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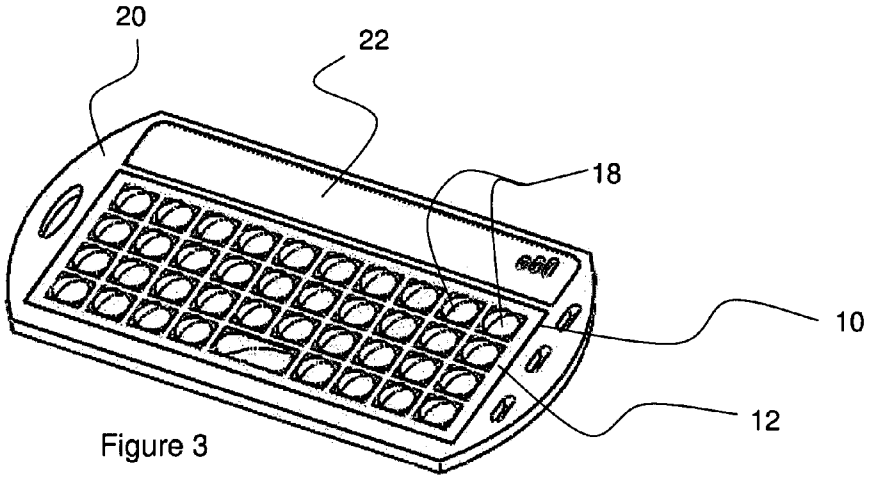

Figure 3

(57) Abstract: A keypad including an elastic sheet for disposing on a touch screen, the sheet including at least one key member shaped to define a space within the key member for providing tactile feedback when the key member is depressed and contacts the touch screen and a mounting element, for mounting the elastic sheet on the touch screen, coupled to the elastic sheet.

KEYPAD

FIELD OF THE INVENTION

The present invention relates to a keypad, in general and, in particular, to a keypad for touch screens.

BACKGROUND OF THE INVENTION

A touch screen is a display that can detect the presence and location of a touch made on the display surface. The touch may be a finger touch or hand touch, or a touch by any other object, such as a stylus. The touch screen enables one to directly interact with data displayed on the screen, without requiring any intermediate device, such as a mouse or a keypad. Touch screens are incorporated in a variety of digital appliances, such as personal digital assistants (PDA), Tablet PCs, satellite navigation devices, mobile phones, and video games.

One example of a touch screen is a resistive touch screen. A resistive touch screen panel generally includes two transparent conductive layers separated by a narrow gap. The layers are disposed on a monitor displaying data. When an object, such as a finger, presses down on a point on the panel's outer surface, the two layers become connected at that point. This causes a change in the electrical current, which is registered as a touch event and sent to the controller for processing.

Another example of a touch screen is a capacitive touch screen. A capacitive touch screen panel includes a transparent layer that stores electrical charge, such as indium tin oxide. The transparent layer is disposed on a monitor displaying data. When a user touches the transparent layer with his or her finger, some of the charge is transferred to the user, so the charge on the capacitive layer decreases. This decrease is measured in circuits located at each corner of the monitor. A computer calculates, from the relative differences in charge at each corner, exactly where the touch event took place.The capacitive touch screen technology is used in a wide range of applications, including point-of-sale systems, industrial controls, and public information kiosks. Unlike the resistive touch screens, the capacitive touch screen

only responds to a touch by a conductive material, and thus, does not work, for example, with a gloved hand.

There are known other technologies utilized in touch screens, one of which is surface acoustic wave (SAW) technology. SAW technology uses ultrasonic waves that pass over the touch screen panel. When the panel is touched, a portion of the wave is absorbed. This change in the ultrasonic waves registers the position of the touch event and sends this information to the controller for processing. Deficiencies of SAW touch screens include difficulty of use in winter when wearing gloves, or when used by old people.

However, conventional touch screens are unable to supply the confirmation that the tactile feel of buttons and mechanical controls provides. In order to overcome this problem, some systems include an audio signal, which sounds upon a touch on the touch screen. Other systems generate a vibration signal upon a touch on the touch screen. The vibration signal is particularly useful in environments in which audio cues are inappropriate or difficult to hear.

However, these systems do not provide a tactile sensation that resembles pressing on a mechanical button. In addition, these systems require a special technology which must be designed as an integral part of the touch screen.

Accordingly, there is a long felt need for an apparatus which creates a tactile sensation when using a touch screen, and it would be very desirable to have such apparatus which is low cost and can be easily removed.

SUMMARY OF THE INVENTION

There is provided according to the present invention a keypad including an elastic sheet for disposing on a touch screen. The sheet includes at least one key member shaped to define a space within the key member for providing tactile feedback when the key member is depressed and contacts the touch screen. The keypad further includes a mounting element, for mounting the elastic sheet on the touch screen, coupled to the elastic sheet.

According to a further embodiment of the invention, the mounting element includes a static cling sheet coupled to the elastic sheet for mounting the elastic sheet on the touch screen. According to one embodiment of the invention, there is provided a keypad including an elastic sheet forming a single key member for engaging a touch screen, and a mounting element for mounting the key member on a finger of a user.

There is further provided according to the present invention a method for forming a keypad. The method includes configuring, from an elastic sheet, at least one key member shaped to define a space within the key member for providing tactile feedback when the key member is depressed and contacts the touch screen. The method further includes coupling a mounting element to the elastic sheet.

There is also provided, according to the invention, a keypad including an elastic sheet forming a single key member for engaging a touch screen, the key member being shaped to define a space within the key member for providing tactile feedback, and a mounting element for mounting the key member on a finger of a user.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be further understood and appreciated from the following detailed description taken in conjunction with the drawings in which:

Figure 1 is a schematic top view illustration of a keypad constructed and operative in accordance with one embodiment of the present invention;

Figure 2 is an exploded illustration of the touch screen keypad of **Figure 1**;

Figure 3 is a top view illustration of the touch screen keypad of **Figure 1** mounted on a handheld device;

Figure 4a is a side sectional view of a key in a touch screen keypad constructed and operative in accordance with one embodiment of the present invention;

Figure 4b is a side sectional view of a key in a touch screen keypad constructed and operative in accordance with another embodiment of the present invention;

Figure 4c is a side sectional view of a key in a touch screen keypad constructed and operative in accordance with further embodiment of the present invention;

Figure 4d is a side sectional view of a key in a touch screen keypad constructed and operative in accordance with another embodiment of the present invention;

Figure 5 is a side sectional view of a touch screen keypad mounted on a touch screen;

Figure 6 is a top perspective view illustration of a touch screen keypad constructed and operative in accordance with another embodiment of the present invention;

Figure 7 is a top view illustration of the touch screen keypad of **Figure 6**;

Figure 8 is a partial cut-away bottom perspective view illustration of the touch screen keypad of **Figure 6**;

Figure 9 is a schematic illustration of a person using a handheld device having a touch screen keypad of **Figure 6** mounted thereon;

Figure 10a is a perspective view of a touch screen keypad mounted in accordance with one embodiment of the present invention on a handheld device;

Figure 10b is a perspective view of a touch screen keypad mounted in accordance with another embodiment of the present invention on a handheld device;

Figure 10c is a perspective view of a touch screen keypad mounted in accordance with another embodiment of the present invention on a handheld device;

