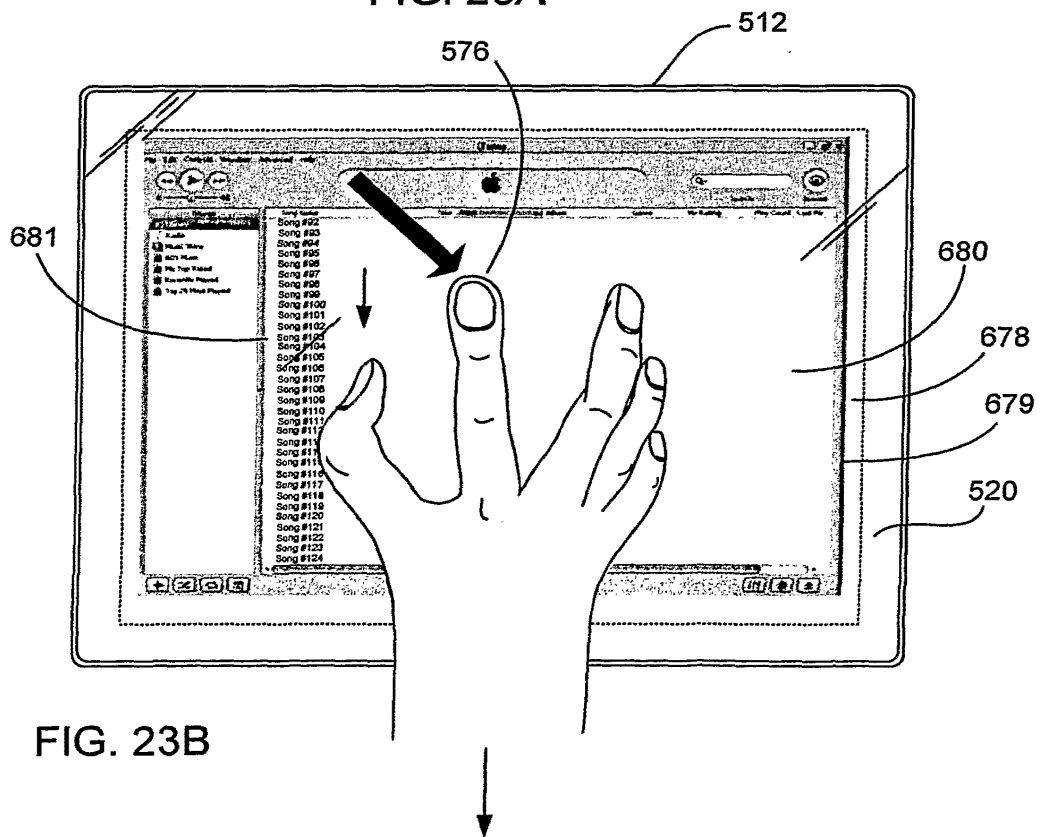
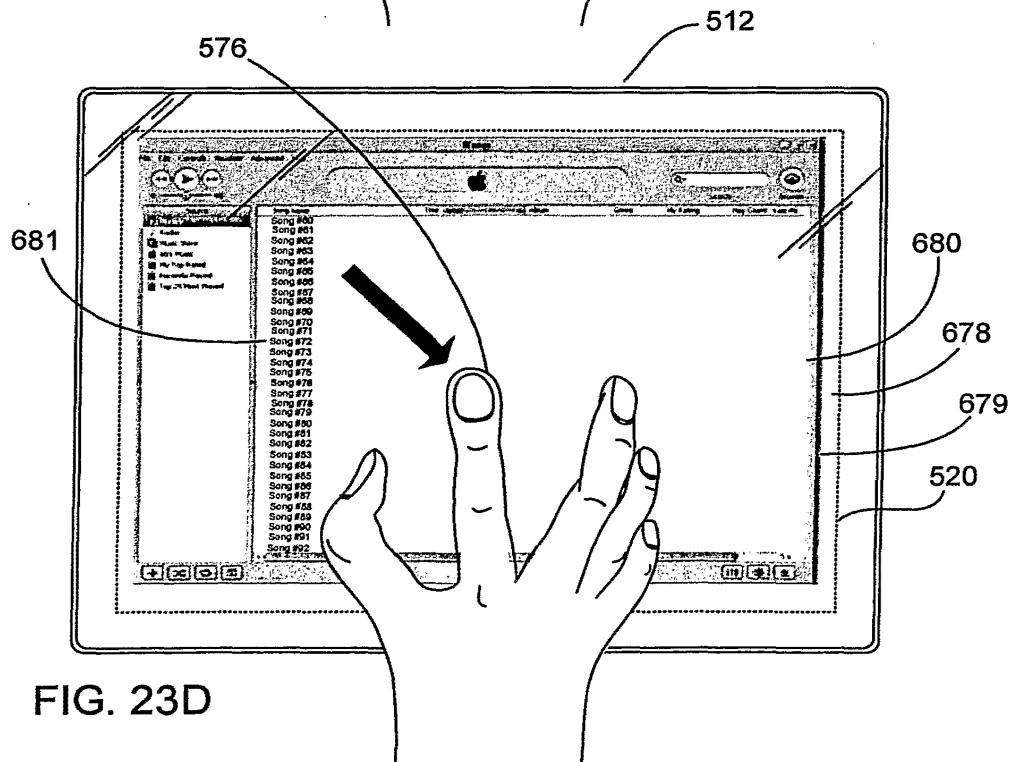
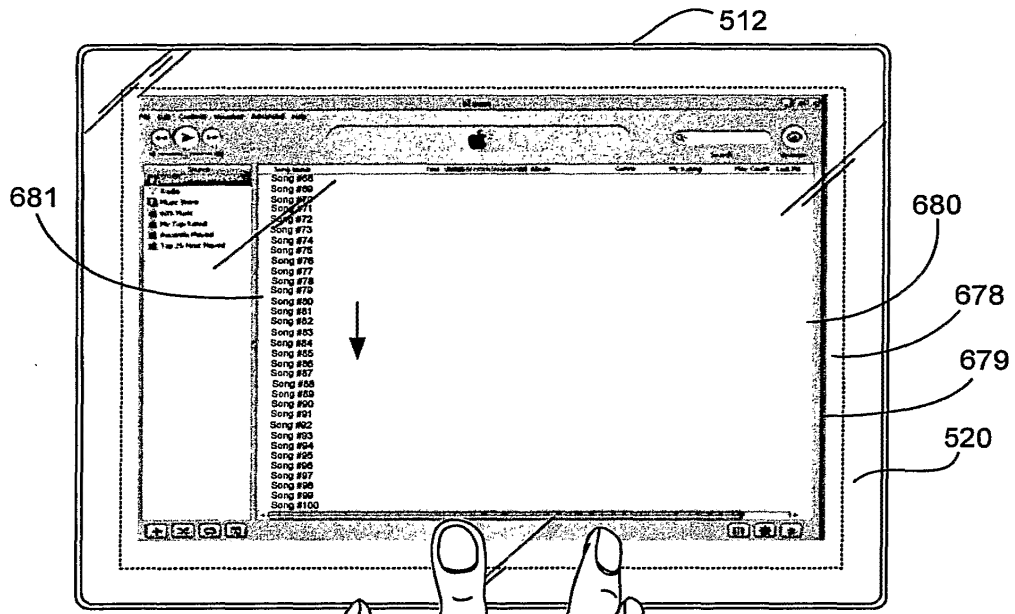


FIG. 23B



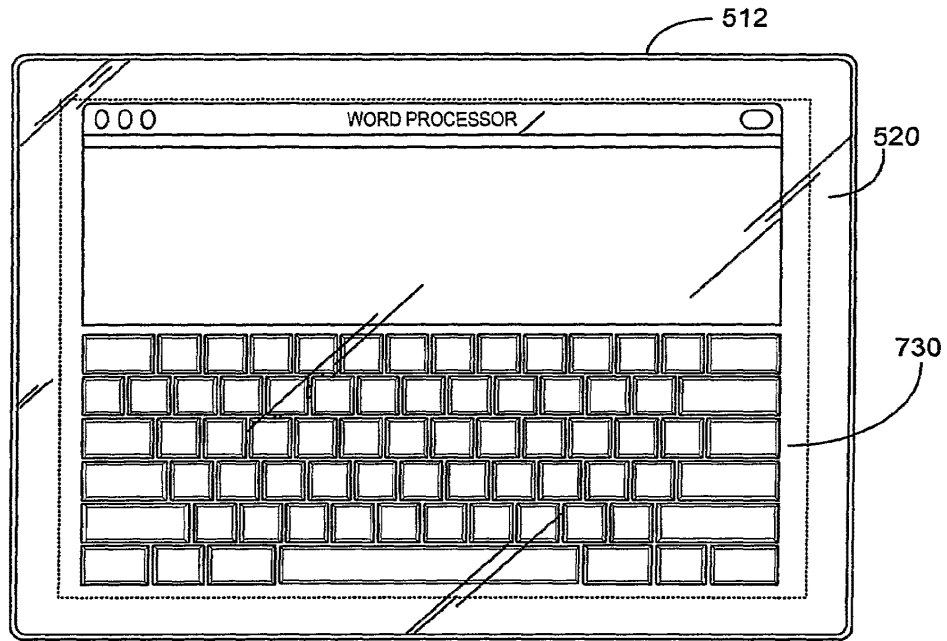


FIG. 25A

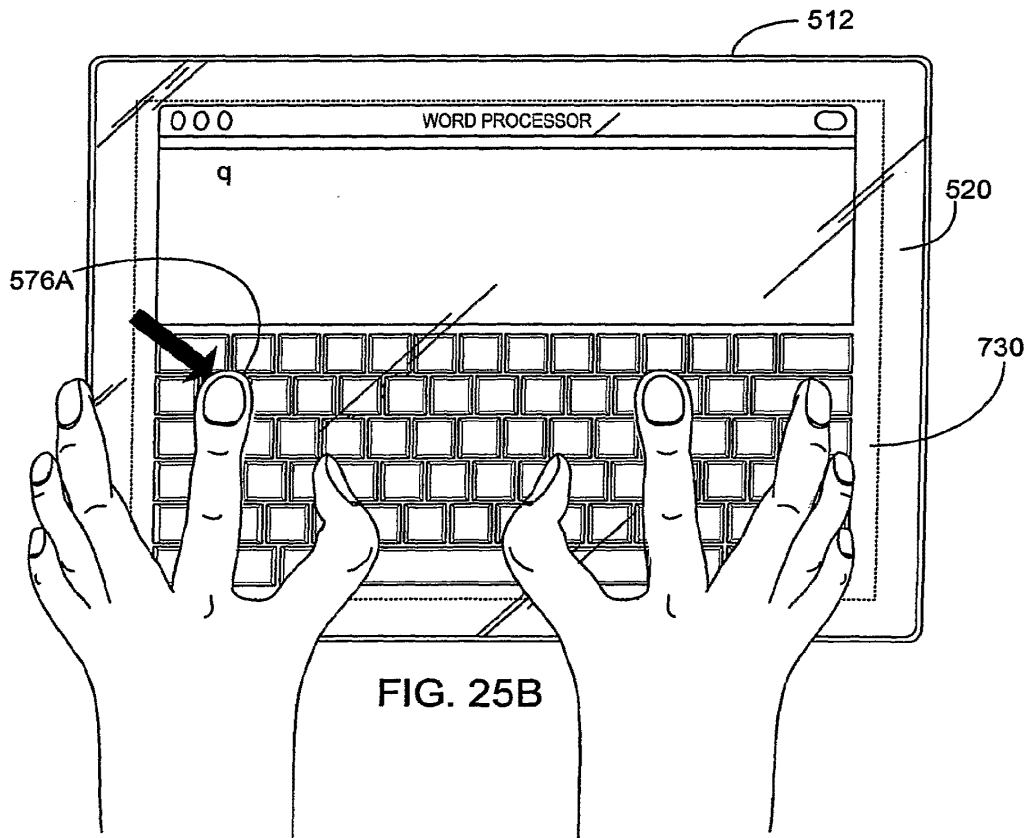
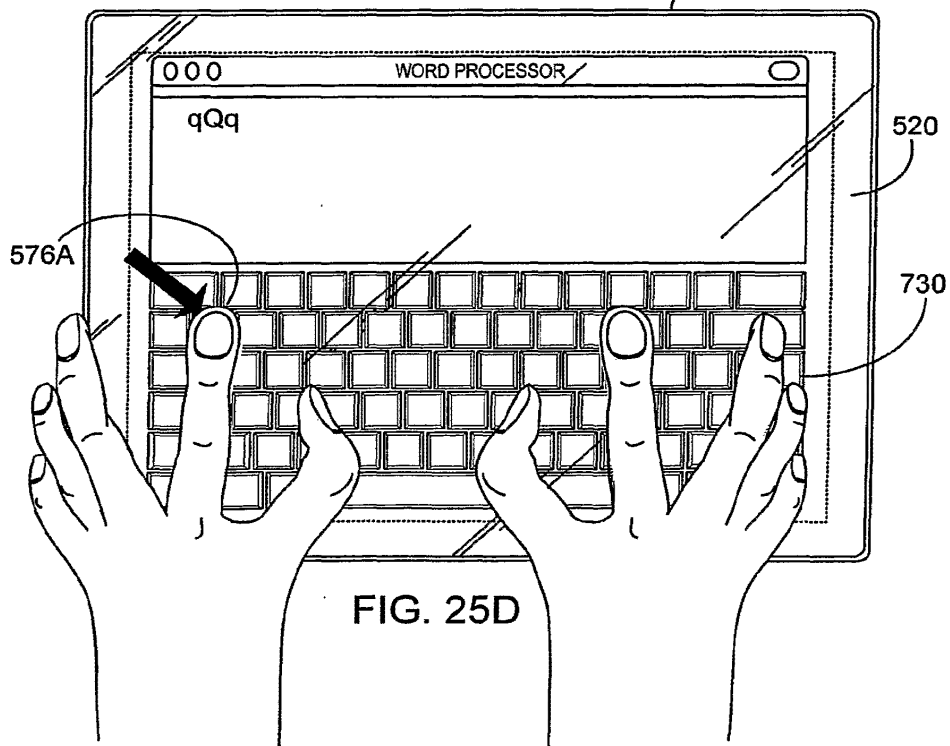
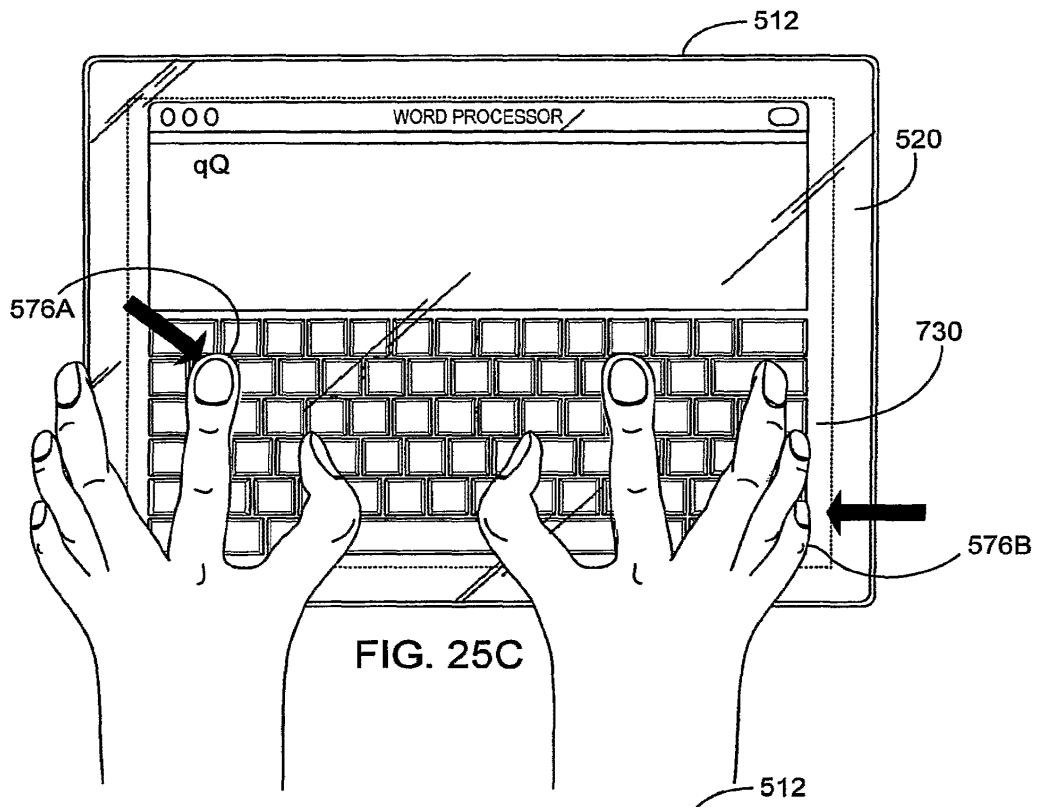


FIG. 25B





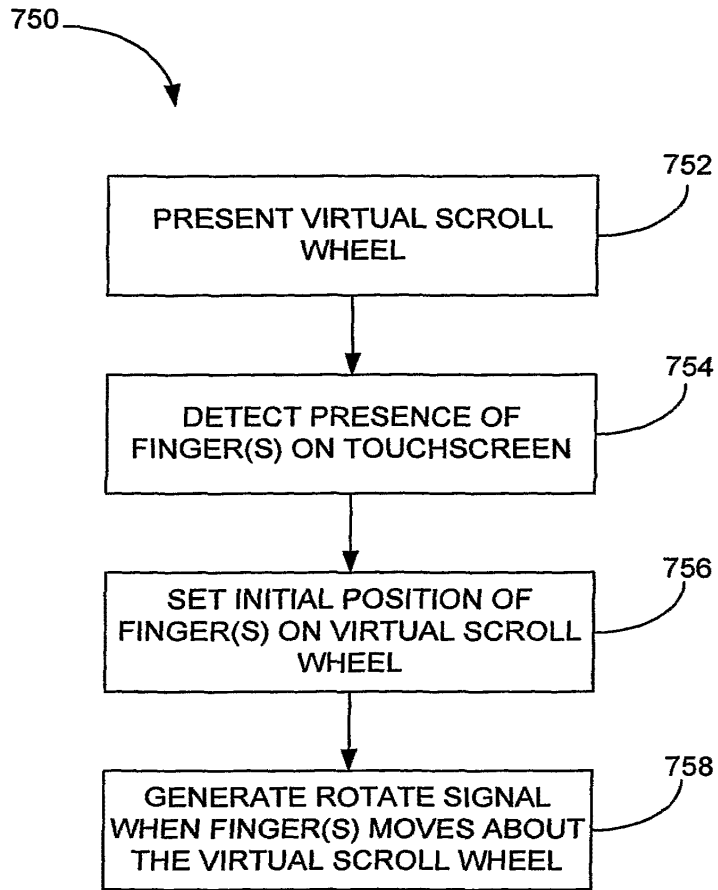
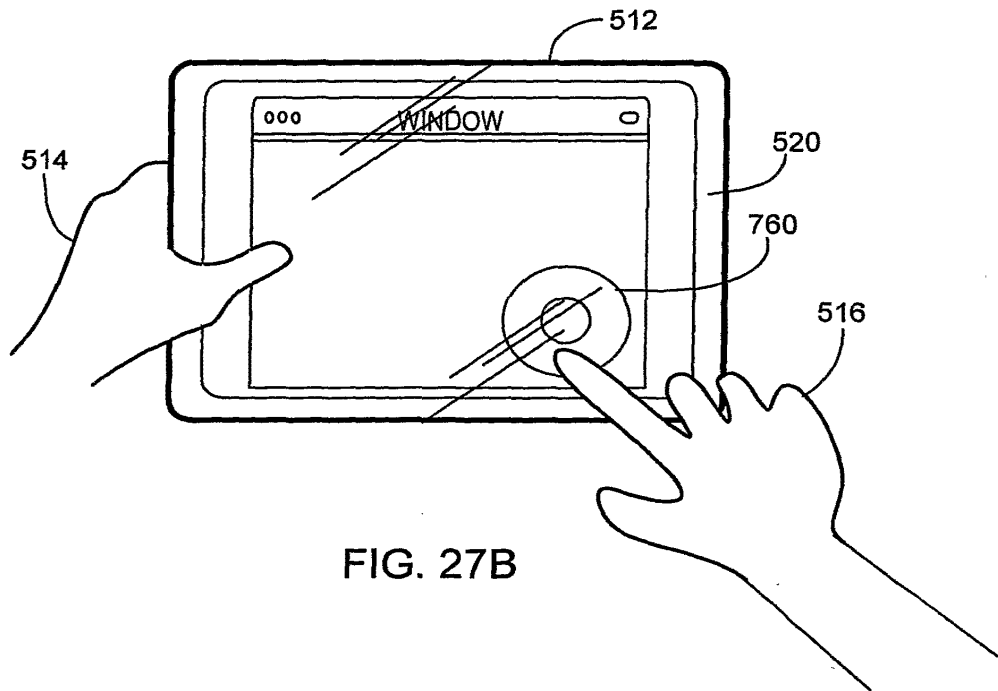
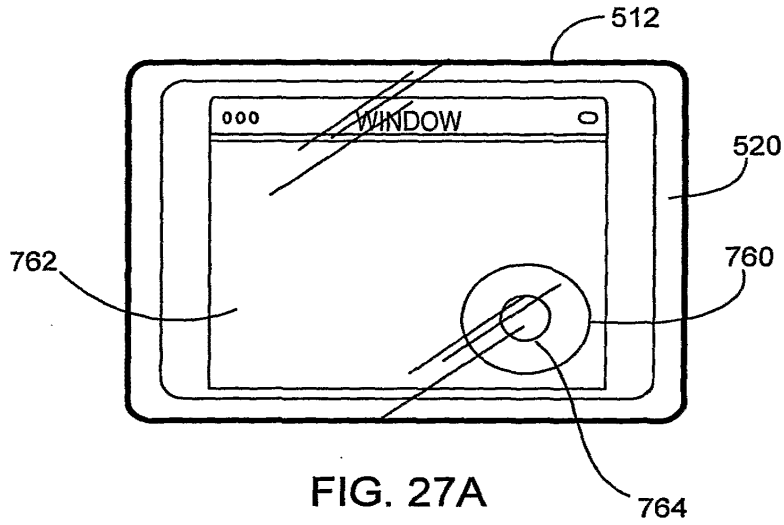


FIG. 26



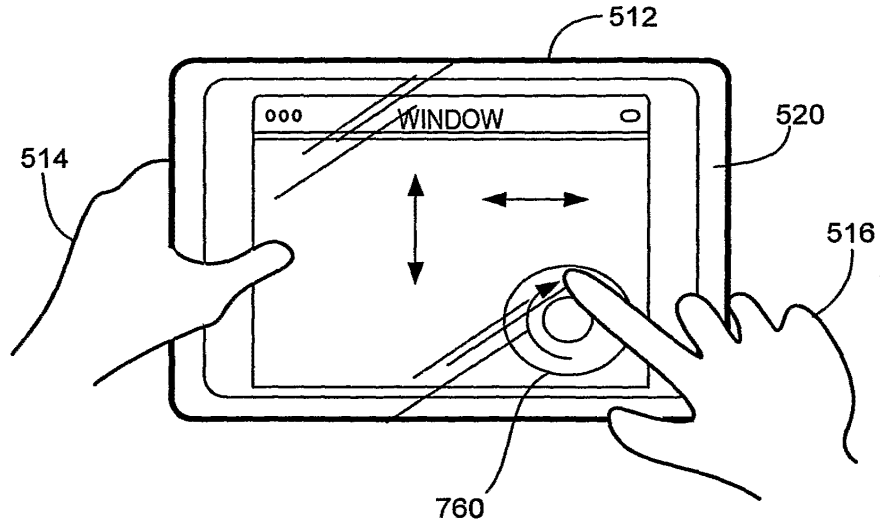


FIG. 27C

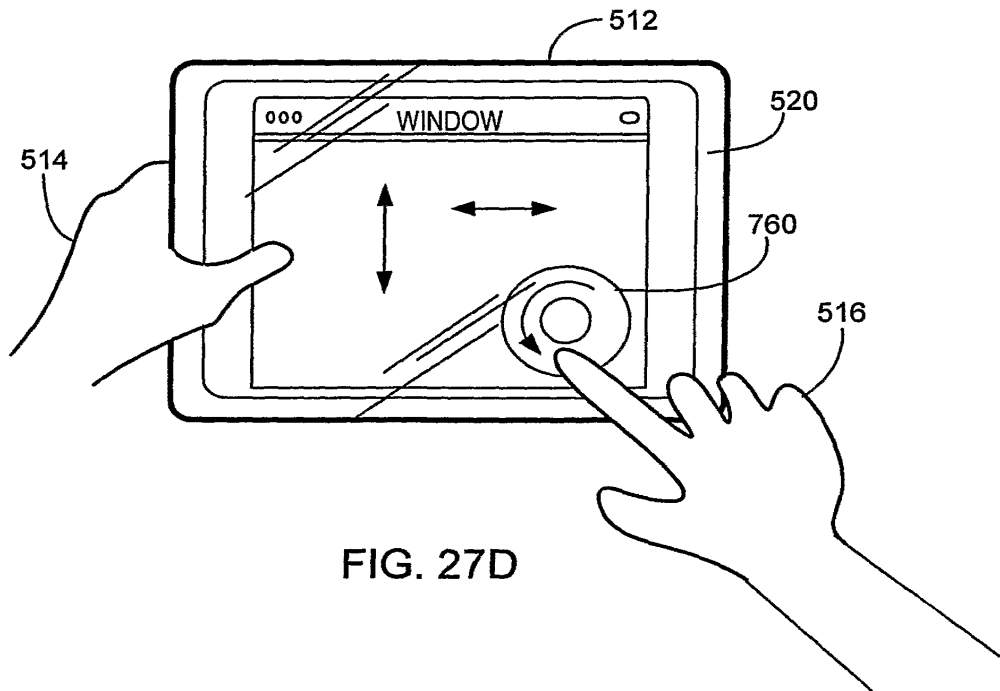


FIG. 27D

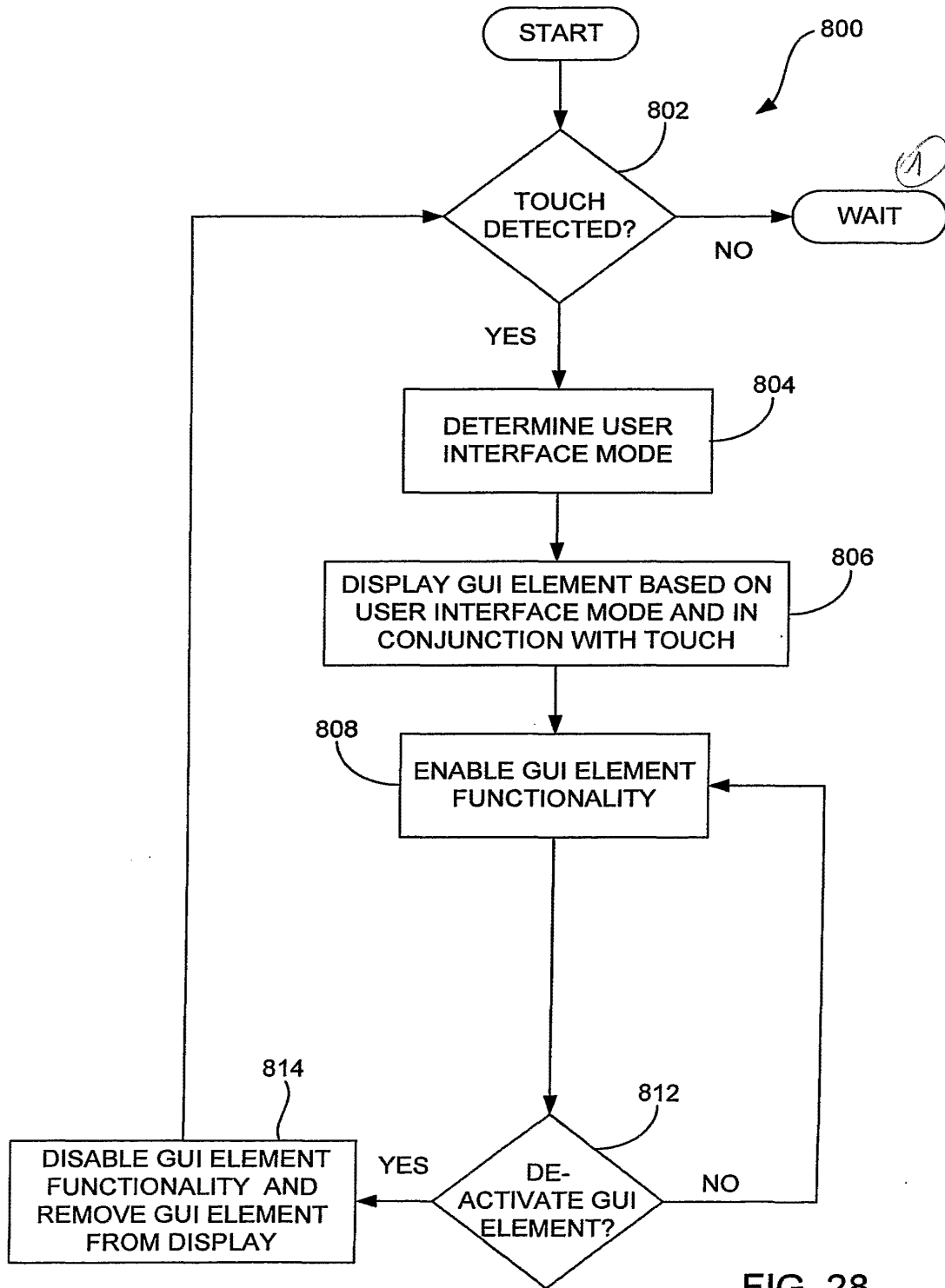


FIG. 28

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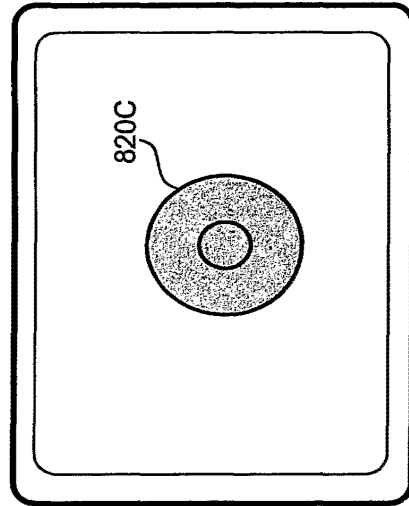


FIG. 29C

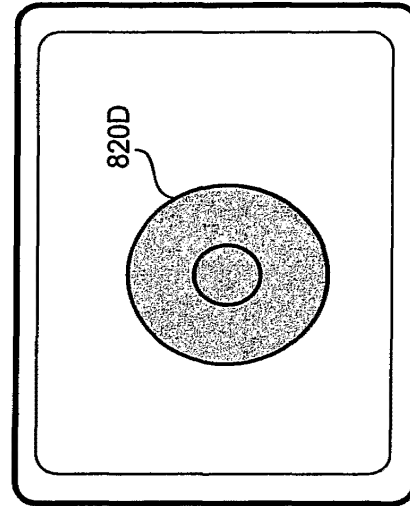


FIG. 29D

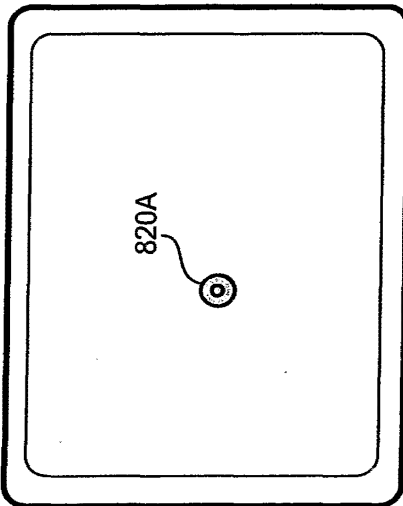


FIG. 29A

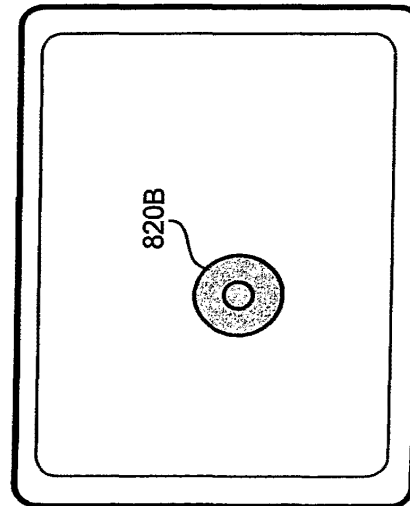


FIG. 29B

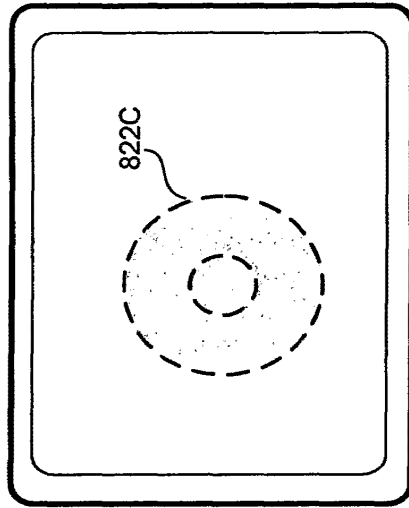


FIG. 30C

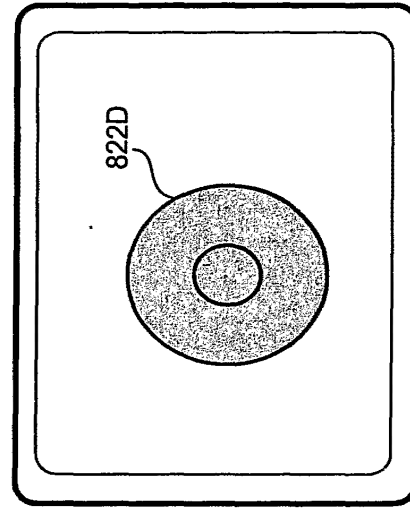


FIG. 30D

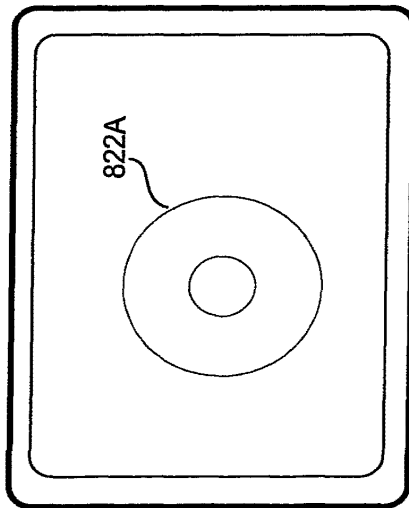


FIG. 30A

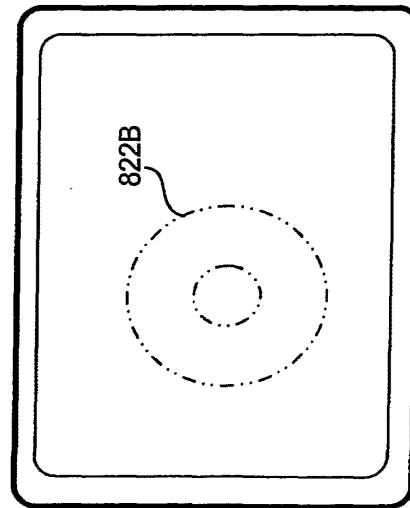


FIG. 30B

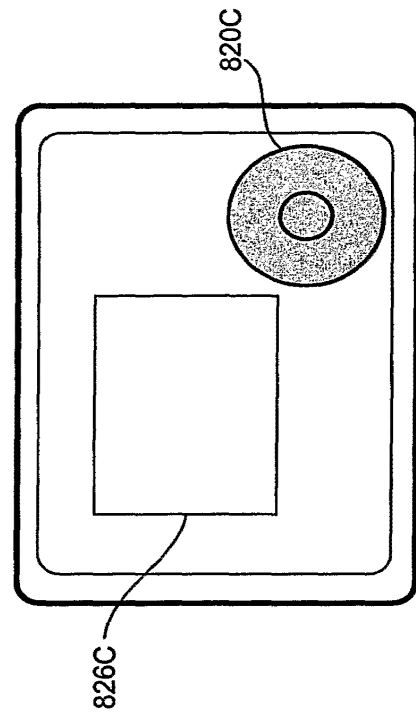


FIG. 31C

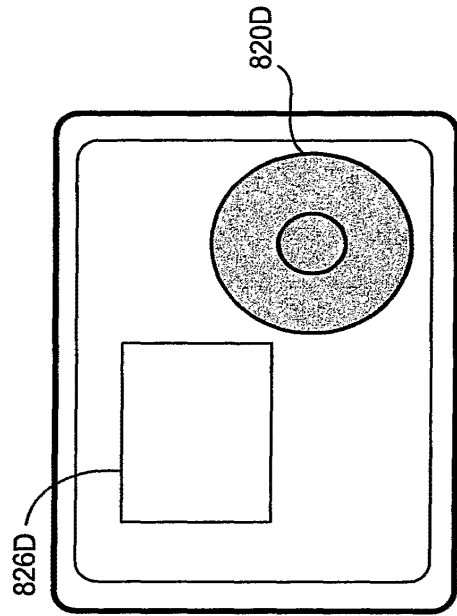


FIG. 31D

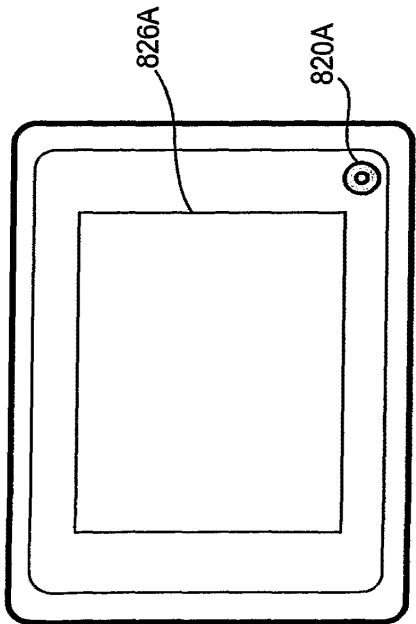


FIG. 31A

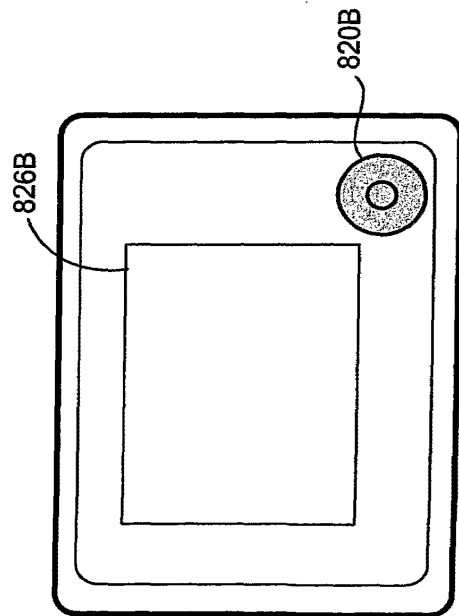


FIG. 31B



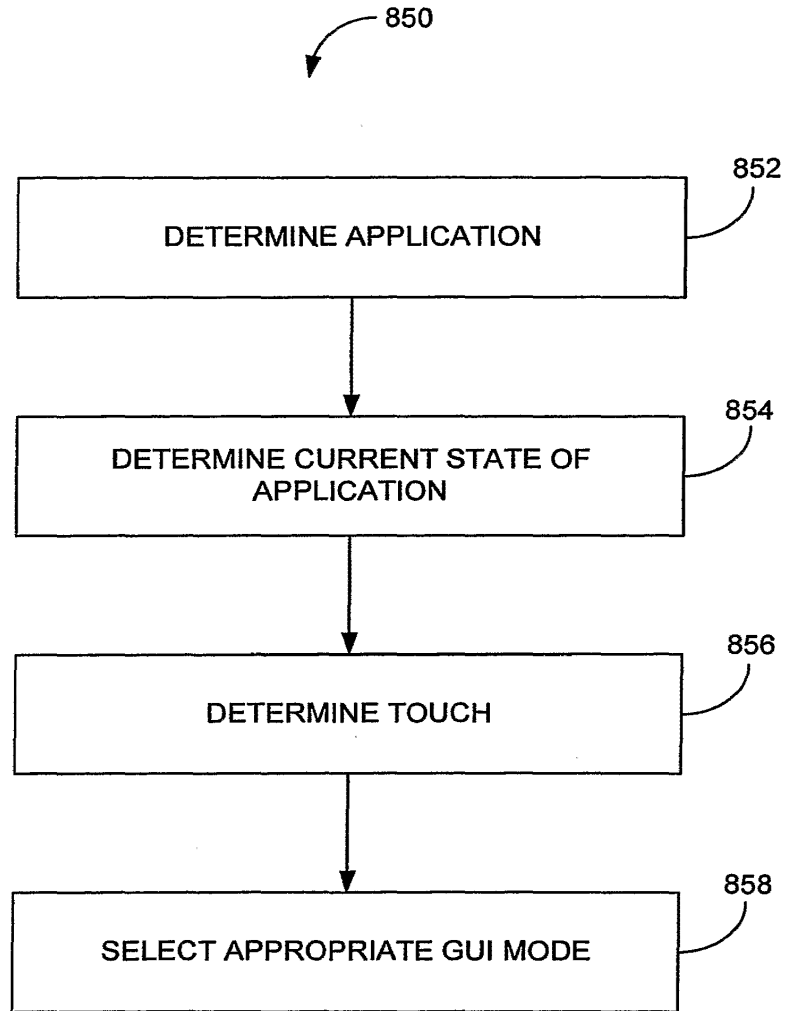


FIG. 32

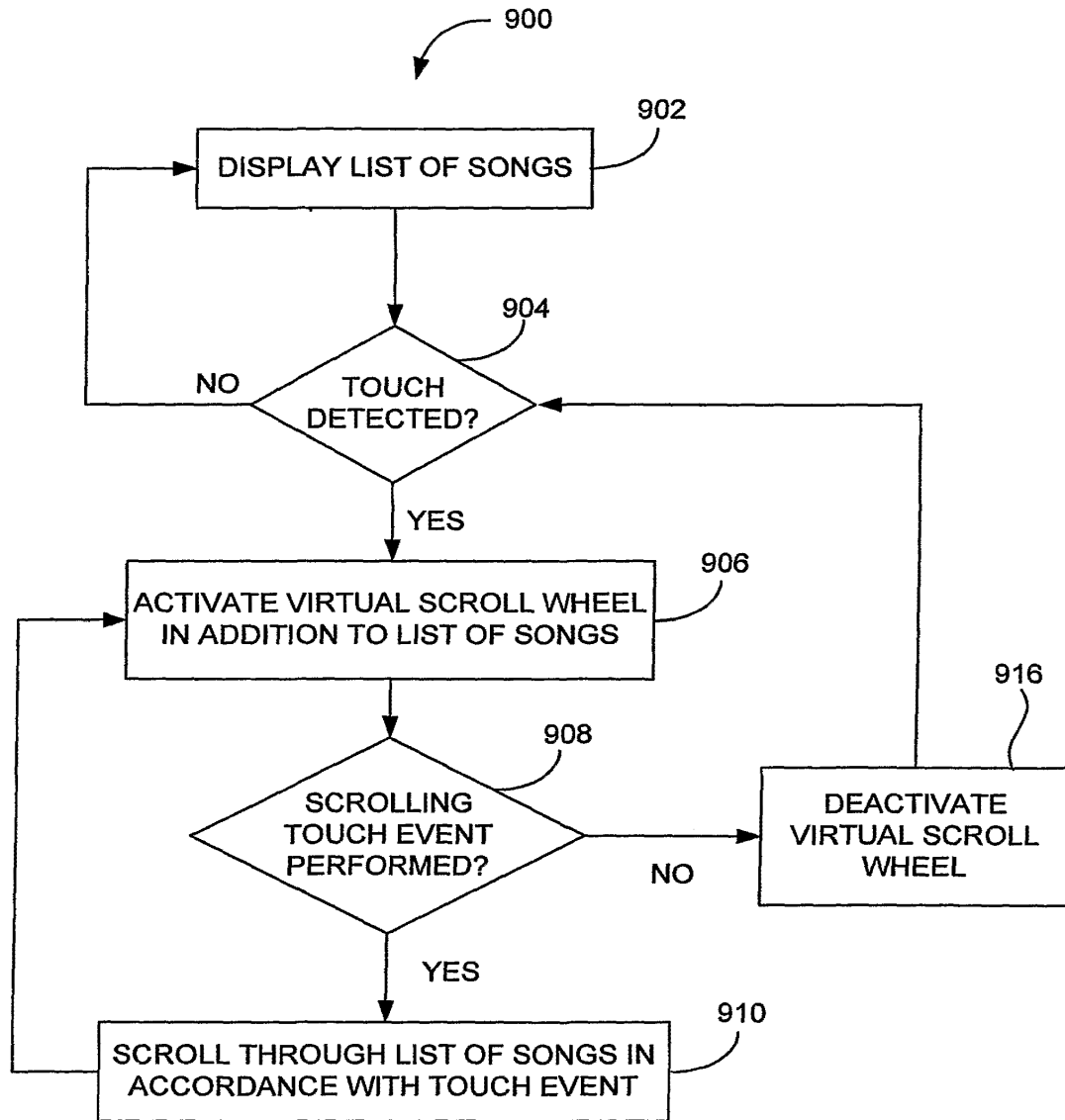
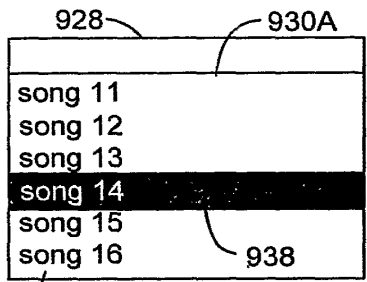


FIG. 33



932A FIG. 34A

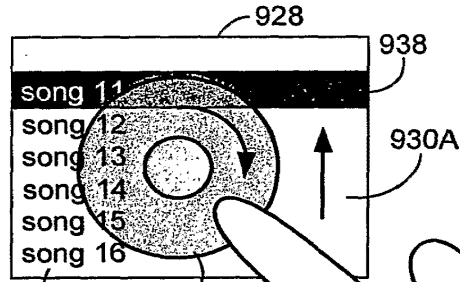


FIG. 34D

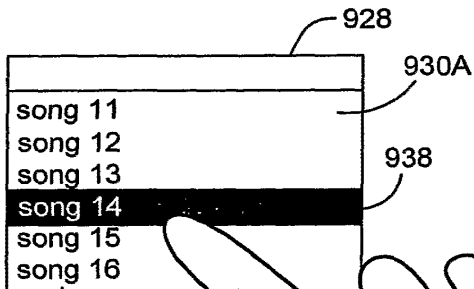


FIG. 34B

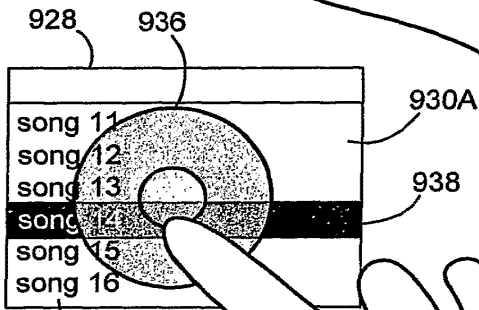
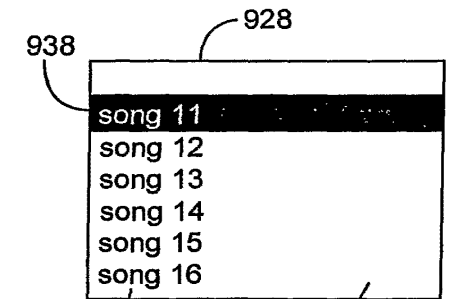