Figure 10d is a perspective view of a touch screen keypad mounted in accordance with another embodiment of the present invention on a handheld device;

Figure 10e is a perspective view of a touch screen keypad in accordance with another embodiment of the present invention mounted on a handheld device constructed and operative;

Figure 11 is a perspective view illustration of a keypad constructed and operative in accordance with one embodiment of the present invention;

Figure 12a is a perspective view illustration of a keypad constructed and operative in accordance with a further embodiment of the present invention;

Figure 12b is a perspective view illustration of a keypad constructed and operative in accordance with a further embodiment of the present invention;

Figure 13 is a perspective view illustration of a keypad constructed and operative in accordance with another embodiment of the present invention;

Figure 14a is a perspective front view illustration of a keypad constructed and operative in accordance with one embodiment of the present invention; and,

Figure 14b is a perspective view illustration of the keypad of **Figure 14a** in use.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a keypad covering at least a portion of a touch screen, for providing a tactile interaction. The keypad includes an elastic sheet adapted to engage a portion of the touch screen. The sheet includes at least one key member shaped to define a space within the key member, for providing tactile feedback. In particular, a tactile sensation is created (typically, movement of the key member against mechanical resistance) as the key member is depressed against the touch screen and returns to its original shape. According to one embodiment, the outside surface of the elastic sheet is formed with a tactile texture. Preferably, the keypad is at least partially transparent, allowing the user to view the data displayed on the touch screen beneath it. According to one embodiment, the keypad further includes a mounting element for coupling the keypad to the touch screen.

Figures 1 and **2** are a top view illustration and an exploded illustration, respectively, of a touch screen keypad **10** constructed and operative in accordance with one embodiment of the present invention. Keypad **10** includes a plate **12,** having at least one aperture, and preferably having a plurality of apertures **14.** Keypad **10** further includes an elastic sheet **16** having an upper surface **16a** facing the user, and a lower surface **16b** facing the touch screen. Upper surface **16a** defines a plurality of key members **18,** each key member includes a top portion and a wall portion which define a space. The elastic material of key members **18** permits depressing the top portion until it abuts the touch screen. Elastic sheet **16**, according to one embodiment, is made of a conductive material, which is configured to activate the touch screen when key member **18** depressed by the user's finger. One example of a conductive elastic material is polyvinyl chloride (PVC), whose conductivity is similar to the conductivity of a human finger.

Plate **12** is coupled to upper surface **16a** of elastic surface **16**, and each of key members **18** is disposed in one of apertures **14**. Plate **12** provides elastic sheet **16** with firmness, and helps maintain keypad **10** in position on the touch screen.

According to another embodiment of the invention, plate **12** is coupled to lower surface **16b**, and each of key members **18** is disposed coaxially with one of apertures **14**. Plate **12**, according to this embodiment, provides an additional space between elastic sheet **16** and the touch screen for enabling a tactile feedback of the key member when depressed.

Coupling plate **12** to upper surface **16a** or lower surface **16b** of elastic surface may be carried out by various known methods, such as gluing, soldering etc.

Keypad **10** further includes a mounting element for mounting the elastic sheet and the plate on a touch screen. According to one embodiment of the invention, the mounting element may be a static cling sheet **15** for removably mounting elastic sheet **16** and plate **12** on a cellular phone touch screen. The static cling sheet **15** is made of a conductive material, such as PVC, or any other material, which carries static electricity. When plate **12** is disposed on top of elastic sheet **16**, cling sheet **15** is coupled to the lower surface **16b** of elastic sheet **16** for holding sheet **16** on the touch screen. When plate **12** is disposed underneath elastic surface **16**, cling sheet **15** is coupled to the bottom of plate **12**. Coupling cling sheet **15** to elastic sheet **16** or to the bottom of plate **12** may carried out by various known methods, such as gluing, soldering etc.

It will be appreciated that the static cling sheet is transparent or translucent, and it is configured to properly function with capacitive touch screens to allow activation of a virtual key on the touch screen. Alternatively, in the event that the cling sheet is not transparent it may be adapted for coupling only to portions of the bottom of keypad **10**, for example, strips of static cling material coupled to portions of plate **12**, so as to allow the user to view the virtual keys, and to allow lower surface **16b** to contact the touch screen when depressed.

Figure 3 is a top view illustration of touch screen keypad **10** of **Figure 1** mounted on a touch screen of a cellular phone. Keypad **10** is mounted on a cellular phone **20** having a touch screen **22** by means of a mounting element (not shown). Keypad **10**, according to this embodiment, covers only a portion of touch screen **22**,

preferably the portion displaying a virtual keyboard. According to this embodiment, each key member **18** on keypad **10** is disposed over a spot on touch screen **22** displaying one virtual key. In this way, each key member **18** serves as a mechanical key associated with a virtual key on touch screen **22**. Keypad **10** is preferably at least partially transparent, allowing the user to view the virtual keyboard displayed on touch screen **22** through the keypad. Alternatively, the character associated with each key on the virtual keyboard may be printed directly on key member **18** disposed thereabove.

Pressing on the top portion of one of key members **18** causes the corresponding portion of lower surface **16b** to contact touch screen **22.** When touch screen **22** is a resistive touch screen, lower surface **16b** pressing on the touch screen causes an electric contact between the two conductive layers inside the touch screen. When touch screen **22** is a capacitive touch screen, lower surface **16b** touching a spot on the touch screen discharges the electric charge on that spot on the touch screen. In the latter case, elastic sheet **16** must be electrically conductive, preferably having conductivity characteristics similar to those of the human finger. It will be appreciated that keypad **10** may be configured to function compatibly with a touch screen **22** which is based on other technologies, or a combination thereof.

It will be further appreciated that keypad **10** may be placed on a different portion of touch screen **22,** for example, for providing a tactile sensation when clicking on icons on a touch screen, or may be completely removed.

Figure 4a is a side sectional view of a key member forming part of a touch screen keypad, according to one embodiment of the invention. Key member **30a** includes an elastic layer **32** forming a dome **34** defining a space between the elastic layer **32** and the touch screen. Key member **30a** further includes a semi-rigid shell **36a** seated on dome **34** which is configured to snap when depressed, in order to provide a tactile sensation, and to snap back to its original shape when released. Shell **36a** can be a cap covering dome **34** or may be a band over the apex of dome **34**. Shell **36a** is placed on dome **34** and provides elastic layer **32** with a firm structure. Shell

36a may be made of a transparent material and, according to one embodiment, may be configured to magnify the icons or virtual keys displayed on the touch screen.

According to another embodiment, a shell may be disposed underneath dome **34**, as can be seen in **Figure 4b,** illustrating a key member **30b** having a shell **36b**. It will be appreciated that elastic layer **32**, and/or shell **36b**, will have conductive characteristics, if the keypad is to be used on a capacitive touch screen.

Figure 4c is a side sectional view of a key member, according to another embodiment of the present invention, forming part of a touch screen keypad. Key member **40** includes an elastic layer **42** defining a dome **44**. Key member **40** further includes a rigid contact element **46**, here illustrated as a small ball, disposed underneath dome **44**. Contact element **46** is particularly important when key member **40** is used with a resistive touch screen, which requires pressure to create contact between the two conductive layers inside the resistive touch screen.

Figure 4d is a side sectional view of a key forming a part of touch screen keypad according to a further embodiment of the invention. Key member **50** is substantially the same as key member **40** of **Figure 4c** and includes an elastic layer **52** defining a dome **54** with a contact element **56** therein. Adjacent key member **50** there is provided a mounting element, here illustrated as a suction mount **58**, for removably attaching the keypad to a touch screen. Suction mount **58** is pressed onto the touch screen, thereby creating a vacuum which maintains the keypad in place. It will be appreciated that suction mount **58** may be replaced with any other mounting element.

Figure 5 is a side sectional view of a touch screen keypad **60** including an elastic layer **65** defining various key members, according to different embodiments of the invention, mounted on a touch screen **80**. Keypad **60** includes a first key member **62** having an outer shell **64,** substantially as described with regard to key member **30a** of **Figure 4a.** Keypad **60** further includes a second key member **66** having an inner shell **68**, substantially as described with regard to key member **30b** of **Figure 4b.** Keypad **60** further includes a third key member **70** having a rigid contact element **72**,

substantially as described with regard to key member **40** of **Figure 4c.** For the sake of convenience, keypad **60** is illustrated here as having keys **62**, **66** and **70**, which differ from one another, as described above. Typically however, keypad **60** includes a set of keys, all having a similar structure, for example, the structure of one of keys **62**, **66** or **70**.

Keypad **60** further includes an upper plate **74a** providing keypad **60** with stability and assisting the user in maintaining keypad **70** in place. Upper plate **74a** is disposed around keys **62**, **66**, and **70**, precluding the movement of one key when an adjacent key is pressed, and thus avoiding unintentional activation of a virtual key on touch screen **82**. Preferably, keypad **60** further includes a bottom plate **74b** mounted between and beneath keys **62**, **66** and **70**. Bottom plate **74b** separates keys **62**, **66** and **70** from touch screen **80** thus, precluding undesired contact with touch screen **80**. Elastic layer **65** defining keys **62**, **66**, and **70** is clamped between upper plate **74a** and bottom plate **74b**, thereby retaining the keys in place on the touch screen. In addition, keypad **60** includes suction mounts **78**, for attaching keypad **60** to a touch screen **80** for a display device **82**.

As illustrated in **Figure 5**, when a user depresses key **66,** i.e. using a finger **84**, shell **68** is pressed against touch screen **80**. Shell **68** resists the pressure applied by finger **84**, and provides the user with tactile feedback. Shell **68** pressing on touch screen **80** functions as a finger pressing substitute. It will be appreciated that the surface contacting the touch screen, such as shell **68**, may be made of conductive material configured to activate a capacitive touch screen. Alternatively, for example when touch screen **80** is a resistive touch screen, shell **68** may be provided with the firmness necessary for creating contact between the conductive layers of the touch screen.

Figures 6 and 7 are a perspective illustration and a top view illustration, respectively, of a touch screen panel **90** constructed and operative in accordance with another embodiment of the present invention. Touch screen panel **90** includes a keypad portion **92** having a plurality of elongated keys **94,** which are made of an

elastic material. Preferably, each elongated key **94** is configured to cover a line of virtual keys displayed along the width of a touch screen. Alternatively, each elongated key **94** may be configured to cover a column of keys displayed along the length of a touch screen with a space between each key and the screen. Keypad portion **92** further includes keypad suction mounts **93**, for coupling panel **90** to the touch screen. Panel **90** further includes a plate **96,** preferably made of a rigid material. Plate **96** surrounds each one of elongated keys **94**, providing keypad portion **92** with stability and precluding the movement of keypad portion **92**. The immovability of keypad portion **92** is important, in particular, when one of elongated keys **94** is depressed, so as to avoid the unintentional activation of the wrong virtual key on the touch screen. According to this embodiment, plate **96** further defines a window portion **98,** extending away from keypad portion **92**. Window portion **98** may be configured to be disposed on portions of a touch screen which do not display a virtual keyboard.

Panel **90** further includes a mounting portion **100** having two suction mounts **102**. Mounting portion **100** is coupled to window portion **98** by means of a hinge **104,** which permits pivoting of window portion **98** and keypad portion **92** away from the touch screen.

Panel **90** is disposed on a touch screen in such a way that keypad portion **92** covers the virtual keyboard displayed on the touch screen, whereas other portions of the touch screen can be viewed through window portion **98**. Panel **90** may be coupled to the touch screen by pressing suction mounts **102** and keypad suction mounts **93** onto the periphery of the touch screen. When the user wishes to use the touch screen without panel **90**, he merely releases keypad suction mounts **93**, and pivots keypad **92** and window portion **98** away from the touch screen. Mounting portion **100** can remain coupled by suction mounts **102** to the touch screen. Keypad suction mounts **93** may be smaller than suction mounts **102**, and thus can be released easily, allowing the user to pivot keypad portion **92** away from the touch screen. Suction mounts **102,** on the other hand, are intended to remain attached to the touch screen, so as to

maintain mounting portion **100** in place. In this way, when the user wishes to make use of panel **90** again, he can pivot keypad portion **92** back to its original position on the touch screen, so that elongated keys **94** again cover the virtual keyboard displayed thereon. When the user wishes to completely remove panel **90,** he releases suction mounts **102** as well, thereby detaching mounting portion **100**. It will be appreciated that mounting portion **100** may be replaced with a mounting portion constituting an integral part of the handheld device.

Figure 8 is a bottom perspective view of a keypad portion **92** of touch screen keypad **90** of **Figures 6** and **7**. Keypad portion **92** includes a plurality of elastic elongated keys **94,** each surrounded by plate **96**. Each elongated key **94** is convex and is configured to allow selective contact between the key and the touch screen disposed underneath, only when elongated key **94** is depressed. It will be appreciated that each elongated key **94** is made of an elastic material, ensuring that when one segment of elongated key **94** is depressed, contact between that segment and the touch screen is created, which can be felt by the user, whereas other segments of elongate key **94** are not in contact with the touch screen.

Figure 9 is schematic illustration of a user **120** using a handheld device, such as an iPhone™, having the touch screen keypad **90** of **Figure 6** mounted thereon. Handheld device **110** includes a touch screen **112** displaying a set of virtual keys **114**. Keypad **90** is mounted on handheld device **110** with suction mounts **102** and keypad suction mounts **93**. Keypad portion **92** covers virtual keys **114** displayed on touch screen **112** in such a way that each elongated key **94** covers a line of virtual keys **114**. Other portions of touch screen **112** may be viewed through window portion **98**. User **120** depresses a segment of elongated key **94**, which is disposed on top of one of virtual keys **114**. As elongated key **94** is depressed, contact is created between the segment of key **94** being depressed and a spot on touch screen **112** associated with one virtual key **114**. As a result, virtual key **114** is activated. Thus, activating virtual key **114** provides the user with tactile feedback associated with the process of depressing elongated key **94**.

Figures 10a to **10e** show various methods according to the invention, of coupling a touch screen keypad to a touch screen.