FIG. 34C



932A FIG. 34E 930A

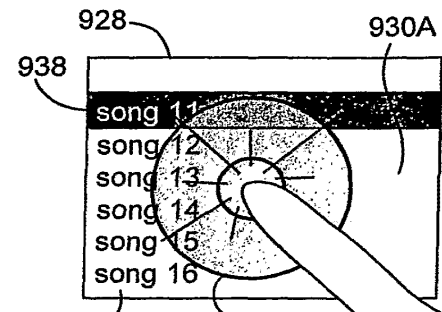


FIG. 34F

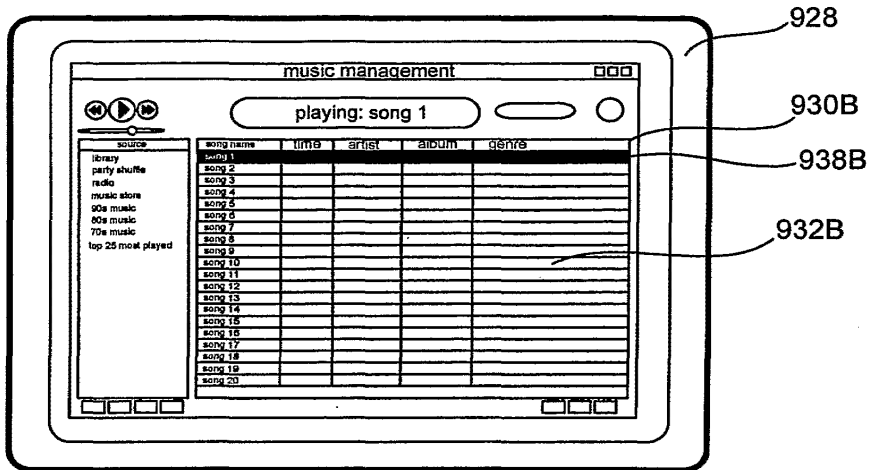


FIG. 35A

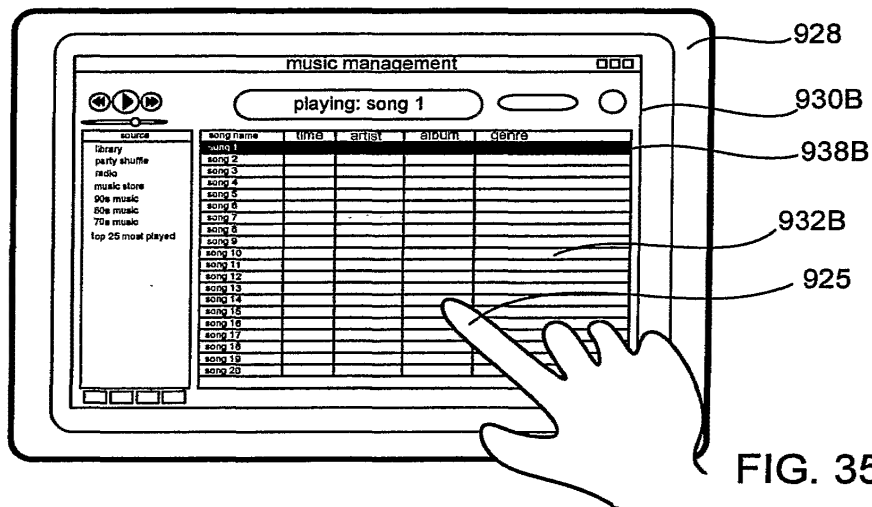


FIG. 35B

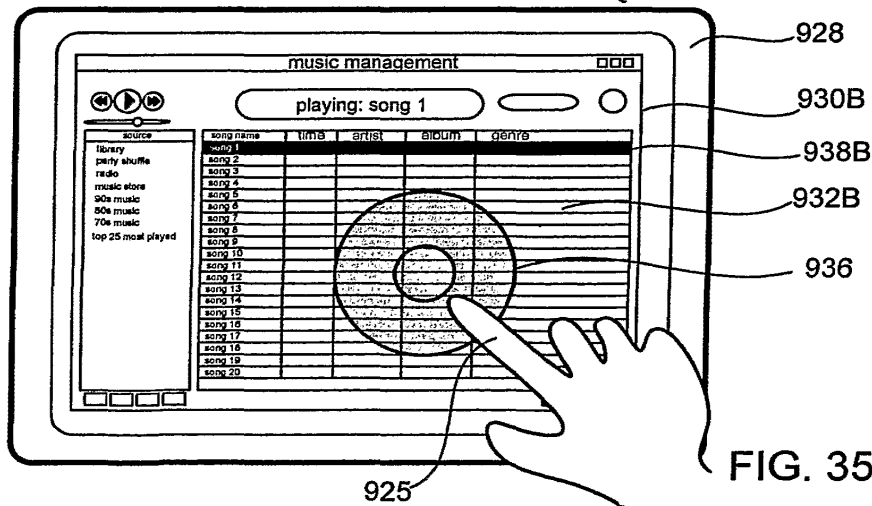


FIG. 35C

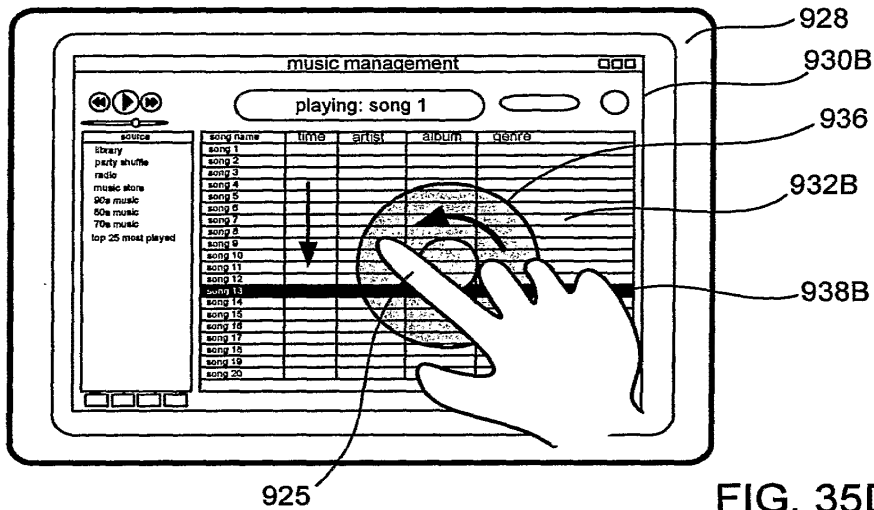


FIG. 35D

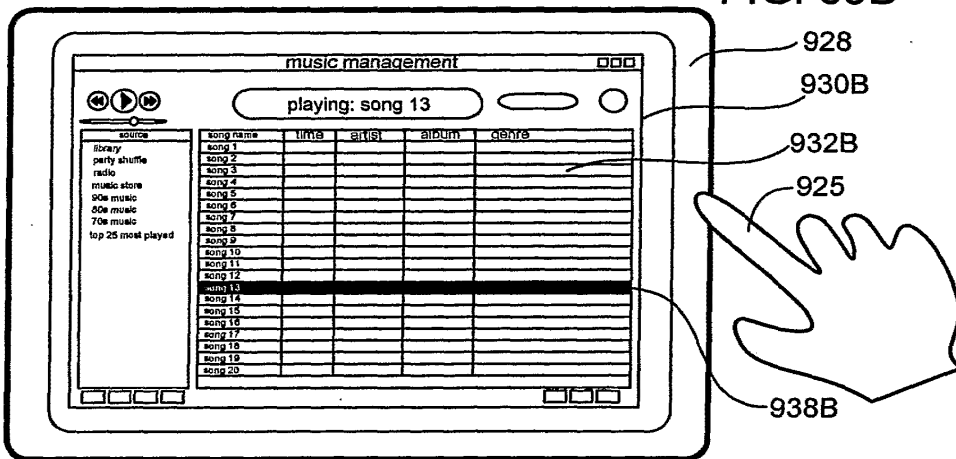


FIG. 35E

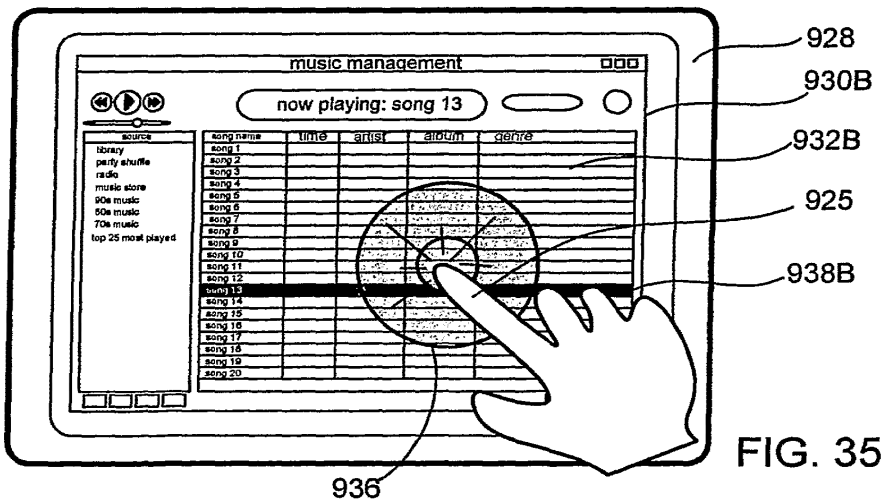


FIG. 35F

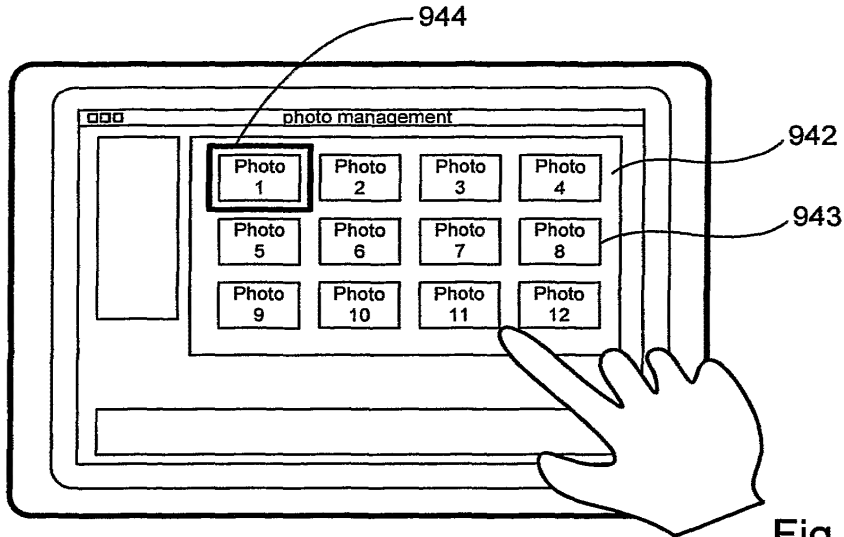


Fig. 36A

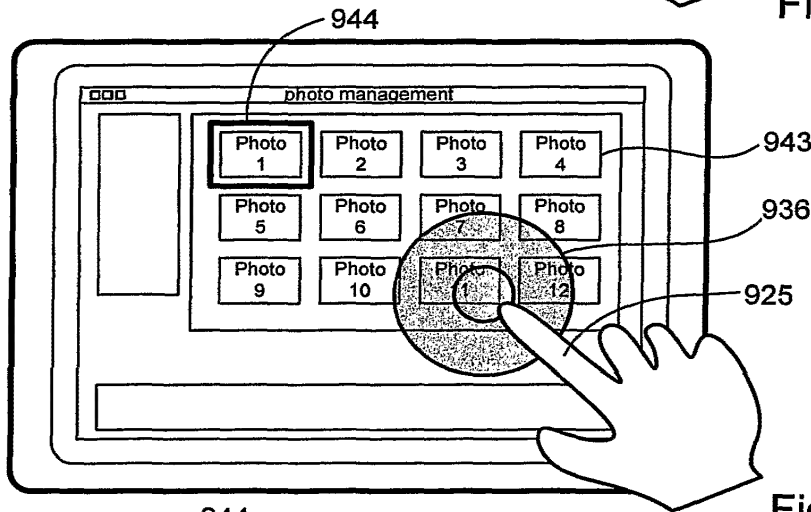


Fig. 36B

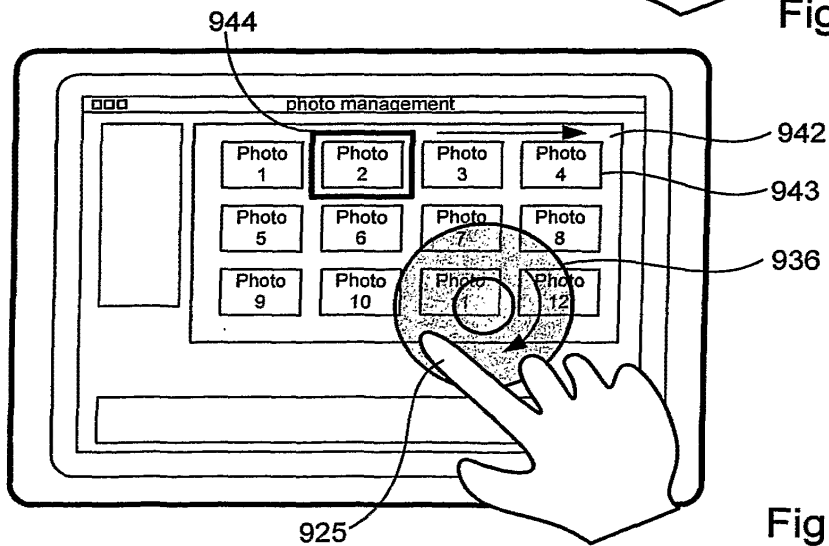


Fig. 36C

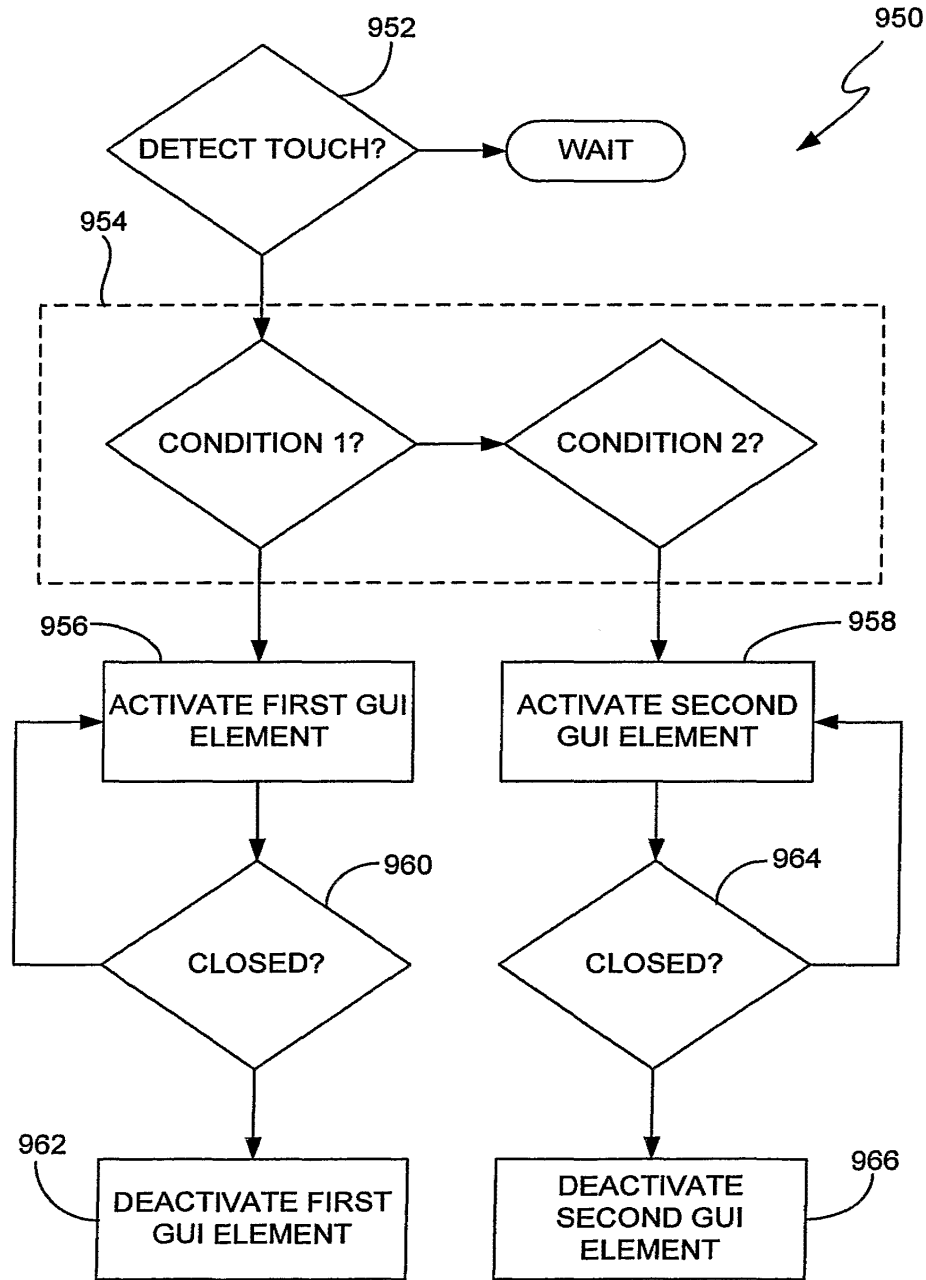


FIG. 37

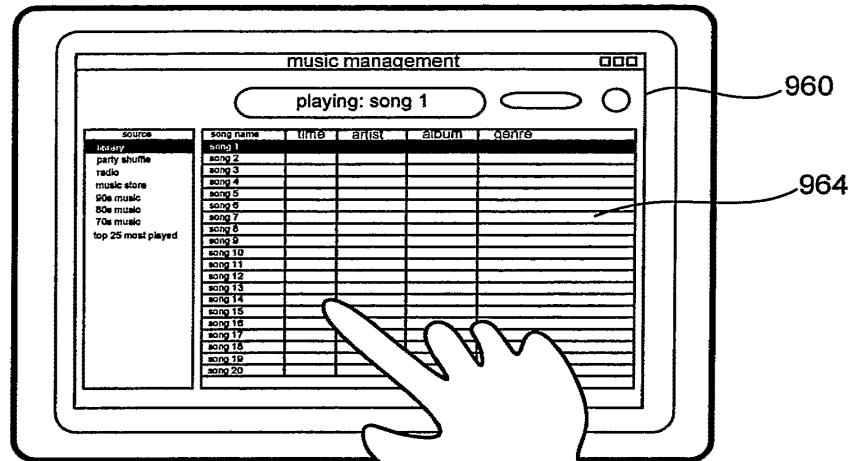


FIG. 38A

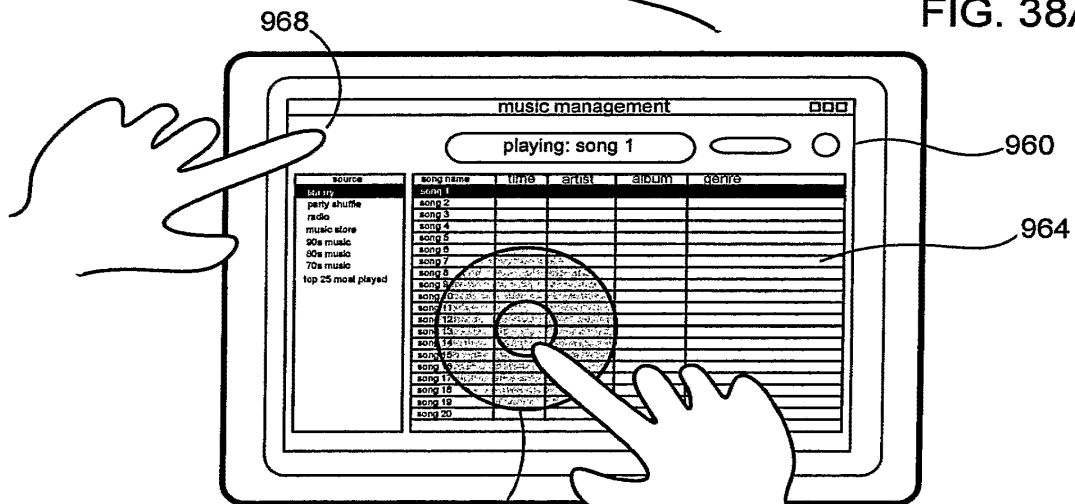


FIG. 38B

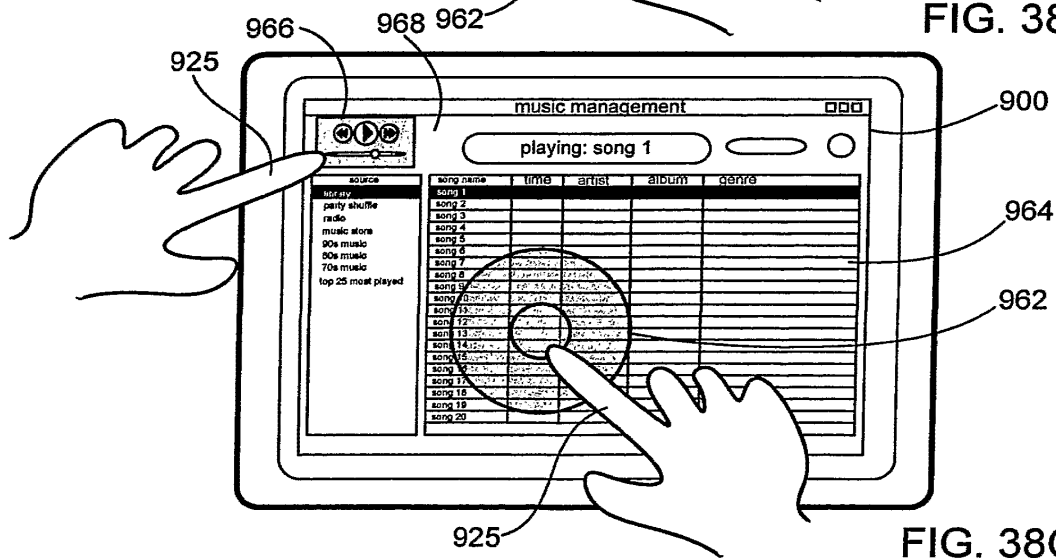


FIG. 38C



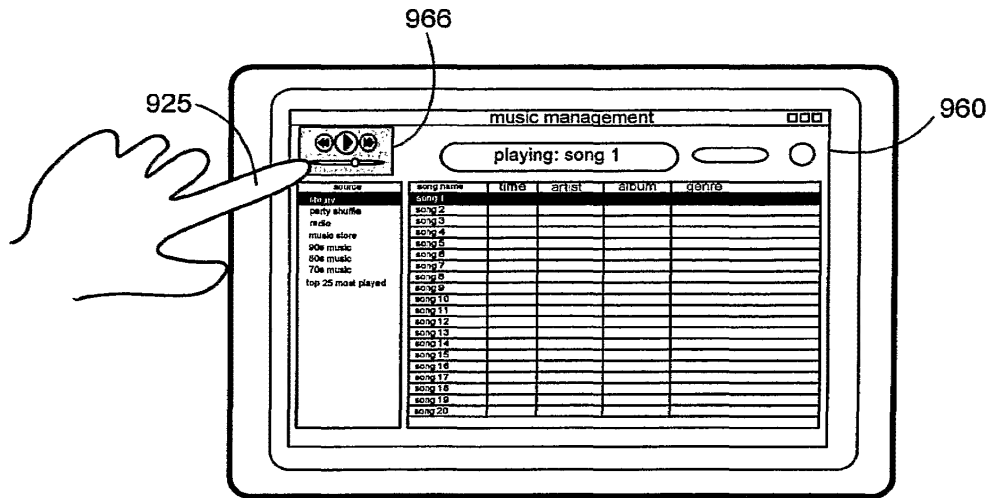


FIG. 38D

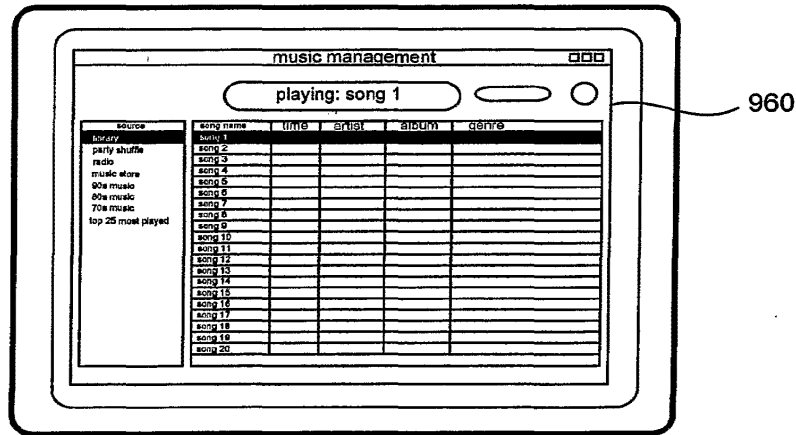


FIG. 38E

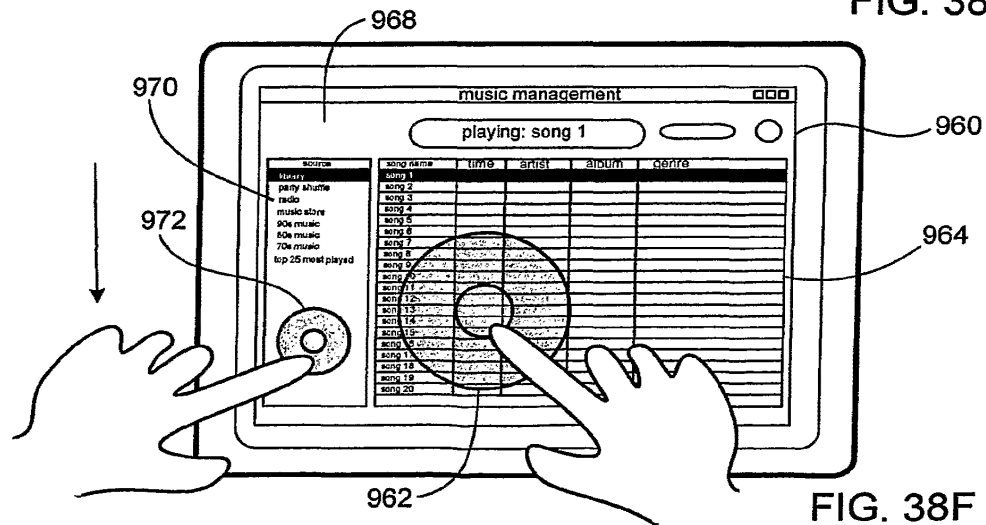


FIG. 38F

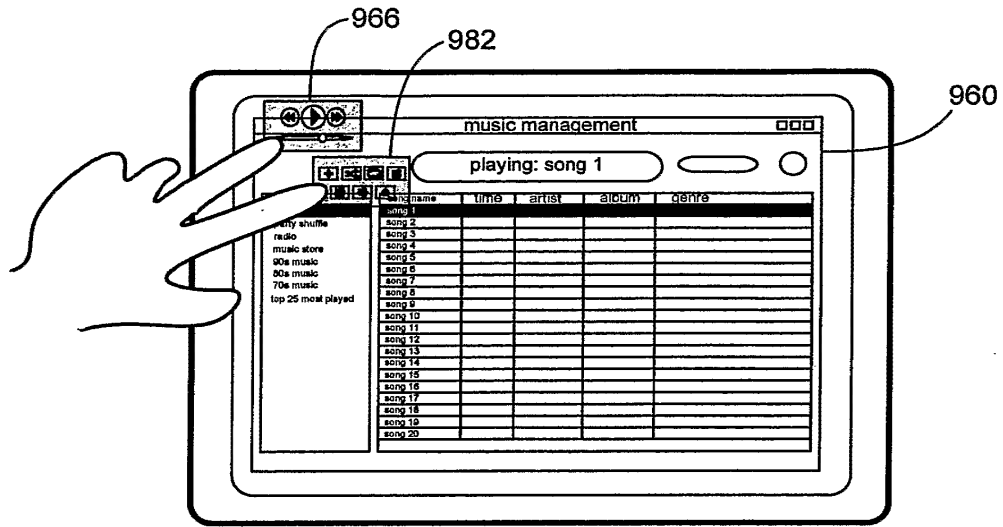


FIG. 38G

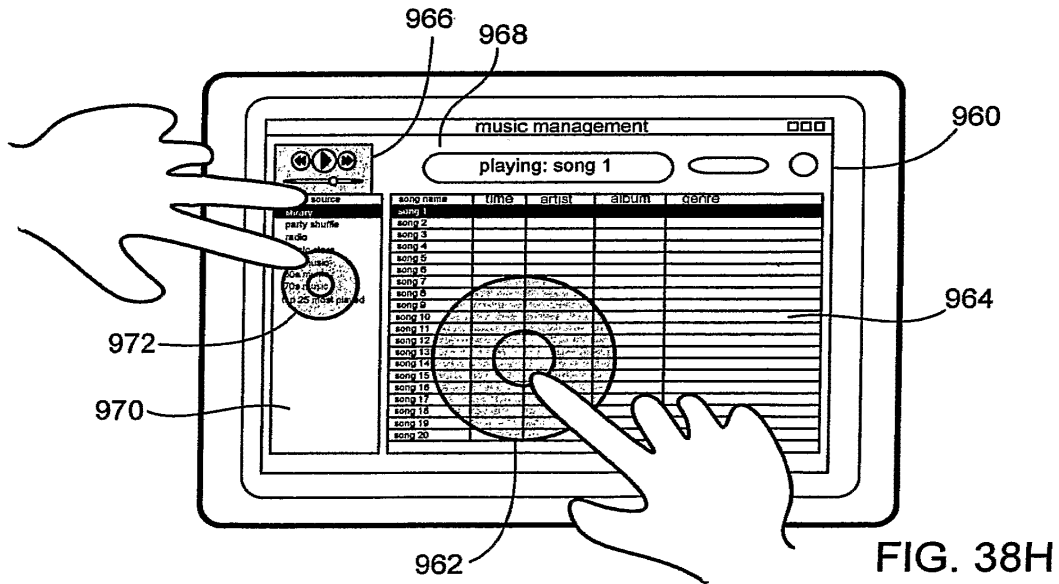
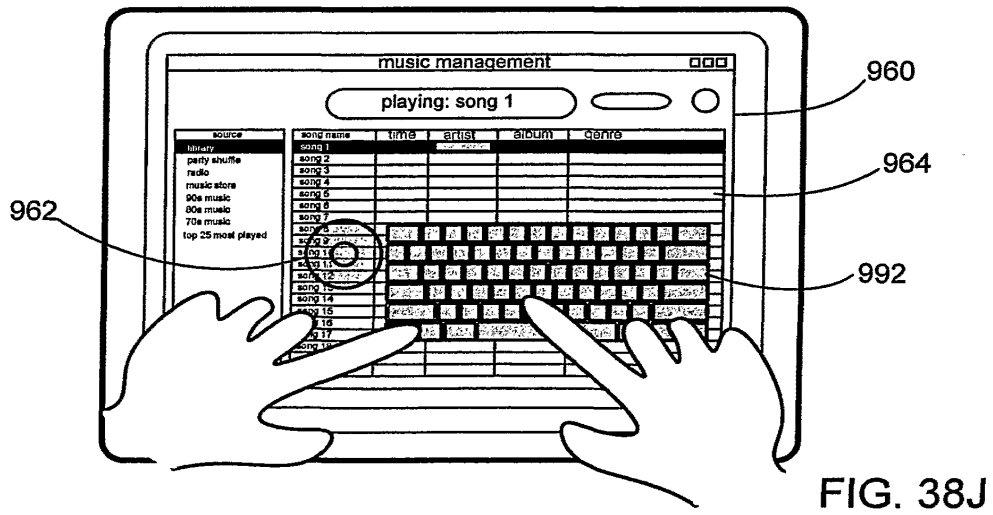
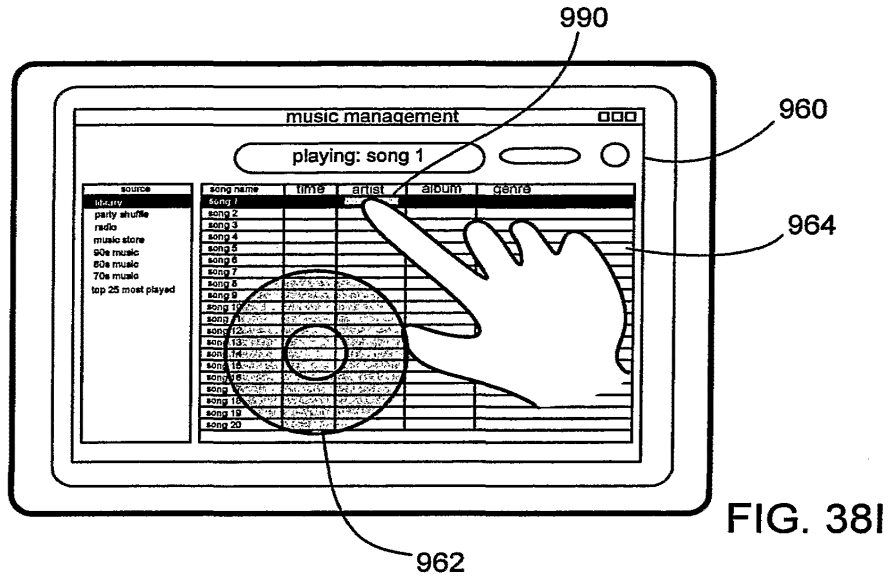


FIG. 38H



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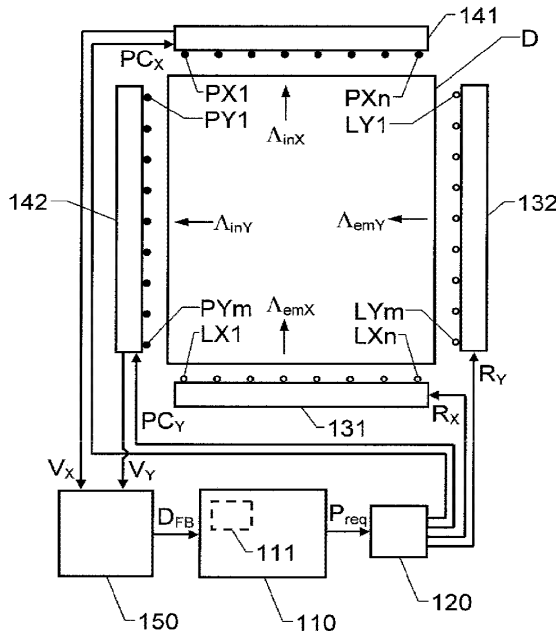


Fig. 1

(57) Abstract: A user interface for receiving input commands in a mobile terminal includes a display device (D) for presenting visual information. Arrays of light sources (131, 132) and arrays of light detectors (141, 142) are arranged along respective first and second sides of the display device (D). Each array of light sources (131, 132) is configured to transmit light pulses ( $A_{emx}$ ,  $A_{emy}$ ) over the display device (D), and each array of light detectors (141, 142) is configured to receive a part ( $A_{inx}$ ,  $A_{iny}$ ) of the energy in the transmitted light pulses ( $A_{emx}$ ,  $A_{emy}$ ). A processing unit (110) controls the light sources (131, 132) such that a respective light pulse ( $A_{emx}$ ,  $A_{emy}$ ) is repeatedly transmitted from each source ( $LX1, \dots, LXn; LY1, \dots, LYm$ ) in the arrays according to a predefined sequence. However, prior to transmitting the light pulse ( $A_{emx}$ ,  $A_{emy}$ ), an initial measurement value ( $V_1$ ) registered by at least one detector ( $D_{ph}$ ) in the at least one array of light detectors (141, 142) is recorded. Thus, the initial measurement value ( $V_1$ ) represents an ambient light intensity. Based on the initial measurement value ( $V_1$ ) and a secondary measurement value ( $V_2$ ) registered by at least one light detector ( $D_{ph}$ ) during emission of light from the light source ( $D_{em}$ ), the processing unit (110) determines whether or not a light-obstructive object is present on the display device (D) between a given light source ( $D_{em}$ ) in the arrays of light sources (131, 132) and at least one light detector ( $D_{ph}$ ) in the at least one array of light detectors (141, 142).

## Scanning of a Touch Screen

### THE BACKGROUND OF THE INVENTION AND PRIOR ART

The present invention relates generally to solutions for scanning a touch screen in search of objects positioned on the screen to indicate input commands. More particularly the invention relates to an interface arrangement according to the preamble of claim 1, a mobile terminal according to the preamble of claim 9 and a method of generating input commands according to the preamble of claim 10. The invention also relates to a computer program product according to claim 17 and a computer readable medium according to claim 18.

The current trend in mobile and portable devices is that the devices are made physically smaller and smaller. At the same time, the devices are provided with more functionality and processing capacity. Therefore, flexible user interfaces are required to enable efficient input of commands and data, while allowing presentation of complex information. To this aim, touch screens and other types of multi-purpose interface means are highly useful.

US 2004/0263482 discloses a touch screen arrangement for a mobile telephone. Here, in addition to a display unit, the touch screen includes a number of light pulse emitting elements and a number of light receiving elements, which are arranged along the edges of the display unit. The emitting elements generate light pulses according to a predetermined sequence, and based on light energy registered by the receiving elements, it is determined whether or not a light-obstructive object (e.g. a fingertip) is present on the display unit. Hence, user-generated commands can be fed into the telephone.

However, depending on the conditions in which the telephone is operated the energy level received by the light receiving elements may vary substantially. For instance, when operated in direct sunlight, the received energy level is typically many factors

of ten higher than the energy level received when the unit is operated in a dark or shaded environment.

#### SUMMARY OF THE INVENTION

The object of the invention is therefore to alleviate the above  
5 problems, and present a reliable and efficient solution for scanning a touch screen optically.

According to the invention, the object is achieved by the interface arrangement as initially described, wherein the processing unit is adapted to record an initial measurement value registered  
10 by at least one detector in the at least one array of light detectors prior to transmitting the light pulse. Thus, the initial measurement value represents an ambience light intensity. The processing unit is specifically adapted to determine whether or not a light-obstructive object is present on the display device based on the initial  
15 measurement value and a secondary measurement value registered by at least one light detector during emission of light from the light source.

The proposed arrangement is advantageous because the light detection is made relative to the ambience light intensity. Therefore, the effects of any variations in the surrounding light conditions can be cancelled out.  
20

According to one preferred embodiment of the invention, the display device has a rectangular outline with four separate sides, and the at least one second side represents a respective side  
25 opposite to the at least one first side. Hence, each light detector may expediently register light pulses from one or more light sources.

According to another preferred embodiment of the invention, the interface arrangement includes a selection means adapted to  
30 control the at least one array of light sources to emit light from a given light source during a specified interval. Thereby, the pre-

defined sequence of light pulses can be effected in a straightforward manner.

According to yet another preferred embodiment of the invention, the processing unit is adapted to cause pre-charging of at least one detector in the at least one array of light detectors in coordination with the light emitted from the given light source, such that the pre-charging is initiated at least a threshold time prior to a start of a specified interval. Namely, this enables registration of the initial measurement value representing the ambience light intensity.

According to still another preferred embodiment of the invention, the interface arrangement includes a digitizing unit, which is configured to receive measurement values from the at least one array of light detectors and in response thereto deliver digital data to the processing unit. Preferably, the processing unit is further configured to initiate the emission of light from a given light source no earlier than after that digital data representing the initial measurement value has been received by the processing unit. Consequently, it is ensured that the initial measurement value exclusively represents the ambience light.

According to another preferred embodiment of the invention, the processing unit is configured to control the at least one array of light sources such that each light pulse has a duration exceeding a conversion time of the digitizing unit for producing the digital data based on the received measurement values. Thereby, good data quality can be guaranteed, and thus also a reliable behavior of the proposed interface.

According to a further preferred embodiment of the invention, the processing unit is configured to cause pre-charging of at least one detector in the at least one array of light detectors in coordination with the light emitted from the given light source, such that the pre-charging is terminated no earlier than a delay time after expiry of the specified interval during which light is

emitted from the given light source. The delay time here represents a conversion time of the digitizing unit for producing the digital data based on the received measurement values. The delay time is desirable because it enables detection of a maximum amount of energy in the emitted light pulse.

According to another aspect of the invention the object is achieved by the terminal described initially, wherein the terminal includes the interface arrangement of the above-proposed type.

According to yet another aspect of the invention, the object is achieved by the method described initially, wherein an initial measurement value is recorded, which has been registered by at least one detector in the array of light detectors prior to transmitting the light pulse. The initial measurement value thus represents an ambience light intensity. It is then determined whether or not a light-obstructive object is present on the display device based on the initial measurement value and a secondary measurement value registered by at least one light detector during emission of light from the source. The advantages of this method, as well as the preferred embodiments thereof, are apparent from the discussion hereinabove with reference to the proposed vehicle arrangement.

According to a further aspect of the invention the object is achieved by a computer program product directly loadable into the internal memory of a computer, comprising software for controlling the above proposed method when said program is run on a computer.

According to another aspect of the invention the object is achieved by a computer readable medium, having a program recorded thereon, where the program is to make a computer control the above proposed method.

Further advantages, advantageous features and applications of the present invention will be apparent from the following description and the dependent claims.



## BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is now to be explained more closely by means of preferred embodiments, which are disclosed as examples, and with reference to the attached drawings.

- 5 Figure 1 shows a block diagram over an interface arrangement according to one embodiment of the invention;
- Figure 2 shows schematic circuit diagrams over a light source and a light detector respectively according to
- 10 one embodiment of the invention;
- Figures 3a-d show diagrams illustrating examples of the timing relationship between a set of key signals in the circuit diagrams of Figure 2;
- Figure 4 illustrates a mobile terminal including the proposed
- 15 interface arrangement; and
- Figure 5 shows a flow diagram illustrating the general method of generating input commands to a mobile terminal according to the invention.

## 20 DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

We refer initially to Figure 1, which shows a block diagram over an interface arrangement for receiving input commands in a mobile terminal according to one embodiment of the invention.

25 The arrangement includes a display device D, at least one array of light sources 131 and 132 respectively, at least one array of light detectors 141 and 142 respectively and a processing unit 110.

The display device D, e.g. including an LCD (Liquid Crystal Display) screen, is adapted to present visual information to a user.

30 The arrays of light sources 131 and 132 are arranged along a respective side of the display device D. Preferably; the display

device D has a rectangular outline with four separate sides. In such a case, a first array of light sources 131 may be arranged along a lowermost side of the display device D, and a second array of light sources 132 may be arranged along a rightmost side of the display device D as illustrated in Figure 1. However, depending on the outline of the display device D and the design of software which controls the user interface, numerous alternative arrangements of the arrays of light sources 131 and 132 are likewise conceivable according to the invention. For example the light sources may exclusively be arranged along a single side of the display device D, and be configured to emit light rays at different angles across the display device D.

The arrays of light detectors 141 and 142 are arranged along a respective side of the display device D where no light sources are arranged. Thus, provided that the display device D has a rectangular outline with four separate sides as illustrated in Figure 1, a first array of light detectors 141 may be arranged opposite to the first array of light sources 131, and a second array of light detectors 142 may be arranged opposite to the second array of light sources 132. However, technically, the arrays of light sources and detectors 131, 132, 141 and 142 can be arranged so that the arrays of light sources 131 and 132 are instead arranged along adjoining sides, and analogously, the arrays of light detectors 141 and 142 likewise are arranged along adjoining sides of the display device D.

In any case, each array of light sources is configured to transmit light pulses, here exemplified by  $\Lambda_{emX}$  and  $\Lambda_{emY}$ , over the display device D. Moreover, each array of light detectors 141 and 142 is configured to receive a part  $\Lambda_{inX}$  and  $\Lambda_{inY}$  of the energy in the transmitted light pulses  $\Lambda_{emX}$  and  $\Lambda_{emY}$  respectively. Each light source, in turn, may either be configured to emit light in a relatively narrow lobe, such that its emitted light can be registered by one detector only; or in a comparatively wide lobe, such that its emitted light can be registered by two or more detectors.

The processing unit 110 is adapted to control the arrays of light sources 131 and 132, such that a respective light pulse  $\Lambda_{emX}$  and  $\Lambda_{emY}$  is repeatedly transmitted from each source LX1, ..., LXn and LY1, ..., LYm respectively in the arrays 131 and 132 according to a predefined sequence. The processing unit 110 is also adapted to receive information pertaining to light energy registered by the detectors PX1, ..., PXn; PY1, ..., PYm in the arrays of light detectors 141 and 142. Based thereon, the processing unit 110 is adapted to determine whether or not a light-obstructive object (e.g. represented by a fingertip) is present on the display device D between a given light source and at least one light detector in the arrays of light detectors 141 and 142. Naturally, the numbers n and m of light sources and light detectors in the arrays 131, 132, 141 and 142 depend on the desired accuracy/resolution at which a position of the light-obstructive element is to be determined. Moreover, as touched upon above, the number light sources may be different from the light detectors. Nevertheless, for a typical implementation, the numbers n and m normally range from 4 to 20.

Specifically, according to the invention, the processing unit 110 is adapted to record an initial measurement value  $V_1$ , which is registered by at least one detector in the arrays of light detectors 141 and 142 *prior to* transmitting the light pulse  $\Lambda_{emX}$  and  $\Lambda_{emY}$ . Hence, the initial measurement value  $V_1$  represents an ambience light intensity. Then, based on the initial measurement value  $V_1$  and a secondary measurement value  $V_2$  is registered by at least one light detector during emission of light from the light source, the processing unit 110 is adapted to determine whether or not a light-obstructive object is present on the display device D at such a position that this object intersects a path of the emitted light. Here, a light-obstructive object may be deemed to be present if the difference between the initial measurement value  $V_1$  and the secondary measurement value  $V_2$  exceeds a threshold value.

According to one preferred embodiment of the invention, the interface arrangement further includes a digitizing unit 150, which

is configured to receive measurement values  $V_X$  and  $V_Y$  from the arrays of light detectors 141 and 142 respectively, and in response thereto deliver corresponding digital data  $D_{FB}$  to the processing unit 110. Thereby, any light intensities registered by the light detectors may be processed in the unit 110 in a straightforward manner.

Preferably, the arrangement also includes a selection means 120 adapted to, on one hand, control the arrays of light sources 131 and 132 to emit light from a given light source during a specified interval; and on the other hand, control the arrays of light detectors 141 and 142 to register light energy in one or more detectors during corresponding specified intervals. The selection means 120 is either a separate unit (as illustrated in Figure 1), or an integral module of the processing unit 110. In any case, based on a request signal  $P_{req}$  originated in the processing unit 110, the selection means 120 is configured to generate a specific control signal  $R_X$ ,  $R_Y$ ,  $PC_X$  or  $PC_Y$  to the arrays of light sources 131 or 132, or the arrays of light detectors 141 or 142 respectively. Here, each control signal in a first set of control signals  $R_X$  and  $R_Y$  is adapted to cause light to be emitted from a particular light source in a given array of light sources 131 or 132, whereas each control signal in a second set of control signals  $PC_X$  and  $PC_Y$  is adapted to cause registration of light received by a particular light detector in a given array of light detectors 141 or 142.

It is further preferable if the processing unit 110 includes, or is associated with, a computer readable medium 111, e.g. a memory module, which stores a program, where the program is adapted to make the processing unit 110 control the proposed arrangement as described above.

Figure 2 shows a schematic circuit diagram over a light source and a light detector respectively according to one embodiment of the invention. The right hand circuitry represents one of the light sources in one of said arrays, say 132, whereas the left hand circuitry represents one of the light detectors in one of said

arrays, say 142.

In the embodiment illustrated in Figure 2, a first switch S1 is configured to pre-charge a photo diode  $D_{ph}$  in response to a first control signal PC, e.g. embodied by the above signal  $PC_{\gamma}$  from the selection means 120. Hence, the first control signal PC is adapted to cause the photo diode  $D_{ph}$  to register an ambient light intensity. A set of resistors  $r_1$ ,  $r_2$  and  $r_3$  are arranged to accomplish appropriate bias voltages for a second switch S2 and the photo diode  $D_{ph}$  respectively. The second switch S2 is configured to set the photo diode  $D_{ph}$  in an active state or an idle state in response to a second control signal  $SET_{idle}$ , e.g. generated by the processing unit 110 and forwarded via the selection means 120. Preferably, both the first and second switches S1 and S2 are connected to a supply voltage  $V_{sup}$ , say 3V.

A third switch S3, is configured to control a fourth switch S4 in response to a third control signal R, e.g. embodied by the above signal  $R_{\gamma}$  from the selection means 120. The fourth switch S4, in turn, is configured to activate a light emitting diode  $D_{em}$ , such that light energy  $\Delta_{em}$  is produced. A charge capacitor  $C_s$  and a charging resistor  $r_4$  are connected to the light emitting diode  $D_{em}$  and arranged to supply the required energy to the light emitting diode  $D_{em}$ . The charging resistor  $r_4$  is further connected to the supply voltage  $V_{sup}$ , say 3V.

Figure 3a shows a diagram illustrating one example of a voltage  $V_C$  (in a point C downstream of the light emitting diode  $D_{em}$  in Figure 2) as a function of time  $t$ , Figure 3b shows a diagram illustrating one example of a voltage  $V_D$  (in a point D upstream of the light emitting diode  $D_{em}$  in Figure 2) as a function of time  $t$ , Figure 3c shows a diagram illustrating one example of a voltage  $V_A$  (in a point A upstream of the photo diode  $D_{ph}$  in Figure 2) as a function of time  $t$ , and Figure 3d shows a diagram illustrating one example of a voltage  $V_B$  (in a point B downstream of the photo diode  $D_{ph}$  in Figure 2) as a function of time  $t$ .

In this example, we presume that the predefined sequence of light pulses implemented by the processing unit 110 prescribes that a light pulse is to be generated by the light source (i.e. the light emitting diode  $D_{em}$ ) during a specified interval  $T_0$ , and that this light source shall produce a subsequent light pulse a time  $T_1$  later. The third control signal  $R$  causes a voltage dip in  $V_C$  during the interval  $T_0$ . As a result, the charge capacitor  $C_s$  releases its stored energy through the light emitting diode  $D_{em}$ , and the diode emits light over the display device towards the photo diode  $D_{ph}$ .