Figure 10a is a perspective view of a handheld device **130** having a touch screen **132**, and a touch screen keypad **134** mounted thereon. According to this embodiment, keypad **134** is disposed along the length of touch screen **132,** and is configured to engage a horizontally disposed virtual keyboard in landscape orientation displayed thereon. Keypad **134** includes a hinge **136**, which is coupled to handheld device **130**, allowing the user to pivot keypad **134** onto and away from touch screen **132**. Preferably, hinge **136** is coupled to the edge of handheld device **130**, so as to allow pivoting keypad **134** to the front or the back side of handheld device **130**, as indicated at reference numerals **134** and **134'**. Preferably, hinge **136** is configured to permit pivoting of keypad **134** until it abuts the back side of handheld device **130**, so as to allow the smooth use of handheld device **130,** when the user is not using keypad **134**.

According to **Figure 10b** touch screen keypad **144** is slideably mounted on the handheld device **140**.

Figure 10c is a perspective view of a handheld device **150** having a touch screen **152**. Handheld device **150** is substantially the same as handheld device **130** of **Figure 10a**. According to this embodiment handheld device **150** includes a touch screen **152** displaying a vertical virtual keyboard in a portrait orientation. A touch screen keypad **154** is mounted on touch screen **152** and is configured to cover the portrait virtual keyboard displayed thereon. Keypad **154** includes a hinge **156**, substantially the same as described in reference to hinge **136** of **Figure 10a**.

In **Figure 10d**, there is shown a laptop computer **160** with a touch screen keyboard **162** and a touch screen keypad **164** according to the invention mounted on keyboard **162**.

Figure 10e shows a schematic illustration of touch screen keyboard **170** which is used with a desktop computer (not shown). A touch screen keypad **172** is mounted

on keyboard **170**, so as to provide the user with tactile feedback similar to the feedback provided by a standard keyboard.

Figure 11 shows a schematic illustration of touch screen keypad **180** adapted and configured according to one embodiment of the invention. Keypad **180** includes a plurality of key members **182** separated by a plurality of grooves **184**. Each key member **182** includes a projection **186**, here illustrated as a hemisphere. Projection **186** facilitates the depression of each key member **182** and assists the user in feeling the desired key member to be depressed. Keypad **180**, according to this embodiment, includes a single surface, preferably made of a transparent conductive material. It will be appreciated that the elasticity of keypad **180** may be adapted to allow depression of one key member **182** without moving adjacent key members.

Figure 12a is a schematic illustration of a keypad **190a** constructed and operative in accordance with another embodiment of the invention. Keypad **190a** includes an upper plate **192**, a lower plate **194**, and a conductive layer **196** clamped therebetween. Conductive layer **196** defines a plurality of key members **198** projecting through apertures in upper plate **192**. Preferably, keypad **190a** further includes coupling members **193** for coupling upper plate **192**, lower plate **194**, and conductive layer **196** together.

Keypad **190a** is configured to engage a vertical virtual keyboard displayed on a touch screen in a portrait orientation. Alternatively, the keypad may be configured to engage a horizontally disposed virtual keyboard, such as keypad **190b**, in landscape orientation shown in **Figure 12b**. According to one embodiment, key members **199** defined on keypad **190b** are wider than key member **198** defined on keypad **190a**, in accordance with the width of the virtual keys beneath them.

Figure 13 is a schematic illustration of a keypad **200** constructed and operative in accordance with further embodiment of the invention. Keypad **200** includes an elastic panel **202**, which is, preferably, a conductive transparent layer. Elastic panel **202**, according to one embodiment, is a homogeneous surface, but alternatively may include a pattern, such as grooves defining keys. Keypad **200**

further includes a plurality of domes **204** mounted underneath elastic panel **202**, although not necessarily one dome in registration with each virtual key. Domes **204** are configured to snap when keypad **200** depressed, in order to provide a tactile sensation. According to the illustrated embodiment, the apex **205a** of each dome **204** is coupled to elastic layer **202,** and the base **205b** is disposed on a touch screen panel or on a plate around a touch screen. Depressing a portion of elastic layer **202** and engagement of the virtual key on the touch screen, causes at least one dome **204** to be depressed, thus providing the user with tactile feedback. It will be appreciated that elastic panel **202** is elastic enough to allow pressing one portion thereof until contacting the touch screen, while other portions are not in contact with the touch screen, and thus only the desired virtual key is activated. Alternatively, base **205b** may define a bottom layer closing the dome, defining a space within the key member between the apex **205a** and the base **205b.**

According to one embodiment keypad **200** may be coupled to a touch screen by means of a rubber band wrapped around the handheld device. When keypad **200** is used, elastic panel **202** can be inserted between the rubber band and the touch screen. When keypad **200** is removed, the rubber band may be removed or alternatively may be left on the handheld device.

Figure 14a is a front view illustration of a keypad **210** constructed and operative in accordance with one embodiment of the invention, in the form of a finger cover. Keypad **210** is made of an elastic sheet forming a single key member **212** for engaging a touch screen, and a mounting element **214** for mounting key member **212** on the finger **218** of a user. In the illustrated embodiment, mounting element **214** is a finger socket for mounting the key member on a finger **218**. It will be appreciated that the finger socket can be the finger of a glove. Key member **212** is preferably shaped as a dome. Finger socket **214** is preferably made of an elastic material configured for removable mounting on any desired finger. Key member **212** is adapted to engage a touch screen panel when pressed by a finger in the finger socket. Preferably, dome-shaped key member **212** is configured to snap when

depressed, in order to provide a tactile sensation. Alternatively, the mounting element may be a ring (not shown), a layer of adhesive material (not shown) for adhering to the skin on the user's finger and/or to his finger nail, or any other suitable means for mounting the key member on a finger of a user.

As shown in **Figure 14b**, a user having a keypad **210** mounted on his finger **218** can activate a virtual key or icon displayed on a touch screen **215**, by pressing key member **212** onto the desired spot on touch screen **215**. As the user presses key member **212** onto touch screen **215,** key member **212** is depressed until finger socket **214** contacts touch screen **215**. As the user lifts finger **218** away from touch screen **215**, dome **215** returns to its original shape.

It will be appreciated that when touch screen **215** is a capacitive touch screen, at least the tip of finger socket **214** is made of a conductive material, allowing electric coupling between touch screen **215** and the user's finger **218**. In that case, key member **212**, mounted on the tip of finger socket **212**, may include an aperture permitting contact between finger socket **214** and touch screen **215**. Alternately, both key member **212** and finger socket **214** can be made of conductive material, allowing the electric coupling with user's finger **218** and thereby permitting the discharge of touch screen **215**.

While key member of the invention has been described with respect to a limited number of embodiments, it will be appreciated that many variations, modifications and other applications of the invention may be made. It will further be appreciated that the invention is not limited to what has been described hereinabove merely by way of example. Rather, the invention is limited solely by the claims which follow.

CLAIMS

1. A keypad comprising:

an elastic sheet for disposing on a touch screen, said sheet including at least one key member shaped to define a space within said key member for providing tactile feedback when said key member is depressed and contacts said touch screen; and

a mounting element coupled to said elastic sheet.

2. The keypad according to claim 1, wherein said key member defines a dome providing tactile feedback.

3. The keypad according to either claim 1 or claim 2, further comprising a plate coupled to said elastic sheet.

4. The keypad according to claim 3, wherein said plate is coupled to an upper surface of said elastic sheet.

5. The keypad according to claim 3, wherein said plate is coupled to a lower surface of said elastic sheet.

6. The keypad according to any of the preceding claims, wherein said mounting element is a static cling sheet coupled to said elastic sheet.

7. The keypad according to any of the preceding claims, wherein said key member is an elongated key member providing selective contact with a selected virtual key therebeneath.

8. The keypad according to claim 2, wherein said key member further includes a shell on an outer surface of said dome.

9. The keypad according to claim 2, wherein said key member further includes a shell on an inner surface of said dome.

10. The keypad according to claim 8 or claim 9, wherein said shell is a semi-rigid shell.

11. The keypad according to claim 2, wherein said dome further includes a rigid contact member arranged to contact said touch screen.

12. The keypad according to any of the preceding claims, wherein said elastic sheet is formed of a conductive material.

13. The keypad according to any of the preceding claims, comprising a plurality of key members.

14. The keypad according to claim 1 or claim 2, wherein said mounting element includes an element for mounting the key member on a tip of a finger.

15. A method for forming a keypad, the method comprising:

configuring, from an elastic sheet, at least one key member shaped to define a space within said key member for providing tactile feedback when said key member is depressed and contacts said touch screen; and

coupling a mounting element to said elastic sheet.

16. A keypad comprising:

an elastic sheet forming a single key member for engaging a touch screen, said key member being shaped to define a space within said key member for providing tactile feedback; and

a mounting element for mounting said key member on a finger of a user.

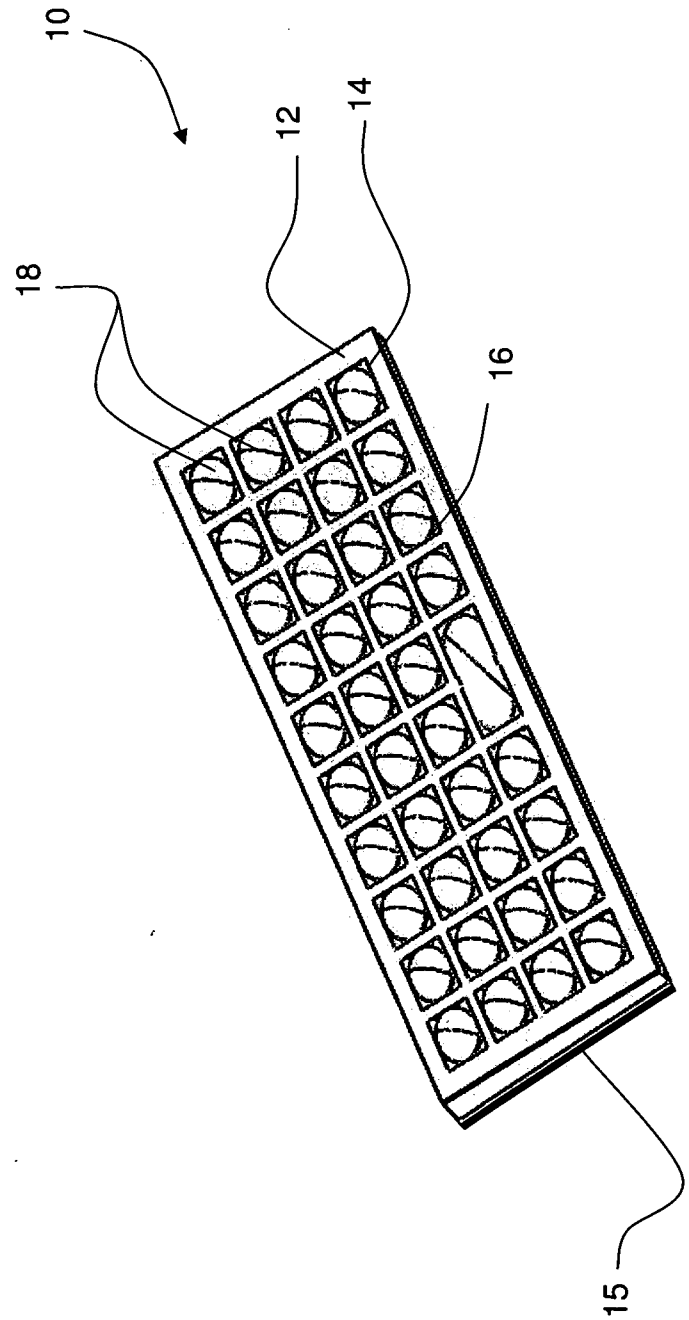

Figure 1

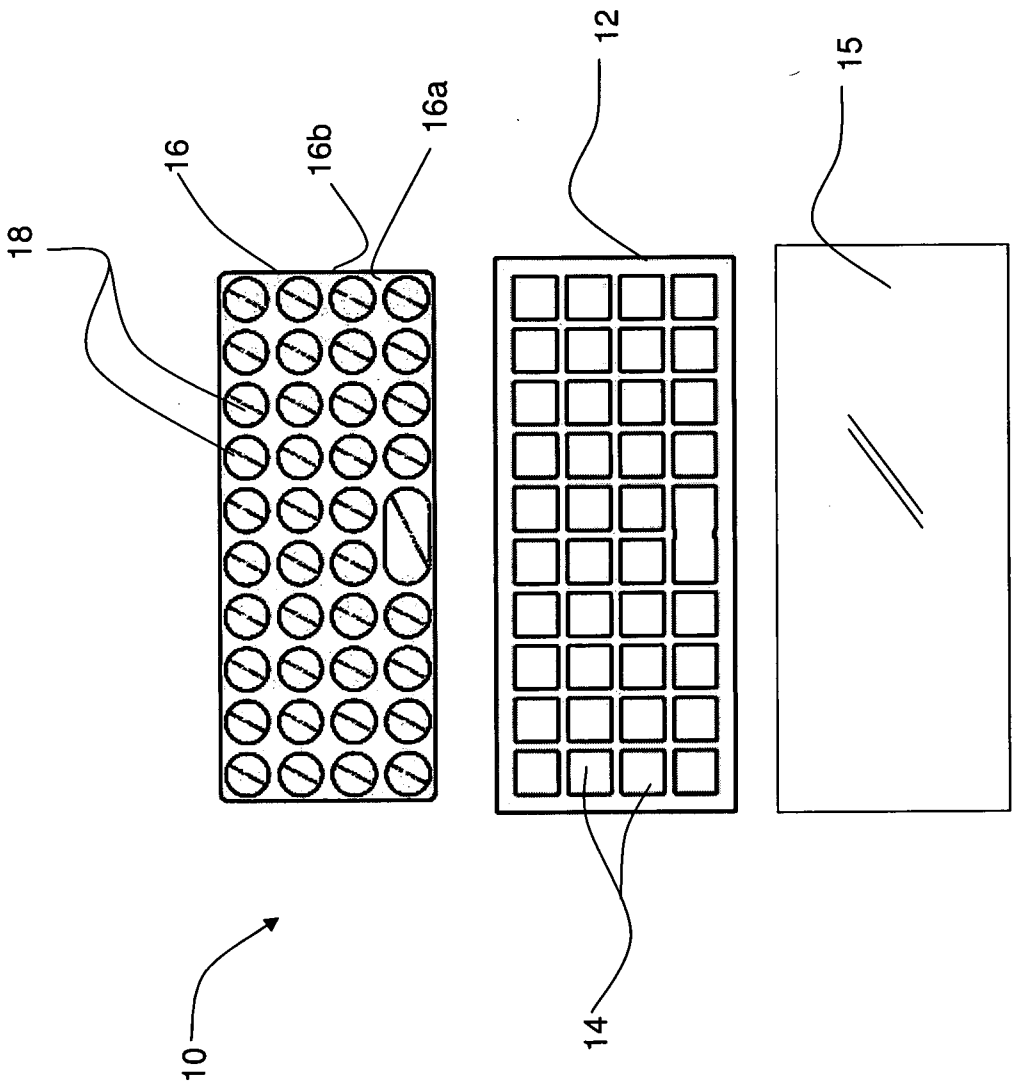

Figure 2

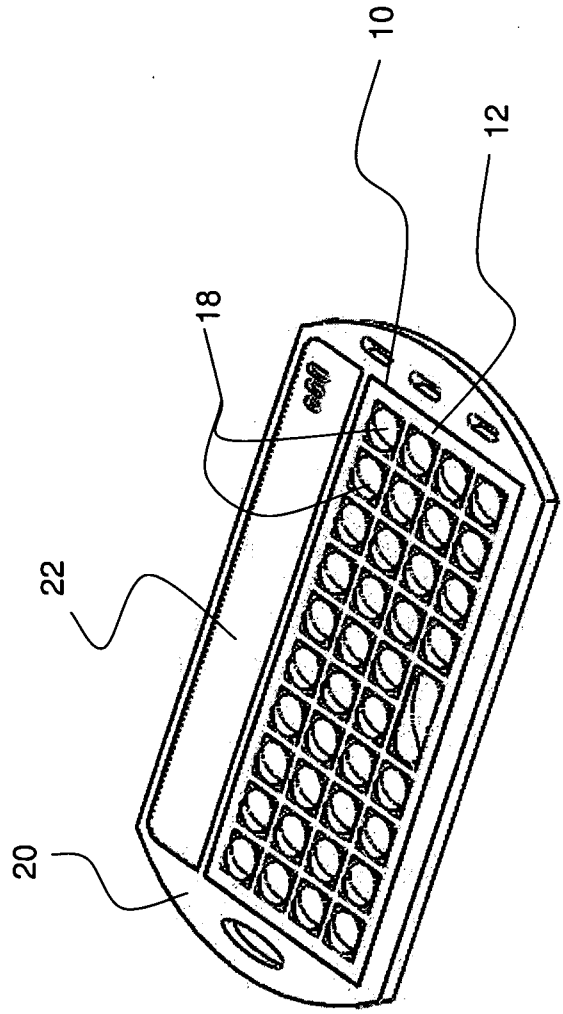

Figure 3

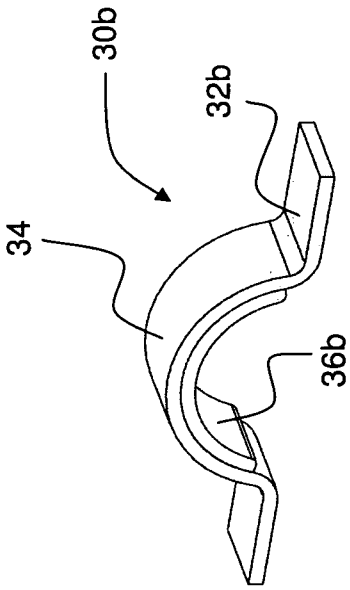

Figure 4b

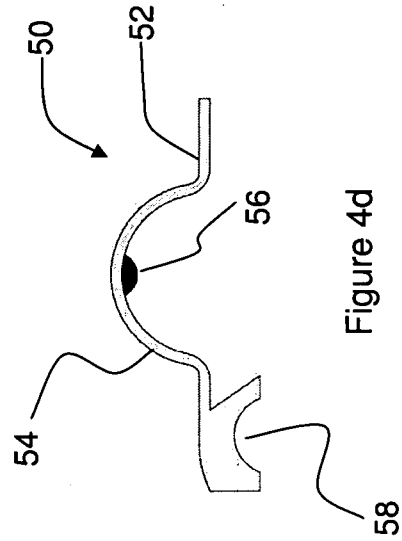

Figure 4d

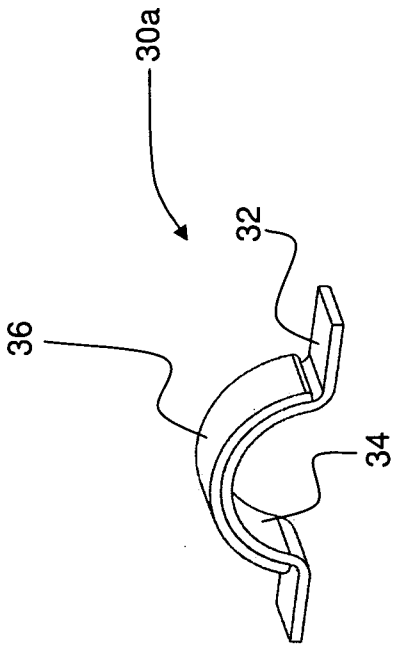

Figure 4a