As can be seen in Figure 3b, during the interval  $T_0$ ,  $V_D$  drops from a maximum value  $V_0$  due to the drain of electric charges from the capacitor  $C_s$ . Thereafter, the capacitor  $C_s$  is recharged until the time  $T_1$  has expired, and the procedure is repeated.

We now refer to Figures 3c and 3d. As mentioned above, an initial measurement value  $V_1$  representing the ambience light intensity is registered by the light detector (i.e. the photo diode  $D_{ph}$ ) prior to emitting the light pulse from the light emitting diode  $D_{em}$ ). Thus, to this aim, the processing unit 110 controls the photo diode  $D_{ph}$  in coordination with the light emitted from the light emitting diode  $D_{em}$ . Preferably, the processing unit 110 is configured to cause pre-charging of the photo diode  $D_{ph}$  by forwarding the first control signal  $PC$  to the first switch  $S_1$ . The processing unit 110 initiates this pre-charging at least a threshold time  $T_3$  prior to the start of the specified interval  $T_0$ , and continues the pre-charging during an interval  $T_2$ .

Moreover, it is preferred that the processing unit 110 is configured to initiate the emission of light from the light emitting diode  $D_{em}$  no earlier than after that the processing unit 110 has been allowed sufficient time to receive digital data  $D_{FB}$  (e.g. via the above-mentioned digitizing unit 150) representing the initial measurement value  $V_1$ . In practice, this normally means that a period  $T_4$  after the threshold time  $T_3$  must also expire before the specified interval  $T_0$  can be initiated.

Additionally, according to one preferred embodiment of the invention, the processing unit 110 is configured to control the light detectors in coordination with the light pulses, such that the pre-charging interval T2 is terminated no earlier than a delay time TD after expiry of the specified interval T0 during which light is emitted from the given light emitting diode  $D_{em}$ . Consequently, the first and third control signals PC and R respectively have such timing interrelationship that the pre-charging interval T2 continues at least a period TD after ending the specified interval T0. Then, at the end of the delay time TD, the voltage  $V_A$  is caused to drop down to a relatively low idle voltage in response to the first control signal PC. Here, the delay time TD represents a conversion time of the digitizing unit 150 for producing the digital data  $D_{FB}$  based on the received measurement value, i.e. a secondary measurement value  $V_2$  registered by the photo diode  $D_{ph}$  during emission of light  $\Lambda_{em}$  from the light source  $D_{em}$ .

In order to make sure that the secondary measurement value  $V_2$  is registered while the light  $\Lambda_{em}$  from the light emitting diode  $D_{em}$  still is being emitted, the processing unit 110 is preferably configured to record digital data  $D_{FB}$  representing this value a time T5 after the initiating the specified interval T0, where  $T5 < T0$ . In other words, it is advantageous if the processing unit 110 is configured to control the array of light sources 131 and 132 such that each light pulse  $\Lambda_{em}$  (or  $\Lambda_{emX}$  and  $\Lambda_{emY}$  in Figure 1) has a duration T0 exceeding a conversion time of the digitizing unit 150 for producing the digital data  $D_{FB}$  based on the received measurement values. At the end of the specified interval T0, the voltage  $V_B$  is caused to drop down from a value slightly exceeding the secondary measurement value  $V_2$  in response to the first control signal PC. The voltage  $V_B$  levels out at a  $V_1$ -value designating an updated ambient light intensity in respect of a subsequent light pulse.

Figure 4 illustrates a mobile terminal T, which includes the above-described interface arrangement. Hence, the terminal T may be any type of device which is configured to process digital data

in response to user-generated commands, and present processed information on a display device D integrated in the terminal T. I.e. the terminal may represent a cellular/mobile phone, a wireless telephone, a PDA (Portable Digital Assistant), a portable  
5 game device, or a hybrid unit comprising two or more thereof.

In order to sum up, the general method of generating input commands to a mobile terminal according to the invention will be described below with reference to the flow diagram in Figure 5.

A first step 510 records at least one initial measurement value,  
10 which is registered by at least one detector in an array of light detectors arranged along one side of a display device. The initial measurement value(s) is/are taken to represent(s) an ambience light intensity.

Subsequently, a step 520 initiates transmission of light over the  
15 display device from at least one light source in an array of light sources, which is arranged along a side of the display device different from the side where the array of light detectors is arranged. Hence, a light pulse starts. A step 530 then records a secondary measurement value registered by at least one light detector,  
20 i.e. during transmission of light from the at least one light source. Thereafter, a step 540 terminates the transmission of light from the at least one source in an array of light sources. Hence, the light pulse ends.

After that, based on the initial and secondary measurement values,  
25 a step 550 determines whether or not a light-obstructive object was present on the display device between the at least one light source and at least one light detector. Finally, the procedure loops back to step 510 via a step 560, which causes a predefined delay. The delay is here adapted to accomplish a desired separation  
30 in time between two consecutive light pulses, such that a respective light pulse is repeatedly transmitted from each source according to a predefined sequence.

All of the process steps, as well as any sub-sequence of steps,



described with reference to the Figure 5 above may be controlled by means of a programmed computer apparatus. Moreover, although the embodiments of the invention described above with reference to the drawings comprise computer apparatus and processes performed in computer apparatus, the invention thus also extends to computer programs, particularly computer programs on or in a carrier, adapted for putting the invention into practice. The program may be in the form of source code; object code, a code intermediate source and object code such as in partially compiled form, or in any other form suitable for use in the implementation of the process according to the invention. The carrier may be any entity or device capable of carrying the program. For example, the carrier may comprise a storage medium, such as a Flash memory, a ROM (Read Only Memory), for example a CD (Compact Disc) or a semiconductor ROM, an EPROM (Erasable Programmable Read-Only Memory), an EEPROM (Electrically Erasable Programmable Read-Only Memory), or a magnetic recording medium, for example a floppy disc or hard disc. Further, the carrier may be a transmissible carrier such as an electrical or optical signal which may be conveyed via electrical or optical cable or by radio or by other means. When the program is embodied in a signal which may be conveyed directly by a cable or other device or means, the carrier may be constituted by such cable or device or means. Alternatively, the carrier may be an integrated circuit in which the program is embedded, the integrated circuit being adapted for performing, or for use in the performance of, the relevant processes.

The term "comprises/comprising" when used in this specification is taken to specify the presence of stated features, integers, steps or components. However, the term does not preclude the pre or addition of one or more additional features, integers, steps or components or groups thereof.

The invention is not restricted to the described embodiments in the figures, but may be varied freely within the scope of the claims.

Claims

1. An interface arrangement for receiving input commands in a mobile terminal, comprising:
- 5 a display device (D) adapted to present visual information to a user,
- at least one array of light sources (131, 132) arranged along at least one first side of the display device (D), each array of light sources being configured to transmit light pulses ( $\Lambda_{emX}$ ,  $\Lambda_{emY}$ ) over the display device (D),
- 10 at least one array of light detectors (141, 142) arranged along at least one second side of the display device (D), each array of light detectors (141, 142) being configured to receive a part ( $\Lambda_{inX}$ ,  $\Lambda_{inY}$ ) of the energy in the transmitted light pulses ( $\Lambda_{emX}$ ,  $\Lambda_{emY}$ ), and
- 15 a processing unit (110) adapted to control the array of light sources (131, 132) such that a respective light pulse ( $\Lambda_{emX}$ ,  $\Lambda_{emY}$ ) is repeatedly transmitted from each source (LX1, ..., LXn; LY1, ..., LYm) in the at least one array of light sources (131, 132) according to a predefined sequence, receive information pertaining
- 20 to light energy registered by the detectors (PX1, ..., PXn; PY1, ..., PYm) in the at least one array of light detectors (141, 142), and based thereon determine whether or not a light-obstructive object is present on the display device (D) between a given light source ( $D_{em}$ ) and at least one light detector ( $D_{ph}$ ) in the at least
- 25 one array of light detectors (141, 142), **characterized in that** the processing unit (110) is adapted to:
- record an initial measurement value ( $V_1$ ) registered by at least one detector ( $D_{ph}$ ) in the at least one array of light detectors (141, 142) prior to transmitting the light pulse ( $\Lambda_{emX}$ ,  $\Lambda_{emY}$ ), the
- 30 initial measurement value ( $V_1$ ) representing an ambience light intensity, and
- determine whether or not a light-obstructive object is present on the display device (D) based on the initial measurement value ( $V_1$ ) and a secondary measurement value ( $V_2$ ) registered
- 35 by at least one light detector ( $D_{ph}$ ) during emission of light from the light source ( $D_{em}$ ).

2. The interface arrangement according to claim 1, wherein the display device (D) has a rectangular outline with four separate sides, and the at least one second side represents a respective side opposite to the at least one first side.
- 5 3. The interface arrangement according to any one of the claims 1 or 2, comprising a selection means (120) adapted to control the at least one array of light sources (131, 132) to emit light from a given light source ( $D_{em}$ ) during a specified interval ( $T_0$ ).
- 10 4. The interface arrangement according to claim 3, wherein the processing unit (110) is adapted to cause pre-charging of at least one detector ( $D_{ph}$ ) in the at least one array of light detectors (141, 142) in coordination with the light emitted from the given light source ( $D_{em}$ ) such that the pre-charging is initiated at least a  
15 threshold time ( $T_3$ ) prior to a start of specified interval ( $T_0$ ).
5. The interface arrangement according to claim 4, comprising a digitizing unit (150) configured to receive measurement values ( $V_x, V_y$ ) from the at least one array of light detectors (141, 142) and in response thereto deliver digital data ( $D_{FB}$ ) to the processing unit (110).  
20
6. The interface arrangement according to claim 5, wherein the processing unit (110) is configured to initiate the emission of light from the given light source ( $D_{em}$ ) no earlier than after that ( $T_4$ ) digital data ( $D_{FB}$ ) representing the initial measurement value  
25 ( $V_1$ ) has been received by the processing unit (110).
7. The interface arrangement according to any one of the claims 5 or 6, wherein the processing unit (110) is configured to control the at least one array of light sources (131, 132) such that each light pulse ( $\Lambda_{emX}, \Lambda_{emY}$ ) has a duration ( $T_0$ ) exceeding  
30 a conversion time of the digitizing unit (150) for producing the digital data ( $D_{FB}$ ) based on the received measurement values

$(V_x, V_y)$ .

8. The interface arrangement according to any one of the claims 4 to 7, wherein the processing unit (110) is configured to cause pre-charging of at least one detector ( $D_{ph}$ ) in the at least one array of light detectors (141, 142) in coordination with the light emitted from the given light source ( $D_{em}$ ) such that the pre-charging (T2) is terminated no earlier than a delay time (TD) after expiry of the specified interval (T0) during which light is emitted from the given light source ( $D_{em}$ ), the delay time (TD) representing a conversion time of the digitizing unit (150) for producing the digital data ( $D_{FB}$ ) based on the received measurement values ( $V_x, V_y$ ).

9. A mobile terminal for processing digital data, **characterized in that** the terminal (T) comprises the interface arrangement according to any one of the preceding claims.

10. A method of generating input commands to a mobile terminal having: a display device (D) adapted to present visual information to a user, an array of light sources (131, 132) arranged along a first side of the display device (D) and configured to transmit light pulses ( $\Lambda_{emX}, \Lambda_{emY}$ ) over the display device (D), and an array of light detectors (141, 142) arranged along a second side of the display device (D), the array of light detectors (141, 142) being configured to receive a part ( $\Lambda_{inX}, \Lambda_{inY}$ ) of the energy in the transmitted light pulses ( $\Lambda_{emX}, \Lambda_{emY}$ ), the method comprising:

controlling the array of light sources (131, 132) such that a respective light pulse ( $\Lambda_{emX}, \Lambda_{emY}$ ) is repeatedly transmitted from each source ( $LX1, \dots, LXn; LY1, \dots, LYm$ ) in the array of light sources (131, 132) according to a predefined sequence,

receiving information pertaining to light energy registered by the detectors ( $PX1, \dots, PXn; PY1, \dots, PYm$ ) in the array of light detectors (141, 142), and based thereon

determining whether or not a light-obstructive object is pre-

sent on the display device (D) between the light source ( $D_{em}$ ) and at least one light detector ( $D_{ph}$ ),

**characterized by**

5 recording an initial measurement value ( $V_1$ ) registered by at least one detector ( $D_{ph}$ ) in the array of light detectors (141, 142) prior to transmitting the light pulse ( $\Lambda_{emX}$ ,  $\Lambda_{emY}$ ), the initial measurement value ( $V_1$ ) representing an ambience light intensity, and  
10 determining whether or not a light-obstructive object is present on the display device (D) based on the initial measurement value ( $V_1$ ) and a secondary measurement value ( $V_2$ ) registered by at least one light detector ( $D_{ph}$ ) during emission of light from the source ( $D_{em}$ ).

11. The method according to claim 10, comprising controlling the at least one array of light sources (131, 132) to emit light  
15 from a given light source ( $D_{em}$ ) during a specified interval ( $T_0$ ).

12. The method according to claim 11, comprising pre-charging at least one detector ( $D_{ph}$ ) in the at least one array of light detectors (141, 142) in coordination with the emission of light from the given light source ( $D_{em}$ ) in such a manner that the pre-charging is  
20 initiated at least a threshold time ( $T_3$ ) prior to a start of specified interval ( $T_0$ ).

13. The method according to claim 12, comprising:  
digitizing measurement values ( $V_X$ ,  $V_Y$ ) received from the at least one array of light detectors (141, 142), and  
25 producing digital data ( $D_{FB}$ ) in response thereto.

14. The method according to claim 13, comprising initiating the emission of light from the given light source ( $D_{em}$ ) no earlier than after that ( $T_4$ ) digital data ( $D_{FB}$ ) representing the initial measurement value ( $V_1$ ) has been received by the processing unit (110).

30 15. The method according to any one of the claims 13 or 14, comprising controlling the at least one array of light sources

(131, 132) such that each light pulse ( $\Lambda_{emX}$ ,  $\Lambda_{emY}$ ) has a duration (T0) exceeding a conversion time for digitizing the measurement values ( $V_X$ ,  $V_Y$ ).

16. The method according to any one of the claims 13 to 15,  
5 comprising pre-charging the at least one detector ( $D_{ph}$ ) in the at least one array of light detectors (141, 142) in coordination with the emission of light from the given light source ( $D_{em}$ ) such that the pre-charging (T2) is terminated no earlier than a delay time (TD) after expiry of the specified interval (T0) during which light  
10 is emitted from the given light source ( $D_{em}$ ), the delay time (TD) representing a conversion time for digitizing measurement values ( $V_X$ ,  $V_Y$ ).

17. A computer program product directly loadable into the internal memory of a computer, comprising software for controlling the steps of any of the claims 10 to 16 when said program is  
15 run on the computer.

18. A computer readable medium (111), having a program recorded thereon, where the program is to make a computer control the steps of any of the claims 10 to 16.  
20

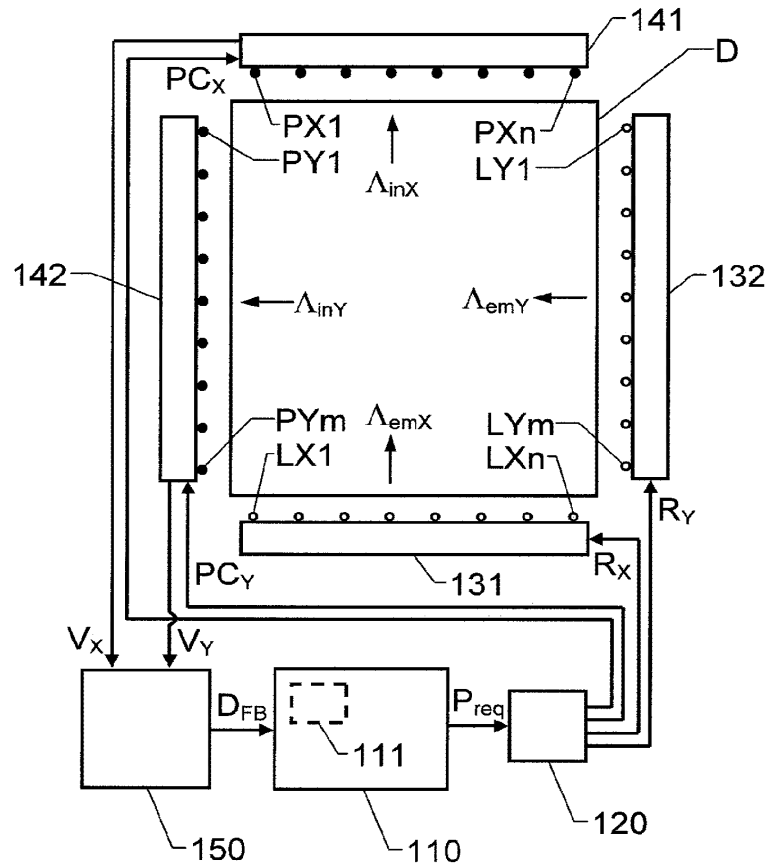


Fig. 1

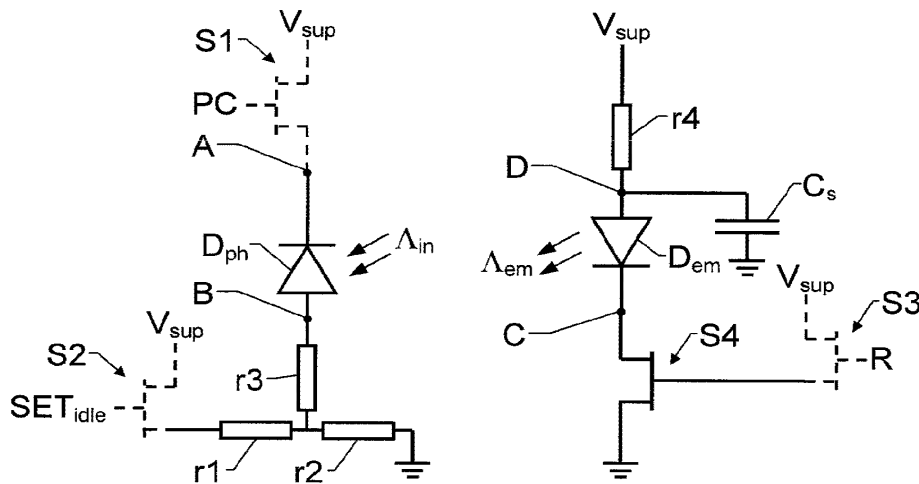


Fig. 2

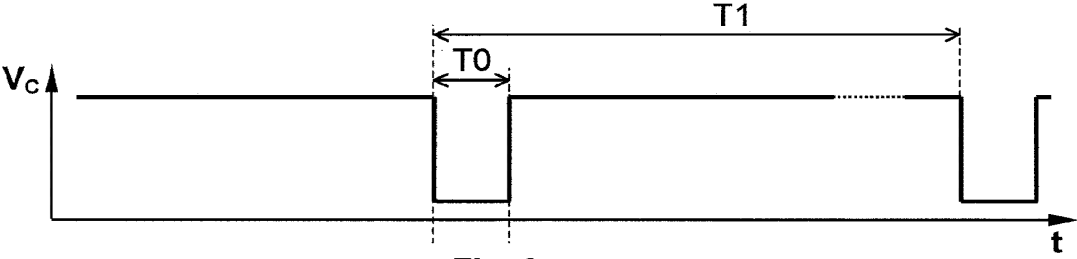


Fig. 3a

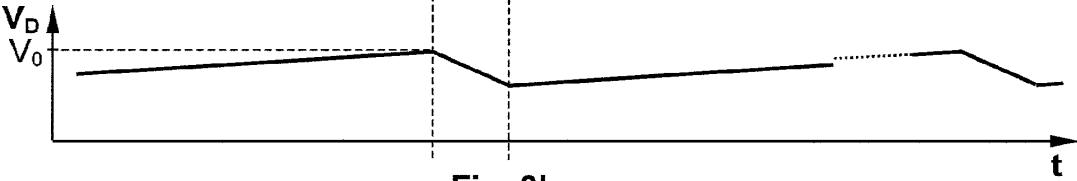


Fig. 3b

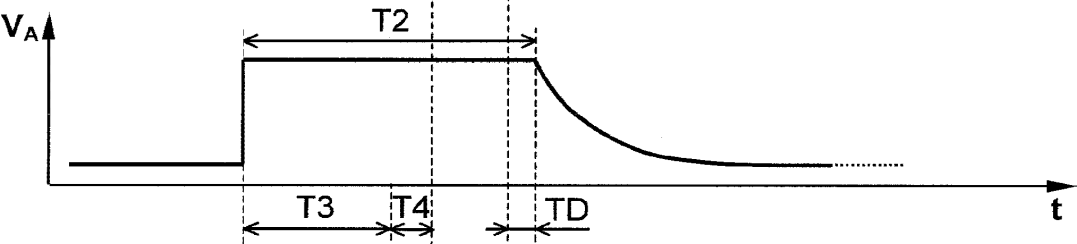


Fig. 3c

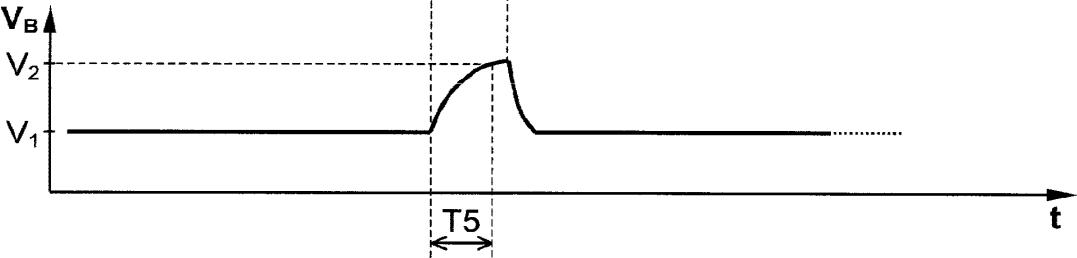


Fig. 3d



3/3

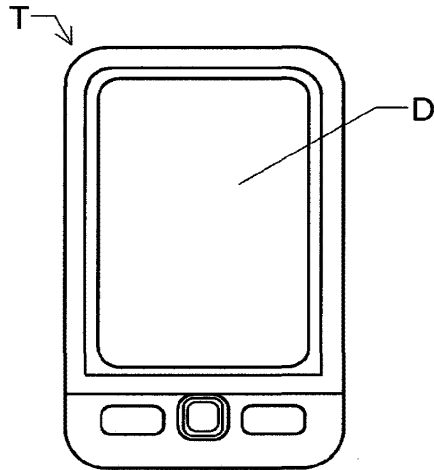


Fig. 4

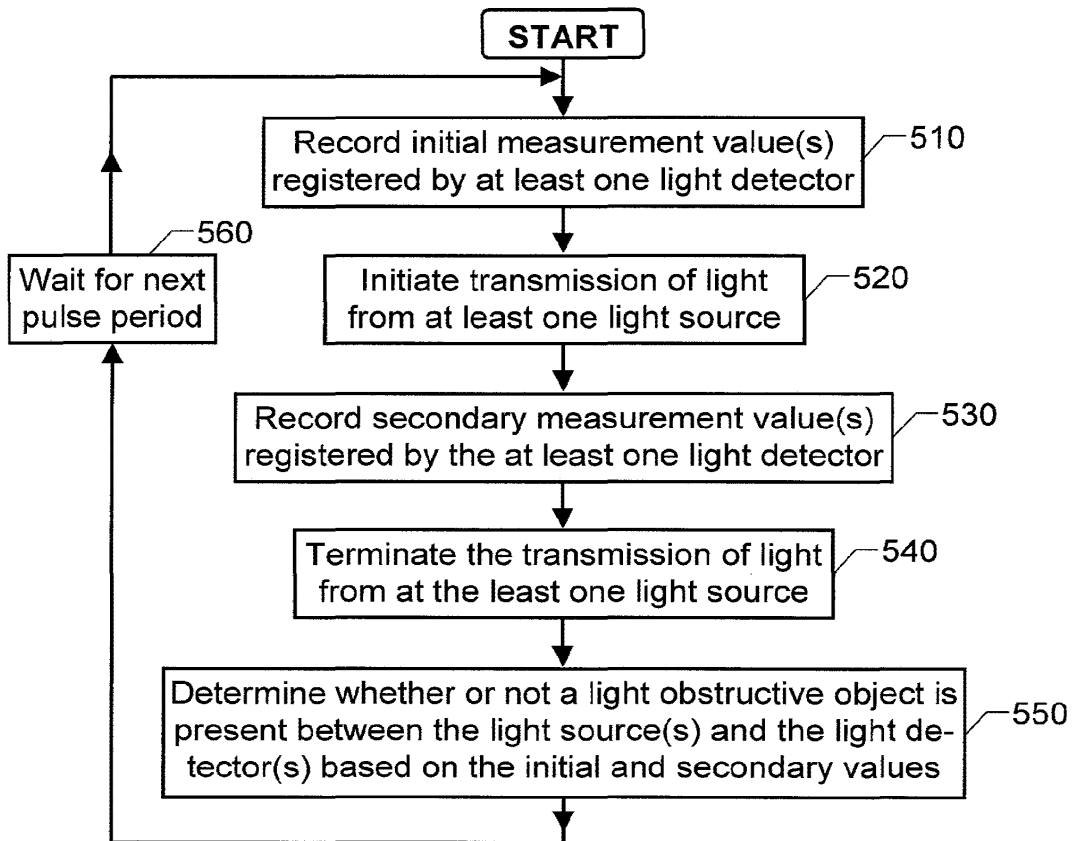


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SE2007/050508

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, H04Q		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
EPO-INTERNAL, WPI DATA, PAJ		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 03038592 A1 (GOERTZ, M G), 8 May 2003 (08.05.2003), figures 4,6, claims 1,16, abstract  --	1-18
Y	US 4243879 A (CARROLL, A B ET AL), 6 January 1981 (06.01.1981), column 1, line 24 - line 45; column 5, line 14 - column 6, line 49; column 6, line 53 - line 61, claims 1-3,22, abstract  --	1-18
Y	US 5194863 A (BARKER, J H ET AL), 16 March 1993 (16.03.1993), column 3, line 1 - line 32; column 3, line 42 - line 49, figure 1, claims 3-5, abstract  -- -----	1-18
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
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Date of the actual completion of the international search		Date of mailing of the international search report
21 April 2008		24-04-2008
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86		Authorized officer  Gordana Ninkovic /LR Telephone No. +46 8 782 25 00

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**International patent classification (IPC)**  
**G06F 3/042** (2006.01)

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Cited literature, if any, will be enclosed in paper form.

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

26/01/2008

International application No.

PCT/SE2007/050508

WO	03038592	A1	08/05/2003	CA	2472354	A	08/05/2003
				CN	1276338	C	20/09/2006
				CN	1599895	A	23/03/2005
				EP	1454224	A	08/09/2004
				JP	2005507520	T	17/03/2005
				SE	0103835	A,L	03/05/2003
				US	20040263482	A	30/12/2004
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US	4243879	A	06/01/1981	NONE			
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US	5194863	A	16/03/1993	EP	0450203	A	09/10/1991
				JP	3002917	A	09/01/1991
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## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	38677787
<b>Application Number:</b>	16796880
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1091
<b>Title of Invention:</b>	TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE
<b>First Named Inventor/Applicant Name:</b>	Magnus Goertz
<b>Customer Number:</b>	75660
<b>Filer:</b>	Marc Aron Berger
<b>Filer Authorized By:</b>	
<b>Attorney Docket Number:</b>	AEQUITAS.P001
<b>Receipt Date:</b>	24-FEB-2020
<b>Filing Date:</b>	
<b>Time Stamp:</b>	23:17:40
<b>Application Type:</b>	Utility under 35 USC 111(a)

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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	AEQUITAS-P001_InformatkonDisclosureStatement-1_02-24-2020.pdf	1045110 <small>4e1e86a179ae1c190c8e-fa0a65286ac5c7519de0</small>	no	34

### Warnings:

<b>Information:</b>					
2	Information Disclosure Statement (IDS) Form (SB08)	AEQUITAS-P001_InformationDisclosureStatement-2_02-24-2020.pdf	612874 54d817e2a096c8db25e841fd734fe10f2e116fbf	no	7
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4	Foreign Reference	EP0513694A2.pdf	110959 07624ab7b4bc18d21559780db1fe6a5c25eff8d	no	12
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5	Foreign Reference	EP0618528A1.pdf	205298 44fb379c9cfd2fb739a324aabf0cb0a2be7cfcfa	no	18
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6	Foreign Reference	EP0703525A1.pdf	398443 509104ca60e05036054f119e54a55ae49a5f88fe	no	34
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16	Non Patent Literature	CARLSON.pdf	1093238	no	14
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17	Non Patent Literature	DAMM.pdf	15932109	no	8
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19	Non Patent Literature	HARRISON.pdf	1764540	no	8
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20	Non Patent Literature	HODGES.pdf	1984437	no	10
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21	Non Patent Literature	JERMYN.pdf	13049228	no	15
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22	Non Patent Literature	KARLSON.pdf	1232718	no	10
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<b>Warnings:</b>					
<b>Information:</b>					
			<b>Total Files Size (in bytes):</b>	69860963	
<p><b>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  <b>If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</b></p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  <b>If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</b></p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  <b>If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</b></p>					

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	38678055
<b>Application Number:</b>	16796880
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1091
<b>Title of Invention:</b>	TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE
<b>First Named Inventor/Applicant Name:</b>	Magnus Goertz
<b>Customer Number:</b>	75660
<b>Filer:</b>	Marc Aron Berger
<b>Filer Authorized By:</b>	
<b>Attorney Docket Number:</b>	AEQUITAS.P001
<b>Receipt Date:</b>	25-FEB-2020
<b>Filing Date:</b>	
<b>Time Stamp:</b>	02:58:18
<b>Application Type:</b>	Utility under 35 USC 111(a)

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Submitted with Payment	no
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	KENWOOD-1.pdf	6725991	no	68
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2	Non Patent Literature	KURTENBACH-1.pdf	16689317	no	24
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<p><b>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

<b>Electronic Acknowledgement Receipt</b>	
<b>EFS ID:</b>	38678156
<b>Application Number:</b>	16796880
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1091
<b>Title of Invention:</b>	TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE
<b>First Named Inventor/Applicant Name:</b>	Magnus Goertz
<b>Customer Number:</b>	75660
<b>Filer:</b>	Marc Aron Berger
<b>Filer Authorized By:</b>	
<b>Attorney Docket Number:</b>	AEQUITAS.P001
<b>Receipt Date:</b>	25-FEB-2020
<b>Filing Date:</b>	
<b>Time Stamp:</b>	04:25:53
<b>Application Type:</b>	Utility under 35 USC 111(a)

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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4	Non Patent Literature	MYNATT.pdf	1771964	no	8
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5	Non Patent Literature	PIRHONEN.pdf	182365	no	8
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6	Non Patent Literature	PLAISANT-1.pdf	4245348	no	2
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9	Non Patent Literature	SOUTHERN_BELLE.pdf	927972	no	9
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<b>Total Files Size (in bytes):</b>				33999699	

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**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



<b>Electronic Acknowledgement Receipt</b>	
<b>EFS ID:</b>	38678164
<b>Application Number:</b>	16796880
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1091
<b>Title of Invention:</b>	TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE
<b>First Named Inventor/Applicant Name:</b>	Magnus Goertz
<b>Customer Number:</b>	75660
<b>Filer:</b>	Marc Aron Berger
<b>Filer Authorized By:</b>	
<b>Attorney Docket Number:</b>	AEQUITAS.P001
<b>Receipt Date:</b>	25-FEB-2020
<b>Filing Date:</b>	
<b>Time Stamp:</b>	04:33:11
<b>Application Type:</b>	Utility under 35 USC 111(a)

**Payment information:**

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1	Non Patent Literature	DESKACCESSORY.pdf	1523403  d5302035a2e11e412e98a5860de00cb31ff73d06	no	3

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2	Non Patent Literature	WAGNER.pdf	525458	no	3
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Information:					
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Warnings:					
Information:					
5	Non Patent Literature	KECKEROO.pdf	353789	no	5
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Total Files Size (in bytes):				3318026	
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

<b>Electronic Acknowledgement Receipt</b>	
<b>EFS ID:</b>	38678182
<b>Application Number:</b>	16796880
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1091
<b>Title of Invention:</b>	TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE
<b>First Named Inventor/Applicant Name:</b>	Magnus Goertz
<b>Customer Number:</b>	75660
<b>Filer:</b>	Marc Aron Berger
<b>Filer Authorized By:</b>	
<b>Attorney Docket Number:</b>	AEQUITAS.P001
<b>Receipt Date:</b>	25-FEB-2020
<b>Filing Date:</b>	
<b>Time Stamp:</b>	04:53:47
<b>Application Type:</b>	Utility under 35 USC 111(a)

**Payment information:**

Submitted with Payment	no
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**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	MANKOFF.pdf	27160 bb33bcf1ceedd430eb7acd5593cc11a05c7f3901	no	2

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Information:					
2	Other Reference-Patent/App/Search documents	US12486033_OfficeAction_04-02-2012.pdf	2909626	no	51
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3	Other Reference-Patent/App/Search documents	US12486033_OfficeAction_03-27-2013.pdf	1741924	no	45
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Warnings:					
Information:					
4	Other Reference-Patent/App/Search documents	US12486033_OfficeAction_06-20-2014.pdf	1968754	no	46
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5	Other Reference-Patent/App/Search documents	US12486033_OfficeAction_02-12-2015.pdf	1313814	no	33
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6	Other Reference-Patent/App/Search documents	US12486033_NoticeOfAllowance_07-06-2015.pdf	1079632	no	27
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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# PRV

PATENT- OCH REGISTRERINGSVERKET  
Patentavdelningen

PCT/SE 02/02000  
29 APR 2004

10/494055

PCT/SE 02 / 0 2 0 0 0

REC'D 20 NOV 2002

WIPO PCT

### Intyg Certificate



*Härmed intygas att bifogade kopior överensstämmer med de handlingar som ursprungligen ingivits till Patent- och registreringsverket i nedannämnda ansökan.*

*This is to certify that the annexed is a true copy of the documents as originally filed with the Patent- and Registration Office in connection with the following patent application.*

- (71) *Sökande Neonode AB, Kista SE  
Applicant (s)*
- (21) *Patentansökningsnummer 0103835-5  
Patent application number*
- (86) *Ingivningsdatum 2001-11-02  
Date of filing*

*Stockholm, 2002-11-07*

*För Patent- och registreringsverket  
For the Patent- and Registration Office*

*Sonia André*  
Sonia André

*Avgift  
Fee*

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P01-544

M. Goertz 2

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UPPFINNINGENS BENÄMNING:

På ett bärande substrat uppbyggd eller vilande pekskärm.

15

TEKNISKT OMRÅDE

Föreliggande uppfinning hänför sig generellt till en på ett bärande substrat uppbyggd eller vilande pekskärm, och mera speciellt till en sådan pekskärm som är uppbyggd av en display-enhet, med ett antal ljussändande enheter och ett antal ljusmottagande enheter kantrelaterade nämnda display-enhet.

Vid en sådan display-enhet är nämnda ljussändande enheter anordnade att, via ljuspulser alstrande kretsar, sända ljuspulser på ett litet avstånd över en display-enheten tillhörig övre yta, vilken övre yta uppvisar, såsom i rader och kolumner orienterade, bokstäver, siffror och/eller annan motsvarande grafik, i beroende av den meny som skall användas.

Nämnda ljusmottagande enheter är anordnade att mottaga sålunda utsända ljuspulser.

Mera speciellt bygger den uppfinningsenliga display-enheten på att de ljuspulser utsändande kretsarna och de ljuspul-

ser mottagande kretsarna skall vara samordnat anslutna till en beräkningsenhet, varvid denna beräkningsenhet är tilldelad beräkningskretsar som i beroende av positionen för en eller flera, såsom koordinatorienterade, ljusmottagande enheter med tillhörande kretsar, som borde indikera närvaro av en ljuspuls, låter utvärdera en position representativ för den geografiska positionen på displayenhetens övre yta där ljusstrålar, såsom korsande ljusstrålar, har skuggats av ett som peke tjänande föremål.

10

#### TEKNIKENS TIDIGARE STÅNDPUNKT

Metoder och arrangemang av ovan angiven beskaffenhet är tidigare kända i ett flertal olika utföringsformer.

15

Såsom ett första exempel på teknikens tidigare ståndpunkt kan nämnas pekskärmar, med rätt stora yttre dimensioner, och där en vald tjocklek för pekskärmen är av ringa betydelse.

20

Den känd pekskärmen är här uppbyggd utav en display-enhet, i form utav en LCD-enhet, med kantorienterade ljussändande enheter och ljusmottagande enheter.

25

Mera speciellt har vid denna tillämpning de ljussändande enheterna och de ljusmottagande enheterna orienterats i rader över displayenhetens övre yta och med sändnings- och mottagningsriktningarna för ljuspulserna orienterade och riktade omedelbart över displayenhetens övre yta och med enheterna direkt motriktade varandra.

30

Även här är ljuspulser utsändande kretsar och ljuspulser mottagande kretsar samordnade och anslutna till en beräkningsenhet, för att i beroende av positionen för en eller



flera, såsom koordinatorienterade, ljusmottagande enheter, med tillhörande kretsar, som borde indikera närvaro av en ljuspuls, för att låta utvärdera en position representativ för den geografiska positionen på display-enhetens övre yta där korsande ljusstrålar skuggats av ett som peke tjänande föremål.

#### REDOGÖRELSE FÖR FÖRELIGGANDE UPPFINNING

10

##### TEKNISKT PROBLEM

Beaktas den omständigheten att de tekniska överväganden som en fackman inom hithörande tekniskt område måste göra för att kunna erbjuda en lösning på ett eller flera ställda tekniska problem är dels initialt en nödvändig insikt i de åtgärder och/eller den sekvens av åtgärder som skall vidtagas dels ett nödvändigt val av det eller de medel som erfordras så torde med anledning härav de efterföljande tekniska problemen vara relevanta vid frambringandet av föreliggande uppfinningsföremål.

20

Under beaktande av teknikens tidigare ståndpunkt, såsom den beskrivits ovan, torde det därför få ses som ett tekniskt problem att kunna anvisa sådana konstruktionsförändringar för pekskärmar att de kan tilldelas en tjocklek, som blir betydligt tunnare än tidigare kända pekskärmas tjocklek.

Det ligger ett tekniskt problem att kunna anvisa en pekskärm som, t.o.m. vad avser pekskärmens yttre dimensioner i övrigt, skall kunna skapa förutsättningar för att kunna minska en mobil telefonenhets yttre mått, men ändå kunna öka display-enhetens display-yta utöver den som en känd mobiltelefon uppvisar.

Det ligger då ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta en pekskärm, i enlighet med föreliggande uppfinning, få användas som ett alternativ till ett ordinarie tangentbord och en display-yta för en mobil telefonapparat.

Det ligger också ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta utnyttja en display-enhet, i form utav en LCD-enhet, varigenom erbjudes den möjligheten att "tangenterna" kan framställas på skärmen i form av grafik, så att när en penna eller ett finger placeras på samma ställe där tangenten är presenterad genereras en tangenttryckning till en applikation.

Det ligger också ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta utnyttja en LCD-enhet, vars övre yta, för olika sekvenser inom en informationsöverförande mod, kan tilldelas olika informationsbärande strukturer i beroende av en vald meny.

Det ligger då ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta nämnda ljussändande enheter och nämnda ljusmottagande enheter få vara orienterade intill nämnda display-enhet, med sändnings- och mottagningsriktningarna för ljuspulserna riktade vinkelrätt, eller i vart fall väsentligen vinkelrätt, till nämnda plana övre yta för display-enheten.

Det ligger ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta pulser avvinklande medel få vara orienterade nära display-enheten och dess kantparti.

Det ligger då ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta ett bärande substrat få utgöras av ett, en telefonenhet tillhörigt, kretskort, en tilldelad form för en LCD-enhet  
5 eller liknande.

Det ligger ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta ett substrat få vara anpassat att inte bara uppbära nämnda display-enhet utan jämväl nämnda ljussändande och ljusmottagande enheter.  
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Det ligger ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta nämnda ljussändande enheter och nämnda ljusmottagande enheter,  
15 via anslutningstrådar eller motsvarande, få vara anslutbara till korresponderande ljussändande kretsar och ljusmottagande kretsar.

Det ligger ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta nämnda ljuspulser avvinklande medel få utgöras av spegelenheter.  
20

Det ligger då ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta nämnda ljuspulser avvinklande medel få utgöras av spegelenheter,  
25 med spegelytor orienterad 45 grader i förhållande till en ljuspulserna tilldelad utbredningsriktning från nämnda ljusalstrande enheter.

Det ligger då ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta ljuspulser avvinklande medel få utgöras av en rätvinkligt lik-  
30 sidig, tresidig och rätvinklig prismaenhet.

Det ligger då ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta nämnda kretskort få uppbära ävenledes elektroniska kretsar och komponenter, anpassade att utföra funktioner relaterade till en mobil telefonenhet.

Det ligger ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta nämnda ljussändande enheter och nämnda ljusmottagande enheter få vara orienterade i rader, med sinsemellan rätvinkliga orienteringar, med ett avstånd mellan dessa rader endast något överstigande dimensionerna tilldelade nämnda display-enhet.

Det ligger också ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta nämnda kretskort, med display-enhet, ljussändande enheter, ljusmottagande enheter samt fasta komponenter erforderliga för en mobil telefonenhet, få vara anpassat för en in-fästning till ett telefonenheten tilldelat hölje.

Det ligger då ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta nämnda ljuspulser avvinklande medel få vara kantorienterat infäst längs sargen för ett utbytbart lock, där sargen samverkar med ett transparent skyddsmedel, såsom en plast- eller en glasskiva.

Det ligger ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att vid vissa förutsättningar, där två eller flera sidorelaterade ljusmottagande enheter med tillhörande ljusavkännande kretsar samtidigt indikerar brist på ljuspulser, så skall beräkningsenheten vara anpassad att med hjälp av interna beräk-

ningskretsar låta tolka denna information så att den avsedda geografiska positionen skall betraktas vara belägen mellan punkter, representativa av nämnda ljusavkännande kretsar.

5

Det ligger också ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att vid vissa förutsättningar, där två eller flera vinkelorienterade och sidorelaterade ljusmottagande enheter med tillhörande ljusavkännande kretsar samtidigt indikerar brist på ljuspulser, så skall beräkningsenheten vara anpassad att med hjälp av interna beräkningskretsar låta tolka denna information så att den avsedda geografiska positionen skall betraktas vara belägen mellan punkter representativa av nämnda ljusavkännande kretsar.

Det ligger också ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta nämnda ljussändande enheter, via tillhöriga ljussändande kretsar, vara aktiverade, en och en eller utvalt positionerade, i en på förhand bestämd ordning och att de korresponderade ljusavkännande kretsarna ävenledes är aktiverbara i den på förhand bestämda ordningen.

Det ligger då ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta ett flertal ljussändande enheter få vara anpassade att under en vald tidsvaraktighet konsekutivt låta sända ljuspulser och att en ljuspulser mottagande enhet är anpassad att därvid vara aktiverad, för att under den valda tidsvaraktigheten låta mottaga förväntade ljuspulser och därvid låta registrera uppträdande ljuspulser och skuggade ljuspulser.

Det ligger ett tekniskt problem i att kunna inse betydelsen utav och fördelarna förknippade med att låta ett flertal ljusmottagande kretsar få vara anpassade att under en vald tidsvaraktighet konsekutivt låta mottaga sända ljuspulser från en ljussändande enhet och att de ljuspulser mottagande enheterna skall då vara anpassade att därvid vara aktiva för att under den valda tidsvaraktigheten låta mottaga förväntade ljuspulser och därvid låta registrera uppträdande ljuspulser och skuggade ljuspulser.

LÖSNINGEN

Föreliggande uppfinning utgår därvid ifrån den inledningsvis anvisade kända tekniken och bygger därvid på en på ett bärande substrat vilande pekskärm, och som är uppbyggd med hjälp av en display-enhet, samt med ett antal ljussändande enheter och ett antal ljusmottagande enheter kantrelaterade nämnda display-enhet.

Nämnda ljussändande enheter är anordnade att, via ljuspulser alstrande kretsar, låta sända ljuspulser på ett avstånd över en display-enheten tilldelad övre yta, vilken övre yta kan uppvisa, såsom i rader och kolumner orienterade, bokstäver, siffror eller motsvarande grafik.

Nämnda ljusmottagande enheter är anordnade att, via ett antal ljuspulser emottagande kretsar, mottaga ljuspulser, varvid de ljuspulser utsändande kretsarna och de ljuspulser emottagande kretsarna är samordnat anslutna till en beräkningsenhet. Denna beräkningsenhet är tilldelad beräkningskretsar som i beroende av positionen för en eller flera, såsom koordinatorienterade, ljusmottagande enheter med tillhörande kretsar, som borde indikera närvaro av en ljuspuls, låter utvärdera en position representativ för

den geografiska positionen på display-enhetens övre yta där ljusstrålar, såsom korsande ljustrålar, skuggats av ett som peke tjänande föremål.

- 5 För att kunna lösa ett eller flera av de ovan angivna tekniska problemen anvisar föreliggande uppfinning speciellt att den kända tekniken skall kunna kompletteras med att låta nämnda ljussändande enheter och nämnda ljusmottagande enheter få vara orienterade intill nämnda display-enhet
- 10 med sändnings- och mottagningsriktningarna för ljuspulserna riktade vinkelrätt, eller i vart fall väsentligen vinkelrätt, till ett plan orienterat i nämnda plana yta för display-enheten.
- 15 Vidare anvisas utnyttjandet av ett antal ljuspulser avvinklande medel, orienterade nära display-enheten och riktande nämnda ljuspulser att passera parallellt över en display-enheten tillhörig övre yta.
- 20 Såsom föreslagna utföringsformer, fallande inom ramen för föreliggande uppfinnings grundidé, föreslås att ett bärande substrat skall kunna utgöras av ett, en telefonenhet tillhörigt, kretskort.
- 25 Nämnda substrat är även anpassat att inte bara uppbära nämnda display-enhet utan jämväl nämnda ljussändande och ljusmottagande enheter.
- 30 De ljussändande enheterna och de ljusmottagande enheterna är via anslutningstrådar eller motsvarande anslutna till nämnda ljussändande kretsar och nämnda ljusmottagande kretsar.

Vart och ett av de ljuspulser avvinklande medlen kan utgöras av en spegelenhet.

5 Nämnda ljuspulser avvinklande medel kan då utgöras av spegelenheter med spegelytor orienterad 45 grader i förhållande till en ljuspulserna tilldelad utbredningsriktning från nämnda ljusalstrande enheter.

10 De ljuspulser avvinklande medlen kan också utgöras av en rätvinkligt liksidig, tresidig och rätvinklig prismaenhet.

Som ett substrat tjänande kretskort kan ävenledes uppbära elektroniska kretsar och komponenter, anpassade att utföra funktioner relaterade till en mobil telefonenhet.

15

De ljussändande enheterna och de ljusmottagande enheterna är orienterade i rader, med sinsemellan rätvinkliga orienteringar, med ett avstånd mellan dessa rader endast något överstigande motsvarande dimension tilldelad nämnda display-enhet.

20 Vidare anvisas att kretskortet, med display-enhet, ljussändande enheter, ljusmottagande enheter samt fasta komponenter, erforderliga för en mobil telefonenhet, är anpassat för en infästning till ett telefonenheten tilldelat hölje.

25 Nämnda ljuspulser avvinklande medel är kantorienterat infäst längs sargen för ett utbytbart lock, där sargen samverkar med och uppbär ett transparent skyddsmedel, såsom en plast- eller en glasskiva.

30 Därutöver anvisas sådana förutsättningar att när två eller flera sidorelaterade ljusmottagande enheter med tillhörande ljusavkännande kretsar samtidigt indikerar brist på



ljuspulser är beräkningsenheten anpassad att med hjälp av interna beräkningskretsar låta tolka denna information så att den avsedda geografiska positionen skall betraktas vara belägen mellan punkter representativa av nämnda ljus-  
5 avkännande kretsar.

Vid förutsättningar där två eller flera vinkelorienterade och sidorelaterade ljusmottagande enheter med tillhörande ljusavkännande kretsar samtidigt indikerar brist på ljus-  
10 pulser är beräkningsenheten anpassad att med hjälp av interna beräkningskretsar låta tolka denna information så att den avsedd geografiska positionen skall betraktas vara belägen mellan punkter representativa av nämnda ljusavkännande kretsar.

15 Vidare anvisas att när ljussändande enheter via tillhöriga ljussändande kretsar är aktiverade, en och en eller utvalt positionerade, i en på förhand bestämd ordning så skall de korresponderade ljusavkännande kretsarna ävenledes vara  
20 aktiverbara i den på förhand bestämda ordningen.

Ett flertal ljussändande enheter kan vara anpassade att under en vald tidsvaraktighet konsekutivt låta sända ljuspulser, varvid en ljuspulser mottagande enhet är anpassad  
25 att därvid vara aktiverad för att under den valda tidsvaraktigheten låta mottaga förväntade ljuspulser och därvid låta registrera uppträdande ljuspulser och skuggade ljuspulser.

30 Ett flertal ljusmottagande enheter kan vara anpassade att under en vald tidsvaraktighet konsekutivt låta mottaga sända ljuspulser från en ljussändande enhet, varvid de ljuspulser mottagande enheterna är anpassade att därvid vara aktiverad för att under den valda tidsvaraktigheten

låta mottaga förväntade ljuspulser och därvid låta registrera uppträdande ljuspulser och skuggade ljuspulser.

5 FÖRDELAR

De fördelar som främst kan få anses vara kännetecknande för föreliggande uppfinning och de därigenom anvisade speciella signifikativa kännetecknen är att härigenom har det skapats förutsättningar för att utgående från den inledningsvis angivna tekniken låta skapa en pekskärm, med kantrelaterade ljussändande enheter och ljusmottagande enheter och som intill ljuspulser avvinklande medel kan vara monterade intill kantytan för en display-enhet eller en LCD-enhet och där pekskrmen därigenom kan erbjudas en  
10  
15  
speciell tunn utformning och en anpassning till en handdator, en mobiltelefon eller andra elektroniska enheter.

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20 Det som främst kan få anses vara kännetecknande för föreliggande uppfinning anges i det efterföljande patentkravets 1 kännetecknande del.

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25 KORT FIGURBESKRIVNING

En för närvarande föreslagen utföringsform, uppvisande de med föreliggande uppfinning förknippade signifikativa kännetecknen, skall nu i ett exemplifierande syfte närmare beskrivas med en hänvisning till bifogad ritning där;

30  
Figur 1 visar i en perspektivistisk sprängvy en enligt uppfinningens anvisningar konstruerad pekskärm,

- Figur 2 visar i sidovy och snitt en monterad pekskärm i enlighet med figur 1,
- Figur 3 visar också i snitt, enligt figur 2, men där en peke applicerats vilande emot display-enhetens övre yta, för skuggande av en ljuspuls,
- Figur 4 visar i horisontalvy en mobiltelefonenhet eller en handdatorenhet utnyttjande en pekskärm, i enlighet med föreliggande uppfinning, och där en peke orienterats vilande mot ett ytavsnitt för display-enheten svarande mot siffran "3",
- Figur 5 visar ett exempel på en pulsformad aktivering av de utnyttjande ljussändande och ljusmottagande enheterna, via enhetstillhöriga kretsar,
- Figur 6 visar i en planvy display-enheten, omgiven av ett antal ljussändande och ljusmottagande enheter orienterade i rätvinkliga kolumner, och där en geografisk punkt illustreras ge pulsskugga för två vinkelrätt orienterade ljusmottagande enheter,
- Figur 7 visar en utföringsform där en stor punkt skapar pulsskugga för två parvis vinkelrätt orienterade pulsmottagande enheter och
- Figur 8 visar en alternativ utföringsform för att kunna utvärdera en geografisk position gällande för punkten ifråga.

BESKRIVNING ÖVER NU FÖRESLAGEN UTFÖRINGSFORM.

Det skall då inledningsvis framhållas att i den efterföljande beskrivningen över en för närvarande föreslagen utföringsform, som uppvisar de med uppfinningen förknippade signifikativa kännetecknen och som tydliggöres genom de i de efterföljande ritningarna visade figurerna, har vi låtit välja termer och en speciell terminologi i den avsikten att därvid i första hand låta tydliggöra uppfinningssiden.

10

Det skall emellertid beaktas att här valda uttryck inte skall ses som begränsande till enbart här utnyttjade och valda termer utan det skall underförstås att varje sålunda vald term skall tolkas så att den därutöver omfattar samtliga tekniska ekvivalenter som fungerar på samma eller väsentligen samma sätt för att därvid kunna uppnå samma eller väsentligen samma avsikt och/eller tekniska effekt.

Med en hänvisning till figur 1 visas således där schematiskt en utföringsform och en tillämpning för föreliggande uppfinning, där de med föreliggande uppfinning förknippade signifikativa egenheterna generellt konkretiserats genom en nu förslagen och i det efterföljande närmare beskriven utföringsform.

25

Sålunda visar figur 1 mera speciellt en på ett bärande substrat yllande pekskärm 1 och där det bärande substratet tilldelats hänvisningsbeteckningen 2.

30 Detta bärande substrat 2 visas här som ett kort med tryckt ledningsdragning.

Detta "substrat" skulle även kunna vara utstående kanter (ej visade) från en display-enhet, i form av en LCD-enhet.

Pekskärmen 1 är uppbyggd kring en display-enhet 3, med ett antal ljussändande enheter 4 och ett antal ljusmottagande enheter 5, kantrelaterade nämnda display-enhet 3 och substrat 2.

Erforderliga medel och anslutningar för att driva LCD-enheten 3 är ej visade.

10 Nämnda ljussändande enheter 4 är anordnade att, via ljuspulser alstrande kretsar 4a, sända korta ljuspulser, där en sådan ljuspuls angivits med hänvisningsbeteckningen 40, orienterad på ett litet avstånd över en display-enheten 3 tilldelad övre yta 3a.

15

Den övre yta 3a skall då på känt sätt kunna uppvisa en grafik.

Denna grafik är i utföringsexemplet vald att ansluta till den som erfordras vid en vald meny, i form av en mobiltelefonapparat.

Denna grafik illustreras således i utföringsexemplet såsom i rader och kolumner orienterade siffror (figur 4), men det är uppenbart att en display-enhet, i form utav en LCD-enhet, kan bringas att visa ett antal siffror/bokstäver, ord, meningar eller motsvarande grafisk i beroende av den valda menyn.

30 Ett antal ljuspulser mottagande kretsar 5a är anpassade att mottaga ljuspulser från de ljusmottagande enheterna 5.

Figur 6 illustrerar i detta avseende att de ljuspulser ut-sändande kretsarna 4a och de ljuspulser mottagande kretsarna 5a är samordnat anslutna till en datorbestyckad be-

räkningsenhet 6.

Denna beräkningsenhet 6 är tilldelad ett antal beräknings-  
kretsar, där en beräkningskrets 6a är anpassad att i bero-  
5 ende av positionen för en eller flera, såsom koordinat-  
orienterade, ljusmottagande enheter, en tilldelad hänvis-  
ningsbeteckningen 5P i figur 6 i anslutning till kretsarna  
5a, låta utvärdera punktens P1 geografiska läge och därvid  
aktivera en funktion som motsvaras av detta läge i den  
10 valda menyn.

Beräkningen kan också baseras på de med hänvisningsbeteck-  
ningarna 5'A - 5'H angivna enheterna i anslutning till  
kretsar 5a' genom att beakta att enheten 5'C är skuggad.  
15

Med ledning av uppgifter om vilka av enheten 5I-5S och  
enheterna 5'A - 5'H som borde indikera närvaro av en ljus-  
puls, utvärderas en position representativ för den geogra-  
fiska positionen P1 på display-enhetens 3 övre yta 3a, där  
20 korsande ljusstrålar från den ljussändande enheten 4L och  
den ljussändande enheten 4'F vid kretsarna 4a och 4a'  
skuggats av ett som peke 9 tjänande föremål och därigenom  
skuggas de ljusmottagande enheterna 5P och 5'C i anslut-  
ning till kretsarna 5a och 5a'.

25 Med en hänvisning till figur 2 visas där att nämnda ljus-  
sändande enheter, såsom den med hänvisningsbeteckningen 4L  
angivna, och nämnda ljusmottagande enhet, såsom den med  
hänvisningsbeteckningen 5P angivna, skall vara orienterade  
30 intill nämnda display-enhet 3 med sändnings- och mottag-  
ningsriktningarna för ljuspulserna 40a och 40b riktade  
vinkelrätt, eller i vart fall väsentligen vinkelrätt, till  
ett plan "3a'" orienterat att sammanfalla med nämnda plana  
övre yta 3a för display-enheten 3.

Uppfinningen anvisar även utnyttjandet utav ljuspulser avvinklande medel 7, 8 och dessa skall vara orienterade mycket nära display-enheten 3.

5

Vidare framgår att nämnda bärande substrat 2 skall således inte bara bära en display-enhet 3 utan även de ljussändande enheterna 4 och de ljusmottagande enheterna 5, i form utav ett antal i en rad orienterade enheter och ett antal i en rad orienterade ljusmottagande enheter.

10

Det bärande substratet 2 skall kunna utgöras av ett, en telefonenhet, en handdatorenhet eller liknande tillhörigt kretskort 2'.

15

Det nämnda substratet 2 är således anpassat för att inte bara centralt låta uppbära nämnda display-enhet 3 utan jämväl kantrelaterat, kring samtliga fyra kanter, uppbära nämnda ljussändande 4, 4' och ljusmottagande enheter 5, 5'.

20

Nämnda ljussändande enheter och nämnda ljusmottagande enheter kan med fördel via anslutningstrådar vara anslutna till nämnda ljussändande kretsar 4a, 4a' och nämnda ljusmottagande kretsar 5a, 5a', vilka med fördel kan vara fästade till eller ingå som komponenter i kretskortet 2'.

25

Mera speciellt antyds i figur 2 att nämnda ljuspulser avvinklande medel 7, 8 skulle vart och ett kunna utgöras av en spegelenhet, med en vinklad spegelyta, där i så fall spegelenheternas spegelytor 7', 8' bör vara orienterade 45 grader i förhållande till en ljuspulserna 40a, 40b tilldelad utbredningsriktning.

30

Figur 2 illustrerar emellertid att nämnda ljuspulser avvinklande medel 7, 8 skall var och en utgöras av en rätvinkligt liksidig och tresidig samt rätvinklig prismaenhet, där resp. prismaenhets spegelyta 7' resp. 8' kommer att erhålla den inledningsvis angivna orienteringen.

Nämnda kretskort 2' skall även kunna uppbära elektroniska kretsar och komponenter, anpassade att kunna utföra funktioner relaterade till en mobil telefonenhet, en handdatorenhet eller liknande.

Figur 1 illustrerar vidare att nämnda ljussändande enheter 4 är radorienterade och nämnda ljusmottagande enheter 5 är ävenledes radorienterade samt med vinkelrätt därtill orienterade ljussändande enheter och ljusmottagande enheter 4' och 5'.

De är således orienterade i motställda rader med sinsemellan rätvinkliga orienteringar och med ett avstånd mellan dessa rader endast något överstigande dimensionerna tilldelade nämnda display-enhet 3.

Figur 1 illustrerar vidare att nämnda kretskort 2, 2', med display-enhet 3, ljussändande enheter 4, 4', ljusmottagande enheter 5, 5' samt fasta komponenter erforderliga för en mobil telefonenhet, är anpassat för en infästning till ett telefonenheten tilldelat hölje 10.

Nämnda ljuspulser avvinklande medel, 7, 8 resp. 7", 8", är kantorienterat infäst längs en rektangelformad sarg 11a för ett utbytbart lock 11, där sargen samverkar med ett transparent skyddsmedel 11b, såsom en plast- eller glas-skiva.



Med hänvisning till figur 3 illustreras närmare en föreläggningen tillämpning av föreliggande uppfinning, där det antages att en peke 9, en penna eller ett finger, bringats till en position P1 på display-enheten 3 och att därigenom 5 ljuspulser, utsända ifrån den ljussändande enheten 4L skuggas av pekens spets 9a, varvid den pulsmottagande enheten 5P icke kommer att mottaga några ljuspulser, i enlighet med figur 6, och att därigenom beräkningsenheten 6 kan fastställa att ljuspulser utsänts från enheterna 4L 10 och 4'F men att någon ljuspuls icke mottagits varken på enheten 5P eller enheten 5'C, varigenom den geografiska positionen för P1 kan utvärderas.

Med hänvisning till figur 4 illustreras i planvy funktionen visad i figur 3 och där en yta 12 påverkats på det sätt som tidigare beskrivits.

Här bör måhända noteras, med hänvisning till figur 7, att ytan 12 för siffran 3 täcker två mottagare 5'C resp. 5'D 20 samt två mottagare 5Q resp. 5P och att en rätt indikering kommer att ske även om endast en mottagare av dessa indikerar skugga.

Med en hänvisning till figur 5 illustreras där ett pulsschema, anpassat att kunna spara energi och kunna öka intensiteten och ljusstyrkan.

Genom denna pulsning kommer var och en av de ljussändande enheterna (4, 4') att vara tända endast under en kort tid.

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Under denna korta tid som en sändare, såsom sändaren 4L, är tänd läser en motställd mottagare 5P om ljuspuls uppträder ej.

Direkt efter det att mottagarens 5P status har lästs så släcks sändaren.

5 Genom att låta öka intensiteten på var och en av de sändande enheterna kan eventuella störningar från omgivande ljus undertryckas.

10 Sålunda illustrerar figur 7 att vid förutsättningar där två eller flera sidorelaterade ljusmottagande enheter med tillhörande ljusavkännande kretsar samtidigt indikerar  
15 brist på ljuspulser är beräkningsenheten 6 anpassad att med hjälp av interna beräkningskretsar 6a låta tolka denna information så att den avsedda geografiska positionen P1 skall betraktas vara belägen mellan punkter representativa  
15 av nämnda ljusavkännande kretsar.

20 Sålunda illustrerar figur 5 att varje sändare skall tändas endast en kort tid, exempelvis 10us, med en hög ström, som mera än 1A, med en efterföljande paus, som kan vara anpassad till mer än 100 ggr den valda pulstiden.

25 Sålunda illustrerar figur 5 vidare att sändningstiden för enheten 4L börjar något före mottagningstiden för enheten 5P, att en vilotid är anordnad innan enheten 4K aktiveras och därefter enheten 5Q.

Detsamma gäller för enheten 4J och enheten 5R samt övriga enheter, de senare dock ej visade i figur 5.

30 Med en förnyad hänvisning till figur 7 visas där förutsättningarna där två eller flera sidorelaterade ljusmottagande enheter 5Q, 5P, med tillhörande ljusavkännande kretsar samtidigt indikera brist på ljuspulser.

Vid en sådan tillämpning är beräkningsenheten 6 anpassad att med hjälp av interna beräkningskretsar 6a låta tolka denna information så att den avsedd geografiska positionen P1' skall betraktas vara belägen mellan punkter representativa av nämnda ljusavkännande kretsar 50, 5P.

Figur 7 låter illustrera att samma förutsättningar föreligger för mottagningskretsarna 5'C och 5'D.

10 Vid förutsättningar där två eller flera vinkelorienterade och sidoorienterade ljusmottagande enheter med tillhörande ljusaavkännande kretsar samtidigt låter indikera brist på ljuspulser är beräkningsenheten 6a anpassad att med hjälp av sina interna beräkningskretsar 6a' tolka denna information så att den avsedda geografiska positionen P1' skall betraktas vara belägen mellan punkter representativa för nämnda ljusavkännande kretsar.

20 De ljussändande enheterna är via tillhöriga ljussändande kretsar aktiverade, en och en eller utvalt positionerade, i en på förhand bestämd ordning, och att de korresponderade ljusavkännande kretsarna ävenledes är aktiverbara i den på förhand bestämda ordningen.

25 Mera speciellt, och med hänvisning till figur 5 framgår att nämnda ljussändande enheter 4 med tillhöriga ljussändande kretsar 4a är aktiverade en och en eller utvalt positionerade, i en på förhand bestämd ordning och att de korresponderande ljusavkännande kretsarna 5a ävenledes är aktiverbara i den på förhand bestämda ordningen.

30 Med hänvisning till figur 8 illustreras att ett flertal ljussändande enheter, betecknade 4J, 4K och 4L är anpassade att under en vald tidsvaraktighet samtidigt eller

konsekutivt sända ljuspulser och att en ljuspulser mottagande enhet 5R är anpassad att därvid vara aktiverad för att under den valda tidsvaraktigheten låta mottaga förväntade ljuspulser och därvid låta registrera uppträdande ljuspulser och skuggade ljuspulser, för att därvid kunna utvärdera den geografiska positionen gällande för punkten P1'.

Även om detta icke visas är det uppenbart att ett flertal ljusmottagande enheter 5P, 5Q, 5R skulle kunna vara anpassade att under en vald tidsvaraktighet konsekutivt låta mottaga sända ljuspulser från endast en ljussändande enhet, säg enheten 4L, och att dessa ljuspulser mottagande enheterna är anpassade att därvid vara aktiverade för att under den valda tidsvaraktigheten låta mottaga förväntade ljuspulser och därvid låta registrera uppträdande ljuspulser och skuggade ljuspulser.

Uppfinningen är givetvis inte begränsad till den ovan, såsom ett utföringsexempel angivna utföringsformen utan kan genomgå modifikationer inom ramen för uppfinningstanken illustrerad i efterföljande patentkrav.

25

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Patentkrav

1. På ett substrat uppbyggt eller vilande pekskärm, med en display-enhet (3), med ett antal ljussändande enheter (4L) och ett antal ljusmottagande enheter (5P) kantrelaterade nämnda display-enhet (3), varvid
- 5 (5P) kantrelaterade nämnda display-enhet (3), varvid nämnda ljussändande enheter (4L) är anordnade att, via ljuspulser alstrande kretsar, sända ljuspulser (40) på ett avstånd över en display-enheten tilldelad övre yta (3a), vilken övre yta uppvisar, såsom i
- 10 rader och kolumner orienterade, bokstäver, siffror eller motsvarande grafik, samt nämnda ljusmottagande enheter (5P) är anordnade att, via ett antal ljuspulser emottagande kretsar, mottaga ljuspulser, varvid de ljuspulser utsändande kretsarna och de ljuspulser utvärderande kretsarna är samordnat anslutna
- 15 till en beräkningsenhet (6), varvid denna beräkningsenhet är tilldelad beräkningskretsar som i beroende av positionen för en (5P) eller flera, såsom koordinatorienterade, ljusmottagande enheter med
- 20 tillhörande kretsar som borde indikera närvaro av en ljuspuls, låter utvärdera en position representativ för den geografiska positionen på display-enhetens övre yta (3a) där ljusstrålar skuggats av ett som peke (9) tjänande föremål, **kännetecknad därav**, att
- 25 nämnda ljussändande enheter (4L) och nämnda ljusmottagande enheter (5P) är orienterade intill nämnda display-enhet (3) med sändnings- och mottagningsriktningarna för ljuspulserna (40a, 40b) riktade vinkelrätt, eller i vart fall väsentligen vinkelrätt, till nämnda plana yta (3a) för display-enheten (3) och att ljuspulser avvinklande medel (7,8) är orienterade nära display-enheten (3).
- 30

2. Skärm enligt patentkravet 1, **kännetecknad därav**, att nämnda substrat utgöres av ett, en telefonenhet tillhörigt, kretskort.
- 5 3. Skärm enligt patentkravet 1 eller 2, **kännetecknad därav**, att nämnda substrat är anpassat att inte bara uppbära nämnda display-enhet utan jämväl nämnda ljussändande och ljusmottagande enheter.
- 10 4. Skärm enligt patentkravet 3, **kännetecknad därav**, att nämnda ljussändande enheter och nämnda ljusmottagande enheter är via anslutningstrådar eller motsvarande anslutna till nämnda ljussändande kretsar och nämnda ljusmottagande kretsar.
- 15 5. Skärm enligt patentkravet 1, **kännetecknad därav**, att nämnda ljuspulser avvinklande medel utgöres av en eller flera spegelenheter.
- 20 6. Skärm enligt patentkravet 1 eller 5, **kännetecknad därav**, att nämnda ljuspulser avvinklande medel utgöres av spegelenheter med spegelytorna orienterade 45 grader i förhållande till en ljuspulsen tilldelad utbredningsriktning från nämnda ljusalstrande enheter.
- 25 7. Skärm enligt patentkravet 1, **kännetecknad därav**, att nämnda ljuspulser avvinklande medel utgöres av i vart fall en rätvinkligt liksidig, tresidig och rätvinklig prismaenhet.
- 30 8. Skärm enligt patentkravet 1 eller 2, **kännetecknad därav**, att nämnda kretskort uppbär ävenledes elektroniska kretsar och komponenter, anpassade att ut-

föra funktioner relaterade till en mobil telefonenhet.

- 5 9. Skärm enligt patentkravet 1, 2 eller 8, **kännetecknad därav**, att nämnda ljussändande enheter och nämnda ljusmottagande enheter är orienterade i rader med sinsemellan rätvinkliga orienteringar, med ett avstånd mellan dessa endast något överstigande dimensionerna tilldelade nämnda display-enhet.
- 10 10. Skärm enligt patentkravet 9, **kännetecknad därav**, att nämnda kretskort, med display-enhet, ljussändande enheter, ljusmottagande enheter samt fasta komponenter erforderliga för en mobil telefonenhet, är anpassat för en infästning till ett telefonenheten tilldelat hölje.
- 15 11. Skärm enligt patentkravet 1, 9 eller 10, **kännetecknad därav**, att nämnda ljuspulser avvinklande medel är kantorienterat infäst längs sargen för ett utbytbart lock, där sargen samverkar med ett transparent skyddsmedel, såsom en plast- eller glasskiva.
- 20 12. Skärm enligt patentkravet 1, **kännetecknad därav**, att vid förutsättningar där två eller flera sidorelaterade ljusmottagande enheter med tillhörande ljusavkännande kretsar samtidigt indikerar brist på ljuspulser är beräkningsenheten anpassad att med hjälp av interna beräkningskretsar låta tolka denna information så att den avsedda geografiska positionen skall betraktas vara belägen mellan punkter representativa av nämnda ljusavkännande kretsar.
- 25 30 35 13. Skärm enligt patentkravet 12, **kännetecknad därav**, att vid förutsättningar där två eller flera vinkel-

orienterade och sidorelaterade ljusmottagande enheter med tillhörande ljusavkännande kretsar samtidigt indikerar brist på ljuspulser är beräkningsenheten anpassad att med hjälp av interna beräkningskretsar låta tolka denna information så att den avsedd geografiska positionen skall betraktas vara belägen mellan punkter representativa av nämnda ljusavkännande kretsar.

10 14. Skärm enligt patentkravet 1, **kännetecknad därav**, att nämnda ljussändande enheter är via tillhöriga ljussändande kretsar aktiverade, en och en eller utvalt positionerade, i en på förhand bestämd ordning och att de korresponderade ljusavkännande kretsarna  
15 ävenledes är aktiverbara i den på förhand bestämda ordningen.

20 15. Skärm enligt patentkravet 1, **kännetecknad därav**, att ett flertal ljussändande enheter är anpassade att under en vald tidsvaraktighet konsekutivt låta sända ljuspulser och att en ljuspulser mottagande enhet är anpassad att därvid vara aktiverad för att under den valda tidsvaraktigheten låta mottaga förväntade ljuspulser och därvid låta registrera uppträdande  
25 ljuspulser och skuggade ljuspulser.

30 16. Skärm enligt patentkravet 1, **kännetecknad därav**, att ett flertal ljusmottagande enheter är anpassade att under en vald tidsvaraktighet konsekutivt låta mottaga sända ljuspulser från en ljussändande enhet och att de ljuspulser mottagande enheterna är anpassade att därvid vara aktiverade för att under den valda tidsvaraktigheten låta mottaga förväntade ljuspulser



och därvid låta registrera uppträdande ljuspulser  
och skuggade ljuspulser.

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GOOGLE

Sammandrag

På ett substrat uppbyggt eller vilande pekskärm (1), med  
5 en display-enhet (3), med ett antal ljussändande enheter  
(4L) och ett antal ljusmottagande enheter (5P) kant-  
relaterade nämnda display-enhet (3).

Nämnda ljussändande enheter (4L) och nämnda ljusmottagande  
10 enheter (5P) är orienterade intill nämnda display-enhet  
(3) med sändnings- och mottagningsriktningarna för ljus-  
pulserna (40a, 40b) riktade vinkelrätt, eller i vart fall  
väsentligen vinkelrätt, till nämnda plana yta (3a) för  
display-enheten (3) och att ljuspulser avvinklande medel  
15 (7,8) är orienterade nära display-enheten (3).

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Det föreslås att figur 3 bilägges sammandraget vid publi-  
30 ceringen.



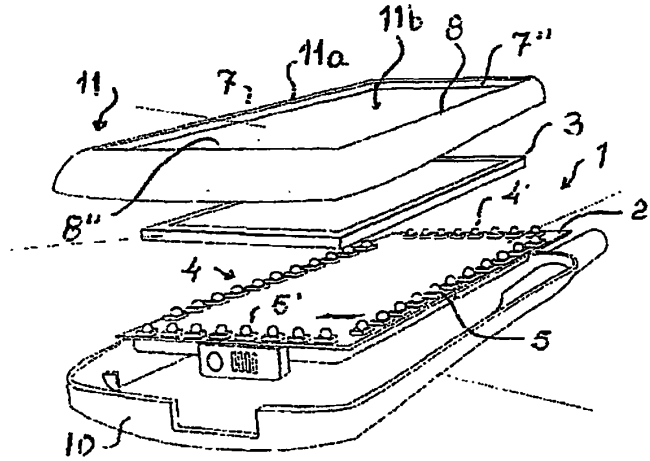


Fig. 1.

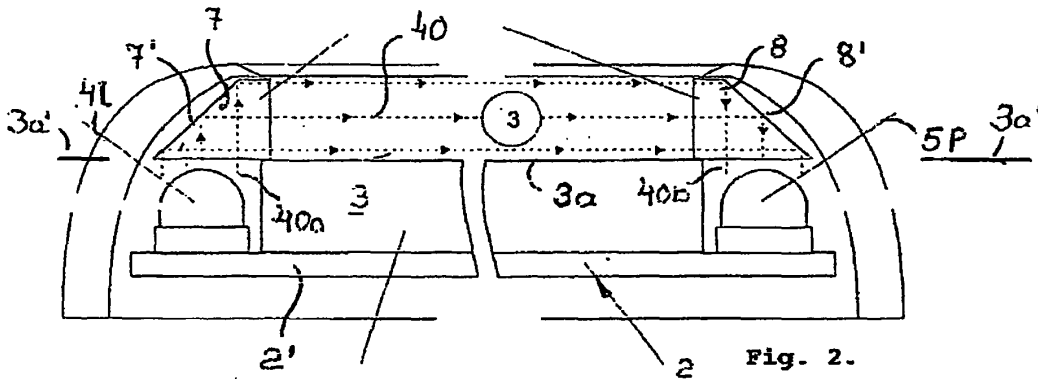


Fig. 2.

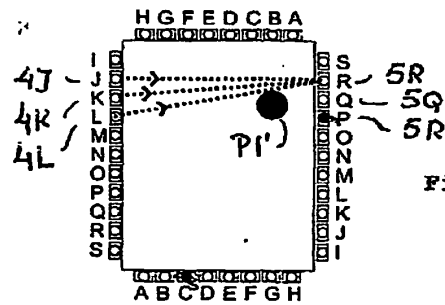


Fig. 8.

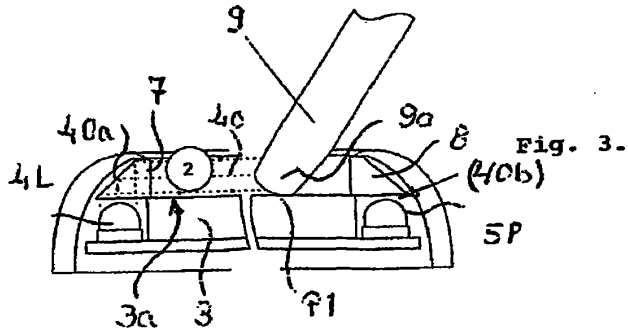


Fig. 3.

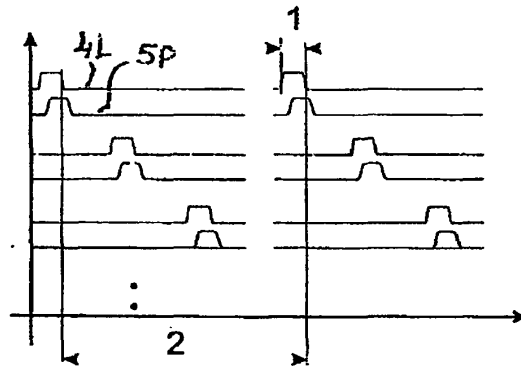


Fig. 5.

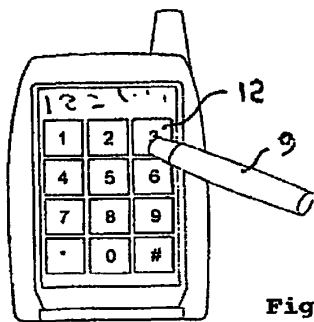


Fig. 4.

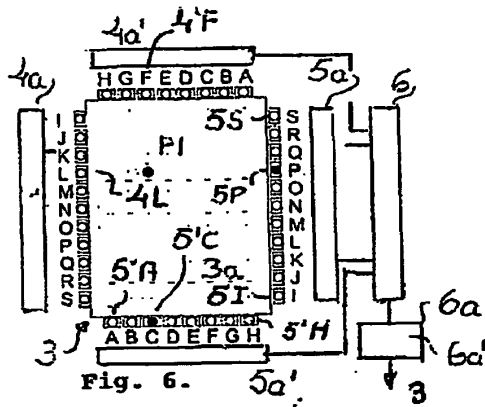


Fig. 6.

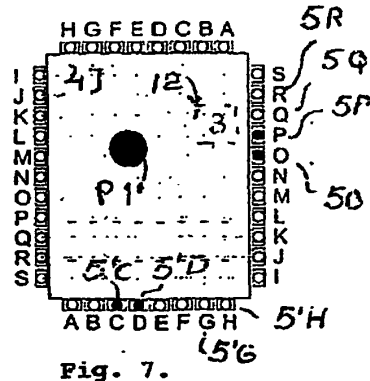


Fig. 7.

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<b>Confirmation Number:</b>	1091
<b>Title of Invention:</b>	TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE
<b>First Named Inventor/Applicant Name:</b>	Magnus Goertz
<b>Customer Number:</b>	75660
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<b>Application Number:</b>	16796880
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1091
<b>Title of Invention:</b>	TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE
<b>First Named Inventor/Applicant Name:</b>	Magnus Goertz
<b>Customer Number:</b>	75660
<b>Filer:</b>	Marc Aron Berger
<b>Filer Authorized By:</b>	
<b>Attorney Docket Number:</b>	AEQUITAS.P001
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<b>Time Stamp:</b>	07:59:32
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**File Listing:**

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1	Other Reference-Patent/App/Search documents	US13430718_OfficeAction_06-05-2012.pdf	404255 b37d51e0f094bc99288d92ba64dafdeaa6a b7d3d	no	13

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<p><b>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  <b>If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</b></p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  <b>If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</b></p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  <b>If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</b></p>					

<b>Electronic Acknowledgement Receipt</b>	
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<b>Application Number:</b>	16796880
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<b>Attorney Docket Number:</b>	AEQUITAS.P001
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<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>	

Attorney's Docket No.: AEQUITAS.P001 PATENT

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In Re Patent Application of: )  
 ) Examiner: N/A  
 Magnus Goertz )  
 Joseph Shain ) Art Unit: N/A  
 )  
 Application No: 16/796,880 )  
 )  
 Filed: February 20, 2020 )  
 )  
 For: TOUCH SCREEN ELECTRONIC )  
 DEVICE AND ASSOCIATED )  
 USER INTERFACE )  
 )

Mail Stop AMENDMENT  
Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

**STATEMENT PURSUANT 37 C.F.R. §1.125(b)**

Sir:

Pursuant to 37 C.F.R. §1.57(b)(1), Applicant is submitting a substitute specification to include portions of the specification of the priority document U.S. Patent Application No. 10/315,250.

Pursuant to 37 C.F.R. §1.125(b), Applicant hereby affirms that the substitute specification submitted herewith contains no new matter. Applicant is submitting a version of the substitute specification with markings showing all the changes relative to the original specification. Applicant is also submitting an accompanying clean version of the substitute specification.



Respectfully submitted,  
SOQUEL GROUP LLC

/Marc A. Berger/

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Dated: February 25, 2020

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Attorney Docket No. AEQUITAS.P001 -2-

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	38682800
<b>Application Number:</b>	16796880
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1091
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<b>First Named Inventor/Applicant Name:</b>	Magnus Goertz
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<b>Application Type:</b>	Utility under 35 USC 111(a)

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1	Specification	AEQUITAS- P001_SubstituteSpecification- CleanVersion.pdf	3712898  <small>d01e0a8603045721870d8a6451680169f72e15d9</small>	no	46

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<p><b>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

APPLICATION FOR UNITED STATES LETTERS PATENT

For

USER INTERFACE FOR MOBILE COMPUTER UNIT  
TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE

Inventors:

Magnus Goertz

Joseph Shain

USER INTERFACE FOR MOBILE COMPUTER UNIT  
TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE

CROSS REFERENCES TO RELATED APPLICATIONS

[0001] ~~This application is a continuation of U.S. Serial No. 12/486,033, filed on June 17, 2009, now U.S. Patent No. 9,164,654, entitled USER INTERFACE FOR MOBILE COMPUTER UNIT, by inventors Magnus Goertz and Joseph Shain; U.S. Serial No. 12/486,033 is a continuation-in-part of U.S. Serial No. 10/315,250, now U.S. Patent No. 8,095,879, filed on December 10, 2002, entitled USER INTERFACE FOR MOBILE HANDHELD COMPUTER UNIT by inventor Magnus Goertz. U.S. Serial No. 12/486,033 claims priority from provisional application No. 61/132,469, filed on June 19, 2008, entitled KEYPAD FOR CHINESE CHARACTERS by inventors Magnus Goertz, Robert Pettersson, Staffan Gustafsson and Johann Gerell. This application claims priority to and is a continuation of US Patent Application No. 14/886,048, which is a continuation of US Patent Application No. 12/486,033, now US Patent No. 9,164,654, which claims priority to US Provisional Patent Application No. 61/132,469 and is a continuation-in-part of US Patent Application No. 10/315,250, now US Patent No. 8,095,879, the contents of all of which are incorporated herein by reference in their entirety.~~

FIELD OF THE INVENTION

[0002] The field of the present invention is user interfaces for electronic devices and, more particularly, to touch screen user interfaces.

[1]

## BACKGROUND OF THE INVENTION

[0003] Touch screens provide user interfaces through which a user enters input to a computing device by touching a screen at a selected location, with a stylus or with his finger.

[0004] Conventional touch screens are limited as to the types of user inputs that they can recognize. For example, conventional touch screens are unable to distinguish between a soft tap and a hard press. In some prior art embodiments users initially select an item on the screen, and then subsequently activate the selected item. However, because prior art touch screens do not distinguish between degrees of pressure, the user is required to remove his finger or stylus from the screen and activate his selection with a second tap. It would be advantageous to produce touch screens that distinguish between varying amounts of pressure applied to the screen so that a user can select an item by touching its location on the screen, and then activate the item by applying additional pressure to the touch location without having to first remove his finger or stylus from the screen.

[0005] In conventional touch screens the keys are often small relative to the touch area, especially in handheld devices. The keys are also often situated close together. This can make it difficult to determine which key is being pressed by the user. It would be advantageous to clearly indicate to the user which key the user has selected, and furthermore, to allow the user to accept or reject the selected key without first removing his finger or stylus from the screen in order to perform a second tap.

[0006] Current user interfaces are basic and often require navigation through a series of menus in order to perform a desired operation. The present invention presents a user interface that is versatile in providing the user with many options, while requiring only few selections to activate a desired function. To further enhance user experience, certain functions are performed automatically without requiring the user to enter a selection.

[2]

## SUMMARY OF THE DESCRIPTION

[0007] Aspects of the present invention relate to user interfaces designed for use with a touch screen. The present invention relates to computer readable media storing computer programs with computer program code, which, when read by a computer unit, allows the computer to present a user interface for the computer unit.

[0008] In accordance with embodiments of the present invention, the computer unit features a touch sensitive display area. According to preferred embodiments an initial display configuration presents a plurality of gadgets on the display. These gadgets are small areas of the screen that indicate which functions each gadget will perform when activated by the user. When a gadget is activated, typically by the user touching the area of the display on which the gadget is displayed, the gadget increases in size and provides the user with icons and information about the gadget's functions. Significantly, the gadget does not cover the entire display area. Thus, when a gadget, or even a plurality of gadgets, is active, the primary display of all available gadgets is still accessible. This primary display can be compared to a desktop in computer operating system user interfaces. However, this primary display in the user interface of the present invention is not the same as a desktop where active windows can cover icons on the desktop. In the present invention, gadgets are arranged in a manner that open gadgets do not cover other gadgets. Rather, when an open gadget expands in size, other gadgets are shifted to make room for the expanded gadget. This allows the user to scroll the primary display or desktop to view any gadget. In the context of the present invention, this primary display area that includes both open and closed gadgets is called the home window. The user scrolls the home window to view gadgets that are shifted beyond the viewable area of the display. An expanded, or activated, gadget has an expanded window, but often it is not large enough to display everything contained in that gadget window. To view contents of the gadget not displayed in the visible portion of the gadget

[3]

window, the user scrolls the gadget window. Thus, two different scroll operations are provided: scrolling the home window and scrolling a gadget window. According to one embodiment, scrolling is executed by gliding a finger or stylus along the touch screen to shift the active display area of the home window or of the gadget. The scrolling affects the home window if the finger glide began in an area of the screen that does not belong to an active gadget; the scroll affects an active gadget window if the finger glide began inside that active gadget window.

[0009] Various embodiments of the invention support several methods of scrolling a window. According to one embodiment, scrolling is done when the user touches the display inside the window area, for example at an edge of the window, or on an icon, such as an arrow or scrollbar, indicating a scroll operation. According to another embodiment, scrolling is done by the user touching the window with a finger or stylus and then gliding the finger or stylus along the touch sensitive screen in a direction indicating the desired direction of the scroll. When the content of the home display is larger in two dimensions than the actual display screen, this operation is like panning an image or map. When it is larger along only one axis (e.g., only vertically), the scrolling only scrolls in the one axis even when the glide is not orthogonal along the one axis.

[0010] Another aspect of the present invention relates to computer readable media storing a computer program with computer program code, which, when read by a mobile handheld computer unit, allows the computer to present a user interface for the mobile handheld computer unit. The user interface features a touch sensitive area in which representations of a plurality of keys are displayed, and each key is mapped to a corresponding location in the touch sensitive area at which the representation of the key is displayed. A key in this context includes, inter alia, alphabetic keys such as in a QWERTY keypad, numeric keys and also icons representing programs or functions. A key is selected, but not activated, when an object touches the corresponding

[4]



location. This intermediate status of being selected but not activated facilitates the user to subsequently activate a desired key and avoid activating a neighboring key that the user selected but does not wish to activate. A selected key is activated when the object touching it applies additional pressure to the key location.

[0011] According to preferred embodiments of the invention, when a key is selected, the user interface generates a secondary representation of the key, such as a callout balloon containing the key representation. The callout balloon is placed away from the key location (being touched) so that the user can easily view which key is selected without lifting his finger. According to another embodiment, an audio representation of the selected key is generated so the user hears which key was selected.

[0012] According to still further features in preferred embodiments of the invention, the user touches the screen (with a finger or stylus) at a first location, for example selecting a first key. The user then glides his finger or stylus over the screen to additional locations. At each additional location a new key is selected and the previously selected key is deselected. The user can activate any selected key by applying additional pressure to the screen. The user does not have to remove the object from the screen to glide and select additional keys even after activating a first key.

[0013] Additional touch pressure is detected in various ways according to several embodiments. According to one embodiment, the touch sensitive area is a light-based touch screen operable to detect different levels of touch pressure. For example, light-based touch screens typically include a calculating unit operable to identify the size, shape and contours of an area being touched based on a pattern of obstructed light. See applicant's U.S. patent application no. 10/494,055, now U.S. Patent No. 7,880,732, titled ON A SUBSTRATE FORMED OR RESTING DISPLAY ARRANGEMENT, the contents of which are incorporated herein by reference. When a finger or flexible object is used as a touch object, as additional pressure is applied to the touch surface,

[5]

the contact area of the finger or object touching the screen increases. Thus, additional pressure is detected when an increase in the contours of the covered touch area is detected.

[0014] Alternatively, or in combination with the above, the touch sensitive area features both a touch screen operable to identify a touch location on the screen and a pressure sensor operable to detect pressure applied to the screen but not sensitive to the location of the object applying the pressure.

[0015] Other aspects of the present invention relate to convenient arrangement and function of icons to perform popular functions within a user interface. Thus, a camera gadget features a multimedia messaging service (MMS) button facilitating sending an active photo in an MMS message; a keylock gadget locks the computer and displays an instrumental keypad for entering a musical code to unlock the computer; a reporting gadget displays information for a first period of time and is then automatically deactivated. Several reporting gadgets are provided, including a gadget that displays the time of day; a gadget displays a weather forecast; a gadget that displays stock market information.

[0016] According to still further features in preferred embodiments the reporting gadget continues to display its information for a second period of time if the gadget is touched during the first period of time. I.e., automatic deactivation after the first period of time is canceled.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The present invention will be more fully understood and appreciated from the following detailed description, taken in conjunction with the drawings in which:

[0018] **FIGS. 1A – 1K** are a series of screens illustrating Chinese stroke input, in accordance with an embodiment of the present invention;

[0019] **FIGS. 2A – 2M** are a series of screens illustrating Chinese Pinyin input, in accordance with an embodiment of the present invention;

[6]

[0020] **FIGS. 3** is a screen of a handheld terminal displaying a plurality of gadgets, in accordance with an embodiment of the present invention;

[0021] **FIGS. 4 – 6** are diagrams illustrating selection of elements displayed on a touch screen. A selected element is displayed in a callout as shown in **Figs. 5 - 6**. The user does not lift his finger off the screen between selection of different elements, as in figures **5** and **6**. The user simply glides his finger along the screen. This is shown in **Fig. 7**. To activate a selected element the user presses on the screen without first lifting his finger off the screen as shown in **Fig. 8** and in the series of **Figs. 7-8**, all in accordance with an embodiment of the present invention;

[0022] **Figs. 7-8** illustrate a side view of a user selecting and activating an on-screen element, in accordance with an embodiment of the present invention;

[0023] **Figs. 9-11** illustrate turning a phone on and off. **Fig. 9** illustrates pressing the home key on a turned-off phone. **Fig. 10** illustrates the phone when it is turned on. **Fig. 11** illustrates pressing the home key to turn a phone off.

[0024] **Figs. 12-15** illustrate locking and unlocking a phone. **Fig. 12** illustrates activating a lock gadget onscreen to lock the phone. **Fig. 13** illustrates pressing the home button on a locked phone to unlock the phone. **Fig. 14** illustrates the unlocked phone. **Fig. 15** shows pressing the home key on a locked phone to display a keypad for entering a security code to unlock the phone.

[0025] **Figs. 16-17** illustrate pressing the home key to return to the home display screen. **Fig. 16** shows an open active calling gadget. Pressing the home button presents the home screen shown in **Fig. 17**.

[0026] **Figs. 18-21** illustrate scrolling options. In the phone shown in **Fig. 18** scrolling is done by gliding a finger or stylus along the touch sensitive screen. **Fig. 19** illustrates a scrollbar along one edge of the screen for scrolling up and down. **Figs. 20-21** illustrate arrow buttons for scrolling up and down.

[7]

[0027] **Fig 22** illustrates scrolling the home display screen, in accordance with an embodiment of the present invention;

[0028] **Figs. 23-24** illustrate a Fav5 gadget, in accordance with an embodiment of the present invention;

[0029] **Figs. 25-26** illustrate a History gadget, in accordance with an embodiment of the present invention;

[0030] **Figs. 27-28** illustrate a Calling gadget, in accordance with an embodiment of the present invention;

[0031] **Figs. 29-30** illustrate placing a call using a Calling gadget, in accordance with an embodiment of the present invention; **Fig. 30** illustrates the shortcut buttons presented when an incoming call is received (i.e., when the phone is ringing).

[0032] **Figs. 31-32** illustrate volume control, in accordance with an embodiment of the present invention;

[0033] **Figs. 33-34** illustrate an MP3 player gadget, in accordance with an embodiment of the present invention;

[0034] **Figs. 35-37** illustrate an operator promotion gadget, in accordance with an embodiment of the present invention;

[0035] **Figs. 38-39** illustrate a video player gadget, in accordance with an embodiment of the present invention;

[0036] **Figs. 40-42** illustrate a camera gadget and shortcut buttons provided when the camera gadget is activated, in accordance with an embodiment of the present invention;

[0037] **Figs. 43-45** illustrate an SMS gadget and shortcut buttons provided when the SMS gadget is activated, in accordance with an embodiment of the present invention; **Fig. 45** illustrates how related SMS messages are displayed as a conversation in an active SMS gadget; and

[0038] **Figs. 46-54** illustrate scrolling the home display screen and gadget windows, in accordance with an embodiment of the present invention.

[8]

LIST OF APPENDICES

APPENDIX A is a copy of the original specification of US Serial No. 10/315,250 as filed on December 10, 2002.

#### DETAILED DESCRIPTION

[0039] Touch screen keypads offer great flexibility in keypad interface design – flexibility that cannot be achieved with electro-mechanical keypads. Custom design keypads can be generated on a touch screen, where the markings on each key and the functions that each key provides are optimized for a designated application. Moreover, touch screen keypads can change modes, from one pad of keys and associated functions to a different pad of keys and associated functions. Custom keypads are of particular advantage for multi-lingual applications.

[0040] A general description of touch screen keypad interfaces, in accordance with embodiments of the present invention, and several examples thereof, are described in detail hereinbelow.

[0041] Embodiments of the present invention relate to improved keypads for inputting Chinese characters using XT9 stroke input, and using Chinese Pinyin. XT9 stroke input builds Chinese characters using six basic strokes, and offers selection of possible characters and phrases based on a set of strokes that have been input. Chinese Pinyin uses Latin characters that transliterate a sound or a syllable, in combination with a digit that represents an intonation or inflection. E.g., Ma in a rising tone is m-a-1, and Ma in a descending tone is m-a-2.

[0042] Reference is now made to **FIGS. 1A – 1K**, which illustrate an improved stroke-based keypad for entering Chinese characters by inputting strokes, in accordance with an embodiment of the present invention. Shown in **FIGS. 1A – 1K** is a keypad **100**, used for inputting basic strokes. Also shown in **FIGS. 1A – 1K** is a sequence of strokes **101 – 106** that are successively input by a user, and a corresponding sequence of Chinese characters **111 – 114** that are entered in a message being composed.

[0043] In accordance with an embodiment of the present invention, keypad **100** is generated and displayed on a touch screen. Keypad **100** has fewer

[10]

than the standard 12 keys in a touch pad, allowing more room on screen for displaying characters.

[0044] Further in accordance with an embodiment of the present invention, the keys of keypad **100** are customized so that they contain only relevant information. For example, a prior art keypad displays a digit, 3 - 4 characters, and a basic Chinese stroke, all inside one key, even though in XT9 stroke mode the basic Chinese stroke is the only useful one. The custom keys of the present invention display only the basic Chinese strokes, or the strokes and numbers, but no characters.

[0045] There are two types of key presses supported by keypad **100** – regular and long. A regular key press adds the stroke shown on the key to the series of strokes **101** – **106** already pressed. As strokes are successively entered, a numbered array **121** of Chinese characters or phrases is dynamically displayed along the top of the keypad. These characters or phrases are predicted based on the key presses already entered. In order to select one of the numbered elements of array **121**, the user performs a long key press on that number. Alternatively, the user may keep entering strokes until only one option remains.

[0046] Often, however, more predicted characters or phrases exist than can be displayed along the top of the keypad. The N2 phone, manufactured by Neonode of Stockholm, Sweden, has a joystick button at the bottom of the phone. Twitching the joystick up/down displays different sets of predicted characters or phrases. When the intended character or phrase is displayed and associated with a given digit, a long press on that digit serves to select the intended character or phrase.

[0047] Reference is now made to **FIGS. 2A – 2M**, which illustrate an improved keypad for inputting Chinese characters using Pinyin, in accordance with an embodiment of the present invention. Shown in **FIGS. 2A – 2M** is a keypad **200**, used for inputting Latin characters. Also shown in **FIGS. 2A – 2M** is a sequence of Latin characters M-o-H-S-a-n that are successively input

[11]

by a user, and a corresponding sequence of Chinese characters that are entered in a message being composed.

[0048] In accordance with an embodiment of the present invention, keypad **200** uses accent characters, rather than digits, to convey an intended intonation or inflection. Further in accordance with an embodiment of the present invention, keypad **200** displays only information relevant for Pinyin input on each key; no Chinese basic strokes are shown.

[0049] There are two types of Pinyin input. A user enters a Latin transliteration of an intended word using the Latin keypad input (12 keys). For each key, several letters are possible. The list of predicted Latin syllables based on the current sequence of keypad presses is displayed. Twitching the joystick right or left selects the desired combination. Also, a series of predicted Chinese characters or phrases is displayed and selected by a long press on a respective digit. Twitching the joystick up/down displays other predicted Chinese characters or phrases. Entering a space after a series of letters indicates the end of a previous character or phrase.

[0050] In accordance with an embodiment of the present invention, the user is able to combine stroke and Pinyin input, and compose a sequence of at least two Chinese characters using XT9 stroke input for at least one character and Pinyin input for at least one other character. The user switches between XT9 stroke input mode and Pinyin input mode by performing a sweeping motion in relation to the touch screen, such as, inter alia, sweeping a finger across the top of the touch screen. The series of at least two Chinese characters may be a text message, a name, a data entry, or any other such input.

[0051] Further in accordance with an embodiment of the present invention, the user is able to compose a series of at least one Chinese character and at least one non-Chinese term, wherein the non-Chinese term includes at least one Latin character, digit, emoticon, punctuation mark, another non-Chinese symbol, or any combination thereof. The series is composed by switching input modes for each alphabet or Chinese input or digit input by sweeping

[12]



across the top of the touch screen. For example, the user may input at least one Chinese character using either Pinyin or stroke input, or a combination thereof. The user may then perform a sweeping motion in relation to the touch screen to change the input mode to English. For example, the user may sweep a finger across the top of the touch screen to change the input mode to English. In this mode, the keypad presents Latin characters. The user then proceeds to input Latin characters using the Latin keypad displayed on the touch screen. Alternatively, the user may repeat a series of sweeping motions; e.g., the user sweeps a finger across the top of the touch screen, repeatedly, changing the input mode with each sweeping motion, until a digit keypad is displayed and digit input mode is active. The user may then proceed to enter at least one digit, adding the at least one digit to the series of Chinese characters already contained in the message. It will thus be appreciated that the user may switch between different input modes while composing a single message, a command, a name, a data entry or another such input, including at least two different types of characters, in an easy and simple and convenient manner.

[0052] Further in accordance with an embodiment of the present invention, a keypad displaying emoticons is displayed. In this mode, the user may select an emoticon to be entered into the text of a message, or such other input.

[0053] Yet further in accordance with an embodiment of the present invention, drawings, including inter alia, emoticons, are constructed in a similar manner to XT9 stroke input. In this mode, the user interface displays the basic building blocks for the drawing, such as a curve, a semicolon, a circle, and other symbols. As the user taps multiple symbols, possible drawings or emoticons that can be formed using the selected elements are displayed, and the user may either select the desired complete drawing or emoticon from the displayed list, or may continue entering additional building blocks until only one option remains. This mode of input is convenient as the number and size of the keys presented is optimized for the number of

[13]

available building blocks, and each key only displays information relevant for the active input mode.

[0054] Embodiments of the present invention provide methods and systems for enabling multiple input modes, whereby the screen display in each input mode is optimized for that mode. Optimizations include (i) configuring the number of keys displayed, (ii) configuring the size, position and shape of the keys in relation to the screen, (iii) configuring the size, position and shape of the area of the display showing text already entered, (iv) configuring the size, position and shape of the area of the display showing possible completions for the current character, phrase or symbol, and (v) displaying only at least one character, symbol, digit or other figure that is relevant to the active input mode on each key.

[0055] Embodiments of the present invention also provide methods and systems for enabling multiple input modes and switching between the input modes by performing a sweeping motion in relation to the screen. These methods and systems are easier and more convenient than using a menu interface to switch input modes. Additionally, these methods do not use up screen space to provide a switching key, to switch between input modes, and, as such, screen space may be used for information related to the current input mode and the current text. These methods and systems also enable switching between many input modes, by repeating the sweeping motions to advance through the input modes. In the N2 phone manufactured by Neonode AB, this mode of switching active keypads is used with standard 12-key keypads, for example, inter alia, switching between numeric, Swedish and English keypads. However, switching the layout of the keys is not used in the Neonode N2 phone. Moreover, other, prior art methods of switching between input modes require more than one action to advance through a list of input modes.

[0056] Reference is now made to **Figs. 3** and **9-45**, which include several exemplary touch screen interfaces. Shown in **Fig. 3** is a touch screen interface, displaying a clock dial in the lower left corner of the screen. Several

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gadgets are displayed in the touch screen, each gadget representing an application that runs on the phone. A gadget is an application running on the phone. In their icon like state, gadgets are also running showing information like latest incoming message, current song played, currency, weather etc. A gadget can be any type of application. Example gadgets include: streaming radio, note book, web mail, phone application, clock. A gadget can be updated with information both from the phone (new SMS) or from a third party over the Internet (RSS feed). A gadget in an icon state on the home screen can only occupy a defined space. In most cases a gadget can be expanded and either displayed as an overlay directly on the home screen like the volume control or displayed as a full screen application like the camera.

[0057] Problem: it is hard to hit the right item on a touch display because when you move the finger to and from the surface it is also easy to move it in the X-Y direction by mistake, especially when used with one hand. According to embodiments of the present invention, the solution to this problem is to use a conventional touch technology to find the object's X-Y position, add tactile or graphical illustration of where your finger is, and add a force sensor to the display to read the activation. Thus, according to embodiments of the present invention, selection and subsequent activation of an on-screen element, such as, inter alia, a gadget, a letter, a key, a button or an icon, is implemented by two primary features. The first feature, referred to as pressure sensing, provides the touch screen with one or more pressure sensors operative to determine contact with the screen by an external object such as a finger. In one embodiment, the user places a finger or a stylus over the desired on-screen element to select it, as illustrated in **Figs. 4-7**, and then applies pressure to the screen to activate the on-screen element, as illustrated in **Fig. 8**. In another embodiment, the user selects the on-screen element by placing a finger or stylus over the position of the on-screen element but not in contact with the screen. Several touch screen devices, such as certain light-based touch screens and certain tablet personal computers, enable detection of a

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finger or other pointing device over a position on the screen without making actual contact. Applicant's U.S. patent application no. 12/371,609, now U.S. Patent No. 8,339,379, for LIGHT-BASED TOUCH SCREEN, filed on 15 Feb. 2009, is incorporated herein in its entirety by reference. In another embodiment, the user selects the on-screen element with a finger or other pointing device in contact with the screen and activates the on-screen element by removing his finger or pointing device from contact with the screen. In another embodiment, the user selects the on-screen element with a finger or other pointing device in contact with the screen and activates the on-screen element by increasing the pressure of contact with the screen. In this case the pressure sensor distinguishes between the initial contact and the subsequent high pressure contact. This is illustrated in **Figs. 7** and **8** showing a profile of a finger in contact with a display, where only the thickness of the display is shown. In **Fig. 7** the finger moves across the screen to select at least one element. Movement across the screen is indicated by a double-tipped arrow parallel to the screen surface. Once an element is selected by positioning the finger over a desired element, the element is activated by applying pressure to the screen as indicated by the down-pointing arrow in **Fig. 8**.

[0058] The second feature, referred to as callout balloons, indicates a selected on-screen element to the user by displaying a graphic, such as by (i) enlarging the on-screen element, (ii) displaying a callout balloon with a copy of the on-screen element inside, or (iii) a combination thereof. The callout balloon is illustrated in **Figs. 5** and **6**. **Fig. 5** shows a star inside a callout balloon, and **Fig. 6** shows the letter 'A' inside a callout balloon. As the user moves his finger over the screen, different callout balloons appear. Callout balloons are generated in such a manner that the user's finger and hand do not obstruct the user from viewing the callout balloon. Thus, for example, the callout balloon appears above the finger as shown in the figures. When the finger is at the top of the screen the callout balloon is displayed off to a side of

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the screen that is visible to the user. The user may configure the interface to display callouts to the left or right of his finger. For example, a user who operates the phone with his left hand may prefer to display callout balloons off to one side of his finger, and a user who operates the phone with his right hand may prefer that callout balloons display to the other side of his finger. These two features of pressure sensing and callout balloons can be applied separately or in combination.

[0059] In accordance with an embodiment of the present invention, touch screens for phones captioned "Power ON / Power OFF" are shown in **Figs. 9-11**. Two phones are displayed under the "Power ON" caption; namely, a first phone (**Fig. 9**) with a blank screen, indicating that power is off, and a second phone (**Fig. 10**) with gadgets displayed thereon, indicating that power is on. A "home key" is displayed at the bottom of the phones. Activating the home key, such as by touching the key, causes the power to be turned on. A single phone is displayed in **Fig. 11** under the "Power OFF" caption. Touching the home key for an extended period of time, such as for 5 seconds, causes the phone to power off. An "off" gadget is shown at the bottom center of the display screen. Activating the "off" gadget also causes the phone to power off.

[0060] Additionally in accordance with an embodiment of the present invention, touch screens for phones captioned "Key lock" are shown in **Figs. 12-15**. In **Fig. 12** a lock gadget is displayed in the lower right corner of the screen. Activating the lock gadget, such as by pressing on it, causes the phone to lock. When the phone is locked activation of the phone is restricted in some manner. E.g., when the phone is locked, touching the screen in a way that would activate a gadget when the phone is unlocked, does not activate the gadget when the phone is locked. In order to unlock the phone, the user activates the home key, located at the bottom center of the device, as shown in **Fig. 13**. **Fig. 14** shows the phone after it has been unlocked: gadgets are now displayed on screen and are activated in response to user input.

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[0061] Further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Key lock high security" is shown in **Fig. 15**. When the home key is activated, such as by touching the home key, a keypad is displayed and a user is prompted to enter a security code. Subsequently, the phone cannot be unlocked unless the security code is entered. Optionally, additional security is implemented by use of fingerprint identification, wherein the phone cannot be unlocked unless a fingerprint is authenticated. Optionally, additional security is implemented by requiring the user to glide a finger over the screen in a designated gesture, in order to unlock the phone. The phone cannot be unlocked unless the touch screen detects the designated gesture. Examples of designated gestures include inter alia, an "S" shaped gesture, or a gesture wherein multiple corners of the screen are touched concurrently or in sequence. Optionally, additional security is implemented by displaying a musical keypad or keyboard and the user must play a particular tune of at least one note on the keypad or keyboard in order to unlock the phone.

[0062] Yet further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Home / return from application" is shown in **Figs. 16-17**. An application display screen is shown in **Fig. 16**, indicating that the user is running an application that substantially occupies the screen. A basic screen is shown in **Fig. 17**, for activating gadgets and applications. In order to return from the application screen (**Fig. 16**) to the basic screen (**Fig. 17**), the user activates the home key displayed at the bottom of the phone, such as by touching the home key. Tapping on the home key causes the open application to remain open, and causes the basic screen to display, thereby enabling launching additional applications. According to an alternative embodiment, tapping on the home key causes the open application to be closed.

[0063] Moreover in accordance with an embodiment of the present invention, a touch screen for a phone is shown in **Figs. 18-21**. Four phones are

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displayed, each phone illustrating a different method and system for a touch-based user interface scroll operation. Scrolling is useful when multiple gadgets are available for the user to activate or use, but not all of the gadgets are displayed on the screen at one time. In this case, the user can scroll to expose additional gadgets and to hide some of the previously visible gadgets. In **Fig. 18**, the user sweeps his finger or other interface input, such as inter alia a stylus, along the screen in a direction indicating that he would like to uncover additional gadgets and cover exposed gadgets. E.g., sweeping a finger across the width of the screen from right to left causes gadgets virtually located beyond the left screen border to be exposed, and causes gadgets previously located along the right screen border to be hidden. Similarly, sweeping a finger across the height of the screen from the bottom to top causes gadgets virtually located above the top edge of the display to be exposed, and gadgets previously located at the bottom edge of the screen to be hidden. In this embodiment, the user scrolls directly on the screen. Then we miss the possibility to touch and drag on other gadgets.

[0064] In **Fig. 19** a scroll cursor is shown along the right edge of the screen. The user touches the cursor and makes a sliding gesture along the right edge of the screen to cause gadgets virtually located beyond the bottom edge of the screen to be exposed, and causes gadgets previously situated at the upper edge of the screen to be hidden. This embodiment uses a scrollbar. The user puts a finger on the side and scrolls down to get lower down on the page.

[0065] In **Fig. 20** a button gadget is shown with two opposite arrows at the lower right corner of the screen. The user selects this gadget by touching one of the arrows, which causes the screen display to scroll according to the direction of the touched arrow. In this embodiment a drag button is provided. The user puts a finger on the button to drag the screen up or down.

[0066] In **Fig. 21** two arrow gadgets are shown at the top and bottom of the display screen. The user selects one of the two arrows, which causes the screen display to scroll according to the direction of the selected arrow. In

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this embodiment two drag buttons are provided that operate like the single drag button illustrated in **FIG. 20**. The user puts a finger on the lower scroll button to drag the screen up, or on the upper scroll button to drag the screen down.

[0067] Additionally in accordance with an embodiment of the present invention, a touch screen for a phone is shown in **Fig. 22** based on the scrolling with a scrollbar illustrated in **FIG. 19**. A dark border indicates the physical limits of the display screen. Gadgets are shown extending above and below the screen, indicating virtual locations of additional gadgets. By scrolling, the user causes successive display of additional gadgets, substantially in the order in which they appear in their virtual locations. The original display is denoted in the figure as the "Home area". At the bottom of the gadget list is a series of links updated by external feeds, such as Internet websites, for installing new gadgets into the phone.

[0068] After the user scrolls to reveal additional gadgets and a specific time limit has elapsed, e.g., 3 seconds, the screen automatically returns to a default display, hiding recently exposed gadgets and revealing previously hidden gadgets. Such return to default display is of advantage for revealed gadgets that do not require extended viewing, such as, inter alia, a clock or a weather report. The return to default display obviates the need for the user to perform an action in order to return the screen to its initial display. Activating the home key after scrolling also returns the screen to its initial display, showing the originally displayed gadgets and hiding the recently revealed gadgets. Such return to initial display is graphically presented (i) by returning the original display completely, (ii) by fading in the original display over the current scrolled display, (iii) by gradually displacing the scrolled display with the original display, (iv) by graphically scrolling the display in reverse to the original display, or (v) by a combination of such presentations. The user puts a finger on the screen and scroll bar handle and drags down to display more gadgets down the page. The user uses the Home button to get back to the

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home area. An optional feature: the user puts a finger on the scroll bar handle and drags up to display upper gadgets that are less frequently used. The screen is automatically scrolled back three seconds after the finger is removed.

[0069] Further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Fav 5" is shown in **Figs. 23-24**. Two phones are displayed under the "Fav 5" caption. In **Fig. 23** the "Fav 5" gadget is shaded indicating that it is activated. **Fig. 24** shows what this gadget does; namely, it displays five contacts that the user previously selected as his favorite five contacts. The "Fav 5" is a speed-dial interface for placing a call or otherwise contacting a person without having to navigate multiple menus or scroll through a large contact list. Each contact is shown with three buttons on the screen: "CALL", "SMS" and "MORE". By tapping on "CALL", a user causes initiation of a phone conversation with the contact. Similarly, by tapping on "SMS", a user causes initiation of an SMS message to the contact. By tapping on "MORE", a user is able to rearrange or edit contact details and to edit the contact's position within the "Fav 5" gadget.

[0070] Further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "History" is shown in **Figs. 25-26**. Two phones are displayed under the "History" caption. A "history" gadget displays a user's call history, including incoming, outgoing and missed calls. The phone's user interface is similar to that of the "Fav 5" phone, including "CALL", "SMS" and "MORE" buttons for each contact. Optionally, an SMS history, for sent SMS messages, for received SMS messages, or for both sent and received SMS messages, is also included in the history list. The history list is generally longer than the number of contacts that fit within a single screen, and the user scrolls up and down the list to locate and select a desired contact.

[0071] Yet further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Telephone" is shown in **Figs. 27-28**. Two phones are displayed under the "Telephone" caption. A

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"Telephone" gadget is shown shaded in **Fig. 27**. The "Telephone" gadget displays the carrier name, signal strength and other relevant information. Activating the "Telephone" gadget, such as by tapping on the screen at the gadget location, causes the screen shown in **Fig. 28** to appear. At the top of the display an active number is shown. The active number is entered by the user (i) using the keypad shown in the bottom half of the screen, or (ii) by selecting one of the contacts shown in the contact list in the upper half of the screen. The user scrolls the contact list to display a desired contact that is not currently exposed. The user also searches for a contact by entering the contact name using the alphanumeric keypad displayed in the bottom half of the screen. The user selects one of two modes, (i) number entry, or (ii) alphabetized search, by respectively selecting "Name" or "Number" at the bottom center of the screen. Selecting "Name" causes an alphabetic keypad to be displayed, and selecting "Number" causes a numerical keypad to be displayed. When a number or contact is selected, the user presses "Call" at the lower right corner of the screen to initiate the call.

[0072] Moreover in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Active call" is shown in **Figs. 29-30**. Two phones are displayed under the "Active call" caption. The phones are displayed during an initiated call. **Fig. 29** is presented for outgoing calls. The contact name occupies the entire upper half of the screen, for clear display of who is being called. Pressing on the "More" button enables call options such as mute and hold, and also enables editing an active contact's details, sending an SMS and other functions.

[0073] **Fig. 30** is presented for incoming calls, which are displayed as a callout overlaying the existing screen display. Such overlay may be a blended overlay, or a complete overlay. The callout stretches across the screen and is presented in an animated fashion, such as wiggling. In addition to the identity of the caller, three buttons, "ANSWER", "DENY" and "QUIET" are presented to respectively answer the call, reject the call or mute the ring.

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[0074] Additionally in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Volume" is shown in **Figs. 31-32**. Two phones are displayed under the "Volume" caption. **Fig. 31** includes "+" and "-" volume buttons on the left edge of the phone. When one of the buttons is pressed, a "volume" gadget appears on screen is shown in **Fig. 32**. The user scrolls within the "volume" gadget to adjust the magnitude of volume and to select a sound source. Two sound sources are shown in **Fig. 32**; namely, "Mp3" and "Call". The "volume" gadget disappears after it is not engaged by the user for a designated time period, such as four seconds. The "volume" gadget disappears with an animated flourish such as, inter alia, ducking into a corner of the screen before disappearing, fading, shimmering, or a combination thereof. When the two sound sources shown in **FIG. 32** are displayed, the user can select to change to another sound source. The sound source control of **FIG. 32** disappears after four seconds.

[0075] Additionally in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Mp3 player" is shown in **Figs. 33-34**. Two phones are displayed under the "Mp3 player" caption. **Fig. 33** includes an "Mp3" gadget. The "Mp3 gadget" operates similarly to the "volume" gadget, in that it disappears after it is not engaged by the user for a designated time period. The "play list" button displays a playlist of songs (not shown). The active song, indicated in **Fig. 34** as "Maria C", is listed at the top, and buttons are provided for stop, play/pause, forward and backward.

[0076] Further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Operator ad" is shown in **Figs. 35-37**. The "Operator ad" screen enables presentation of advertising offerings on the phone. Two phones are displayed under the "Operator ad" caption. **Fig. 35** is presented prior to displaying an offering. **Fig. 36** is a pop-up window that is overlaid on at least a portion of the screen. The user presses "GO" to activate the offer. **Fig. 37** includes, as its topmost gadget, a display for an offering of 100 free SMS messages. The display for the offering displaces the topmost

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gadget that was previously displayed in **Fig. 35**, and the user may scroll the display, as described hereinabove, in order to view the displaced gadget. Tapping on the offering activates the gadget and causes inter alia an operator webpage or Java application to open. When the user activates the offering, a payment may be generated for the phone manufacturer, reseller or other vendor.

[0077] Yet further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Video" is shown in **Figs. 38-39**. Two phones are displayed under the "Video" caption. A "Video" gadget is shown shaded in **Fig. 38**. Activating the "Video" gadget causes a video display screen to open, as shown in **Fig. 39**. Video controls such as play/pause, stop, volume control and open new video file, are provided on screen in **Fig. 39**. When the controls are not engaged by the user for a designated time period, they disappear, either directly or with an audio or visual presentation effect such as fading, shimmering, shrinking, ducking into a corner of the screen, or a combination thereof.

[0078] Yet further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Camera" is shown in **Figs. 40-42**. Three phones are displayed under the "Camera" caption. A "camera" gadget is shown shaded in **Fig. 40**. When the user activates the "Camera" gadget, a viewfinder is presented, as shown in **Fig. 41**. The right side of the viewfinder displays controls for capturing an image, sending an image via multi-media message (MMS), and a "MORE" button for enabling additional options, such as inter alia changing camera settings, changing image resolution, setting camera effects and applying image processing functions. If the user selects "Send MMS", an interface for selecting at least one recipient for the MMS is displayed. **Fig. 42** illustrates an interface of this nature, enabling entering a phone number using the keypad in the bottom half of the screen, or selecting a contact from a list shown at the top half of the screen. The user can also access his "FAV 5" gadget to quickly access contacts, as

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described hereinabove. When the user selects "Send" the image is sent via MMS to the selected at least one recipient.

[0079] Yet further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Messaging SMS" is shown in **Figs. 43-45**. Three phones are displayed under the "Messaging SMS" caption. An "SMS" gadget for sending and viewing SMS messages is shown shaded in **Fig. 43**, indicating that the user has activated this gadget, for example by tapping on it. Activating the "SMS" gadget causes an interface for viewing and composing SMS messages to open, as illustrated in **Fig. 44**. The user scrolls down the list of messages arranged in an order, such as (i) by date and time received, (ii) alphabetically according to the sender name or subject, (iii) by thread of correspondence grouping all messages belonging to a single conversation together, or such other sorting method or combination thereof. Displayed with each message are the time of the message, the sender and the sender's phone number. To compose a new message the user activates the "Empty message button" shown at the top of the list in **Fig. 44**. To open a message the user selects it from the list and selects "Open" in the bottom right corner of the screen. To view a list of sent messages, the user selects the "Sent" button shown in the bottom center of the screen. To open drafts of messages, the user selects the "Draft" button shown at the bottom center of the screen. Selecting the "More" button shown at the bottom left of the screen causes an interface for more options to open, including inter alia (i) configuring how the list of messages is displayed, (ii) configuring how messages are sorted, (iii) deleting messages, and (iv) saving messages to designated folders. In an alternative embodiment, the interface for accessing and viewing messages operates substantially as a call history interface.

[0080] **Fig. 45** shows an interface for composing a new message. When the message being composed is a reply to a previously received message, the previously received message is displayed, for example, inside a callout graphic as shown in the rightmost phone. A QWERTY keyboard interface is provided

[25]

for composing a new message. In **Fig. 45**, the new message is shown at the right side of the white area of the display following the name of the recipient, "To Amber:". Selecting the "Send" button causes the new message to be sent to the recipient. Selecting the "New" button causes a new message interface to open. Selecting "More" enables additional options. Selecting the "123" button at the bottom left of the keypad shown in the figure toggles the keypad from QWERTY to a numeric keypad. Other types of keypads are also supported and toggled by additional presses of the "123" button. Whenever a new keypad is displayed, the "123" toggle button displays an indicator of the next keyboard to be displayed. For example, when the next press of the toggle button will cause an English keypad to be presented, the toggle button will display the letters "En" instead of "123". If the next press of the toggle button will cause an English keypad to be presented and the T9 language prediction to be turned on, the toggle button will display the characters "T9 En".

[0081] **Figs. 46-54** show a series of nine phones, to illustrate a user interface. Each phone in **Figs. 46-54** shows a finger and a phone display containing an item "G3". On a device having a limited display area, an open application, such as a web browser, occupies a large portion of the display area. This prevents displaying additional useful information to the user from other applications, gadgets and web sessions, at the same time. According to an embodiment of the present invention, gadgets are arranged in a contiguous series or stack, as shown in **Fig. 46** labeled "Home screen", with gadgets **G1-G6** displayed on screen and additional gadgets **G7-G9** virtually situated below the bottom edge of the screen. The user scrolls the sequence of gadgets, revealing gadgets previously virtually situated beyond one edge of the screen or display window, and hiding gadgets previously situated at an opposite edge of the screen or display window.

[0082] The effect of the scrolling activity is illustrated in **Fig. 47** labeled "Pan home screen". The user sweeps his finger in an upward direction along the length of the screen to cause the display to scroll, and thereby reveal gadgets

[26]

virtually situated in the opposite direction of the user's finger sweep.

Comparing **Fig. 47** to **Fig. 46**, it is seen that the scroll action has caused gadgets **G1** and **G2** to be hidden, and gadgets **G7** and **G8** to be revealed. **G3** - **G6** are correspondingly displayed closer to the upper edge of the screen, in accordance with the scrolling action.

[0083] **FIGS. 48 – 50** illustrate how when a web gadget is activated – all gadgets beneath the web gadget slide down and disappear. Instead, the browser takes this space. When a gadget is activated, for example by tapping on the screen position associated with the gadget, the display area of the selected gadget extends in one direction, for example down-screen to the bottom of the screen or beyond the bottom of the screen. This extension is shown in **Fig. 50** labeled "open gadget / browser". In this figure, a "CNN headlines" gadget is shown extending beyond the bottom edge of the screen. When a gadget is open, the user has two scrolling options: (i) scroll the stack of gadgets, and (ii) scroll the window of the open gadget. The initial position of the user's scrolling finger determines which scrolling option will occur. When the initial position of the scrolling finger is at a height of the screen aligned with un-open gadgets in the stack of gadgets, the option to scroll the stack of gadgets is active. This is illustrated in **Figs. 51-52** labeled "Panning Gadget." **Fig. 51** shows the initial scrolling finger position aligned with un-open gadgets in the gadget stack. **Fig. 52** illustrates sliding the finger in the direction of the top of the screen, thereby shifting the entire gadget stack up. It is noted that shifting also shifts the visible portion of the open gadget as an integral part of the gadget stack. The second option of scrolling only the active gadget is illustrated in **Figs. 53-54** labeled "Panning Web." In **Fig. 53** the initial position of the scrolling finger is shown aligned with an area of the screen displaying the open gadget. **Fig. 54** illustrates the scrolling action whereby only the data inside the open gadget is shifted in response to sweeping the finger towards the top of the screen, as indicated by the arrow; the stack of unopened gadgets is not shifted. The present invention addresses

[27]

the problem that only one browser session can be opened at a time. How can we tell the user that in an intuitive way and still stay in the same screen and keep important information at the top? The solution, in some embodiments of the invention, is to always open the browser towards the bottom of the screen and keep content above the browser gadget.

[0084] In the foregoing specification, the invention has been described with reference to specific exemplary embodiments thereof. It will, however, be evident that various modifications and changes may be made to the specific exemplary embodiments without departing from the broader spirit and scope of the invention as set forth in the appended claims. Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense.

[28]



APPENDIX A

USER INTERFACE

TECHNICAL FIELD

[0001] The present invention relates to a user interface for a mobile handheld computer unit, which computer unit comprises a touch sensitive area, and which touch sensitive area is divided into a menu area and a display area.

[0002] The computer unit is adapted to run several applications simultaneously and to present any active application on top of any other application on the display area.

[0003] The present invention also relates to an enclosure for a handheld computer unit.

[0004] The present invention also relates to a computer readable medium. A computer program product with computer program code is stored within the computer readable medium, which code, when read by a computer, will make it possible for this computer to present a user interface according to the invention.

DESCRIPTION OF BACKGROUND ART

[0005] Mobile handheld computers are known in various embodiments. One kind of handheld computer is the personal digital assistant (PDA), which is getting more and more powerful.

[0006] Another kind of handheld computer unit is the mobile phone, which also is getting more and more powerful. There are also examples of where the mobile phone and the PDA are merging into one unit.

[0007] A third kind of handheld computer is the laptop computer, which is getting smaller and smaller, even competing in size with the PDA's.

[0008] The need to manage more information has led the development towards new solutions regarding user interfaces and navigation. The PDA's and mobile phones are getting larger and larger in order to provide a user-friendly interface.

[0009] Since the users have gotten used to small handheld units, it is hard to move towards larger units. This has led to foldable keyboards, different kinds of joy sticks and different kinds of touch sensitive displays and pads intended to help in providing a user interface that is suitable for small handheld compute units.

[30]

## SUMMARY OF THE PRESENT INVENTION

### **Technical Problems**

[0010] It is a problem to provide a user-friendly interface that is adapted to handle large amount of information and different kinds of traditional computer-related applications on a small handheld computer unit.

[0011] It is a problem to provide a user interface that is simple to use, even for inexperienced users of computers or handheld devices.

[0012] It is a problem to provide a small handheld computer unit with an easily accessible text input function.

[0013] It is also a problem to provide a simple way to make the most commonly used functions for navigation and management available in the environment of a small handheld computer unit.

### **Solution**

[0014] Taking these problems into consideration, and with the starting point from a user interface for a mobile handheld computer unit, which computer unit comprises a touch sensitive area, which touch sensitive area is divided into a menu area and a display area, which computer unit is adapted to run several applications simultaneously and to present an active application on top of any other application on the display area, the present invention teaches that the menu area is adapted to present a representation of a first, a second and a third predefined function, where the first function is a general application dependent function, the second function is a keyboard function, and the third function is a task and file manager. The present invention also teaches that any one of these three functions can be activated when the touch sensitive area detects a movement of an object with its starting point within the representation of the function on the menu area and with a direction from the menu area to the display area.

[31]

[0015] With the purpose of providing a simple way of managing any application or the operations system, the present invention teaches that if the first function is activated, the display area is adapted to display icons representing services or settings, depending on the current active application. One of the icons always represents a "help"-service, regardless of application. The icons are adapted to represent services or settings of the operations system of said computer unit, such as background picture, clock, users, help, etc. if no application is currently active on the computer unit.

[0016] Selections of preferred service or setting is done by tapping on corresponding icon.

[0017] With the purpose of providing the access to a text input function in any application in the computer unit, the present invention teaches that when the second function is activated, the display area is adapted to display a keyboard and a text field.

[0018] If a text passage in an active application is highlighted, then this text passage is displayed in the text field for editing through the keyboard and that the highlighted text passage is replaced by the edited text passage when the second function is deactivated.

[0019] If no text passage in an active application is highlighted, then the text field is available for inputting and editing of text through the keyboard.

[0020] In the case of the latter the first function can be activated, or the second function can be closed, in which a choice of saving or deleting the inputted text is given. The choice of saving the inputted text results in an activation of the first function. In this case the first function will present services or settings available for the inputted text, such as saving the inputted text for later use, using the inputted text as telephone number in a telephone application, or sending the inputted text as message in communications application.

[0021] In order to provide a task and file management in a user interface for a handheld mobile computer, the present invention teaches that, if the third

function is activated, the display area is adapted to display a list with a library of available applications and files on the computer unit. A selection of an application will start the application, and a selection of a file will open the file in an application intended for the file.

[0022] A selection of an application or a file is done by moving the object so that the representation of desired application or file is highlighted, removing the object from the touch sensitive area, and then tapping on the touch sensitive area.

[0023] According to the present invention a navigation in the list is performed by moving the object in a direction towards the top of the list or towards the bottom of the list. This will cause the marking to move in the same direction. The speed of the movement of the marking is lower than the speed of the movement of the object, with the purpose of making the navigation easier.

[0024] The user interface of the present invention is specifically adapted to be used with a small computer unit where the size of the touch sensitive area is in the order of 2-3 inches. The user interface is also adapted to be operated by one hand, where the object can be a finger, such as the thumb, of a user of the computer unit.

[33]

**Advantages**

[0025] Those advantages that can be primarily associated with a user interface or a computer readable medium according to the present invention reside in the ability to establish a user-friendly interface for small handheld computers, both regarding general application set-up functions, text input functions, and file and task management.

[34]

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The present invention will now be described in more detail with reference to the accompanying drawings, in which

[0027] Figure 1 is a schematic and highly simplified view of a touch sensitive area on a mobile handheld computer unit;

[0028] Figure 2 is a schematic side view illustrating the activation of a function;

[0029] Figure 3 is a schematic illustration of a first function;

[0030] Figure 4 is a schematic side view illustrating the selection of a service or setting represented by an icon;

[0031] Figure 5 is a schematic illustration of a second function;

[0032] Figure 6 is a schematic side view illustrating the selection of a third function;

[0033] Figure 7 is a schematic illustration of an application or file;

[0034] Figure 8 is a schematic illustration on how navigation is performed;

[0035] Figure 9 is a schematic illustration of how the content of the display are is changed;

[0036] Figure 10 is a schematic side view further illustrating how navigation is performed;

[0037] Figure 11 is a schematic illustration of moving forwards in an application;

[0038] Figure 12 is a schematic illustration of moving backwards in, or closing, an application;

[0039] Figure 13 is a schematic illustration of an enclosure

DESCRIPTION OF EMBODIMENTS AT PRESENT PREFERRED

[0041] **Figure 1** illustrates a user interface for a mobile handheld computer unit. The user interface according to the present invention is specifically adapted to computer units comprising a touch sensitive area **1**, which is divided into a menu area **2** and a display area **3**. It should be understood that there are several different kinds of known touch sensitive displays and that the present invention does not depend on what kind of touch sensitive display that is used in relation to the inventive user interface.

[0042] The computer unit is adapted to run several applications simultaneously and to present an active application on top of any other application on the display area **3**. It should be understood that by simultaneously it is meant any technology that will make it appear to a user of the computer unit that applications are run simultaneously and that the present invention does not depend on how this is realised, whether it is through time-sharing of one processor, parallel use of several processors, or any other technique.

[0043] According to the present invention the menu area **2** is adapted to present a representation of a first **21**, a second **22** and a third **23** predefined function.

[0044] The first function **21** is a general application dependent function, the second function **22** is a keyboard function, and the third function **23** is a task and file manager.

[0045] **Figure 2** shows that any one of these three functions **21**, **22**, **23** can be activated when the touch sensitive area **1** detects a movement of an object **4** with its starting point **A** within the representation of a function on the menu area **2** and with a direction **B** from the menu area **2** to the display area **3**.

[0046] **Figure 3** shows that if the first function **21** is activated, then the display area **3** is adapted to display icons **211**, **212**, **213**, **214**, **215**, **216** representing services or functions depending on the current active application. One of the icons, in the figure exemplified by icon **211**, always represents a



"help"-service, regardless of application. Any key that, because of lack of space on the display area, or because the key should be hidden from the active application, or because of any other reason is not shown on the display area of an active application, can be represented by one of the icons 212, 213, 214, 215, 216 that is shown when the first function 21 is activated.

[0047] If for instance the active application handles a picture, then the icons that are shown when the first function is activated can be services such as "save to disk", "send as SMS", or "delete" and they can be settings such as "resolution", "colour", or "brightness".

[0048] If no application is currently active on the computer unit, then the icons 211, 212, 213, 214, 215, 216 are adapted to represent services or settings of the operations system of the computer unit, such as background picture, clock, alarm 215, users 213, help 211, etc.

[0049] Figure 4 shows that selection of a preferred service or setting is done by tapping C, D on corresponding icon 213.

[0050] Figure 5 shows that if the second function 22 is activated, then the display area 3 is adapted to display a keyboard 221 and a text field 222.

[0051] Two different scenarios can be at hand when this function key is activated. A first scenario can be that a text passage in the active application is highlighted as the second function is activated. If this is the case then the highlighted text passage is displayed in the text field 222 for editing through the keyboard 221.

[0052] The highlighted text passage is replaced by the edited text passage when the second function 21 is deactivated.

[0053] A second scenario can be that no text passage in the active application is highlighted. If this is the case then the text field 222 is available for inputting and editing of text through the keyboard 221.

[0054] In the case of the latter scenario, the first function 21 can be activated, or the second function 22 can be closed. If the second function 22 is closed

then a choice of saving or deleting the inputted text is given, where the choice of saving the inputted text results in an activation of the first function 21.

[0055] As the first function 21 is activated with the second function 22 as currently active application the first function 21 will present services or settings available for the inputted text, such as saving the inputted text for later use, using the inputted text as telephone number in a telephone application, or sending the inputted text as message in communications application, such as e-mail, SMS, or fax.

[0056] Figure 6 shows that if the third function 23 is activated, then the display area 3 is adapted to display a list 231 with a library of available applications and files on the computer unit.

[0057] A selection of an application will start the application, and a selection of a file will open the file in an application intended for the file. The name of a selected file can be edited by activation of the second function 22 as the file is highlighted.

[0058] Figure 7 shows that a selection of an application or a file is done by moving E the object 4 so that the representation of desired application or file is highlighted, removing F the object 4 from the touch sensitive area 1, and then tapping G, H on the touch sensitive area 1.

[0059] An application or file is highlighted by placing some kind of marking 232 on the representation of the application or file. This marking can be done in different ways, for example by putting a frame around the representation of the application or file, as shown in the figure, or by inverting the representation of the application or file.

[0060] It should be understood that all lists in the computer unit, such as a list of contact information in an address book, a list of e-mail messages in a mailbox, or a telephone log, can be managed in the above described manner.

[0061] The list 231 can be adapted to present only files or only applications. In this case, the top area of the list 231 can present a field 233 through which the content of the list 231 can be altered. If the list only presents files, then the

field 233 can display a representation of a task manager and a selection of the field 233 will cause the list 231 to alter to present only applications, and if the list 231 only presents applications, then the field 233 displays a representation of a file manager and a selection of the field 233 will cause the list 231 to alter and present only files.

(0062) Figure 8 shows that navigation in the list is performed by moving the object 4 in a direction I towards the top 231a of the list 231 or towards J the bottom 231b of the list 231. This movement I, J of the object 4 will cause the marking 232 to move K, L in the same direction. The speed of the movement K, L of the marking 232 is lower than the speed of the movement I, J of the object 4.

(0063) Figure 9 shows that if the number of applications and/or files in the list 231 exceeds the number of applications and/or files that can be presented on the display area 3, and if the object 4 is moved to the top or bottom position of the display area, then lifted, replaced on the display area, and then again moved to the top or bottom of the display area, then the content of the display area will be replaced one whole page, meaning that if the object 4 is positioned N at the bottom 3b of the display area 3, then lifted, replaced on the display area 3, and then again moved M to the bottom 3b of the display area 3, then the content 31 of the display area 3 will be replaced P by the following applications and/or files 32 in the list 231. In the same way, but not shown in the figure, if the object is position at the top of the display area, then lifted, replaced on the display area 3, and then again moved to the top of the display area, the content of the display area will be replaced by the preceding applications and/or files in the list.

(0064) Figure 10 shows that if the object 4 is removed Q from a first position 33 on the display area 3 and then replaced R, S on a second position 34 on the display area 3, then the navigation can be continued T from the second position 34.

[0065] Figure 11 shows that moving U the object 4 from the left of the display area 3 to the right of the display area 3 moves the active application, function, service or setting on one step forwards. FIG. 12 shows that, in a similar manner, the active application, function, service or setting is closed or backed one step by moving V the object 4 from the right of the display area 3 to the left of the display area 3.

[0066] As shown in figure 1, the menu area 2 is positioned at the bottom of the touch sensitive area 1. The representation of the first function 21 is positioned at the left side of the menu area 2, the representation of the second function 22 is positioned at the middle of the menu area 2, and the representation of the third function 23 is positioned at the right side of the menu area 2.

[0067] As shown in figure 13, the present invention relates to a user interface for a hand held mobile unit that preferably can be manageable with one hand. Hence the present invention teaches that the user interface is adapted to a touch sensitive area 1 with a size that is in the order of 2-3 inches, meaning the diagonal distance W between two corners of the touch sensitive area 1.

[0068] The user interface is adapted to be operated by one hand, where the object 4 can be a finger, such as the thumb shown in the figures, of a user of the computer unit. It should be understood though that the present invention might also be used with another object, such as a pen or other pointing device.

[0069] According to one preferred embodiment of the present invention the computer unit is covered with an enclosure 5, which is provided with an opening 51 for the display area 3, and where the representations of the menu area 2 is printed on top of the enclosure 5. It should be understood that the opening 51 might be a transparent part of the enclosure 5 or that it might be an open aperture depending on among other things technical considerations pertaining to the touch sensitive area 1.

[0070] This makes it possible to allow the enclosure 5 to be removable and exchangeable.

[40]

[0071] Figure 14 shows a computer readable medium, in the figure schematically shown as a solid-state memory 61. A computer program product is stored within the computer readable medium. This computer program product comprises computer readable code 62, which, when read by a computer 6, will make it possible for the computer 6 to present a user interface according to the present invention.

[0072] The present invention also teaches that the computer program product is adapted to function as a shell upon an operations system.

[0073] It will be understood that the invention is not restricted to the aforescribed and illustrated exemplifying embodiments thereof, and that these embodiments can be modified within the scope of the inventive concept illustrated in the accompanying Claims.

[41]

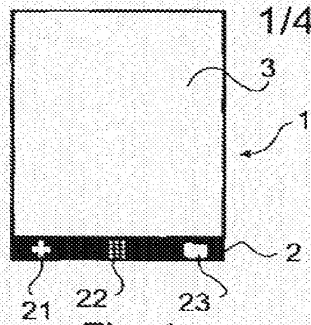


Fig. 1.

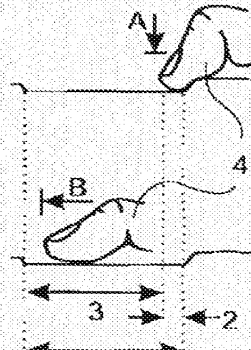


Fig. 2.

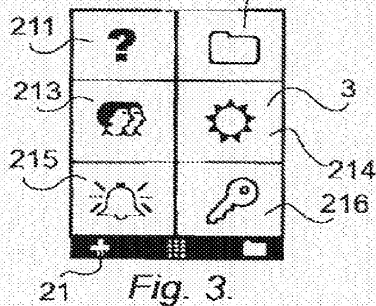


Fig. 3.

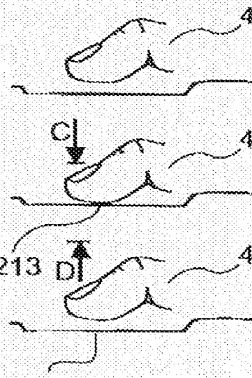


Fig. 4.

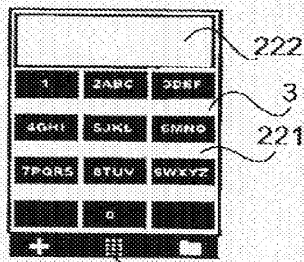


Fig. 5.



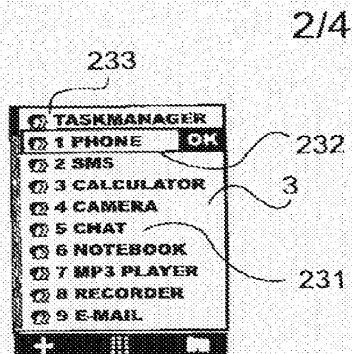


Fig. 6.

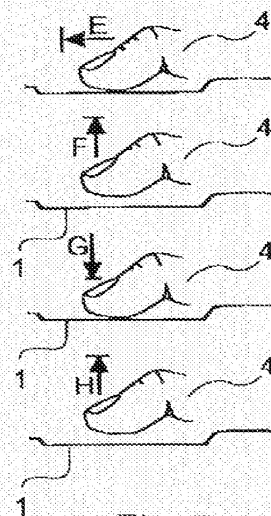


Fig. 7.

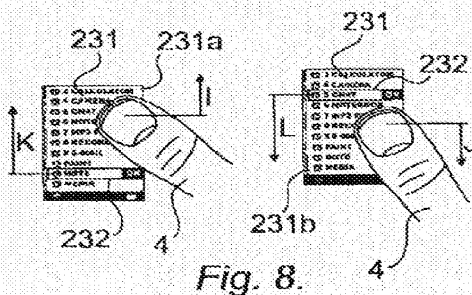


Fig. 8.

3/4

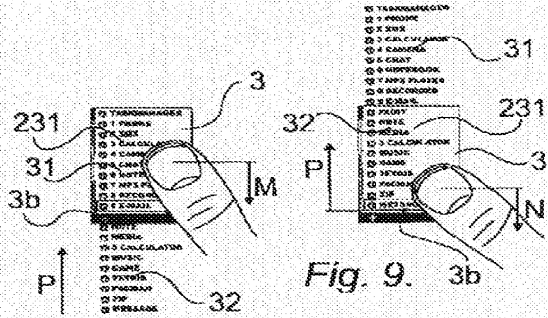


Fig. 9. 3b

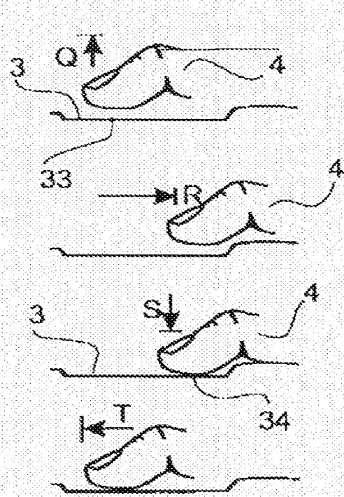


Fig. 10.

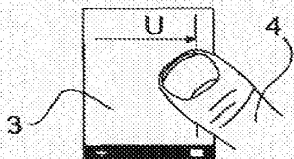


Fig. 11.

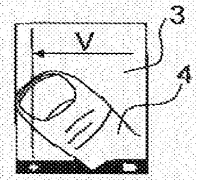


Fig. 12.





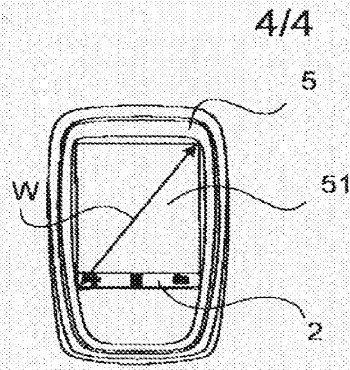


Fig. 13.

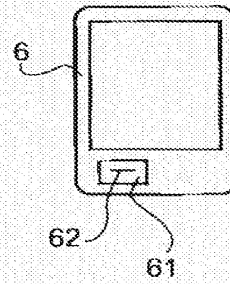


Fig. 14.



APPLICATION FOR UNITED STATES LETTERS PATENT

For

TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE

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Joseph Shain

TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE

CROSS REFERENCES TO RELATED APPLICATIONS

[0001] This application claims priority to and is a continuation of US Patent Application No. 14/886,048, which is a continuation of US Patent Application No. 12/486,033, now US Patent No. 9,164,654, which claims priority to US Provisional Patent Application No. 61/132,469 and is a continuation-in-part of US Patent Application No. 10/315,250, now US Patent No. 8,095,879, the contents of all of which are incorporated herein by reference in their entirety.

FIELD OF THE INVENTION

[0002] The field of the present invention is user interfaces for electronic devices and, more particularly, to touch screen user interfaces.

[1]

## BACKGROUND OF THE INVENTION

[0003] Touch screens provide user interfaces through which a user enters input to a computing device by touching a screen at a selected location, with a stylus or with his finger.

[0004] Conventional touch screens are limited as to the types of user inputs that they can recognize. For example, conventional touch screens are unable to distinguish between a soft tap and a hard press. In some prior art embodiments users initially select an item on the screen, and then subsequently activate the selected item. However, because prior art touch screens do not distinguish between degrees of pressure, the user is required to remove his finger or stylus from the screen and activate his selection with a second tap. It would be advantageous to produce touch screens that distinguish between varying amounts of pressure applied to the screen so that a user can select an item by touching its location on the screen, and then activate the item by applying additional pressure to the touch location without having to first remove his finger or stylus from the screen.

[0005] In conventional touch screens the keys are often small relative to the touch area, especially in handheld devices. The keys are also often situated close together. This can make it difficult to determine which key is being pressed by the user. It would be advantageous to clearly indicate to the user which key the user has selected, and furthermore, to allow the user to accept or reject the selected key without first removing his finger or stylus from the screen in order to perform a second tap.

[0006] Current user interfaces are basic and often require navigation through a series of menus in order to perform a desired operation. The present invention presents a user interface that is versatile in providing the user with many options, while requiring only few selections to activate a desired function. To further enhance user experience, certain functions are performed automatically without requiring the user to enter a selection.

[2]

## SUMMARY OF THE DESCRIPTION

[0007] Aspects of the present invention relate to user interfaces designed for use with a touch screen. The present invention relates to computer readable media storing computer programs with computer program code, which, when read by a computer unit, allows the computer to present a user interface for the computer unit.

[0008] In accordance with embodiments of the present invention, the computer unit features a touch sensitive display area. According to preferred embodiments an initial display configuration presents a plurality of gadgets on the display. These gadgets are small areas of the screen that indicate which functions each gadget will perform when activated by the user. When a gadget is activated, typically by the user touching the area of the display on which the gadget is displayed, the gadget increases in size and provides the user with icons and information about the gadget's functions. Significantly, the gadget does not cover the entire display area. Thus, when a gadget, or even a plurality of gadgets, is active, the primary display of all available gadgets is still accessible. This primary display can be compared to a desktop in computer operating system user interfaces. However, this primary display in the user interface of the present invention is not the same as a desktop where active windows can cover icons on the desktop. In the present invention, gadgets are arranged in a manner that open gadgets do not cover other gadgets. Rather, when an open gadget expands in size, other gadgets are shifted to make room for the expanded gadget. This allows the user to scroll the primary display or desktop to view any gadget. In the context of the present invention, this primary display area that includes both open and closed gadgets is called the home window. The user scrolls the home window to view gadgets that are shifted beyond the viewable area of the display. An expanded, or activated, gadget has an expanded window, but often it is not large enough to display everything contained in that gadget window. To view contents of the gadget not displayed in the visible portion of the gadget

[3]

window, the user scrolls the gadget window. Thus, two different scroll operations are provided: scrolling the home window and scrolling a gadget window. According to one embodiment, scrolling is executed by gliding a finger or stylus along the touch screen to shift the active display area of the home window or of the gadget. The scrolling affects the home window if the finger glide began in an area of the screen that does not belong to an active gadget; the scroll affects an active gadget window if the finger glide began inside that active gadget window.

[0009] Various embodiments of the invention support several methods of scrolling a window. According to one embodiment, scrolling is done when the user touches the display inside the window area, for example at an edge of the window, or on an icon, such as an arrow or scrollbar, indicating a scroll operation. According to another embodiment, scrolling is done by the user touching the window with a finger or stylus and then gliding the finger or stylus along the touch sensitive screen in a direction indicating the desired direction of the scroll. When the content of the home display is larger in two dimensions than the actual display screen, this operation is like panning an image or map. When it is larger along only one axis (e.g., only vertically), the scrolling only scrolls in the one axis even when the glide is not orthogonal along the one axis.

[0010] Another aspect of the present invention relates to computer readable media storing a computer program with computer program code, which, when read by a mobile handheld computer unit, allows the computer to present a user interface for the mobile handheld computer unit. The user interface features a touch sensitive area in which representations of a plurality of keys are displayed, and each key is mapped to a corresponding location in the touch sensitive area at which the representation of the key is displayed. A key in this context includes, inter alia, alphabetic keys such as in a QWERTY keypad, numeric keys and also icons representing programs or functions. A key is selected, but not activated, when an object touches the corresponding

[4]

location. This intermediate status of being selected but not activated facilitates the user to subsequently activate a desired key and avoid activating a neighboring key that the user selected but does not wish to activate. A selected key is activated when the object touching it applies additional pressure to the key location.

[0011] According to preferred embodiments of the invention, when a key is selected, the user interface generates a secondary representation of the key, such as a callout balloon containing the key representation. The callout balloon is placed away from the key location (being touched) so that the user can easily view which key is selected without lifting his finger. According to another embodiment, an audio representation of the selected key is generated so the user hears which key was selected.

[0012] According to still further features in preferred embodiments of the invention, the user touches the screen (with a finger or stylus) at a first location, for example selecting a first key. The user then glides his finger or stylus over the screen to additional locations. At each additional location a new key is selected and the previously selected key is deselected. The user can activate any selected key by applying additional pressure to the screen. The user does not have to remove the object from the screen to glide and select additional keys even after activating a first key.

[0013] Additional touch pressure is detected in various ways according to several embodiments. According to one embodiment, the touch sensitive area is a light-based touch screen operable to detect different levels of touch pressure. For example, light-based touch screens typically include a calculating unit operable to identify the size, shape and contours of an area being touched based on a pattern of obstructed light. See applicant's U.S. patent application no. 10/494,055, now U.S. Patent No. 7,880,732, titled ON A SUBSTRATE FORMED OR RESTING DISPLAY ARRANGEMENT, the contents of which are incorporated herein by reference. When a finger or flexible object is used as a touch object, as additional pressure is applied to the touch surface,

[5]

the contact area of the finger or object touching the screen increases. Thus, additional pressure is detected when an increase in the contours of the covered touch area is detected.

[0014] Alternatively, or in combination with the above, the touch sensitive area features both a touch screen operable to identify a touch location on the screen and a pressure sensor operable to detect pressure applied to the screen but not sensitive to the location of the object applying the pressure.

[0015] Other aspects of the present invention relate to convenient arrangement and function of icons to perform popular functions within a user interface. Thus, a camera gadget features a multimedia messaging service (MMS) button facilitating sending an active photo in an MMS message; a keylock gadget locks the computer and displays an instrumental keypad for entering a musical code to unlock the computer; a reporting gadget displays information for a first period of time and is then automatically deactivated. Several reporting gadgets are provided, including a gadget that displays the time of day; a gadget displays a weather forecast; a gadget that displays stock market information.

[0016] According to still further features in preferred embodiments the reporting gadget continues to display its information for a second period of time if the gadget is touched during the first period of time. I.e., automatic deactivation after the first period of time is canceled.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The present invention will be more fully understood and appreciated from the following detailed description, taken in conjunction with the drawings in which:

[0018] **FIGS. 1A – 1K** are a series of screens illustrating Chinese stroke input, in accordance with an embodiment of the present invention;

[0019] **FIGS. 2A – 2M** are a series of screens illustrating Chinese Pinyin input, in accordance with an embodiment of the present invention;

[6]



[0020] **FIGS. 3** is a screen of a handheld terminal displaying a plurality of gadgets, in accordance with an embodiment of the present invention;

[0021] **FIGS. 4 – 6** are diagrams illustrating selection of elements displayed on a touch screen. A selected element is displayed in a callout as shown in **Figs. 5 - 6**. The user does not lift his finger off the screen between selection of different elements, as in figures **5** and **6**. The user simply glides his finger along the screen. This is shown in **Fig. 7**. To activate a selected element the user presses on the screen without first lifting his finger off the screen as shown in **Fig. 8** and in the series of **Figs. 7-8**, all in accordance with an embodiment of the present invention;

[0022] **Figs. 7-8** illustrate a side view of a user selecting and activating an on-screen element, in accordance with an embodiment of the present invention;

[0023] **Figs. 9-11** illustrate turning a phone on and off. **Fig. 9** illustrates pressing the home key on a turned-off phone. **Fig. 10** illustrates the phone when it is turned on. **Fig. 11** illustrates pressing the home key to turn a phone off.

[0024] **Figs. 12-15** illustrate locking and unlocking a phone. **Fig. 12** illustrates activating a lock gadget onscreen to lock the phone. **Fig. 13** illustrates pressing the home button on a locked phone to unlock the phone. **Fig. 14** illustrates the unlocked phone. **Fig. 15** shows pressing the home key on a locked phone to display a keypad for entering a security code to unlock the phone.

[0025] **Figs. 16-17** illustrate pressing the home key to return to the home display screen. **Fig. 16** shows an open active calling gadget. Pressing the home button presents the home screen shown in **Fig. 17**.

[0026] **Figs. 18-21** illustrate scrolling options. In the phone shown in **Fig. 18** scrolling is done by gliding a finger or stylus along the touch sensitive screen. **Fig. 19** illustrates a scrollbar along one edge of the screen for scrolling up and down. **Figs. 20-21** illustrate arrow buttons for scrolling up and down.

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[0027] **Fig 22** illustrates scrolling the home display screen, in accordance with an embodiment of the present invention;

[0028] **Figs. 23-24** illustrate a Fav5 gadget, in accordance with an embodiment of the present invention;

[0029] **Figs. 25-26** illustrate a History gadget, in accordance with an embodiment of the present invention;

[0030] **Figs. 27-28** illustrate a Calling gadget, in accordance with an embodiment of the present invention;

[0031] **Figs. 29-30** illustrate placing a call using a Calling gadget, in accordance with an embodiment of the present invention; **Fig. 30** illustrates the shortcut buttons presented when an incoming call is received (i.e., when the phone is ringing).

[0032] **Figs. 31-32** illustrate volume control, in accordance with an embodiment of the present invention;

[0033] **Figs. 33-34** illustrate an MP3 player gadget, in accordance with an embodiment of the present invention;

[0034] **Figs. 35-37** illustrate an operator promotion gadget, in accordance with an embodiment of the present invention;

[0035] **Figs. 38-39** illustrate a video player gadget, in accordance with an embodiment of the present invention;

[0036] **Figs. 40-42** illustrate a camera gadget and shortcut buttons provided when the camera gadget is activated, in accordance with an embodiment of the present invention;

[0037] **Figs. 43-45** illustrate an SMS gadget and shortcut buttons provided when the SMS gadget is activated, in accordance with an embodiment of the present invention; **Fig. 45** illustrates how related SMS messages are displayed as a conversation in an active SMS gadget; and

[0038] **Figs. 46-54** illustrate scrolling the home display screen and gadget windows, in accordance with an embodiment of the present invention.

[8]

LIST OF APPENDICES

APPENDIX A is a copy of the original specification of US Serial No. 10/315,250 as filed on December 10, 2002.

[9]

#### DETAILED DESCRIPTION

[0039] Touch screen keypads offer great flexibility in keypad interface design – flexibility that cannot be achieved with electro-mechanical keypads. Custom design keypads can be generated on a touch screen, where the markings on each key and the functions that each key provides are optimized for a designated application. Moreover, touch screen keypads can change modes, from one pad of keys and associated functions to a different pad of keys and associated functions. Custom keypads are of particular advantage for multi-lingual applications.

[0040] A general description of touch screen keypad interfaces, in accordance with embodiments of the present invention, and several examples thereof, are described in detail hereinbelow.

[0041] Embodiments of the present invention relate to improved keypads for inputting Chinese characters using XT9 stroke input, and using Chinese Pinyin. XT9 stroke input builds Chinese characters using six basic strokes, and offers selection of possible characters and phrases based on a set of strokes that have been input. Chinese Pinyin uses Latin characters that transliterate a sound or a syllable, in combination with a digit that represents an intonation or inflection. E.g., Ma in a rising tone is m-a-1, and Ma in a descending tone is m-a-2.

[0042] Reference is now made to **FIGS. 1A – 1K**, which illustrate an improved stroke-based keypad for entering Chinese characters by inputting strokes, in accordance with an embodiment of the present invention. Shown in **FIGS. 1A – 1K** is a keypad **100**, used for inputting basic strokes. Also shown in **FIGS. 1A – 1K** is a sequence of strokes **101 – 106** that are successively input by a user, and a corresponding sequence of Chinese characters **111 – 114** that are entered in a message being composed.

[0043] In accordance with an embodiment of the present invention, keypad **100** is generated and displayed on a touch screen. Keypad **100** has fewer

[10]

than the standard 12 keys in a touch pad, allowing more room on screen for displaying characters.

[0044] Further in accordance with an embodiment of the present invention, the keys of keypad **100** are customized so that they contain only relevant information. For example, a prior art keypad displays a digit, 3 - 4 characters, and a basic Chinese stroke, all inside one key, even though in XT9 stroke mode the basic Chinese stroke is the only useful one. The custom keys of the present invention display only the basic Chinese strokes, or the strokes and numbers, but no characters.

[0045] There are two types of key presses supported by keypad **100** – regular and long. A regular key press adds the stroke shown on the key to the series of strokes **101** – **106** already pressed. As strokes are successively entered, a numbered array **121** of Chinese characters or phrases is dynamically displayed along the top of the keypad. These characters or phrases are predicted based on the key presses already entered. In order to select one of the numbered elements of array **121**, the user performs a long key press on that number. Alternatively, the user may keep entering strokes until only one option remains.

[0046] Often, however, more predicted characters or phrases exist than can be displayed along the top of the keypad. The N2 phone, manufactured by Neonode of Stockholm, Sweden, has a joystick button at the bottom of the phone. Twitching the joystick up/down displays different sets of predicted characters or phrases. When the intended character or phrase is displayed and associated with a given digit, a long press on that digit serves to select the intended character or phrase.

[0047] Reference is now made to **FIGS. 2A – 2M**, which illustrate an improved keypad for inputting Chinese characters using Pinyin, in accordance with an embodiment of the present invention. Shown in **FIGS. 2A – 2M** is a keypad **200**, used for inputting Latin characters. Also shown in **FIGS. 2A – 2M** is a sequence of Latin characters M-o-H-S-a-n that are successively input

[11]

by a user, and a corresponding sequence of Chinese characters that are entered in a message being composed.

[0048] In accordance with an embodiment of the present invention, keypad **200** uses accent characters, rather than digits, to convey an intended intonation or inflection. Further in accordance with an embodiment of the present invention, keypad **200** displays only information relevant for Pinyin input on each key; no Chinese basic strokes are shown.

[0049] There are two types of Pinyin input. A user enters a Latin transliteration of an intended word using the Latin keypad input (12 keys). For each key, several letters are possible. The list of predicted Latin syllables based on the current sequence of keypad presses is displayed. Twitching the joystick right or left selects the desired combination. Also, a series of predicted Chinese characters or phrases is displayed and selected by a long press on a respective digit. Twitching the joystick up/down displays other predicted Chinese characters or phrases. Entering a space after a series of letters indicates the end of a previous character or phrase.

[0050] In accordance with an embodiment of the present invention, the user is able to combine stroke and Pinyin input, and compose a sequence of at least two Chinese characters using XT9 stroke input for at least one character and Pinyin input for at least one other character. The user switches between XT9 stroke input mode and Pinyin input mode by performing a sweeping motion in relation to the touch screen, such as, inter alia, sweeping a finger across the top of the touch screen. The series of at least two Chinese characters may be a text message, a name, a data entry, or any other such input.

[0051] Further in accordance with an embodiment of the present invention, the user is able to compose a series of at least one Chinese character and at least one non-Chinese term, wherein the non-Chinese term includes at least one Latin character, digit, emoticon, punctuation mark, another non-Chinese symbol, or any combination thereof. The series is composed by switching input modes for each alphabet or Chinese input or digit input by sweeping

[12]

across the top of the touch screen. For example, the user may input at least one Chinese character using either Pinyin or stroke input, or a combination thereof. The user may then perform a sweeping motion in relation to the touch screen to change the input mode to English. For example, the user may sweep a finger across the top of the touch screen to change the input mode to English. In this mode, the keypad presents Latin characters. The user then proceeds to input Latin characters using the Latin keypad displayed on the touch screen. Alternatively, the user may repeat a series of sweeping motions; e.g., the user sweeps a finger across the top of the touch screen, repeatedly, changing the input mode with each sweeping motion, until a digit keypad is displayed and digit input mode is active. The user may then proceed to enter at least one digit, adding the at least one digit to the series of Chinese characters already contained in the message. It will thus be appreciated that the user may switch between different input modes while composing a single message, a command, a name, a data entry or another such input, including at least two different types of characters, in an easy and simple and convenient manner.

[0052] Further in accordance with an embodiment of the present invention, a keypad displaying emoticons is displayed. In this mode, the user may select an emoticon to be entered into the text of a message, or such other input.

[0053] Yet further in accordance with an embodiment of the present invention, drawings, including inter alia, emoticons, are constructed in a similar manner to XT9 stroke input. In this mode, the user interface displays the basic building blocks for the drawing, such as a curve, a semicolon, a circle, and other symbols. As the user taps multiple symbols, possible drawings or emoticons that can be formed using the selected elements are displayed, and the user may either select the desired complete drawing or emoticon from the displayed list, or may continue entering additional building blocks until only one option remains. This mode of input is convenient as the number and size of the keys presented is optimized for the number of

[13]

available building blocks, and each key only displays information relevant for the active input mode.

[0054] Embodiments of the present invention provide methods and systems for enabling multiple input modes, whereby the screen display in each input mode is optimized for that mode. Optimizations include (i) configuring the number of keys displayed, (ii) configuring the size, position and shape of the keys in relation to the screen, (iii) configuring the size, position and shape of the area of the display showing text already entered, (iv) configuring the size, position and shape of the area of the display showing possible completions for the current character, phrase or symbol, and (v) displaying only at least one character, symbol, digit or other figure that is relevant to the active input mode on each key.

[0055] Embodiments of the present invention also provide methods and systems for enabling multiple input modes and switching between the input modes by performing a sweeping motion in relation to the screen. These methods and systems are easier and more convenient than using a menu interface to switch input modes. Additionally, these methods do not use up screen space to provide a switching key, to switch between input modes, and, as such, screen space may be used for information related to the current input mode and the current text. These methods and systems also enable switching between many input modes, by repeating the sweeping motions to advance through the input modes. In the N2 phone manufactured by Neonode AB, this mode of switching active keypads is used with standard 12-key keypads, for example, inter alia, switching between numeric, Swedish and English keypads. However, switching the layout of the keys is not used in the Neonode N2 phone. Moreover, other, prior art methods of switching between input modes require more than one action to advance through a list of input modes.

[0056] Reference is now made to **Figs. 3** and **9-45**, which include several exemplary touch screen interfaces. Shown in **Fig. 3** is a touch screen interface, displaying a clock dial in the lower left corner of the screen. Several

[14]



gadgets are displayed in the touch screen, each gadget representing an application that runs on the phone. A gadget is an application running on the phone. In their icon like state, gadgets are also running showing information like latest incoming message, current song played, currency, weather etc. A gadget can be any type of application. Example gadgets include: streaming radio, note book, web mail, phone application, clock. A gadget can be updated with information both from the phone (new SMS) or from a third party over the Internet (RSS feed). A gadget in an icon state on the home screen can only occupy a defined space. In most cases a gadget can be expanded and either displayed as an overlay directly on the home screen like the volume control or displayed as a full screen application like the camera.

[0057] Problem: it is hard to hit the right item on a touch display because when you move the finger to and from the surface it is also easy to move it in the X-Y direction by mistake, especially when used with one hand. According to embodiments of the present invention, the solution to this problem is to use a conventional touch technology to find the object's X-Y position, add tactile or graphical illustration of where your finger is, and add a force sensor to the display to read the activation. Thus, according to embodiments of the present invention, selection and subsequent activation of an on-screen element, such as, inter alia, a gadget, a letter, a key, a button or an icon, is implemented by two primary features. The first feature, referred to as pressure sensing, provides the touch screen with one or more pressure sensors operative to determine contact with the screen by an external object such as a finger. In one embodiment, the user places a finger or a stylus over the desired on-screen element to select it, as illustrated in **Figs. 4-7**, and then applies pressure to the screen to activate the on-screen element, as illustrated in **Fig. 8**. In another embodiment, the user selects the on-screen element by placing a finger or stylus over the position of the on-screen element but not in contact with the screen. Several touch screen devices, such as certain light-based touch screens and certain tablet personal computers, enable detection of a

[15]

finger or other pointing device over a position on the screen without making actual contact. Applicant's U.S. patent application no. 12/371,609, now U.S. Patent No. 8,339,379, for LIGHT-BASED TOUCH SCREEN, filed on 15 Feb. 2009, is incorporated herein in its entirety by reference. In another embodiment, the user selects the on-screen element with a finger or other pointing device in contact with the screen and activates the on-screen element by removing his finger or pointing device from contact with the screen. In another embodiment, the user selects the on-screen element with a finger or other pointing device in contact with the screen and activates the on-screen element by increasing the pressure of contact with the screen. In this case the pressure sensor distinguishes between the initial contact and the subsequent high pressure contact. This is illustrated in **Figs. 7** and **8** showing a profile of a finger in contact with a display, where only the thickness of the display is shown. In **Fig. 7** the finger moves across the screen to select at least one element. Movement across the screen is indicated by a double-tipped arrow parallel to the screen surface. Once an element is selected by positioning the finger over a desired element, the element is activated by applying pressure to the screen as indicated by the down-pointing arrow in **Fig. 8**.

[0058] The second feature, referred to as callout balloons, indicates a selected on-screen element to the user by displaying a graphic, such as by (i) enlarging the on-screen element, (ii) displaying a callout balloon with a copy of the on-screen element inside, or (iii) a combination thereof. The callout balloon is illustrated in **Figs. 5** and **6**. **Fig. 5** shows a star inside a callout balloon, and **Fig. 6** shows the letter 'A' inside a callout balloon. As the user moves his finger over the screen, different callout balloons appear. Callout balloons are generated in such a manner that the user's finger and hand do not obstruct the user from viewing the callout balloon. Thus, for example, the callout balloon appears above the finger as shown in the figures. When the finger is at the top of the screen the callout balloon is displayed off to a side of

[16]

the screen that is visible to the user. The user may configure the interface to display callouts to the left or right of his finger. For example, a user who operates the phone with his left hand may prefer to display callout balloons off to one side of his finger, and a user who operates the phone with his right hand may prefer that callout balloons display to the other side of his finger. These two features of pressure sensing and callout balloons can be applied separately or in combination.

[0059] In accordance with an embodiment of the present invention, touch screens for phones captioned "Power ON / Power OFF" are shown in **Figs. 9-11**. Two phones are displayed under the "Power ON" caption; namely, a first phone (**Fig. 9**) with a blank screen, indicating that power is off, and a second phone (**Fig. 10**) with gadgets displayed thereon, indicating that power is on. A "home key" is displayed at the bottom of the phones. Activating the home key, such as by touching the key, causes the power to be turned on. A single phone is displayed in **Fig. 11** under the "Power OFF" caption. Touching the home key for an extended period of time, such as for 5 seconds, causes the phone to power off. An "off" gadget is shown at the bottom center of the display screen. Activating the "off" gadget also causes the phone to power off.

[0060] Additionally in accordance with an embodiment of the present invention, touch screens for phones captioned "Key lock" are shown in **Figs. 12-15**. In **Fig. 12** a lock gadget is displayed in the lower right corner of the screen. Activating the lock gadget, such as by pressing on it, causes the phone to lock. When the phone is locked activation of the phone is restricted in some manner. E.g., when the phone is locked, touching the screen in a way that would activate a gadget when the phone is unlocked, does not activate the gadget when the phone is locked. In order to unlock the phone, the user activates the home key, located at the bottom center of the device, as shown in **Fig. 13**. **Fig. 14** shows the phone after it has been unlocked: gadgets are now displayed on screen and are activated in response to user input.

[17]

[0061] Further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Key lock high security" is shown in **Fig. 15**. When the home key is activated, such as by touching the home key, a keypad is displayed and a user is prompted to enter a security code. Subsequently, the phone cannot be unlocked unless the security code is entered. Optionally, additional security is implemented by use of fingerprint identification, wherein the phone cannot be unlocked unless a fingerprint is authenticated. Optionally, additional security is implemented by requiring the user to glide a finger over the screen in a designated gesture, in order to unlock the phone. The phone cannot be unlocked unless the touch screen detects the designated gesture. Examples of designated gestures include inter alia, an "S" shaped gesture, or a gesture wherein multiple corners of the screen are touched concurrently or in sequence. Optionally, additional security is implemented by displaying a musical keypad or keyboard and the user must play a particular tune of at least one note on the keypad or keyboard in order to unlock the phone.

[0062] Yet further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Home / return from application" is shown in **Figs. 16-17**. An application display screen is shown in **Fig. 16**, indicating that the user is running an application that substantially occupies the screen. A basic screen is shown in **Fig. 17**, for activating gadgets and applications. In order to return from the application screen (**Fig. 16**) to the basic screen (**Fig. 17**), the user activates the home key displayed at the bottom of the phone, such as by touching the home key. Tapping on the home key causes the open application to remain open, and causes the basic screen to display, thereby enabling launching additional applications. According to an alternative embodiment, tapping on the home key causes the open application to be closed.

[0063] Moreover in accordance with an embodiment of the present invention, a touch screen for a phone is shown in **Figs. 18-21**. Four phones are

[18]

displayed, each phone illustrating a different method and system for a touch-based user interface scroll operation. Scrolling is useful when multiple gadgets are available for the user to activate or use, but not all of the gadgets are displayed on the screen at one time. In this case, the user can scroll to expose additional gadgets and to hide some of the previously visible gadgets. In **Fig. 18**, the user sweeps his finger or other interface input, such as inter alia a stylus, along the screen in a direction indicating that he would like to uncover additional gadgets and cover exposed gadgets. E.g., sweeping a finger across the width of the screen from right to left causes gadgets virtually located beyond the left screen border to be exposed, and causes gadgets previously located along the right screen border to be hidden. Similarly, sweeping a finger across the height of the screen from the bottom to top causes gadgets virtually located above the top edge of the display to be exposed, and gadgets previously located at the bottom edge of the screen to be hidden. In this embodiment, the user scrolls directly on the screen. Then we miss the possibility to touch and drag on other gadgets.

[0064] In **Fig. 19** a scroll cursor is shown along the right edge of the screen. The user touches the cursor and makes a sliding gesture along the right edge of the screen to cause gadgets virtually located beyond the bottom edge of the screen to be exposed, and causes gadgets previously situated at the upper edge of the screen to be hidden. This embodiment uses a scrollbar. The user puts a finger on the side and scrolls down to get lower down on the page.

[0065] In **Fig. 20** a button gadget is shown with two opposite arrows at the lower right corner of the screen. The user selects this gadget by touching one of the arrows, which causes the screen display to scroll according to the direction of the touched arrow. In this embodiment a drag button is provided. The user puts a finger on the button to drag the screen up or down.

[0066] In **Fig. 21** two arrow gadgets are shown at the top and bottom of the display screen. The user selects one of the two arrows, which causes the screen display to scroll according to the direction of the selected arrow. In

[19]

this embodiment two drag buttons are provided that operate like the single drag button illustrated in **FIG. 20**. The user puts a finger on the lower scroll button to drag the screen up, or on the upper scroll button to drag the screen down.

[0067] Additionally in accordance with an embodiment of the present invention, a touch screen for a phone is shown in **Fig. 22** based on the scrolling with a scrollbar illustrated in **FIG. 19**. A dark border indicates the physical limits of the display screen. Gadgets are shown extending above and below the screen, indicating virtual locations of additional gadgets. By scrolling, the user causes successive display of additional gadgets, substantially in the order in which they appear in their virtual locations. The original display is denoted in the figure as the "Home area". At the bottom of the gadget list is a series of links updated by external feeds, such as Internet websites, for installing new gadgets into the phone.

[0068] After the user scrolls to reveal additional gadgets and a specific time limit has elapsed, e.g., 3 seconds, the screen automatically returns to a default display, hiding recently exposed gadgets and revealing previously hidden gadgets. Such return to default display is of advantage for revealed gadgets that do not require extended viewing, such as, inter alia, a clock or a weather report. The return to default display obviates the need for the user to perform an action in order to return the screen to its initial display. Activating the home key after scrolling also returns the screen to its initial display, showing the originally displayed gadgets and hiding the recently revealed gadgets. Such return to initial display is graphically presented (i) by returning the original display completely, (ii) by fading in the original display over the current scrolled display, (iii) by gradually displacing the scrolled display with the original display, (iv) by graphically scrolling the display in reverse to the original display, or (v) by a combination of such presentations. The user puts a finger on the screen and scroll bar handle and drags down to display more gadgets down the page. The user uses the Home button to get back to the

[20]

home area. An optional feature: the user puts a finger on the scroll bar handle and drags up to display upper gadgets that are less frequently used. The screen is automatically scrolled back three seconds after the finger is removed.

[0069] Further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Fav 5" is shown in **Figs. 23-24**. Two phones are displayed under the "Fav 5" caption. In **Fig. 23** the "Fav 5" gadget is shaded indicating that it is activated. **Fig. 24** shows what this gadget does; namely, it displays five contacts that the user previously selected as his favorite five contacts. The "Fav 5" is a speed-dial interface for placing a call or otherwise contacting a person without having to navigate multiple menus or scroll through a large contact list. Each contact is shown with three buttons on the screen: "CALL", "SMS" and "MORE". By tapping on "CALL", a user causes initiation of a phone conversation with the contact. Similarly, by tapping on "SMS", a user causes initiation of an SMS message to the contact. By tapping on "MORE", a user is able to rearrange or edit contact details and to edit the contact's position within the "Fav 5" gadget.

[0070] Further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "History" is shown in **Figs. 25-26**. Two phones are displayed under the "History" caption. A "history" gadget displays a user's call history, including incoming, outgoing and missed calls. The phone's user interface is similar to that of the "Fav 5" phone, including "CALL", "SMS" and "MORE" buttons for each contact. Optionally, an SMS history, for sent SMS messages, for received SMS messages, or for both sent and received SMS messages, is also included in the history list. The history list is generally longer than the number of contacts that fit within a single screen, and the user scrolls up and down the list to locate and select a desired contact.

[0071] Yet further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Telephone" is shown in **Figs. 27-28**. Two phones are displayed under the "Telephone" caption. A

[21]

"Telephone" gadget is shown shaded in **Fig. 27**. The "Telephone" gadget displays the carrier name, signal strength and other relevant information. Activating the "Telephone" gadget, such as by tapping on the screen at the gadget location, causes the screen shown in **Fig. 28** to appear. At the top of the display an active number is shown. The active number is entered by the user (i) using the keypad shown in the bottom half of the screen, or (ii) by selecting one of the contacts shown in the contact list in the upper half of the screen. The user scrolls the contact list to display a desired contact that is not currently exposed. The user also searches for a contact by entering the contact name using the alphanumeric keypad displayed in the bottom half of the screen. The user selects one of two modes, (i) number entry, or (ii) alphabetized search, by respectively selecting "Name" or "Number" at the bottom center of the screen. Selecting "Name" causes an alphabetic keypad to be displayed, and selecting "Number" causes a numerical keypad to be displayed. When a number or contact is selected, the user presses "Call" at the lower right corner of the screen to initiate the call.

[0072] Moreover in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Active call" is shown in **Figs. 29-30**. Two phones are displayed under the "Active call" caption. The phones are displayed during an initiated call. **Fig. 29** is presented for outgoing calls. The contact name occupies the entire upper half of the screen, for clear display of who is being called. Pressing on the "More" button enables call options such as mute and hold, and also enables editing an active contact's details, sending an SMS and other functions.

[0073] **Fig. 30** is presented for incoming calls, which are displayed as a callout overlaying the existing screen display. Such overlay may be a blended overlay, or a complete overlay. The callout stretches across the screen and is presented in an animated fashion, such as wiggling. In addition to the identity of the caller, three buttons, "ANSWER", "DENY" and "QUIET" are presented to respectively answer the call, reject the call or mute the ring.

[22]



[0074] Additionally in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Volume" is shown in **Figs. 31-32**. Two phones are displayed under the "Volume" caption. **Fig. 31** includes "+" and "-" volume buttons on the left edge of the phone. When one of the buttons is pressed, a "volume" gadget appears on screen is shown in **Fig. 32**. The user scrolls within the "volume" gadget to adjust the magnitude of volume and to select a sound source. Two sound sources are shown in **Fig. 32**; namely, "Mp3" and "Call". The "volume" gadget disappears after it is not engaged by the user for a designated time period, such as four seconds. The "volume" gadget disappears with an animated flourish such as, inter alia, ducking into a corner of the screen before disappearing, fading, shimmering, or a combination thereof. When the two sound sources shown in **FIG. 32** are displayed, the user can select to change to another sound source. The sound source control of **FIG. 32** disappears after four seconds.

[0075] Additionally in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Mp3 player" is shown in **Figs. 33-34**. Two phones are displayed under the "Mp3 player" caption. **Fig. 33** includes an "Mp3" gadget. The "Mp3 gadget" operates similarly to the "volume" gadget, in that it disappears after it is not engaged by the user for a designated time period. The "play list" button displays a playlist of songs (not shown). The active song, indicated in **Fig. 34** as "Maria C", is listed at the top, and buttons are provided for stop, play/pause, forward and backward.

[0076] Further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Operator ad" is shown in **Figs. 35-37**. The "Operator ad" screen enables presentation of advertising offerings on the phone. Two phones are displayed under the "Operator ad" caption. **Fig. 35** is presented prior to displaying an offering. **Fig. 36** is a pop-up window that is overlaid on at least a portion of the screen. The user presses "GO" to activate the offer. **Fig. 37** includes, as its topmost gadget, a display for an offering of 100 free SMS messages. The display for the offering displaces the topmost

[23]

gadget that was previously displayed in **Fig. 35**, and the user may scroll the display, as described hereinabove, in order to view the displaced gadget. Tapping on the offering activates the gadget and causes inter alia an operator webpage or Java application to open. When the user activates the offering, a payment may be generated for the phone manufacturer, reseller or other vendor.

[0077] Yet further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Video" is shown in **Figs. 38-39**. Two phones are displayed under the "Video" caption. A "Video" gadget is shown shaded in **Fig. 38**. Activating the "Video" gadget causes a video display screen to open, as shown in **Fig. 39**. Video controls such as play/pause, stop, volume control and open new video file, are provided on screen in **Fig. 39**. When the controls are not engaged by the user for a designated time period, they disappear, either directly or with an audio or visual presentation effect such as fading, shimmering, shrinking, ducking into a corner of the screen, or a combination thereof.

[0078] Yet further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Camera" is shown in **Figs. 40-42**. Three phones are displayed under the "Camera" caption. A "camera" gadget is shown shaded in **Fig. 40**. When the user activates the "Camera" gadget, a viewfinder is presented, as shown in **Fig. 41**. The right side of the viewfinder displays controls for capturing an image, sending an image via multi-media message (MMS), and a "MORE" button for enabling additional options, such as inter alia changing camera settings, changing image resolution, setting camera effects and applying image processing functions. If the user selects "Send MMS", an interface for selecting at least one recipient for the MMS is displayed. **Fig. 42** illustrates an interface of this nature, enabling entering a phone number using the keypad in the bottom half of the screen, or selecting a contact from a list shown at the top half of the screen. The user can also access his "FAV 5" gadget to quickly access contacts, as

[24]

described hereinabove. When the user selects "Send" the image is sent via MMS to the selected at least one recipient.

[0079] Yet further in accordance with an embodiment of the present invention, a touch screen for a phone captioned "Messaging SMS" is shown in **Figs. 43-45**. Three phones are displayed under the "Messaging SMS" caption. An "SMS" gadget for sending and viewing SMS messages is shown shaded in **Fig. 43**, indicating that the user has activated this gadget, for example by tapping on it. Activating the "SMS" gadget causes an interface for viewing and composing SMS messages to open, as illustrated in **Fig. 44**. The user scrolls down the list of messages arranged in an order, such as (i) by date and time received, (ii) alphabetically according to the sender name or subject, (iii) by thread of correspondence grouping all messages belonging to a single conversation together, or such other sorting method or combination thereof. Displayed with each message are the time of the message, the sender and the sender's phone number. To compose a new message the user activates the "Empty message button" shown at the top of the list in **Fig. 44**. To open a message the user selects it from the list and selects "Open" in the bottom right corner of the screen. To view a list of sent messages, the user selects the "Sent" button shown in the bottom center of the screen. To open drafts of messages, the user selects the "Draft" button shown at the bottom center of the screen. Selecting the "More" button shown at the bottom left of the screen causes an interface for more options to open, including inter alia (i) configuring how the list of messages is displayed, (ii) configuring how messages are sorted, (iii) deleting messages, and (iv) saving messages to designated folders. In an alternative embodiment, the interface for accessing and viewing messages operates substantially as a call history interface.

[0080] **Fig. 45** shows an interface for composing a new message. When the message being composed is a reply to a previously received message, the previously received message is displayed, for example, inside a callout graphic as shown in the rightmost phone. A QWERTY keyboard interface is provided

[25]

for composing a new message. In **Fig. 45**, the new message is shown at the right side of the white area of the display following the name of the recipient, "To Amber:". Selecting the "Send" button causes the new message to be sent to the recipient. Selecting the "New" button causes a new message interface to open. Selecting "More" enables additional options. Selecting the "123" button at the bottom left of the keypad shown in the figure toggles the keypad from QWERTY to a numeric keypad. Other types of keypads are also supported and toggled by additional presses of the "123" button. Whenever a new keypad is displayed, the "123" toggle button displays an indicator of the next keyboard to be displayed. For example, when the next press of the toggle button will cause an English keypad to be presented, the toggle button will display the letters "En" instead of "123". If the next press of the toggle button will cause an English keypad to be presented and the T9 language prediction to be turned on, the toggle button will display the characters "T9 En".

[0081] **Figs. 46-54** show a series of nine phones, to illustrate a user interface. Each phone in **Figs. 46-54** shows a finger and a phone display containing an item "G3". On a device having a limited display area, an open application, such as a web browser, occupies a large portion of the display area. This prevents displaying additional useful information to the user from other applications, gadgets and web sessions, at the same time. According to an embodiment of the present invention, gadgets are arranged in a contiguous series or stack, as shown in **Fig. 46** labeled "Home screen", with gadgets **G1-G6** displayed on screen and additional gadgets **G7-G9** virtually situated below the bottom edge of the screen. The user scrolls the sequence of gadgets, revealing gadgets previously virtually situated beyond one edge of the screen or display window, and hiding gadgets previously situated at an opposite edge of the screen or display window.

[0082] The effect of the scrolling activity is illustrated in **Fig. 47** labeled "Pan home screen". The user sweeps his finger in an upward direction along the length of the screen to cause the display to scroll, and thereby reveal gadgets

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virtually situated in the opposite direction of the user's finger sweep.

Comparing **Fig. 47** to **Fig. 46**, it is seen that the scroll action has caused gadgets **G1** and **G2** to be hidden, and gadgets **G7** and **G8** to be revealed. **G3** - **G6** are correspondingly displayed closer to the upper edge of the screen, in accordance with the scrolling action.

[0083] **FIGS. 48 – 50** illustrate how when a web gadget is activated – all gadgets beneath the web gadget slide down and disappear. Instead, the browser takes this space. When a gadget is activated, for example by tapping on the screen position associated with the gadget, the display area of the selected gadget extends in one direction, for example down-screen to the bottom of the screen or beyond the bottom of the screen. This extension is shown in **Fig. 50** labeled "open gadget / browser". In this figure, a "CNN headlines" gadget is shown extending beyond the bottom edge of the screen. When a gadget is open, the user has two scrolling options: (i) scroll the stack of gadgets, and (ii) scroll the window of the open gadget. The initial position of the user's scrolling finger determines which scrolling option will occur. When the initial position of the scrolling finger is at a height of the screen aligned with un-open gadgets in the stack of gadgets, the option to scroll the stack of gadgets is active. This is illustrated in **Figs. 51-52** labeled "Panning Gadget." **Fig. 51** shows the initial scrolling finger position aligned with un-open gadgets in the gadget stack. **Fig. 52** illustrates sliding the finger in the direction of the top of the screen, thereby shifting the entire gadget stack up. It is noted that shifting also shifts the visible portion of the open gadget as an integral part of the gadget stack. The second option of scrolling only the active gadget is illustrated in **Figs. 53-54** labeled "Panning Web." In **Fig. 53** the initial position of the scrolling finger is shown aligned with an area of the screen displaying the open gadget. **Fig. 54** illustrates the scrolling action whereby only the data inside the open gadget is shifted in response to sweeping the finger towards the top of the screen, as indicated by the arrow; the stack of unopened gadgets is not shifted. The present invention addresses

[27]

the problem that only one browser session can be opened at a time. How can we tell the user that in an intuitive way and still stay in the same screen and keep important information at the top? The solution, in some embodiments of the invention, is to always open the browser towards the bottom of the screen and keep content above the browser gadget.

[0084] In the foregoing specification, the invention has been described with reference to specific exemplary embodiments thereof. It will, however, be evident that various modifications and changes may be made to the specific exemplary embodiments without departing from the broader spirit and scope of the invention as set forth in the appended claims. Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense.

[28]

## APPENDIX A

### USER INTERFACE

#### TECHNICAL FIELD

[0001] The present invention relates to a user interface for a mobile handheld computer unit, which computer unit comprises a touch sensitive area, and which touch sensitive area is divided into a menu area and a display area.

[0002] The computer unit is adapted to run several applications simultaneously and to present any active application on top of any other application on the display area.

[0003] The present invention also relates to an enclosure for a handheld computer unit.

[0004] The present invention also relates to a computer readable medium. A computer program product with computer program code is stored within the computer readable medium, which code, when read by a computer, will make it possible for this computer to present a user interface according to the invention.

DESCRIPTION OF BACKGROUND ART

[0005] Mobile handheld computers are known in various embodiments. One kind of handheld computer is the personal digital assistant (PDA), which is getting more and more powerful.

[0006] Another kind of handheld computer unit is the mobile phone, which also is getting more and more powerful. There are also examples of where the mobile phone and the PDA are merging into one unit.

[0007] A third kind of handheld computer is the laptop computer, which is getting smaller and smaller, even competing in size with the PDA's.

[0008] The need to manage more information has led the development towards new solutions regarding user interfaces and navigation. The PDA's and mobile phones are getting larger and larger in order to provide a user-friendly interface.

[0009] Since the users have gotten used to small handheld units, it is hard to move towards larger units. This has led to foldable keyboards, different kinds of joy sticks and different kinds of touch sensitive displays and pads intended to help in providing a user interface that is suitable for small handheld compute units.

[30]



## SUMMARY OF THE PRESENT INVENTION

### **Technical Problems**

[0010] It is a problem to provide a user-friendly interface that is adapted to handle large amount of information and different kinds of traditional computer-related applications on a small handheld computer unit.

[0011] It is a problem to provide a user interface that is simple to use, even for inexperienced users of computers or handheld devices.

[0012] It is a problem to provide a small handheld computer unit with an easily accessible text input function.

[0013] It is also a problem to provide a simple way to make the most commonly used functions for navigation and management available in the environment of a small handheld computer unit.

### **Solution**

[0014] Taking these problems into consideration, and with the starting point from a user interface for a mobile handheld computer unit, which computer unit comprises a touch sensitive area, which touch sensitive area is divided into a menu area and a display area, which computer unit is adapted to run several applications simultaneously and to present an active application on top of any other application on the display area, the present invention teaches that the menu area is adapted to present a representation of a first, a second and a third predefined function, where the first function is a general application dependent function, the second function is a keyboard function, and the third function is a task and file manager. The present invention also teaches that any one of these three functions can be activated when the touch sensitive area detects a movement of an object with its starting point within the representation of the function on the menu area and with a direction from the menu area to the display area.

[31]

[0015] With the purpose of providing a simple way of managing any application or the operations system, the present invention teaches that if the first function is activated, the display area is adapted to display icons representing services or settings, depending on the current active application. One of the icons always represents a "help"-service, regardless of application. The icons are adapted to represent services or settings of the operations system of said computer unit, such as background picture, clock, users, help, etc. if no application is currently active on the computer unit.

[0016] Selections of preferred service or setting is done by tapping on corresponding icon.

[0017] With the purpose of providing the access to a text input function in any application in the computer unit, the present invention teaches that when the second function is activated, the display area is adapted to display a keyboard and a text field,

[0018] If a text passage in an active application is highlighted, then this text passage is displayed in the text field for editing through the keyboard and that the highlighted text passage is replaced by the edited text passage when the second function is deactivated.

[0019] If no text passage in an active application is highlighted, then the text field is available for inputting and editing of text through the keyboard.

[0020] In the case of the latter the first function can be activated, or the second function can be closed, in which a choice of saving or deleting the inputted text is given. The choice of saving the inputted text results in an activation of the first function. In this case the first function will present services or settings available for the inputted text, such as saving the inputted text for later use, using the inputted text as telephone number in a telephone application, or sending the inputted text as message in communications application.

[0021] In order to provide a task and file management in a user interface for a handheld mobile computer, the present invention teaches that, if the third

[32]

function is activated, the display area is adapted to display a list with a library of available applications and files on the computer unit. A selection of an application will start the application, and a selection of a file will open the file in an application intended for the file.

[0022] A selection of an application or a file is done by moving the object so that the representation of desired application or file is highlighted, removing the object from the touch sensitive area, and then tapping on the touch sensitive area.

[0023] According to the present invention a navigation in the list is performed by moving the object in a direction towards the top of the list or towards the bottom of the list. This will cause the marking to move in the same direction. The speed of the movement of the marking is lower than the speed of the movement of the object, with the purpose of making the navigation easier.

[0024] The user interface of the present invention is specifically adapted to be used with a small computer unit where the size of the touch sensitive area is in the order of 2-3 inches, The user interface is also adapted to be operated by one hand, where the object can be a finger, such as the thumb, of a user of the computer unit.

[33]

**Advantages**

[0025] Those advantages that can be primarily associated with a user interface or a computer readable medium according to the present invention reside in the ability to establish a user-friendly interface for small handheld computers, both regarding general application set-up functions, text input functions, and file and task management.

[34]

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The present invention will now be described in more detail with reference to the accompanying drawings, in which

[0027] **Figure 1** is a schematic and highly simplified view of a touch sensitive area on a mobile handheld computer unit;

[0028] **Figure 2** is a schematic side view illustrating the activation of a function;

[0029] **Figure 3** is a schematic illustration of a first function;

[0030] **Figure 4** is a schematic side view illustrating the selection of a service or setting represented by an icon;

[0031] **Figure 5** is a schematic illustration of a second function;

[0032] **Figure 6** is a schematic side view illustrating the selection of a third function;

[0033] **Figure 7** is a schematic illustration of an application or file;

[0034] **Figure 8** is a schematic illustration on how navigation is performed;

[0035] **Figure 9** is a schematic illustration of how the content of the display are is changed;

[0036] **Figure 10** is a schematic side view further illustrating how navigation is performed;

[0037] **Figure 11** is a schematic illustration of moving forwards in an application;

[0038] **Figure 12** is a schematic illustration of moving backwards in, or closing, an application;

[0039] **Figure 13** is a schematic illustration of an enclosure

[35]

DESCRIPTION OF EMBODIMENTS AT PRESENT PREFERRED

[0041] **Figure 1** illustrates a user interface for a mobile handheld computer unit. The user interface according to the present invention is specifically adapted to computer units comprising a touch sensitive area **1**, which is divided into a menu area **2** and a display area **3**. It should be understood that there are several different kinds of known touch sensitive displays and that the present invention does not depend on what kind of touch sensitive display that is used in relation to the inventive user interface.

[0042] The computer unit is adapted to run several applications simultaneously and to present an active application on top of any other application on the display area **3**. It should be understood that by simultaneously it is meant any technology that will make it appear to a user of the computer unit that applications are run simultaneously and that the present invention does not depend on how this is realised, whether it is through time-sharing of one processor, parallel use of several processors, or any other technique.

[0043] According to the present invention the menu area **2** is adapted to present a representation of a first **21**, a second **22** and a third **23** predefined function.

[0044] The first function **21** is a general application dependent function, the second function **22** is a keyboard function, and the third function **23** is a task and file manager.

[0045] **Figure 2** shows that any one of these three functions **21**, **22**, **23** can be activated when the touch sensitive area **1** detects a movement of an object **4** with its starting point **A** within the representation of a function on the menu area **2** and with a direction **B** from the menu area **2** to the display area **3**.

[0046] **Figure 3** shows that if the first function **21** is activated, then the display area **3** is adapted to display icons **211**, **212**, **213**, **214**, **215**, **216** representing services or functions depending on the current active application. One of the icons, in the figure exemplified by icon **211**, always represents a

[36]

"help"-service, regardless of application. Any key that, because of lack of space on the display area, or because the key should be hidden from the active application, or because of any other reason is not shown on the display area of an active application, can be represented by one of the icons **212, 213, 214, 215, 216** that is shown when the first function **21** is activated.

[0047] If for instance the active application handles a picture, then the icons that are shown when the first function is activated can be services such as "save to disk", "send as SMS", or "delete" and they can be settings such as "resolution", "colour", or "brightness".

[0048] If no application is currently active on the computer unit, then the icons **211, 212, 213, 214, 215, 216** are adapted to represent services or settings of the operations system of the computer unit, such as background picture, clock, alarm **215**, users **213**, help **211**, etc.

[0049] **Figure 4** shows that selection of a preferred service or setting is done by tapping **C, D** on corresponding icon **213**.

[0050] **Figure 5** shows that if the second function **22** is activated, then the display area **3** is adapted to display a keyboard **221** and a text field **222**.

[0051] Two different scenarios can be at hand when this function key is activated. A first scenario can be that a text passage in the active application is highlighted as the second function is activated. If this is the case then the highlighted text passage is displayed in the text field **222** for editing through the keyboard **221**.

[0052] The highlighted text passage is replaced by the edited text passage when the second function **21** is deactivated.

[0053] A second scenario can be that no text passage in the active application is highlighted. If this is the case then the text field **222** is available for inputting and editing of text through the keyboard **221**.

[0054] In the case of the latter scenario, the first function **21** can be activated, or the second function **22** can be closed. If the second function **22** is closed

[37]

then a choice of saving or deleting the inputted text is given, where the choice of saving the inputted text results in an activation of the first function **21**.

[0055] As the first function **21** is activated with the second function **22** as currently active application the first function **21** will present services or settings available for the inputted text, such as saving the inputted text for later use, using the inputted text as telephone number in a telephone application, or sending the inputted text as message in communications application, such as e-mail, SMS, or fax.

[0056] **Figure 6** shows that if the third function **23** is activated, then the display area **3** is adapted to display a list **231** with a library of available applications and files on the computer unit.

[0057] A selection of an application will start the application, and a selection of a file will open the file in an application intended for the file. The name of a selected file can be edited by activation of the second function **22** as the file is highlighted.

[0058] **Figure 7** shows that a selection of an application or a file is done by moving **E** the object **4** so that the representation of desired application or file is highlighted, removing **F** the object **4** from the touch sensitive area **1**, and then tapping **G**, **H** on the touch sensitive area **1**.

[0059] An application or file is highlighted by placing some kind of marking **232** on the representation of the application or file. This marking can be done in different ways, for example by putting a frame around the representation of the application or file, as shown in the figure, or by inverting the representation of the application or file.

[0060] It should be understood that all lists in the computer unit, such as a list of contact information in an address book, a list of e-mail messages in a mailbox, or a telephone log, can be managed in the above described manner.

[0061] The list **231** can be adapted to present only files or only applications. In this case, the top area of the list **231** can present a field **233** through which the content of the list **231** can be altered. If the list only presents files, then the

[38]



field **233** can display a representation of a task manager and a selection of the field **233** will cause the list **231** to alter to present only applications, and if the list **231** only presents applications, then the field **233** displays a representation of a file manager and a selection of the field **233** will cause the list **231** to alter and present only files.

[0062] **Figure 8** shows that navigation in the list is performed by moving the object **4** in a direction **I** towards the top **231a** of the list **231** or towards **J** the bottom **231b** of the list **231**. This movement **I, J** of the object **4** will cause the marking **232** to move **K, L** in the same direction. The speed of the movement **K, L** of the marking **232** is lower than the speed of the movement **I, J** of the object **4**.

[0063] **Figure 9** shows that if the number of applications and/or files in the list **231** exceeds the number of applications and/or files that can be presented on the display area **3**, and if the object **4** is moved to the top or bottom position of the display area, then lifted, replaced on the display area, and then again moved to the top or bottom of the display area, then the content of the display area will be replaced one whole page, meaning that if the object **4** is positioned **N** at the bottom **3b** of the display area **3**, then lifted, replaced on the display area **3**, and then again moved **M** to the bottom **3b** of the display area **3**, then the content **31** of the display area **3** will be replaced **P** by the following applications and/or files **32** in the list **231**. In the same way, but not shown in the figure, if the object is position at the top of the display area, then lifted, replaced on the display area **3**, and then again moved to the top of the display area, the content of the display area will be replaced by the preceding applications and/or files in the list.

[0064] **Figure 10** shows that if the object **4** is removed **Q** from a first position **33** on the display area **3** and then replaced **R, S** on a second position **34** on the display area **3**, then the navigation can be continued **T** from the second position **34**.

[39]

[0065] **Figure 11** shows that moving **U** the object **4** from the left of the display area **3** to the right of the display area **3** moves the active application, function, service or setting on one step forwards. **FIG. 12** shows that, in a similar manner, the active application, function, service or setting is closed or backed one step by moving **V** the object **4** from the right of the display area **3** to the left of the display area **3**.

[0066] As shown in **figure 1**, the menu area **2** is positioned at the bottom of the touch sensitive area **1**. The representation of the first function **21** is positioned at the left side of the menu area **2**, the representation of the second function **22** is positioned at the middle of the menu area **2**, and the representation of the third function **23** is positioned at the right side of the menu area **2**.

[0067] As shown in **figure 13**, the present invention relates to a user interface for a hand held mobile unit that preferably can be manageable with one hand. Hence the present invention teaches that the user interface is adapted to a touch sensitive area **1** with a size that is in the order of 2-3 inches, meaning the diagonal distance **W** between two corners of the touch sensitive area **1**.

[0068] The user interface is adapted to be operated by one hand, where the object **4** can be a finger, such as the thumb shown in the figures, of a user of the computer unit. It should be understood though that the present invention might also be used with another object, such as a pen or other pointing device.

[0069] According to one preferred embodiment of the present invention the computer unit is covered with an enclosure **5**, which is provided with an opening **51** for the display area **3**, and where the representations of the menu area **2** is printed on top of the enclosure **5**. It should be understood that the opening **51** might be a transparent part of the enclosure **5** or that it might be an open aperture depending on among other things technical considerations pertaining to the touch sensitive area **1**.

[0070] This makes it possible to allow the enclosure **5** to be removable and exchangeable.

[40]

[0071] **Figure 14** shows a computer readable medium, in the figure schematically shown as a solid-state memory **61**. A computer program product is stored within the computer readable medium. This computer program product comprises computer readable code **62**, which, when read by a computer **6**, will make it possible for the computer **6** to present a user interface according to the present invention.

[0072] The present invention also teaches that the computer program product is adapted to function as a shell upon an operations system.

[0073] It will be understood that the invention is not restricted to the aforescribed and illustrated exemplifying embodiments thereof, and that these embodiments can be modified within the scope of the inventive concept illustrated in the accompanying Claims.

[41]

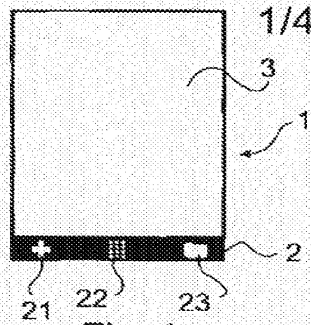


Fig. 1.

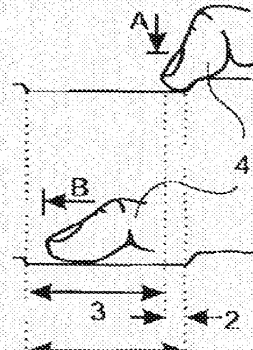


Fig. 2.

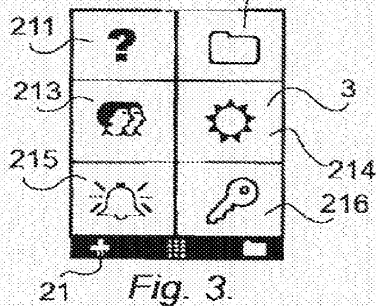


Fig. 3.

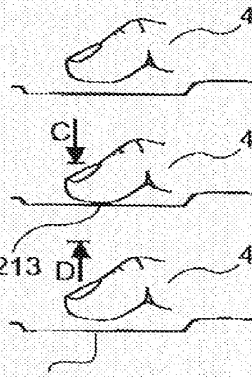


Fig. 4.

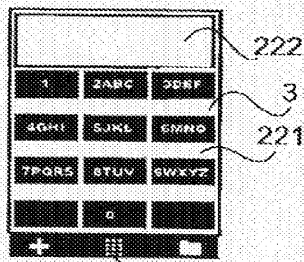


Fig. 5.



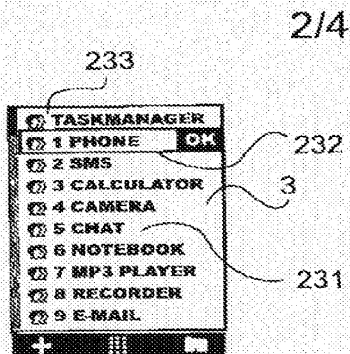


Fig. 6.

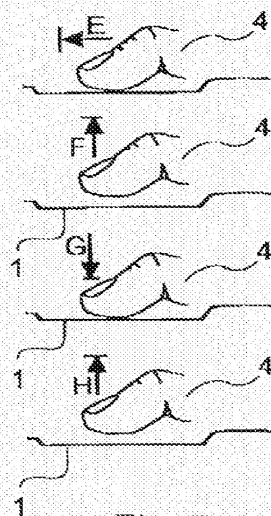


Fig. 7.

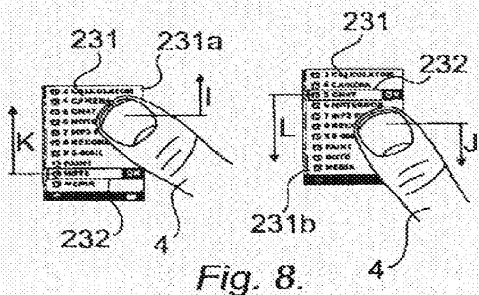
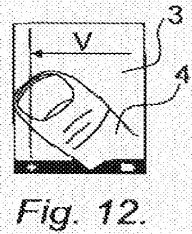
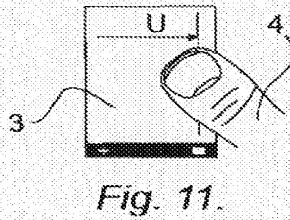
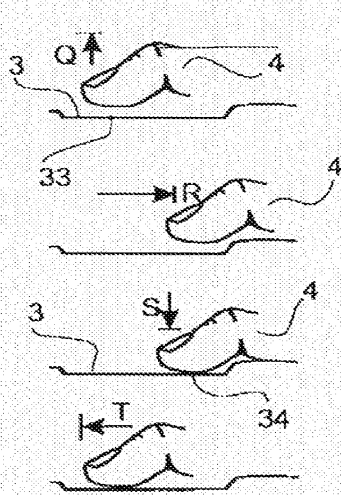
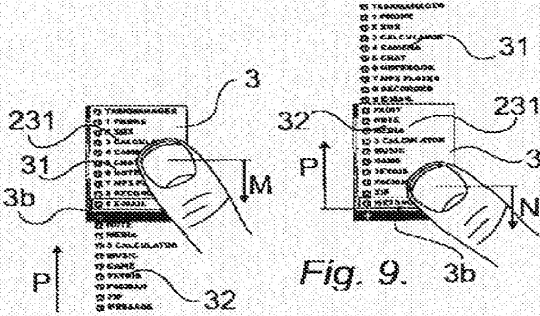


Fig. 8.



3/4



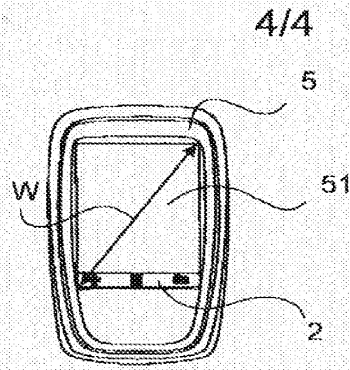


Fig. 13.

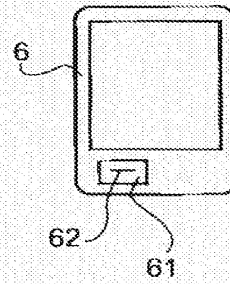


Fig. 14.





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Table with 7 columns: APPLICATION NUMBER, FILING or 371(c) DATE, GRP ART UNIT, FIL FEE REC'D, ATTY.DOCKET.NO, TOT CLAIMS, IND CLAIMS. Values: 16/796,880, 02/20/2020, 785, AEQUITAS.P001, 20, 3

CONFIRMATION NO. 1091
FILING RECEIPT

75660
Soquel Group, LLC
P.O. Box 2063
Santa Cruz, CA 95063



Date Mailed: 03/10/2020

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Magnus Goertz, Lidingo, SWEDEN;
Joseph Shain, Rehovot, ISRAEL;

Applicant(s)

Aequitas Technologies LLC, Laguna Beach, CA;

Power of Attorney: The patent practitioners associated with Customer Number 75660

Domestic Priority data as claimed by applicant

This application is a CON of 14/886,048 10/17/2015
which is a CON of 12/486,033 06/17/2009 PAT 9164654
which claims benefit of 61/132,469 06/19/2008
and is a CIP of 10/315,250 12/10/2002 PAT 8095879

Foreign Applications for which priority is claimed (You may be eligible to benefit from the Patent Prosecution Highway program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: No



Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

**If Required, Foreign Filing License Granted:** 03/05/2020

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/796,880**

**Projected Publication Date:** 06/18/2020

**Non-Publication Request:** No

**Early Publication Request:** No

**\*\* SMALL ENTITY \*\***

**Title**

TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE

**Preliminary Class**

**Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications:** No

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Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

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For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

page 2 of 4

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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**Title 35, United States Code, Section 184**  
**Title 37, Code of Federal Regulations, 5.11 & 5.15**

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<b>PATENT APPLICATION FEE DETERMINATION RECORD</b>						Application or Docket Number 16/796,880				
Substitute for Form PTO-875										
<b>APPLICATION AS FILED - PART I</b>										
(Column 1)		(Column 2)		SMALL ENTITY		OR	OTHER THAN SMALL ENTITY			
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)	RATE(\$)	FEE(\$)				
BASIC FEE <small>(37 CFR 1.16(a), (b), or (c))</small>	N/A	N/A	N/A	75	N/A					
SEARCH FEE <small>(37 CFR 1.16(k), (l), or (m))</small>	N/A	N/A	N/A	330	N/A					
EXAMINATION FEE <small>(37 CFR 1.16(o), (p), or (q))</small>	N/A	N/A	N/A	380	N/A					
TOTAL CLAIMS <small>(37 CFR 1.16(i))</small>	20	minus 20 = *	x 50 =	0.00	OR					
INDEPENDENT CLAIMS <small>(37 CFR 1.16(h))</small>	3	minus 3 = *	x 230 =	0.00	OR					
APPLICATION SIZE FEE <small>(37 CFR 1.16(s))</small>	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00	OR					
MULTIPLE DEPENDENT CLAIM PRESENT <small>(37 CFR 1.16(j))</small>				0.00	OR					
			TOTAL	785	TOTAL					
* If the difference in column 1 is less than zero, enter "0" in column 2.										
<b>APPLICATION AS AMENDED - PART II</b>										
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	RATE(\$)	ADDITIONAL FEE(\$)			
	Total <small>(37 CFR 1.16(i))</small>	*	Minus **	=	x	=	OR	x	=	
	Independent <small>(37 CFR 1.16(h))</small>	*	Minus ***	=	x	=	OR	x	=	
	Application Size Fee <small>(37 CFR 1.16(s))</small>						OR			
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <small>(37 CFR 1.16(j))</small>						OR			
			TOTAL ADD'L FEE		TOTAL ADD'L FEE					
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	RATE(\$)	ADDITIONAL FEE(\$)			
	Total <small>(37 CFR 1.16(i))</small>	*	Minus **	=	x	=	OR	x	=	
	Independent <small>(37 CFR 1.16(h))</small>	*	Minus ***	=	x	=	OR	x	=	
	Application Size Fee <small>(37 CFR 1.16(s))</small>						OR			
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <small>(37 CFR 1.16(j))</small>						OR			
			TOTAL ADD'L FEE		TOTAL ADD'L FEE					
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.										
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".										
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".										
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.										

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number	16796880
	Filing Date	2020-02-20
	First Named Inventor	Magnus Goertz
	Art Unit	2174
	Examiner Name	N/A
	Attorney Docket Number	AEQUITAS.P001

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Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5818437	A	1998-10-06	Grover et al.	
	2	7126583	B1	2006-10-24	Breed	
	3	7889180	B2	2011-02-15	Byun et al.	

If you wish to add additional U.S. Patent citation information please click the Add button.

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Examiner Initial*	Cite No	Publication Number	Kind Code <sup>1</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20020026483	A1	2002-02-28	Isaacs et al.	
	2	20020034281	A1	2002-03-21	Isaacs et al.	
	3	20070242057	A1	2007-10-18	Zadesky et al.	

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**FOREIGN PATENT DOCUMENTS**

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number	16796880
	Filing Date	2020-02-20
	First Named Inventor	Magnus Goertz
	Art Unit	2174
	Examiner Name	N/A
	Attorney Docket Number	AEQUITAS.P001

Examiner Initial*	Cite No	Foreign Document Number <sup>3</sup>	Country Code <sup>2i</sup>	Kind Code <sup>4</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T <sup>5</sup>
	1							

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
	1	IBM, Simon Says "Here's How!", 1994, pages 1 - 70 (Year: 1994)	
	2	3Com PalmPilot Handbook, 1997, pages 1 - 200 (Year: 1997)	
	3	Non-final Office action received for US patent application no. 16/127,238 mailed on March 5, 2020, 18 pages.	

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**EXAMINER SIGNATURE**

Examiner Signature	<input type="text"/>	Date Considered	<input type="text"/>
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number	16796880
	Filing Date	2020-02-20
	First Named Inventor	Magnus Goertz
	Art Unit	2174
	Examiner Name	N/A
	Attorney Docket Number	AEQUITAS.P001

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Marc A. Berger/	Date (YYYY-MM-DD)	2020-03-10
Name/Print	Marc A. Berger	Registration Number	44029

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.



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<b>EFS ID:</b>	38825323
<b>Application Number:</b>	16796880
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1091
<b>Title of Invention:</b>	TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE
<b>First Named Inventor/Applicant Name:</b>	Magnus Goertz
<b>Customer Number:</b>	75660
<b>Filer:</b>	Marc Aron Berger
<b>Filer Authorized By:</b>	
<b>Attorney Docket Number:</b>	AEQUITAS.P001
<b>Receipt Date:</b>	10-MAR-2020
<b>Filing Date:</b>	20-FEB-2020
<b>Time Stamp:</b>	17:08:47
<b>Application Type:</b>	Utility under 35 USC 111(a)

### Payment information:

Submitted with Payment	no
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	AEQUITAS-P001_InformationDisclosureStatement_03-10-2020.pdf	1034494 5f40756dc5405ef16983bc606c283ae40a3a053d	no	4

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2	Non Patent Literature	SIMON-SAYS.pdf	5797628	no	41
			6b0ec8a762625c722b5dd7d3be0f995de1d8868		
Warnings:					
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3	Non Patent Literature	PALMPILOT.pdf	526151	no	19
			8d51954d98c8718b9b9b9b40ff5a290ec21d304		
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			40270495fc388aeb5c1a727ea0b39db1b0af579e		
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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number	16796880
	Filing Date	2020-02-20
	First Named Inventor	Magnus Goertz
	Art Unit	2174
	Examiner Name	N/A
	Attorney Docket Number	AEQUITAS.P001

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1	US Provisional Patent Application Number 60430338, filed on 20 November 2002 by Daniel Suraqui
2	US Provisional Patent Application Number 60257524, filed on 21 December 2000 by David Taylor

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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number	16796880
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	Art Unit	2174
	Examiner Name	N/A
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### CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Marc A. Berger/	Date (YYYY-MM-DD)	2020-03-11
Name/Print	Marc A. Berger	Registration Number	44029

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

<b>Electronic Acknowledgement Receipt</b>	
<b>EFS ID:</b>	38840916
<b>Application Number:</b>	16796880
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1091
<b>Title of Invention:</b>	TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE
<b>First Named Inventor/Applicant Name:</b>	Magnus Goertz
<b>Customer Number:</b>	75660
<b>Filer:</b>	Marc Aron Berger
<b>Filer Authorized By:</b>	
<b>Attorney Docket Number:</b>	AEQUITAS.P001
<b>Receipt Date:</b>	11-MAR-2020
<b>Filing Date:</b>	20-FEB-2020
<b>Time Stamp:</b>	20:39:47
<b>Application Type:</b>	Utility under 35 USC 111(a)

**Payment information:**

Submitted with Payment	no
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**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	AEQUITAS-P001_InformationDisclosureStatement_03-11-2020.pdf	612150 6e0f251a6c27749f6772b5377b5252dd343fc9ca	no	4

**Warnings:**

Information:					
2	Other Reference-Patent/App/Search documents	US60430338.pdf	1639955	no	32
			79f88959d1aebafed2c693c326d1106d613585		
Warnings:					
Information:					
3	Other Reference-Patent/App/Search documents	US60257524.pdf	678638	no	24
			ae1a2a59bfff79b0ae10706c45ee0d5e22ce88143		
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Total Files Size (in bytes):				2930743	
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					





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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

- mberger@soquelgroup.com
pto@soquelgroup.com
rblumberg@soquelgroup.com

<b><i>Decision Granting Request for Prioritized Examination (Track I)</i></b>	<b>Application No.</b> 16/796,880	<b>Applicant(s)</b> Goertz et al.	
	<b>Examiner</b> CHERYL P GIBSON BAYLOR	<b>Art Unit</b> OPET	<b>AIA (FITF) Status</b> No
<p>1. THE REQUEST FILED <u>20 February 2020</u> IS <b>GRANTED</b> .</p> <p>The above-identified application has met the requirements for prioritized examination</p> <p>A. <input checked="" type="checkbox"/> for an original nonprovisional application (Track I).</p> <p>B. <input type="checkbox"/> for an application undergoing continued examination (RCE).</p> <p>2. <b>The above-identified application will undergo prioritized examination.</b> The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:</p> <p>A. filing a <b><u>petition for extension of time</u></b> to extend the time period for filing a reply;</p> <p>B. filing an <b><u>amendment to amend the application to contain more than four independent claims, more than thirty total claims</u></b>, or a multiple dependent claim;</p> <p>C. filing a <b><u>request for continued examination</u></b> ;</p> <p>D. filing a notice of appeal;</p> <p>E. filing a request for suspension of action;</p> <p>F. mailing of a notice of allowance;</p> <p>G. mailing of a final Office action;</p> <p>H. completion of examination as defined in 37 CFR 41.102; or</p> <p>I. abandonment of the application.</p> <p>Telephone inquiries with regard to this decision should be directed to CHERYL GIBSON BAYLOR at (571)272-3213. In his/her absence, calls may be directed to Petition Help Desk at (571) 272-3282.</p>			
/CHERYL GIBSON BAYLOR/ Paralegal Specialist, OPET			

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Table with 4 columns: APPLICATION NUMBER (16/796,880), FILING OR 371(C) DATE (02/20/2020), FIRST NAMED APPLICANT (Magnus Goertz), ATTY. DOCKET NO./TITLE (AEQUITAS.P001)

75660
Soquel Group, LLC
P.O. Box 2063
Santa Cruz, CA 95063

CONFIRMATION NO. 1091
PUBLICATION NOTICE



Title: TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED USER INTERFACE

Publication No. US-2020-0192568-A1

Publication Date: 06/18/2020

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

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Table with columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO., EXAMINER, ART UNIT, PAPER NUMBER, NOTIFICATION DATE, DELIVERY MODE. Includes application details for Magnus Goertz and examiner information.

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- mberger@soquelgroup.com
pto@soquelgroup.com
rblumberg@soquelgroup.com



## DETAILED ACTION

### *Background*

1. The present application is being examined under the pre-AIA first to invent provisions.
2. This action is responsive to the application filed on February 20, 2020.
3. Claims 21-40 are pending. Claims 21, 30, and 37 are independent claims.
4. Acknowledgment is made of Applicant's submission of a Preliminary Amendment, filed February 20, 2020, directed toward addition of and cancelation of claims, and of a Preliminary Amendment, filed February 25, 2020, directed toward amendment of the drawings and the specification.
5. The substitute specification submitted on February 20, 2020, has been entered.

### *Priority*

6. Applicant's claim for the benefit of prior-filed provisional application 61/132469 under 35 U.S.C. 119(e) is acknowledged.
7. Applicant's claim for the benefit of prior-filed applications 12/486033 and 14/886048 under 35 U.S.C. 120 is acknowledged.
8. Applicant's claim for the benefit of prior-filed application 10/315250 under 35 U.S.C. 120 is acknowledged. Applicant has not complied with one or more conditions for receiving the benefit of an earlier filing date under 35 U.S.C. 120 as follows.
9. The later-filed application must be an application for a patent for an invention which is also disclosed in the prior application (the parent or original nonprovisional application or provisional application). The disclosure of the invention in the parent

application and in the later-filed application must be sufficient to comply with the requirements of the first paragraph of 35 U.S.C. 112. See *Transco Products, Inc. v. Performance Contracting, Inc.*, 38 F.3d 551, 32 USPQ2d 1077 (Fed. Cir. 1994).

10. The disclosure of the prior-filed application, Application No. 10/315250, fails to provide adequate support or enablement in the manner provided by the first paragraph of 35 U.S.C. 112 for one or more claims of this application as discussed below.

11. Regarding Claims 21-40, independent Claims 21, 30, and 37 each contain the limitations “highlight a first item corresponding to a current position of an object gliding over a linear list of items on said display and to select a second item from the list at least partially based on where the object stops gliding and is lifted from said display” or analogous variants, yet application 10/315250 does not appear to provide reasonable support for these limitations. The most probable support for the limitations at issue is found on page 3, lines 28-30, and page 7, lines 7-10, of the 10/315250 specification and Figure 7 of the 10/315250 drawings. Page 3 of the 10/315250 specification states that “selection of an application or a file is done by moving the object so that the representation of desired application or file is highlighted, removing the object from the touch sensitive area, and then tapping on the touch sensitive area” and page 7 similarly states “Figure 7 shows that a selection of an application or a file is done by moving E the object 4 so that the representation of desired application or file is highlighted, removing F the object 4 from the touch sensitive area 1, and then 10 tapping G, H on the touch sensitive area 1.” This disclosure provides support only for the concept that movement of an object in contact with the touch sensitive area causes a certain application or file to be highlighted and then that certain application or file is selected by

removing the object from the touch sensitive area and tapping on the on the touch sensitive area. Nothing in this disclosure provides support for the concept that a system is caused “to highlight a first item corresponding to a current position of an object gliding over a linear list of items on said display” and to select a second item “at least partially based on where the object stops gliding and is lifted from said display” as currently claimed. Further, additional disclosure of the 10/315250 application on page 9, line 32, through page 10, line 10, of the specification and in Figure 9 of the drawings, while appearing to suggest some form of item highlighting in association with navigating between list pages, does not provide support for the limitations at issue. As dependent claims incorporate the deficiency, for at least the above reason, Claims 21-40 are not enabled by the disclosure of application 10/315250.

12. Further regarding Claims 22-29, 33, and 38-40, the 10/315250 disclosure fails to provide adequate support or enablement in the manner provided by the first paragraph of 35 U.S.C. 112 for these claims. Each of Claims 22, 33, and 38 recites the limitations “a fourth application and a fifth application capable of running simultaneously, the fourth application being a music player, and the fifth application being email, chat or SMS” or analogous variants. Although the 10/315250 specification states on page 1, line 7, and p. 5, line 12, that “[t]he computer unit is adapted to run several applications simultaneously,” this disclosure fails to provide support for simultaneously running two applications with specifically one application being a music player and another application being email, chat, or SMS. As dependent claims incorporate the deficiency, for at least the above reason, Claims 22-29, 33, and 38-40 are not enabled by the disclosure of application 10/315250.



13. Further regarding Claims 23, 24, 31, 32, and 37-40, the 10/315250 disclosure fails to provide adequate support or enablement in the manner provided by the first paragraph of 35 U.S.C. 112 for these claims. Each of Claims 22, 31, and 37 recites the limitations “(a) a tap-present state, wherein a plurality of tap-activatable icons ... are present ... and (b) a tap-absent state, wherein the plurality of tap-activatable icons are absent, the tap-absent state configured to be transitioned to the tap-present state in response to a multi-step user gesture comprising the object: (i) touching an edge area of said display, and then (ii) gliding on said display away from the edge area” or analogous variants. Although the 10/315250 disclosure describes on pages 5 and 6 of the specification in association with Figures 1-4 of the drawings that one of three functions may be activated when the touch-sensitive area detects a movement of an object from a representation of a function on a menu area with a direction to a display area and that display icons that are subsequently displayed in the display area can be selected by tapping, nothing in the disclosure provides reasonable support for “a tap-absent state” as claimed. As dependent claims incorporate the deficiency, for at least the above reason, Claims 23, 24, 31, 32, and 37-40 are not enabled by the disclosure of application 10/315250.

14. Further regarding Claims 25-28, the 10/315250 disclosure fails to provide adequate support or enablement in the manner provided by the first paragraph of 35 U.S.C. 112 for these claims. Claim 25 recites the limitation “wherein the maximum diagonal dimension of the representation is less than a thumb’s width.” Although the 10/315250 disclosure indicates that the user interface can be operated with a thumb and that “the user interface is adapted to a touch sensitive area 1 with a size that is in

the order of 2-3 inches, meaning the diagonal distance  $W$  between two corners of the touch sensitive area 1" (10/315250 Specification, p. 8, lines 28-30), no support is provided for a requirement that a maximum diagonal dimension of a representation is less than a thumb's width. As dependent claims incorporate the deficiency, for at least the above reason, Claims 25-28 are not enabled by the disclosure of application 10/315250.

15. Further regarding Claims 29, 36, and 10, the 10/315250 disclosure fails to provide adequate support or enablement in the manner provided by the first paragraph of 35 U.S.C. 112 for these claims. Each of the claims recites the limitations "(a) to enable a graphical user interface for accessing a plurality of gadgets, each gadget comprising an area containing at least a portion of dynamically generated data related to that gadget, wherein the user interface: (i) arranges the plurality of gadgets in a layout that is larger than said display, whereby some of the gadgets are in said display and others of the gadgets are out of said display; (ii) expands one of the gadgets in said display beyond an edge of said display to show more data therein by shifting other gadgets" or analogous variants in the claimed systems. Application 10/315250 does not teach shifting or displacing gadgets based on activating a gadget or a similar concept. For at least the above reasons, Claims 29, 36, and 10 are not enabled by the disclosure of application 10/315250.

16. Note that although Applicant appears to be pursuing subject matter in the instant claims that may be drawn to disclosures in the 10/315260 application, likely in an effort to gain the earlier priority date, each of the rejections of claims below under pre-AIA 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement

can be viewed as disqualifying Applicant's claims for the benefit of each of the prior-filed applications. In order to expedite prosecution, prior art has been applied in relationship to most claim limitations as if requirements for priority to the 10/315260 application have been met, yet any reliance on disclosure of the instant application (such as amended claims at the time of filing) not supported by underlying applications to overcome rejections will result in loss of priority to prior applications and the availability of prior art up to the date of filing of the instant application for prior art rejections. Similarly, any reliance on the disclosure of intervening underlying applications will result in loss of priority to preceding applications.

***Information Disclosure Statement***

17. The information disclosure statements submitted on February 24, 2020; March 30, 2020; and March 11, 2020, were filed before the mailing of a first Office action on the merits. The submissions are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statements are being considered by the examiner.

***Claim Rejections - 35 USC § 112***

18. The following is a quotation of the second paragraph of pre-AIA 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

19. Claims 25-28, 30-36, 39, and 40 are rejected under pre-AIA 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. Claims 25, 30,

and 39 each recites the limitations “in response to a multi-step user gesture comprising the object touching said display at a location corresponding to a demarcated representation of the function followed by the object gliding away from the location along said display, wherein ... the representation represents only the function” or analogous variants in the claimed systems. The original disclosure and disclosures of underlying applications 10/315250, 12/486033, and 14/886048 do not appear to discuss the limitation “wherein ... the representation represents only the function” and the language of the claim itself does not put one of ordinary skill in the art on notice how a representation of a function must be designed or implemented in order to satisfy the requirement that “the representation represents only the function” as claimed, rendering the metes and bounds of the claims indefinite. See MPEP § 2173.02. This conclusion can be drawn from at least the understanding that any graphical representation can have various associations, meaning a representation can be viewed as representing various concepts or aspects other than a function to which it may be associated. Dependent Claims 26-28, 31-36, and 40 incorporate the deficiency.

20. Claims 25-28, 30-36, 39, and 40 are further rejected under pre-AIA 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. Claims 25, 30, and 39 each recites the limitations “in response to a multi-step user gesture comprising the object touching said display at a location corresponding to a demarcated representation of the function followed by the object gliding away from the location along said display, wherein ... the function is not activated differently based on a direction of the gliding” or analogous variants in the claimed systems. The original

disclosure and disclosures of underlying applications 10/315250, 12/486033, and 14/886048 do not appear to discuss the limitation “wherein ... the function is not activated differently based on a direction of the gliding” and the language of the claim itself does not put one of ordinary skill in the art on notice how a representation of a function must be designed or implemented in order to satisfy the requirement that “the function is not activated differently based on a direction of the gliding” as claimed, rendering the metes and bounds of the claims indefinite. See MPEP § 2173.02. This conclusion can be drawn from at least the understanding that the disclosure of the 10/315250 application (the nearest disclosure from which the limitation at issue appears to be drawn) does not provide support for a definite interpretation of the meaning of the claim language, describing only that one of three functions can be activated “when the touch sensitive area 1 detects a movement of an object 4 with its starting point A within the representation of a function on the menu area 2 and with a direction B from the menu area 2 to the display area 3” (10/315250 Specification, p. 5, lines 25-27). This disclosure suggests differences in activation at least in the sense that a movement direction that is not “with a direction B from the menu area 2 to the display area 3” does not activate the function. Further, evaluating the 10/315250 disclosure from a pragmatic implementation perspective that would be understood by one of ordinary skill in the art, if a corresponding system is designed to tolerate variations in direction (which is not clearly supported by the disclosure noted), then angled movements not directly “to the display area” (i.e. not straight up from the bottom of the screen) would require a longer gesture to reach the display area, which can be viewed as a function “activated differently based on a direction of the gliding” at least in the sense of activation timing or

gesture length. Thus it would not be clear to one of ordinary skill in the art in view of Applicant's disclosure (or from the language of the claims) how a function must be activated so as to meet the requirements of the negative limitation at issue. Dependent Claims 26-28, 31-36, and 40 incorporate the deficiency.

21. Claims 25-28 are further rejected under pre-AIA 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. Claims 25 and 26 recite the limitation "the maximum diagonal dimension" in the claimed systems. There is insufficient antecedent basis for this limitation in the claims. Dependent Claims 27 and 28 incorporate the deficiency.

22. Claims 26, 27, 29, 36, and 40 are further rejected under pre-AIA 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. Claims 26, 29, 36, and 40 each recite the limitation "the group consisting of" in the claimed systems. There is insufficient antecedent basis for this limitation in the claims. Dependent Claim 27 incorporates the deficiency.

23. Note that the prior art analysis of relevant claims below is based on a most likely interpretation made in light of the above deficiencies.

24. The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

25. Claims 21-40 are rejected under pre-AIA 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Independent Claims 21, 30, and 37 each recite the limitations “a top surface comprising a touch sensitive display, the top surface containing no movable button” or analogous variants in the claimed systems. The specifications of the instant application and underlying applications incorporated by reference do not contain the word “movable” and an analogous disclosure using alternative wording does not appear to be present in the specifications, supporting a finding that the instant disclosure lacks reasonable support for possession of the limitations at issue. Considering drawings of the instant application and underlying incorporated applications, it is not clear that any depictions of systems or devices represent a system comprising a top surface containing or having no movable button as claimed. Further, any depictions in the figures that appear to lack movable buttons can be viewed as coincidental and do not reasonably provide support for possession of the negative limitation “the top surface containing no movable button.” A negative limitation must have a basis in the original disclosure. An alternative can be explicitly excluded if alternative elements are positively recited, yet mere absence of a positive recitation (such as a movable button on a top surface) is not basis for an exclusion. *See* MPEP § 2173.05[i]. Dependent Claims 22-29, 31-36, and 38-40 incorporate the deficiency. As the limitations at issue were included in the claims of the instant application as originally filed, to overcome these rejections Applicant may amend the specification of the instant

application to include the limitations not supported by the specification. See MPEP § 2163(B). However, note that, as discussed above, any reliance on disclosure of the instant application not supported by underlying applications to overcome rejections will result in loss of priority to prior applications and the availability of prior art up to the date of filing of the instant application for prior art rejections.

26. Claims 21-36 are further rejected under pre-AIA 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Independent Claims 21 and 30 each recite the limitations “to present a plurality of communication options on said display for a given contact, wherein the communication options comprise call, email, and chat or SMS” or analogous variants in the claimed systems. The specification of the instant application describes an arrangement in which each contact is shown with three buttons “CALL,” “SMS,” and “MORE,” which allows a user to initiate a phone conversation or an SMS message with a contact or to rearrange or edit contact details or the contact’s position but does not provide any indication of initiating an email, supporting a finding that the instant disclosure lacks reasonable support for possession of the limitations at issue. Figure 24 of the instant application, referenced by the noted portion of the specification, also provides no support for the idea of an option to email a given contact. The only support for email in the instant disclosure appears to be a reference in paragraph 56 of the instant specification that example gadgets include web mail, but this disclosure does not make reference to an option in association with a



given contact. Dependent Claims 22-29 and 31-36 incorporate the deficiency. As the limitations at issue were included in the claims of the instant application as originally filed, to overcome these rejections Applicant may amend the specification of the instant application to include the limitations not supported by the specification. See MPEP § 2163(B). However, note that, as discussed above, any reliance on disclosure of the instant application not supported by underlying applications to overcome rejections will result in loss of priority to prior applications and the availability of prior art up to the date of filing of the instant application for prior art rejections.

27. Claims 23, 24, 31, 32, and 37-40 are further rejected under pre-AIA 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Claims 23, 31, and 37 each recite the limitation “a tap-absent state” in the claimed systems. The instant specification and underlying applications incorporated by reference do not contain the word “absent” and support of the claim limitation using alternative language does not appear to be present, supporting a finding that the instant disclosure lacks reasonable support for possession of the limitation at issue. Dependent Claims 24, 32, and 38-40 incorporate the deficiency. As the limitations at issue were included in the claims of the instant application as originally filed, to overcome these rejections Applicant may amend the specification of the instant application to include the limitations not supported by the specification. See MPEP § 2163(B). However, note that, as discussed above, any reliance on disclosure of the instant application not supported by underlying applications

to overcome rejections will result in loss of priority to prior applications and the availability of prior art up to the date of filing of the instant application for prior art rejections.

28. Claims 25-28, 30-36, 39, and 40 are further rejected under pre-AIA 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. As discussed above, Claims 25, 30, and 39 each recites the limitations “in response to a multi-step user gesture comprising the object touching said display at a location corresponding to a demarcated representation of the function followed by the object gliding away from the location along said display, wherein ... the representation represents only the function” or analogous variants in the claimed systems. The original disclosure and disclosures incorporated by reference do not appear to discuss the limitation “wherein ... the representation represents only the function,” supporting a finding that the claimed subject matter was not described in the specification so as to reasonably support possession of the claimed invention. Dependent Claims 26-28, 31-36, and 40 incorporate the deficiency. As the limitations at issue were included in the claims of the instant application as originally filed, to overcome these rejections Applicant may amend the specification of the instant application to include the limitations not supported by the specification. See MPEP § 2163(B). However, note that, as discussed above, any reliance on disclosure of the instant application not supported by underlying applications to overcome rejections will result in loss of priority to prior applications and the

availability of prior art up to the date of filing of the instant application for prior art rejections.

29. Claims 25-28, 30-36, 39, and 40 are further rejected under pre-AIA 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. As discussed above, Claims 25, 30, and 39 each recites the limitations “in response to a multi-step user gesture comprising the object touching said display at a location corresponding to a demarcated representation of the function followed by the object gliding away from the location along said display, wherein ... the function is not activated differently based on a direction of the gliding” or analogous variants in the claimed systems. The original disclosure and disclosures incorporated by reference do not appear to discuss the negative limitations “wherein ... the representation ... is not relocated during the multi-step user gesture, and the function is not activated differently based on a direction of the gliding,” supporting a finding that the claimed subject matter was not described in the specification so as to reasonably support possession of the claimed invention. Page 5 of the 10/315250 specification only describes that any one of three functions can be activated “when the touch sensitive area 1 detects a movement of an object 4 with its starting point A within the representation of a function on the menu area 2 and with a direction B from the menu area 2 to the display area 3” (10/315250 Specification, p. 5, lines 25-27), but does not exclude embodiments in which a representation is relocated or a function is activated differently based on a direction of gliding as claimed. As

discussed above, a negative limitation must have a basis in the original disclosure. An alternative can be explicitly excluded if alternative elements are positively recited, yet mere absence of a positive recitation (of a representation relocated during a gesture or a function activated differently based on a direction of gliding) is not basis for an exclusion. See MPEP § 2173.05[i]. Dependent Claims 26-28, 31-36, and 40 incorporate the deficiency. As the limitations at issue were included in the claims of the instant application as originally filed, to overcome these rejections Applicant may amend the specification of the instant application to include the limitations not supported by the specification. See MPEP § 2163(B). However, note that, as discussed above, any reliance on disclosure of the instant application not supported by underlying applications to overcome rejections will result in loss of priority to prior applications and the availability of prior art up to the date of filing of the instant application for prior art rejections.

***Claim Rejections - 35 USC § 103***

30. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

31. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

32. Claim 21 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over the IBM Simon Personal Communicator (hereinafter "Simon"), as evidenced by *Simon Says "Here's How" – Users Manual*, IBM Corp., Part Number 83G9872, available at <https://www.microsoft.com/buxtoncollection/a/pdf/simon%20user%20manuals.pdf> (1994) (hereinafter "Simon Manual") and O'Malley, Chris, *Simonizing the PDA*, Byte.com, Internet Archive Wayback Machine, available at <https://web.archive.org/web/19990221174856/http://byte.com/art/9412/sec11/art3.htm> (Dec. 1994) (hereinafter "O'Malley"), in view of Shultz et al., U.S. Patent Application 2004/0203350 A1 (published Oct. 14, 2004) (hereinafter "Shultz") and Shah, Niraj A., U.S. Patent Application 2001/0013069 A1 (published Aug. 9, 2001) (hereinafter "Shah").

33. Simon teaches a portable wireless computer system (*e.g.*, Simon Manual, p. 1, *Welcome*, describing Simon as a providing total personal communications in one small, hand-held, mobile device; and p. 11, *How Simon Works*, describing Simon as a cellular phone with personal organization and communication capabilities), comprising:

- a. A top surface comprising a touch sensitive display, the top surface containing no movable button (*see, e.g., id.*, p. 4, *Introducing Simon*, illustrating Simon as comprising a touch-sensitive screen in a top surface of a housing, the top surface having no movable buttons according to labeling of the figures in contrast to a side of the housing having various labeled movable buttons);
- b. A processor (O'Malley, p. 4, para. 2, describing Simon's internal components as including a CPU in the form of a 16-bit x86-compatible processor running at 16 MHz and manufactured by Vadem);

- c. A transceiver for sending and receiving wireless signals over a communications network (*see, e.g.*, Simon Manual, p. 1, *Welcome*, describing Simon as a mobile device including a cellular phone and describing its functionality as wireless; and p. 17, *Phone*, describing Simon's cellular phone as using two-way radio communications controlled by a cellular system; and O'Malley, p. 4, paras. 2 and 4, indicating Simon is a computer comprising a cellular transmitter/receiver and describing Simon's transceiver as a Mitsubishi R F transceiver used in other portable cellular phones);
- d. A solid-state memory storing computer instructions (*id.*, p. 4, para. 2, describing Simon's components as including 2 MB of flash [solid-state] memory that stores Simon's built-in applications) configured to:
  - i. Enable the portable wireless computer system to run a plurality of applications, the applications comprising a telephone (*see, e.g.*, Simon Manual, pp. 17 and 18, *Phone*, describing and illustrating telephone call functionality and interface features), a calculator (*see, e.g., id.*, p. 34, *Mobile Office*, and p. 41, *Calculator*, describing and illustrating calculator functionality and interface features), an alarm (*see, e.g., id.*, p. 42, *Setting an Alarm*, and p. 64, *Calendar Alarm*, describing alarm functionality and interface features), a clock (*see, e.g., id.*, p. 64, *Time*, describing clock functionality and interface features), and email (*see, e.g., id.*, pp. 51-55, *Time*, describing and illustrating electronic mail functionality and interface features); and

- e. Cause the portable wireless computer system (a) to highlight a first item corresponding to a current position of an object gliding over a linear list of items on said display and to select a second item from the list at least partially based on where the object stops gliding and is lifted from said display (*see id.*, pp. 9 and 10, *Using Your Touch Sensitive Screen*, describing and illustrating use of a stylus or finger to interact with the touch-sensitive screen and describing a user sliding the stylus across the screen until a button the user wants highlights and then the user lifting the stylus to select that feature), and (b) to present a plurality of communication options on said display for a given contact, wherein the communication options comprise call and email (*see, e.g., id.*, p. 35, *Address Book*, and p. 40, *Making a Phone Call From the Address Book*, describing and illustrating an address book comprising name and number information and describing and illustrating user interaction to view an entry and to interact with a number of actions buttons including one-touch dialing for phone numbers and including sending a fax; and O'Malley, p. 6, para. 2, describing Simon's programs as well integrated and describing ability of a user to call or send email to someone from the address book); and
- f. A housing surrounding said display and enclosing said processor, said transceiver, and said solid-state memory (*see, e.g.,* Simon Manual, p. 4, *Introducing Simon*, illustrating Simon as comprising a housing; and O'Malley, p. 4, para. 2, describing Simon's internal components as including a CPU, a cellular transmitter/receiver, and flash memory).

34. However, Simon appears to be silent regarding the applications comprising chat or SMS, a camera, and a music player.

35. Shultz teaches a portable wireless computer system (see Shultz, Abstract, para. 21, and Fig. 2, describing and illustrating a wireless mobile communication device), comprising memory storing computer instructions configured to enable the portable wireless computer system to run a plurality of applications, the applications comprising chat or SMS, a camera, and a music player (*see, e.g., id.*, para. 22, describing the device as comprising a storage element such as a memory; para. 21, describing the device as including a processor for implementing one or more applications depending on the functionality of the mobile device, describing implementation of instant messaging applications, and describing implementation of functionality including that of an MP3 player and a digital camera. Running a plurality of applications comprising chat or SMS, a camera, and a music player is obvious over these teachings in order to increase the functionality of a general purpose mobile device).

36. Simon and Shultz are analogous art at least because they are from the same field of endeavor as the claimed invention, referencing portable wireless computer systems and with teachings directed toward a system enabled to run a plurality of applications. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to implement the portable wireless computer system taught by Simon by enabling running of applications comprising chat or SMS, a camera, and a music player as taught by Shultz. Motivation to combine the teachings is found in Shultz, which indicates the value of increased functionality in a wireless communication device (*see, e.g., Shultz*, paras. 16 and 21), and arises from the value of multifunction



devices well known in the art. One of ordinary skill in the art would have been motivated to combine the teachings of Simon and Shultz and implement a portable wireless computer system in which the system is enabled to run a plurality of applications comprising chat or SMS, a camera, and a music player in order to allow a user to access a greater range of functionality at a multifunction mobile device.

37. However, Simon as modified by Shultz appears to be silent regarding the system wherein the communication options comprise chat or SMS.

38. Shah teaches a system (*e.g.* Shah, Abstract, describing a system and method that allows the user to compose a message that is addressed and sent to a variety of destinations), comprising memory storing computer instructions configured to enable the system to present a plurality of communication options on a display for a given contact, wherein the communication options comprise call, email, and chat or SMS (*see, e.g., id.*, para. 66 and Fig. 6, describing and illustrating a web page user interface that allows a sender to send messages via a web browser to a registered user of a server, the contact information including phone, email, and chat information, and paras. 6 and 64, describing functionality to send messages via telephone, email, and chat).

39. Shah is analogous art at least because it is from the same field of endeavor as the claimed invention, referencing communication systems and with teachings directed toward multiple modes of communication. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to implement the portable wireless computer system taught by Simon as modified by Shultz by presenting a plurality of communication options on a display for a given contact, wherein the communication options comprise call, email, and chat or SMS, as taught by Shah. Motivation to

combine the teachings is found in Shah, which teaches the value of allowing a user to address and send various types of information to a variety of communication destinations (*see, e.g.*, Shah, paras. 16 and 21), and arises from the value of aggregating various forms of communication known in the art. One of ordinary skill in the art would have been motivated to combine the teachings of Simon, Shultz, and Shah implement a portable wireless computer system in which a plurality of communication options are presented on a display for a given contact, wherein the communication options comprise call, email, and chat or SMS, in order to allow a user to more easily send information to multiple communication destinations of a recipient.

40. Claim 22 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Simon in view of Shultz and Shah and in further view of Frank et al., U.S. Patent 5,651,107 (issued Jul. 22, 1997) (hereinafter "Frank").

41. Simon as modified by Shultz and Shah teaches the portable wireless computer system of Claim 21 as discussed above and further teaches the portable wireless computer system wherein the plurality of applications comprise: (a) a first application providing options on said display for editing, deleting and sending a picture (*see, e.g.*, Simon Manual, pp. 60 and 61, *Sketch Pad*, describing sketch pad functionality that allows a user to write on the screen with a stylus or finger, describing manipulations using tools including a pencil and an eraser, and describing erasing a sketch or erasing all sketches in memory; and p. 46, *Creating a New Fax*, describing functionality for a user to fax any sketches that the user creates) (b) a second application and a third application capable of running (*see, e.g., id.*, pp. 17, 34, 41, 43, 48, 51, 57, 59, 60, and

63-65, describing various features of Simon including phone, address book, calculator, calendar, fax, email, note pad, sketch pad, and to do features, and p. 17, *Phone*, describing access of the phone feature when the user is in another application [indicating features representing applications]), and (c) a fourth application and a fifth application capable of running, the fourth application being a music player (*see, e.g., Shah, para. 21, describing implementation of one or more applications and describing implementation of functionality including that of an MP3 player. One of ordinary skill in the art would have been motivated to implement a music player under the same rationale as provided in the discussion of Claim 21 above*), and the fifth application being email, chat or SMS (*see, e.g., Simon Manual, pp. 51-56, Mail, describing features of Simon as including email. Note that the teachings anticipate the alternative language of the claim*).

42. However, Simon as modified by Shultz and Shah appears to be silent regarding the second application and a third application capable of running simultaneously, the second application capable of being presented on top of the third application on said display, and silent regarding the fourth application and the fifth application capable of running simultaneously.

43. Frank teaches a computer system (*e.g., Frank, Abstract and col. 1, lines 9-14, describing a computer-controlled display system for displaying overlapping windows of data on a display*), wherein a plurality of applications comprise: (a) a first application, (b) a second application and a third application capable of running simultaneously, the second application capable of being presented on top of the third application on said display, and (c) a fourth application and a fifth application capable of running

simultaneously (*see, e.g., id.*, Abstract and col. 2, lines 38-40, describing a system in which multiple applications are executed concurrently by a CPU such that each application is associated with one or more windows; col. 5, lines 30-48, and Fig. 3, describing and illustrating prior art arrangements in which a top window overlays a second window that overlays a third window and describing systems in which multiple programs are concurrently executed resulting in constant updates to data disposed within the windows; and col. 6, lines 46-56, and Fig. 5, describing and illustrating arrangements in which window image are merged to appear on top of one another).

44. Frank is analogous art at least because it is from the same field of endeavor as the claimed invention, referencing computer systems enabled to run a plurality of applications. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to implement the portable wireless computer system taught by Simon as modified by Shultz and Shah such that a plurality of applications are capable of running simultaneously and one application is capable of being presented on top of another application on a display as taught by Frank. Motivation to combine the teachings is found in Frank, which indicates increased functionality in allowing a user to access multiple windows on a display with a top window fully visible and constituting the current work file (*see, e.g., Frank*, col. 1, lines 15-23) and teaches use of transparency to increase the usable area of a display (*id.*, col 10, lines 32-35), and arises from the value of computer multitasking well known in the art. One of ordinary skill in the art would have been motivated to combine the teachings of Simon, Shultz, and Frank and implement a portable wireless computer system in which a plurality of applications are capable of running simultaneously and one application is capable of being presented on

top of another application on a display in order to allow a user to more easily navigate among different sets of user interface functionality or content on a display and to increase the usable area of the display.

45. Claims 23-26, 28, 37, and 38 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Simon in view of Shultz, Shah, and Frank and in further view of Gough et al., U.S. Patent 5,603,053 (issued Feb. 11, 1997) (hereinafter "Gough").

46. Regarding Claim 23, Simon as modified by Shultz, Shah, and Frank teaches the portable wireless computer system of Claim 22 as discussed above and further teaches the portable wireless computer system wherein the portable wireless computer system is a mobile phone (*e.g.*, Simon Manual, p. 1, *Welcome*, describing Simon as a providing total personal communications, including a cellular phone, in a mobile device), and the computer instructions are configured to enable the portable wireless computer system to present a user interface, the user interface comprising at least two states, namely: (a) a tap-present state, wherein a plurality of tap-activatable icons for activating a plurality of corresponding predesignated applications, functions, services, settings or tasks are present, each of the plurality of pre-designated applications, functions, services, settings or tasks being activated in response to a tap on its corresponding icon (*see, e.g., id.*, p. 11, *How Simon Works*, describing and illustrating a Mobile Office screen in which a user can use personal organization and communication functions by touching the appropriate icon on the Mobile Office screen), and (b) a tap-absent state, wherein the plurality of tap-activatable icons are absent (*see, e.g., id.*, pp. 11, 14, 18, 26-33, 37-40, 47, 58, and 62, describing and illustrating various other screens in which the Mobile Office icons are

absent. Note that any user interface screen other than the Mobile Office screen can be viewed as “a tap-absent state, wherein the plurality of tap-activatable icons are absent” at least in the sense that particular tap-activatable icons are absent), the tap-absent state configured to be transitioned to the tap-present state in response to a user gesture comprising the object: (i) touching an edge area of said display (*see, e.g., id.*, p. 11, *How Simon Works*, and p. 12, *Using the Buttons*, describing and illustrating icon buttons at the bottom of every screen including an icon that can be touched to go directly to the Mobile Office screen).

47. However, Simon as modified by Shultz, Shah, and Frank appears to be silent regarding the user gesture being a multi-step user gesture comprising the object: (i) touching an edge area of said display, and then (ii) gliding on said display away from the edge area.

48. Gough teaches a computer system (*e.g., Gough, Abstract*, describing an apparatus for inputting data to an active application of a computer system), wherein a tap-absent state is configured to be transitioned to a tap-present state in response to a multi-step user gesture comprising an object: (i) touching an edge area of a display, and then (ii) gliding on said display away from the edge area (*see, e.g., id.*, col. 6, lines 29-44, and Fig. 4a, describing and illustrating selection of an icon in a palette [which can be viewed as in an edge area of a display] by dragging the icon from the palette to a particular area of the screen; col. 6, line 55, – col. 7, line 9, and Fig. 4b, describing and illustrating displaying a keyboard at the particular area of the screen and indicating selection of keyboard elements using a stylus. Under such an arrangement as described, the user interface before display of the keyboard can be viewed as a tap-

absent state and the user interface after display of the keyboard can be viewed as a tap-present state at least in the sense that the tap-activatable elements of the keyboard are absent prior to its display).

49. Gough is analogous art at least because it is from the same field of endeavor as the claimed invention, referencing portable computer systems comprising a touch-sensitive display and with teachings directed to multi-step user touch gestures. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to implement the portable wireless computer system taught by Simon as modified by Shultz, Shah, and Frank such that a multi-step user gesture comprises an object touching an edge area of a display and then gliding on said display away from the edge area as taught by Gough. Motivation to combine the teachings is found in Gough, which teaches the value of a drag gesture to allow flexible and organized control of input utilities and to allow a user to better control and utilize limited display space (*see, e.g.,* Gough, col. 2, lines 46-51, and col. 6, lines 36-44), and arises from the value of targeted gestures known in the art. One of ordinary skill in the art would have been motivated to combine the teachings of Simon, Shultz, Shah, Frank, and Gough and implement a portable wireless computer system in which a tap-absent state is configured to be transitioned to a tap-present state in response to a multi-step user gesture comprising an object: (i) touching an edge area of a display, and then (ii) gliding on said display away from the edge area in order to allow a user to better control and utilize limited display space.

50. Regarding Claim 24, Simon as modified by Shultz, Shah, and Frank and as further modified by Gough teaches the portable wireless computer system of Claim 23,

wherein the plurality of tap-activatable icons represent applications (*e.g.*, Simon Manual, p. 12, *Using the Buttons*, describing the Mobile Office screen as allowing a user to select various features) comprising a telephone (*see, e.g., id.*, describing a user touching a phone icon to get to a main phone screen. In view of these teachings and the teachings of Simon noted above, one of ordinary skill in the art would have been motivated to implement a variety of application icons including a telephone in order to allow organized access to functionality of a mobile device), chat or SMS, a camera, a music player (*see, e.g.*, Shah, para. 21, describing implementing one or more applications depending on the functionality of the mobile device, describing implementation of instant messaging applications, and describing implementation of functionality including that of an MP3 player and a digital camera. In view of these teachings and the teachings of Simon noted above, one of ordinary skill in the art would have been motivated to implement a variety of application icons including chat, camera, and music player under the same rationale as provided in the discussion of Claim 21 above and further in order to allow organized access to functionality of a mobile device) and email (*e.g.*, Simon Manual, p. 12, *Using the Buttons*, describing the Mobile Office screen as allowing a user to select advanced communication features including email).

51. Regarding Claim 25, Simon as modified by Shultz, Shah, and Frank teaches the portable wireless computer system of Claim 22 as discussed above and further teaches the portable wireless computer system wherein the computer instructions are configured to activate a function in response to a user gesture comprising the object touching said display at a location corresponding to a demarcated representation of the function (*see, e.g.*, Simon Manual, p. 11, *How Simon Works*, and p. 12, *Using the Buttons*, describing



and illustrating icon buttons at the bottom of every screen including an icon that can be touched to go directly to the Mobile Office screen), wherein a maximum diagonal dimension of the representation is less than a thumb's width (*see, e.g., id.*, pp. 11 and 12, *How Simon Works* and *Using the Buttons*, describing and illustrating special icon buttons at the bottom of every screen including an icon that can be touched to go directly to the Mobile Office screen; and p. 9, *LCD Contrast Adjustment*, illustrating the Simon being held by a hand such that the buttons at the bottom of the screen appear to have a maximum diagonal dimension that is less than a width of the portrayed hand's thumb) and the representation represents only the function (*see, e.g., id.*, pp. 11 and 12, *How Simon Works* and *Using the Buttons*, describing and illustrating an icon that can be touched to go directly to the Mobile Office screen and illustrating a screen in which the Mobile Office icon is not repeated elsewhere on the screen [which can be viewed as an example of the icon representing only the function at least in the sense of it being used in the user interface only to go directly to the Mobile Office screen]) and is not relocated during the user gesture (*see, e.g., id.*, p. 11, *Using the Buttons*, describing and illustrating the icon that can be touched to access the Mobile Office screen as one of four special icons that are at the bottom of every screen [indicating that the icon is not relocated when touched to access the Mobile Office screen])).

52. However, Simon as modified by Shultz, Shah, and Frank appears to be silent regarding the user gesture being a multi-step user gesture comprising the object touching said display at a location corresponding to a demarcated representation of the function followed by the object gliding away from the location along said display,

wherein the representation is not relocated during the multi-step user gesture and the function is not activated differently based on a direction of the gliding.

53. Gough further teaches the computer system (*e.g.*, Gough, Abstract, describing an apparatus for inputting data to an active application of a computer system), wherein computer instructions are configured to activate a function in response to a multi-step user gesture comprising an object touching a display at a location corresponding to a demarcated representation of a function followed by the object gliding away from the location along said display (*see, e.g., id.*, col. 6, lines 29-44, and Fig. 4a, describing and illustrating selection of an icon in a palette by dragging the icon from the palette to a particular area of the screen; col. 6, line 55, – col. 7, line 9, and Fig. 4b, describing and illustrating displaying a keyboard at the particular area of the screen and indicating selection of keyboard elements using a stylus. Under such an arrangement as described, the user interface before display of the keyboard can be viewed as a tap-absent state and the user interface after display of the keyboard can be viewed as a tap-present state at least in the sense that the tap-activatable elements of the keyboard are absent prior to its display), wherein the representation is not relocated during the multi-step user gesture (*see, e.g., id.*, col. 6, lines 29-44, and Fig. 4a, describing and illustrating selection of an icon in a palette by dragging the icon from the palette to a particular area of the screen and illustrating the dragged icon remaining displayed in the palette as the icon is dragged and an outline of a keyboard image is displayed [indicating the icon “not relocated” during the drag in some form]; and col. 3, lines 19-21, and col. 8, line 60, – col. 9, line 2, describing “an outline of the input image” dragged with the stylus [indicating drag of a representation other than the icon engaged]) and the

function is not activated differently based on a direction of the gliding (*see, e.g., id.*, col. 6, lines 29-60, and Fig. 4b, describing and illustrating displaying a keyboard at a particular area of the screen based on a drag of an icon to a desired location. Such an arrangement can be viewed as a function “not activated differently based on a direction of the gliding” at least in the sense that dragging initially in different directions yet ending at the same target location would appear to result in activation of the keyboard at the same location. Also, display of the same keyboard at a given location regardless of characteristics of a drag gesture can be viewed as a function “not activated differently” in some sense).

54. A discussion of Gough as analogous art and a motivation to combine are discussed above. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the teachings of Simon, Shultz, Shah, Frank, and Gough and implement a portable wireless computer system in which computer instructions are configured to activate a function in response to a multi-step user gesture comprising an object touching a display at a location corresponding to a demarcated representation of the function followed by the object gliding away from the location along said display, wherein the representation is not relocated during the multi-step user gesture and the function is not activated differently based on a direction of the gliding, in order to allow a user to access a desired user interface feature while allowing better control and utilization of limited display space.

55. Regarding Claim 26, Simon as modified by Shultz, Shah, and Frank and as further modified by Gough teaches the portable wireless computer system of Claim 25, wherein the function is a member of a group consisting of an application, and a menu

for configuring services or settings for an operations system or an application (*see, e.g.*, Simon Manual, pp. 11 and 12, *How Simon Works* and *Using the Buttons*, describing and illustrating an icon that can be touched to go directly to the Mobile Office screen and describing and illustrating personal organization and communication functions accessed on the Mobile Office screen [representing both an application and a menu for configuring services or settings for an operations system]). Note that the teachings anticipate the alternative language of the claim), and wherein the maximum diagonal dimension of the representation is less than one inch (*see, e.g., id.*, p. 9, *LCD Contrast Adjustment*, illustrating the Simon being held by a hand such that the buttons at the bottom of the screen appear to have a maximum diagonal dimension that is less than one inch when viewed in relationship to the portrayed hand).

56. Regarding Claim 28, Simon as modified by Shultz, Shah, and Frank and as further modified by Gough teaches the portable wireless computer system of Claim 25, wherein the function activated in response to the multi-step user gesture presents one or more alphanumeric characters in a keyboard user interface on said display (*see, e.g.*, Simon Manual, p. 35, *Address Book*, and p. 40, *Making a Phone Call From the Address Book*, describing and illustrating user interaction to view an address book entry and to initiate a call to a phone number of a contact and illustrating display of alphanumeric keyboard in response to selecting a button; and *see, e.g.*, Gough, col. 6, line 29, – col. 7, line 9, and Fig. 4b, describing and illustrating dragging of an icon in a palette to display a keyboard at the particular area of the screen. One of ordinary skill in the art would have been motivated combine the teachings of Simon, Shultz, Shah, Frank, and Gough and implement access to a user interface keyboard in response to a multi-step

user gesture under the same rationale as provided in the discussion of Claim 23 above and further in order to provide convenient access to a virtual keyboard).

57. Regarding Claim 37, Simon as modified by Shultz, Shah, and Frank and as further modified by Gough teaches a mobile phone system corresponding to the portable wireless computer system of Claim 23. The same rationale of rejection provided above is applicable.

58. Regarding Claim 38, Simon as modified by Shultz and Shah teaches a mobile phone system corresponding to the portable wireless computer system of Claim 21 and Simon as modified by Shultz and Shah and as further modified by Frank teaches a mobile phone system corresponding to the portable wireless computer system of Claim 22. In view of the discussion of Claim 37, the same rationales of rejection provided above are applicable.

59. Claims 27, 30-35, and 39 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Simon in view of Shultz, Shah, Frank, and Gough and in further view of Nakagawa et al., U.S. Patent 5,289,168 (issued Feb. 22, 1994) (hereinafter "Nakagawa").

60. Regarding Claim 27, Simon as modified by Shultz, Shah, Frank, and Gough teaches the portable wireless computer system of Claim 26 as discussed above and further teaches the portable wireless computer system wherein the computer instructions are configured (a) to enable the portable wireless computer system to scroll content on said display in response to the object touching a first location on said display (e.g., Simon Manual, p. 41, *New Entry*, describing functionality allowing a user to touch

and hold arrow buttons to scroll quickly through choices), and (b) to enable the portable wireless computer system to move an application, a function, a service or a setting one step forward or backward or to close or remove an application, a function, a service or a setting on said display in response to the object touching a second location on said display (*see, e.g., id.*, p. 11, *How Simon Works*, and p. 12, *Using the Buttons*, describing and illustrating icon buttons at the bottom of every screen including an icon that can be touched to go directly to the Mobile Office screen [representing removing content representing an application, function, service, or setting from the display]).

61. However, Simon as modified by Shultz, Shah, and Frank appears to be silent regarding scrolling content on said display in response to the object touching a first location on said display and gliding up or down on said display from the first location and regarding moving an application, a function, a service, or a setting one step forward or backward or closing or removing an application, a function, a service, or a setting on said display in response to the object touching a second location on said display and gliding to the right or to the left from the second location.

62. Nakagawa teaches a computer system (*e.g., Nakagawa, Abstract*, describing a human-interactive-type dynamic display system), wherein computer instructions are configured (a) to enable the computer system to scroll content on a display in response to an object touching a first location on said display and gliding up or down on said display from the first location (*see, e.g., id.*, col. 5, line 56, – col. 7, line 28, and Fig. 4, describing and illustrating a human-interactive-type display system in which a tablet-type electronic whiteboard that detects input based on contact and movement of a pen on the whiteboard in order to selectively perform scroll, page up and down, window

shift, and count value changing functions; col. 6, lines 37-43, col. 7, lines 47-61, and Figs. 5 and 6, describing and illustrating scroll of an image on the whiteboard up and down as well as right and left based on the pen being brought into contact with the whiteboard within a scroll operation region and moving the pen in a desired direction over a desired distance [representing up or down scroll in response to an object gliding up or down]), and (b) to enable the computer system to move an application, a function, a service or a setting one step forward or backward or to close or remove an application, a function, a service or a setting on said display in response to the object touching a second location on said display and gliding to the right or to the left from the second location (*see, e.g., id.*, col. 8, lines 23-52, and Figs. 7A-7C, describing and illustrating movement between pages of content [moving one step forward or backward] based on the pen being brought into contact with the whiteboard and being moved in a direction, and describing an example of movement to the right. Note that the arbitrary scrolling mechanism described above can also be viewed as representing a step forward or backward in response to a right or left scroll movement. Note also that the teachings anticipate the alternative language of the claim).

63. Nakagawa is analogous art at least because it is from the same field of endeavor as the claimed invention, referencing portable computer systems comprising a touch-sensitive display and with teachings directed to multi-step user touch gestures. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to implement the portable wireless computer system taught by Simon as modified by Shultz, Shah, Frank, and Gough such that content on a display is scrolled in response to an object touching a first location on said display and gliding up or down on said

display from the first location and such that an application, a function, a service, or a setting is moved one step forward or backward or an application, a function, a service, or a setting on said display is closed or removed in response to the object touching a second location on said display and gliding to the right or to the left from the second location as taught by Nakagawa. Motivation to combine the teachings is found in Nakagawa, which teaches the value of its gesture methods in improving a user's remembrance of gestures, improving gesture recognition, and minimizing movement of a user's hand (*see, e.g.*, Nakagawa, col. 3, lines 31-55), and arises from the value of directional gestures known in the art. One of ordinary skill in the art would have been motivated to combine the teachings of Simon, Shultz, Shah, Frank, Gough, and Nakagawa and implement a portable wireless computer system in which content on a display is scrolled in response to an object touching a first location on said display and gliding up or down on said display from the first location and in which an application, a function, a service, or a setting is moved one step forward or backward or an application, a function, a service, or a setting on said display is closed or removed in response to the object touching a second location on said display and gliding to the right or to the left from the second location in order to improve a user's remembrance of gestures, improve gesture recognition, and minimize movement of a user's hand.

64. Regarding Claim 30, Simon as modified by Shultz and Shah and as further modified by Frank teaches a mobile phone system corresponding to the portable wireless computer system of Claim 22; Simon as modified by Shultz, Shah, and Frank and as further modified by Gough teaches a mobile phone system corresponding to the portable wireless computer system of Claim 25; and Simon as modified by Shultz,



Shah, Frank, and Gough and as further modified by Nakagawa teaches a mobile phone system corresponding to the portable wireless computer system of Claim 27. The same rationales of rejection provided above are applicable. Simon as modified by Shultz, Shah, Frank, and Gough and as further modified by Nakagawa further teaches the mobile phone system comprising instructions configured to enable the mobile phone system: (b) to present a plurality of functions, applications, services or settings in response to a second multi-step user gesture comprising the object touching an edge area of said display followed by gliding within said display away from the edge area (*see, e.g., see, e.g.,* Simon Manual, p. 11, *How Simon Works*, and p. 12, *Using the Buttons*, describing and illustrating icon buttons at the bottom of every screen including an icon that can be touched to get help information about how to use features on the current screen and an icon that can be touched to go directly to the Mobile Office screen; and *see, e.g.,* Gough, col. 6, line 6, – col. 7, line 9, and Figs. 2a-4b, describing and illustrating interaction with various icons in a palette, such as by dragging, to perform various functions. One of ordinary skill in the art would have been motivated combine the teachings of Simon, Shultz, Shah, Frank, and Gough and implement activation of a function and presentation of elements in response to gliding gestures under the same rationale as provided in the discussion of Claim 23 above and further in order to provide convenient or consistent access to multiple functions) and (d) to run a first application wherein a touch keyboard presented on said display enables a user to edit or save text in the first application (*e.g.,* Simon Manual, pp. 34 and 35, *New Entry*, describing functionality in an address book feature to add a new entry using an

onscreen keyboard; and pp. 67-70, *Using Keyboards*, describing and illustrating availability of different onscreen keyboards for use).

65. Regarding Claim 31, Simon as modified by Shultz, Shah, and Frank and as further modified by Gough teaches a mobile phone system corresponding to the portable wireless computer system of Claim 23. In view of the discussion of Claim 30, the same rationale of rejection provided above is applicable.

66. Regarding Claim 32, Simon as modified by Shultz, Shah, and Frank and as further modified by Gough teaches a mobile phone system corresponding to the portable wireless computer system of Claim 24. In view of the discussion of Claim 30, the same rationale of rejection provided above is applicable.

67. Regarding Claim 33, Simon as modified by Shultz and Shah teaches a mobile phone system corresponding to the portable wireless computer system of Claim 21 and Simon as modified by Shultz and Shah and as further modified by Frank teaches a mobile phone system corresponding to the portable wireless computer system of Claim 22. In view of the discussion of Claim 30, the same rationales of rejection provided above are applicable.

68. Regarding Claim 34, Simon as modified by Shultz, Shah, Frank, and Gough and as further modified by Nakagawa further teaches the mobile phone system of Claim 30, wherein the text saved in the first application is configured for use as an address, a telephone number, or a message in phone call, email, chat or SMS comprising instructions configured to enable the mobile phone system (*see e.g.*, Simon Manual, pp. 34 and 35, *New Entry*, describing functionality in an address book feature to add a new

entry using an onscreen keyboard and indicating saving of the new entry in some form.

Note that the teachings anticipate the alternative language of the claim).

69. Regarding Claim 35, Simon as modified by Shultz, Shah, and Frank and as further modified by Gough teaches a mobile phone system corresponding to the portable wireless computer system of Claim 28. In view of the discussion of Claim 30, the same rationale of rejection provided above is applicable.

70. Regarding Claim 39, Simon as modified by Shultz, Shah, Frank, and Gough and as further modified by Nakagawa teaches a mobile phone system corresponding to the portable wireless computer system of Claim 27 and Simon as modified by Shultz, Shah, Frank, and Gough and as further modified by Nakagawa teaches a mobile phone system as discussed in relationship to Claim 30 above. In view of the discussion of Claim 37, the same rationales of rejection provided above are applicable.

71. Claim 29 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Simon in view of Shultz, Shah, and Frank and in further view of Hughes et al., U.S. Patent Application 2009/0192849 A1 (published Jul. 30, 2009) (hereinafter "Hughes"), as evidenced by Hughes et al., U.S. Patent Application 61/020702 (filed Jan. 11, 2008) (hereinafter "Hughes Parent"); Ording, Bas, U.S. Patent Application 2008/0168404 A1 (published Jul. 10, 2008) (hereinafter "Ording"); and Schwesig et al., U.S. Patent Application 2008/0303799 A1 (published Dec. 11, 2008) (hereinafter "Schwesig").

72. Simon as modified by Shultz, Shah, and Frank teaches the portable wireless computer system of Claim 22 as discussed above and further teaches the portable wireless computer system wherein the computer instructions are configured to enable

the portable wireless computer system: (a) to enable a graphical user interface for accessing a plurality of gadgets (*e.g.*, Simon Manual, p. 11, *How Simon Works*, describing and illustrating a Mobile Office screen in which a user can use personal organization and communication functions by touching the appropriate icon on the Mobile Office screen [the icons representing gadgets in some form]).

73. However, Simon as modified by Shultz, Shah, and Frank appears to be silent regarding each gadget comprising an area containing at least a portion of dynamically generated data related to that gadget, wherein the user interface: (i) arranges the plurality of gadgets in a layout that is larger than said display, whereby some of the gadgets are in said display and others of the gadgets are out of said display; (ii) expands one of the gadgets in said display beyond an edge of said display to show more data therein by shifting other gadgets; and (iii) pans the layout within said display to bring some of the gadgets into said display and/or to move some of the gadgets out of said display.

74. Hughes teaches a portable computer system wherein computer instructions are configured to enable the portable computer system (*see, e.g.*, Hughes Parent, para. 15, describing systems implemented on computers and other devices; para. 89, providing examples of browsers known in the art at the time of the invention to be operable on computing devices known to comprise instructions to direct the computing devices; and paras. 30 and 46, indicating contemplation of mobile computing; *see also, e.g.*, Hughes, paras. 16, 78, and 129): (a) to enable a graphical user interface for accessing a plurality of gadgets, each gadget comprising an area containing at least a portion of dynamically generated data related to that gadget (*see, e.g.*, Hughes Parent, paras. 87-89 and Figs.

3-6, describing and illustrating a dashboard comprising a customizable framework of widgets in which widgets are small functional components or small applications that can be presented as an overall combined application; para. 88 and Figs. 3-6, describing and illustrating exemplary screen displays in which widgets are in presented in different states or modes and illustrating widgets in their various states presenting dynamic information in some form, such as time of day information within widgets at different levels of expansion), wherein the user interface: (i) arranges the plurality of gadgets in a layout that is larger than said display, whereby some of the gadgets are in said display and others of the gadgets are out of said display (*see, e.g., id.*, paras. 63, 87, 92, 93, and 115, indicating selection and arrangement of widgets for display in a main content area, and paras. 110-112, describing selection of a button corresponding to a widget in a navigation area causing scrolling to the widget's position in the main content area if it is already added to the area, indicating some widgets in the display and others out of the display; *see also, e.g., Hughes*, paras. 150-152), (ii) expands one of the gadgets in said display beyond an edge of said display to show more data therein by shifting other gadgets (*see, e.g., Hughes Parent*, para. 92 and 93, describing widgets in the main content area as presented in various states and describing minimizing or expanding widgets among their different states; para. 104 and Figs. 3 and 5, describing and illustrating interaction with an icon within a header area of a widget to minimize a widget to and expand a widget from a header view state; para. 92, indicating that there is no maximum number of widgets allowable in the main content area and describing the states or modes of a widget in the main content area including single-wide, double-wide, and minimized states, the single- and double-wide states being one row high; and

paras. 88 and 93 and Fig. 5, describing that widgets can be minimized or expanded to double-wide or full screen views; and *see, e.g.*, Hughes, paras. 128 and 133 and Fig. 5, contrasting minimized widget and widgets in an alternative normal or expanded state and illustrating non-minimized widgets. Under such arrangements as described, implementation comprising placement of an arbitrarily large number of widgets within the main content area in a minimized state and then expanding a widget near the bottom of the visible portion of the main content area [within the row height of single- and double-wide states from the bottom of the visible portion of the area] would result in expansion of the selected widget to virtually extend beyond an edge of the display), and (iii) pans the layout within said display to bring some of the gadgets into said display and/or to move some of the gadgets out of said display (*see, e.g.*, Hughes Parent, paras. 110-112, describing selection of a button corresponding to a widget in a navigation area causing scrolling to the widget's position in the main content area if it is already added to the area, indicating functionality to scroll to any given widget; *see also, e.g.*, Hughes, paras. 150-152).

75. Hughes is analogous art at least because it is from the same field of endeavor as the claimed invention, referencing scrollable computer interfaces and with teachings directed toward navigation among and selection of interface elements. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to implement the electronic device taught by Simon as modified by Shultz, Shah, and Frank by arranging a plurality of gadgets in layout that is larger than a display, expanding one of the gadgets beyond an edge of the display, and panning the layout as taught by Hughes. Motivation to combine the teachings is found in Hughes, which

indicates the value of use of a dashboard user interface to improve access to information and facilitate communication and collaboration (*see, e.g.*, Hughes Parent, paras. 61 and 63), and arises from the value of dashboard-style user interfaces known in the art. One of ordinary skill in the art would have been motivated to combine the teachings of Simon, Shultz, Shah, Frank, and Hughes and implement a portable wireless computer system in which a user interface: (i) arranges the plurality of gadgets in a layout that is larger than said display, whereby some of the gadgets are in said display and others of the gadgets are out of said display; (ii) expands one of the gadgets in said display beyond an edge of said display to show more data therein by shifting other gadgets; and (iii) pans the layout within said display to bring some of the gadgets into said display and/or to move some of the gadgets out of said display in order to improve access to information at a user interface.

76. However, although Hughes generally teaches embodiments in which the described interface is presented in a web browser (*see, e.g.*, Hughes Parent, para. 89; *see also, e.g.*, Hughes, para. 129), indicating access by devices known in the art at the time of the invention to be mobile phones and other devices that may comprise touch screens, Simon as modified by Shultz, Shah, Frank, and Hughes it is silent regarding panning the layout in response to the object touching one of the gadgets on said display, and then the object gliding along said display away from the touched location.

77. Ording teaches a portable wireless computer system (*see, e.g.*, Ording, para. 117, describing a portable multifunction device having a touch screen which may display one or more graphics such as application icons, and para. 54, describing embodiments in which the portable multifunction device is a mobile telephone that also

contains other functions), wherein a user interface pans a layout within a display to bring some of a plurality of gadgets into said display and/or to move some of the gadgets out of said display, in response to the object touching one of the gadgets on said display, and then the object gliding along said display away from the touched location (*see, e.g., id.*, para. 117, describing embodiments in which contacts include swipes in various directions, and para. 152, describing embodiments comprising scrolling through a list of applications via a swipe gesture).

78. Ording is analogous art at least because it is from the same field of endeavor as the claimed invention, referencing scrollable computer interfaces and with teachings directed toward navigation among and selection of interface elements. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to implement the electronic device taught by Simon as modified by Shultz, Shah, Frank, and Hughes such that a user interface pans a layout within a display as taught by Ording. Motivation to combine the teachings is found in Ording, which teaches the value of providing intuitive interfaces for devices that perform an increasing number of functions (*see, e.g., Ording*, paras. 4 and 8), and arises from the value of touch-based scroll interaction known in the art. One of ordinary skill in the art would have been motivated to combine the teachings of Simon, Shultz, Shah, Frank, Hughes, and Ording and implement a system in which a user interface pans a layout within display to bring some of a plurality of gadgets into said display and/or to move some of the gadgets out of said display, in response to an object touching one of the gadgets on said display, and then the object gliding along said display away from the touched location in order to



provide touch-based navigation among gadgets, widgets, apps, or icons by means of an intuitive, location-based user input at a touch-sensitive graphical user interface.

79. However, Simon as modified by Shultz, Shah, Frank, Hughes, and Ording is silent regarding computer instructions configured to enable the portable wireless computer system to detect an object touching with hard pressure an on-screen element selected from the group consisting of a gadget, a letter, a key, a button or an icon and then to activate the on-screen element, thereby resulting in: (i) enlarging the on-screen element, (ii) displaying a callout balloon with a copy of the on-screen element inside, or (iii) a combination thereof.

80. Schwesig teaches a computer system (*e.g.*, Schwesig, Abstract, describing an information processing apparatus), wherein computer instructions are configured to enable the computer system to detect an object touching with hard pressure an on-screen element (*see, e.g., id.*, paras. 52-55 and Fig. 2, describing and illustrating an input device used in an information processing apparatus, the input device including a contact sensor and a pressure sensor unit configured to detect pressure when depressed with a finger and the like, and paras. 148 and 149, describing embodiments in which a display device is combined with the input device such as in the form of a touch panel) selected from a group consisting of a gadget, a letter, a key, a button, or an icon and then to activate the on-screen element, thereby resulting in: (i) enlarging the on-screen element, (ii) displaying a callout balloon with a copy of the on-screen element inside, or (iii) a combination thereof (*see, e.g., id.*, Abstract, paras. 25, 28, 64, 81-84, 100-102, 138-140, and Figs. 5A-5C, 7A-8, and 13A-14B, describing and illustrating embodiments in which a selected virtual button is enlarged according to an intensity of a

detected pressure when the detected pressure is equal to or greater than a threshold value, and para. 153, describing embodiments in which, when an input device and a display device are combined such as in the form of a touch panel, a softbutton on which a user touches with a finger is displayed with a size thereof enlarged as the virtual button is enlarged. Note that the noted teachings anticipate the alternative language of the claim).

81. Schwesig is analogous art at least because it is from the same field of endeavor as the claimed invention, referencing portable computer systems comprising a touch-sensitive display and with teachings directed to pressure detection. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to implement the portable wireless computer system taught by Simon as modified by Shultz, Shah, Frank, Hughes, and Ording such that an object detected touching an onscreen element with a hard pressure results in enlarging the onscreen element as taught by Schwesig. Motivation to combine the teachings is found in Schwesig, which teaches the value of its methods in improving a user's accuracy in selecting a certain element (*see, e.g.*, Schwesig, paras. 23-25), and arises from the value of selection feedback well known in the art. One of ordinary skill in the art would have been motivated to combine the teachings of Simon, Shultz, Shah, Frank, Hughes, Ording, and Schwesig and implement a portable wireless computer system in which an object is detected touching with hard pressure an on-screen element selected from the group consisting of a gadget, a letter, a key, a button, or an icon and then the on-screen element is activated, thereby resulting in: (i) enlarging the on-screen element, (ii) displaying a callout balloon with a copy of the on-screen element inside, or (iii) a

combination thereof, in order to allow a user to more accurately select an intended object in the context of a pressure-sensitive touchscreen.

82. Claims 36 and 40 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Simon in view of Shultz, Shah, Frank, Gough, and Nakagawa and in further view of Hughes, Ording, and Schwesig.

83. Regarding Claim 36, Simon as modified by Shultz, Shah, and Frank and as further modified by Hughes, Ording, and Schwesig teaches a mobile phone system corresponding to the portable wireless computer system of Claim 29. In view of the discussion of Claim 30, the same rationale of rejection provided above is applicable.

84. Regarding Claim 40, Simon as modified by Shultz, Shah, and Frank and as further modified by Hughes, Ording, and Schwesig teaches a mobile phone system corresponding to the portable wireless computer system of Claim 29. In view of the discussion of Claim 37, the same rationale of rejection provided above is applicable.

### ***Conclusion***

85. The following prior art made of record and not relied upon is considered pertinent to Applicant's disclosure: Freeman, Stephen, U.S. Patent 5,289,168 (issued Feb. 22, 1994), teaching an image handling apparatus in which zooming and other modes are initiated by swipe gestures and applied pressure; Hansen, Benjamin E., U.S. Patent 5,568,604 (issued Oct. 22, 1996), teaching a method and system in which a user interface is scrolled in response to a stroke or swipe on a touchscreen; Miller et al., U.S. Patent Application 2002/0046315 A1 (published Apr. 18, 2002), teaching a portable

digital audio device comprising touchscreen controls; Simmon et al., U.S. Patent Application 2002/0097273 A1 (published Jul. 25, 2002), teaching system in which a user interface is scrolled in response to a drag gesture along a scrollbar; Kocienda et al., U.S. Patent Application 2007/0152978 A1 (published Jul. 5, 2007), teaching a touch-sensitive user interface in which a popup or callout window is provide in relationship to selection of a virtual keyboard key; and Panabaker et al., U.S. Patent Application 2009/0089705 A1 (published Apr. 2, 2009), teaching a navigation manager in which a zoom factor is adjusted based on a detected pressure.

86. Note that pinpoint citations to prior art references provided in this action are exemplary and should not be taken as limiting; each of the references as a whole is considered to provide disclosure relevant to the claimed invention and may be relied upon for all that it would have reasonably suggested to one of ordinary skill in the art. See MPEP § 2123.

#### ***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Conrad Pack whose telephone number is (571) 270-7967 and fax number is (571) 270-8967. The examiner can normally be reached on Monday through Friday, 8:30 to 5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dennis Chow can be reached at (571) 272-7767. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Conrad Pack/  
Examiner, Art Unit 2174  
8/13/2020

/SHERIEF BADAWI/  
Supervisory Patent Examiner, Art Unit 2174

<b>Notice of References Cited</b>	Application/Control No. 16/796,880	Applicant(s)/Patent Under Reexamination Goertz et al.	
	Examiner CONRAD R PACK	Art Unit 2174	Page 1 of 2

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	S					
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	V	O'Malley, Chris, Simonizing the PDA, Byte.com, Internet Archive Wayback Machine, available at <a href="https://web.archive.org/web/19990221174856/http://byte.com/art/9412/sec11/art3.htm">https://web.archive.org/web/19990221174856/http://byte.com/art/9412/sec11/art3.htm</a> (Dec. 1994)
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\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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Part of Paper No. 20200525

<b>Notice of References Cited</b>	Application/Control No. 16/796,880	Applicant(s)/Patent Under Reexamination Goertz et al.	
	Examiner CONRAD R PACK	Art Unit 2174	Page 2 of 2

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*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
N					
O					
P					
Q					
R					
S					
T					

**NON-PATENT DOCUMENTS**

*	Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
U	
V	
W	
X	

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

<b>Search Notes</b> 	<b>Application/Control No.</b> 16/796,880	<b>Applicant(s)/Patent Under Reexamination</b> Goertz et al.
	<b>Examiner</b> CONRAD R PACK	<b>Art Unit</b> 2174

CPC - Searched*		
Symbol	Date	Examiner
G06F3/04886 (keyword limited)	08/13/2020	CP
G06F3/018 (keyword limited)	08/13/2020	CP
G06F3/0481 (keyword limited)	08/13/2020	CP
G06F3/04817 (keyword limited)	08/13/2020	CP
G06F3/0485 (keyword limited)	08/13/2020	CP
G06F3/04855 (keyword limited)	08/13/2020	CP
G06F3/0488 (keyword limited)	08/13/2020	CP
G06F3/04883 (keyword limited)	08/13/2020	CP
G06F21/31 (keyword limited)	08/13/2020	CP
G06F21/32 (keyword limited)	08/13/2020	CP
H04M1/72583 (keyword limited)	08/13/2020	CP
H04M2250/22 (keyword limited)	08/13/2020	CP


CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
715	700	08/13/2020	CP

\* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/SHERIEF BADAWI/ Supervisory Patent Examiner, Art Unit 2174	
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<b><i>Search Notes</i></b> 	<b>Application/Control No.</b> 16/796,880	<b>Applicant(s)/Patent Under Reexamination</b> Goertz et al.
	<b>Examiner</b> CONRAD R PACK	<b>Art Unit</b> 2174

Search Notes		
Search Notes	Date	Examiner
PALM inventor name search	08/13/2020	CP
East text search and class limited search (see attached)	08/13/2020	CP
Other Searches: Google Web and InnovationQ Plus (see attached)	08/13/2020	CP

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/SHERIEF BADAWI/ Supervisory Patent Examiner, Art Unit 2174	
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**EAST Search History**

**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	111,882	(G06F3/04886 G06F3/018 G06F3/0481 G06F3/04817 G06F3/0485 G06F3/04855 G06F3/0488 G06F3/04883 G06F21/31 G06F21/32 H04M1/72583 H04M2250/22).CPC.	US-PGPUB; USPAT	OR	ON	2020/05/25 20:00
S2	2,778	715/700.CCLS.	US-PGPUB; USPAT	OR	ON	2020/05/25 20:00
S3	125	"20010000668" "20010002694" "20010015719" "20010017934" "20010022579" "20010026268" "20010028344" "20010028365" "20010030641" "20010043189" "20010043198" "20010055006" "20020002326" "20020015064" "20020027549" "20020029341" "20020046315" "20020046353" "20020054153" "20020060699" "20020063696" "20020075244" "20020080183" "20020109677" "20020109843" "20020135619" "20020171691" "20020173300" "20020175900" "20020191029" "20030002809" "20030010043" "20030013483" "20030014239" "20030016253" "20030030656" "20030043207" "20030076306" "20030095102" "20030098803" "20030122787" "20030122882" "20030179189" "20030179239" "20030182628" "20030206162" "20030234346" "20040001101" "20040021643" "20040021681" "20040046791" "20040046960" "20040100510" "20040119763" "20040125143" "20040141010" "20040233179" "20050035956" "20050091612" "20050104860" "20050122308" "20050165615" "20050174473" "20050198582" "20050253818" "20050271319" "20060001654" "20060010394" "20060048073" "20060161870" "20060161871" "20060229509" "20070005449" "20070024598" "20070055926" "20070082707"	US-PGPUB; USPAT	OR	ON	2020/05/25 20:04

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		"6573883" "6597345" "6618063" "6639584" "6646633" "6664983" "6677932" "6690365" "6690387" "6707449" "6727916" "6727917" "6734883" "6750849" "6757001" "6757002" "6765559" "6781575" "6788292" "6803906" "6812940" "6833827" "6857746" "6864882" "6874683" "6888536" "6925611" "6947032" "6954197" "6957397" "6972401" "6977645" "6982733" "6985137" "6988246" "7006077" "7007239" "7030861" "7046232" "7155683" "7159120" "7159763" "7176905" "7184030" "7199786" "7225408" "7231231" "7232986" "7239227" "7283845" "7286063" "7304638" "7333951" "7339580" "7343565" "7353461" "7355594" "7372456" "7441196" "7450114" "7464110" "7479949" "7665043" "7818691" "7880724" "7996878" "8022941" "8120625" "8127141" "8434020").PN.				
S5	29	(EP-0330767-\$ EP-0513694-\$ EP-0618528-\$ EP-0703525-\$ WO-8600446-\$ WO-8600447-\$ WO-0102949-\$ WO-02095668-\$ WO-03038592-\$ WO-2006020304-\$ WO-2009008786-\$).DID.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2020/05/25 20:12
S6	6	("20020026483" "20020034281" "20070242057" "5818437" "7126583" "7889180").PN.	US-PGPUB; USPAT	OR	ON	2020/05/25 20:24
S7	1	("20040010722").PN.	US-PGPUB; USPAT	OR	ON	2020/05/25 20:36
S8	67,859	(glid\$3 swip\$3 slid\$3 move\$1 moving drag\$4) NEAR5 (object stylus finger pen point) NEAR5 (screen display touch\$1screen\$1)	US-PGPUB; USPAT	OR	ON	2020/08/03 04:39
S9	2,146	S8 SAME (highlight\$3 empasi\$4)	US-PGPUB; USPAT	OR	ON	2020/08/03 04:41
S10	203	S9 SAME (list\$3 directory)	US-PGPUB; USPAT	OR	ON	2020/08/03 04:42
S11	7,441	touch\$8.TI,AB. AND (SSD(((solid NEAR state) solid\$1state) NEAR3 (memory drive disk)))	US-PGPUB; USPAT	OR	ON	2020/08/03 05:57
S12	830	S11 AND ((glid\$3 swip\$3 slid\$3 move\$1 moving drag\$4) SAME highlight\$3)	US-PGPUB; USPAT	OR	ON	2020/08/03 05:57
S13	10,506	(chat\$4 SMS (instant NEAR messag\$3)) SAME camera SAME (music player)	US-PGPUB; USPAT	OR	ON	2020/08/03 08:34

S14	27,015	(contact (address NEAR book)) SAME (call\$3 phon\$3 telephon\$3) SAME (e\$1mail\$3 mail\$3) SAME (chat\$4 SMS (instant NEAR messag\$3))	US-PGPUB; USPAT	OR	ON	2020/08/03 08:38
S15	50	S13 AND @AD<"20021210"	US-PGPUB; USPAT	OR	ON	2020/08/03 08:42
S16	706	S14 AND @AD<"20021210"	US-PGPUB; USPAT	OR	ON	2020/08/03 08:45
S17	3,554	S13 AND S14	US-PGPUB; USPAT	OR	ON	2020/08/03 08:52
S18	370	((chat\$4 SMS (instant NEAR messag\$3) text\$3) SAME camera SAME (music player)) AND @AD<"20021210"	US-PGPUB; USPAT	OR	ON	2020/08/03 12:20
S19	8,104	((simultaneous\$2 concurrent\$2) NEAR3 (run\$4 execut\$3) NEAR3 (application program app software)) SAME (top above over front)	US-PGPUB; USPAT	OR	ON	2020/08/03 13:57
S20	923	S19 AND @AD<"20021210"	US-PGPUB; USPAT	OR	ON	2020/08/03 13:58
S21	69	S20 AND ((simultaneous\$2 concurrent\$2) NEAR3 (run\$4 execut\$3)).TI,AB.	US-PGPUB; USPAT	OR	ON	2020/08/03 14:38
S22	5,621	(glid\$3 swip\$3 slid\$3 move\$1 moving drag\$4) NEAR5 (object stylus finger pen point away) NEAR5 (edge side top bottom) NEAR5 (screen display touch\$1screen\$1)	US-PGPUB; USPAT	OR	ON	2020/08/04 15:43
S23	497	S22 AND @AD<"20021210"	US-PGPUB; USPAT	OR	ON	2020/08/04 15:44
S24	169	S22 SAME (icons! tray)	US-PGPUB; USPAT	OR	ON	2020/08/04 15:47
S25	19,305	((show\$3 display\$3 open\$3) WITH (hid\$3 clos\$3) WITH (icons! tray panel drawer)) SAME (glid\$3 swip\$3 slid\$3 drag\$4)	US-PGPUB; USPAT	OR	ON	2020/08/05 00:34
S26	5,216	S25 AND @AD<"20021210"	US-PGPUB; USPAT	OR	ON	2020/08/05 00:35
S27	70	S26 AND (touch\$8 tap tapp\$3 glid\$3 swip\$3).TI,AB.	US-PGPUB; USPAT	OR	ON	2020/08/05 00:36
S28	215	S26 AND (G06F.CPCL. "715".CLAS.)	US-PGPUB; USPAT	OR	ON	2020/08/05 00:45
S29	17,140	(scroll\$3 pan pann\$3) NEAR10 (touch\$3 drag\$4 swip\$3 slid\$3 glid\$3) NEAR10 (up\$5 down\$5 left right direction)	US-PGPUB; USPAT	OR	ON	2020/08/12 11:30
S30	1,620	S29 AND @AD<"20021210"	US-PGPUB; USPAT	OR	ON	2020/08/12 11:31

S31	611	S30 AND (G06F.CPCL. "715".CLAS.)	US-PGPUB; USPAT	OR	ON	2020/08/12 11:32
S32	128	S31 AND (((touch\$3 drag\$4 swip\$3 slid\$3 glid\$3) NEAR10 (up\$5 down\$5)) SAME ((touch\$3 drag\$4 swip\$3 slid\$3 glid\$3) NEAR10 (left right)))	US-PGPUB; USPAT	OR	ON	2020/08/12 11:35
S33	161	pressur\$3 NEAR5 (icon widget gadget) NEAR5 (enlarg\$6 grow\$3 increas\$3 pop\$1up\$1 (pop ADJ up))	US-PGPUB; USPAT	OR	ON	2020/08/12 14:35
S34	19,747	pressur\$3 NEAR5 (icon widget gadget item element object image) NEAR5 (enlarg\$6 grow\$3 increas\$3 pop\$1up\$1 (pop ADJ up) zoom\$3)	US-PGPUB; USPAT	OR	ON	2020/08/12 14:41
S35	149	S34 AND (G06F.CPCL. "715".CLAS.) AND @AD<"20080619"	US-PGPUB; USPAT	OR	ON	2020/08/12 14:43
S36	14,751	((pressur\$3 (press\$3 NEAR3 (hard\$3 firm\$2))) WITH ((icon widget gadget item element object image) NEAR5 (enlarg\$6 grow\$3 increas\$3 magnif\$8 pop\$1up\$1 (pop ADJ up) zoom\$3))) AND @AD<"20080619"	US-PGPUB; USPAT	OR	ON	2020/08/12 22:07
S37	188	S36 AND ((touch\$12 NEAR3 (screen display)) touch\$1screen\$1)	US-PGPUB; USPAT	OR	ON	2020/08/12 22:11

#### EAST Search History (Interference)

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## Bibliographic Data

Application No: 16/796,880

Foreign Priority claimed:  Yes  No

35 USC 119 (a-d) conditions met:  Yes  No

Met After Allowance

Verified and Acknowledged: /CONRAD R PACK/

Examiner's Signature

Initials

Title:

TOUCH SCREEN ELECTRONIC DEVICE AND ASSOCIATED  
USER INTERFACE

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FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
02/20/2020	715	2174	AEQUITAS.P001
<b>RULE</b>			

### APPLICANTS

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### INVENTORS

Magnus Goertz, Lidingo, SWEDEN

Joseph Shain, Rehovot, ISRAEL

### CONTINUING DATA

This application is a CON of 14886048 10/17/2015ABN

14886048 is a CON of 12486033 06/17/2009 PAT 9164654

12486033 has PRO of 61132469 06/19/2008

12486033 is a CIP of 10315250 12/10/2002 PAT 8095879

### FOREIGN APPLICATIONS

#### IF REQUIRED, FOREIGN LICENSE GRANTED\*\*

03/05/2020

\*\* SMALL ENTITY \*\*

#### STATE OR COUNTRY

SWEDEN

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UNITED STATES

#### FILING FEE RECEIVED

\$2,855



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PTO/SB/08a (02-18)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 11/30/2020. OMB 0651-0031  
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number	16796880
	Filing Date	2020-02-20
	First Named Inventor	Magnus Goertz
	Art Unit	N/A
	Examiner Name	N/A
	Attorney Docket Number	AEQUITAS.P001

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	4243879	A	1981-01-06	Carroll et al.	
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	6	4710760	A	1987-12-01	Kasday	
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	8	4790028	A	1988-12-06	Ramage	

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		16796880	
	Filing Date		2020-02-20	
	First Named Inventor	Magnus Goertz		
	Art Unit		N/A	
	Examiner Name	N/A		
	Attorney Docket Number		AEQUITAS.P001	

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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		16796880	
	Filing Date		2020-02-20	
	First Named Inventor	Magnus Goertz		
	Art Unit		N/A	
	Examiner Name	N/A		
	Attorney Docket Number		AEQUITAS.P001	

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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		16796880	
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	First Named Inventor	Magnus Goertz		
	Art Unit	N/A		
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