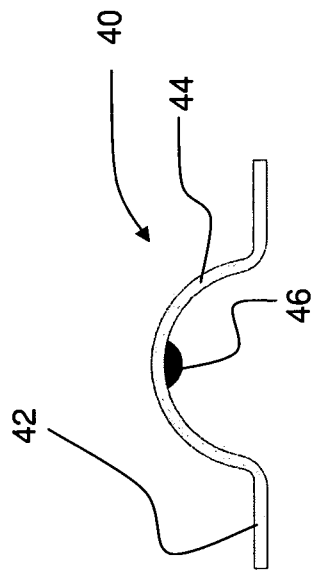

Figure 4c

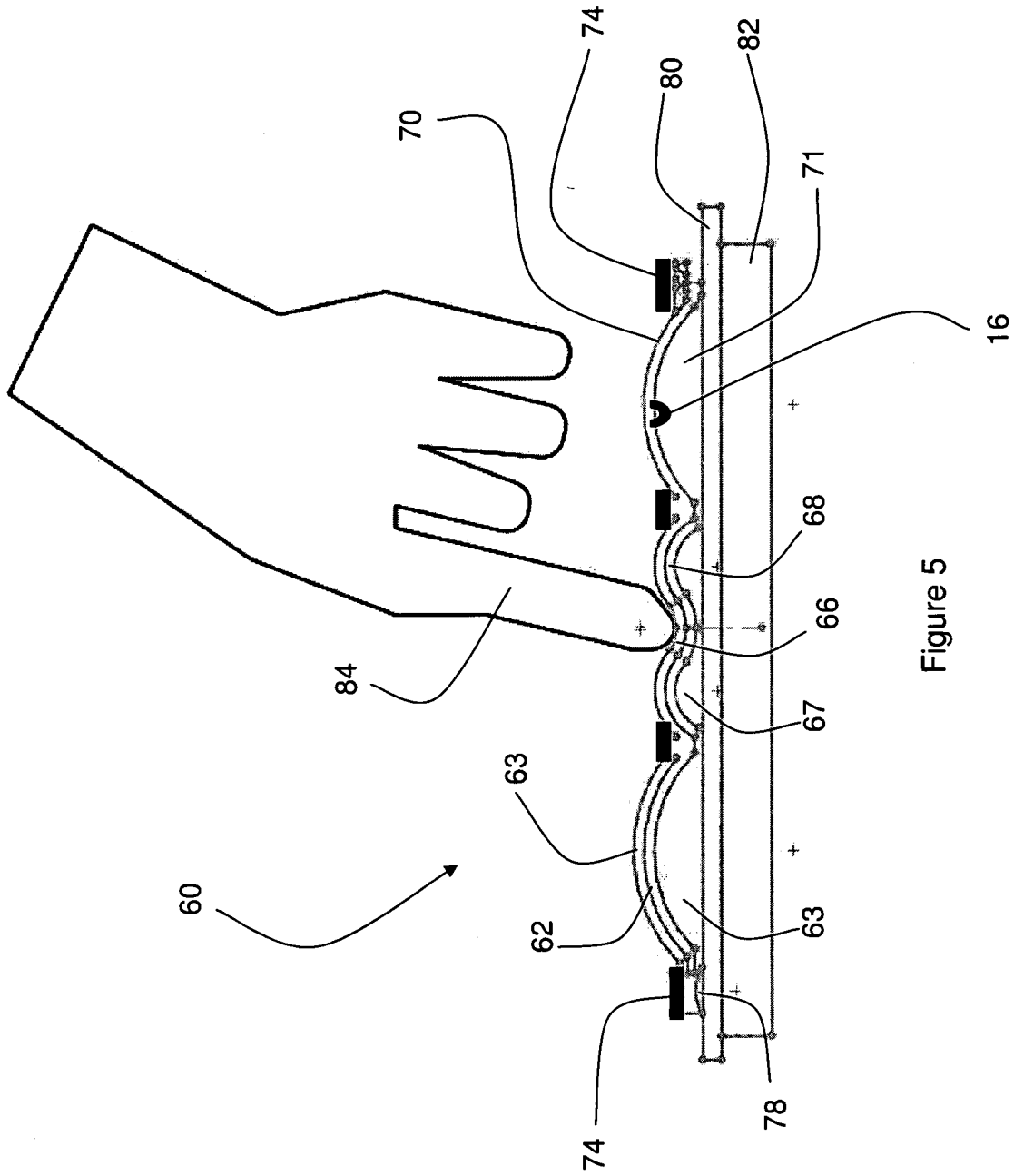

Figure 5

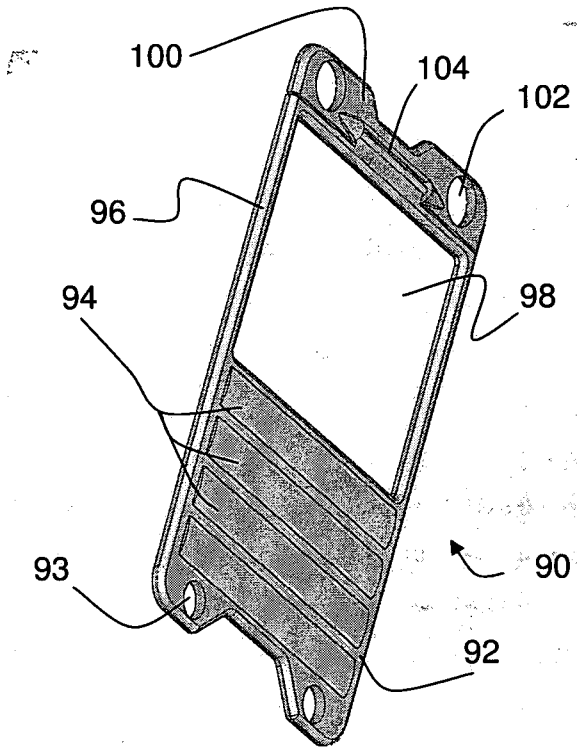

Figure 6

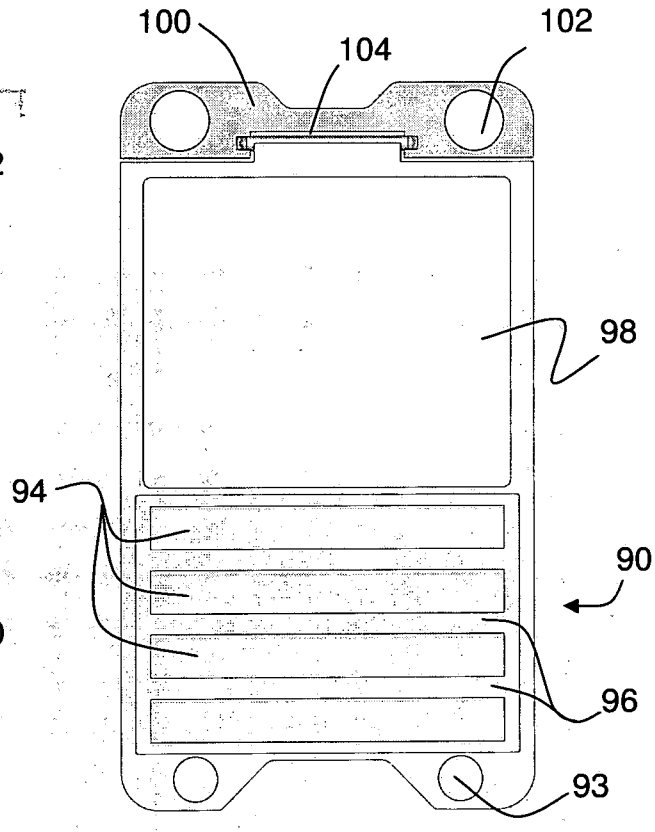

Figure 7

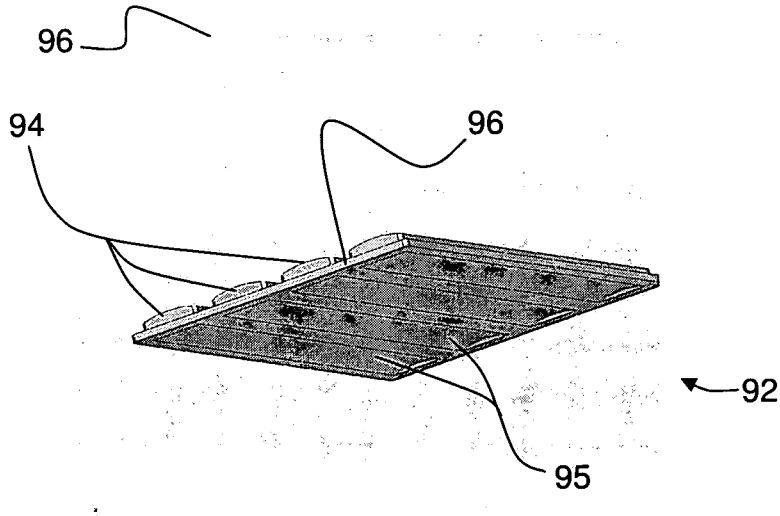

Figure 8

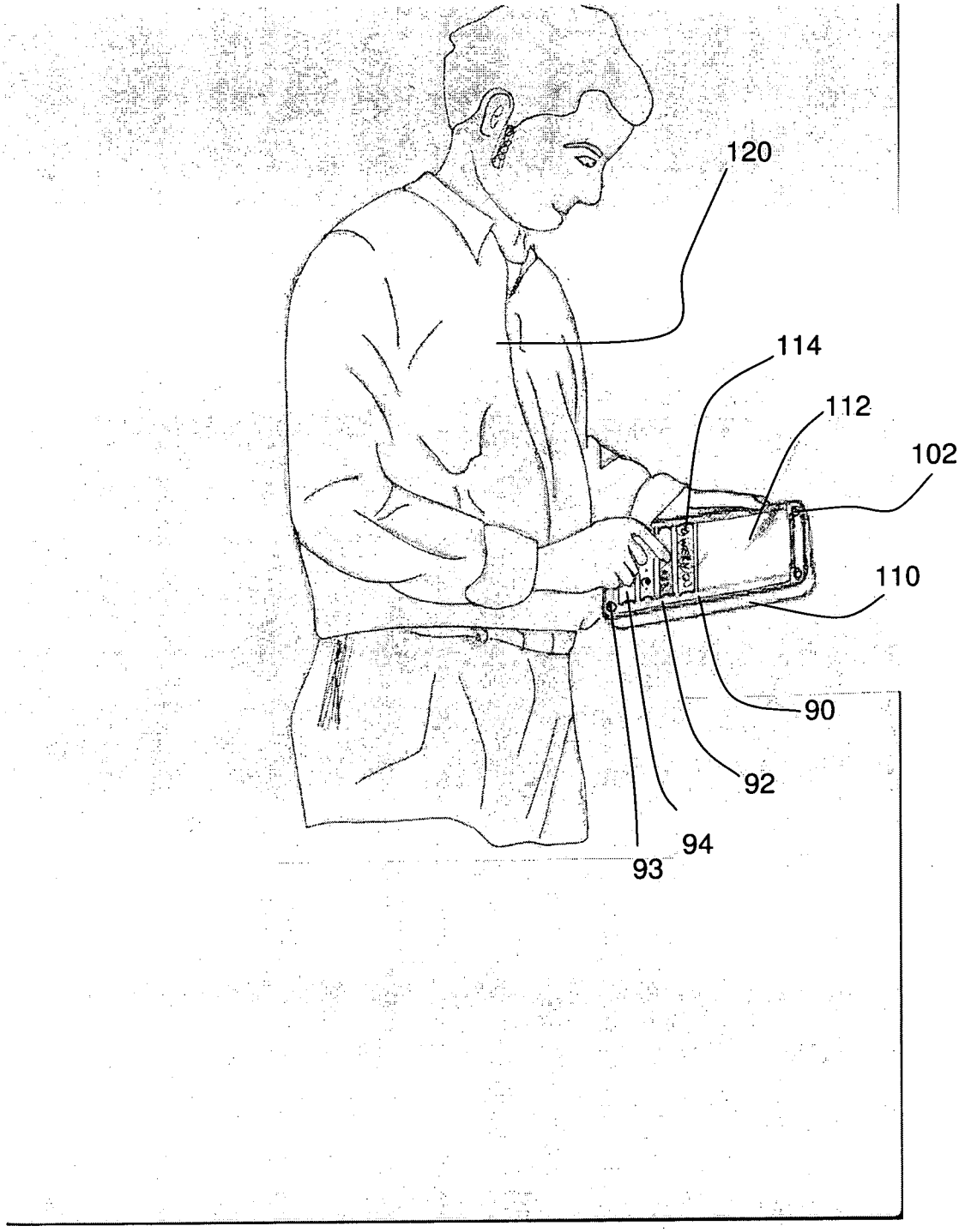

Figure 9

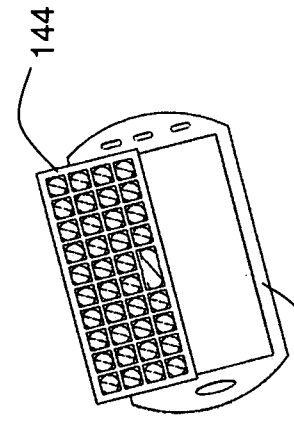

Figure 10b

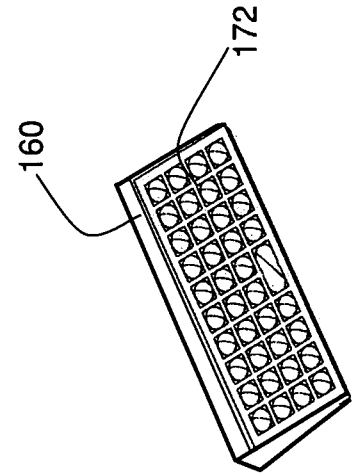

Figure 10e

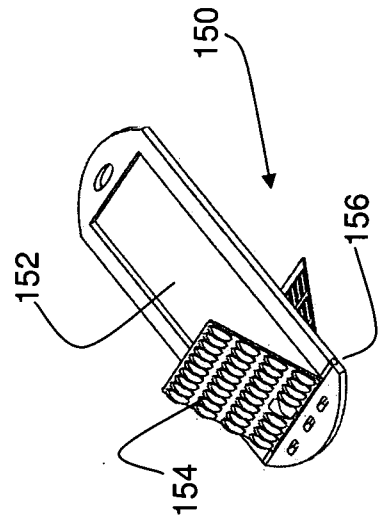

Figure 10c

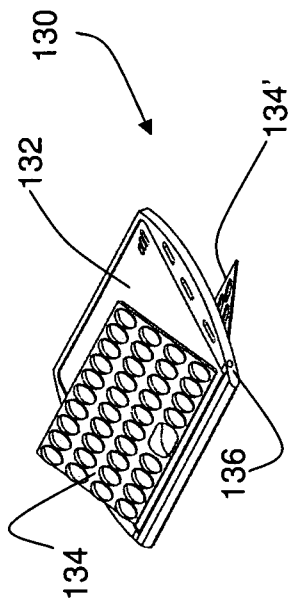

Figure 10a

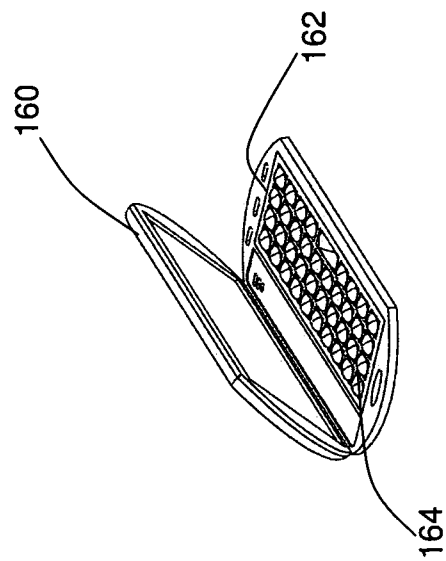

Figure 10d

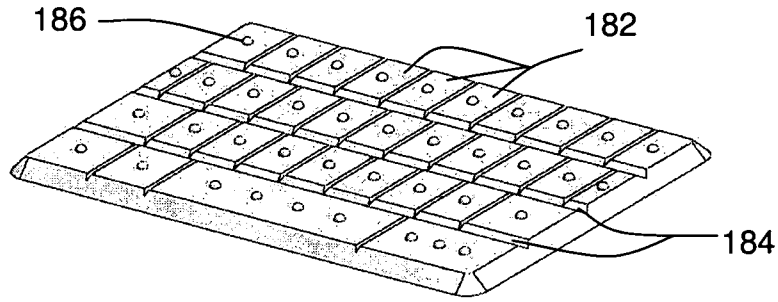

Figure 11

180

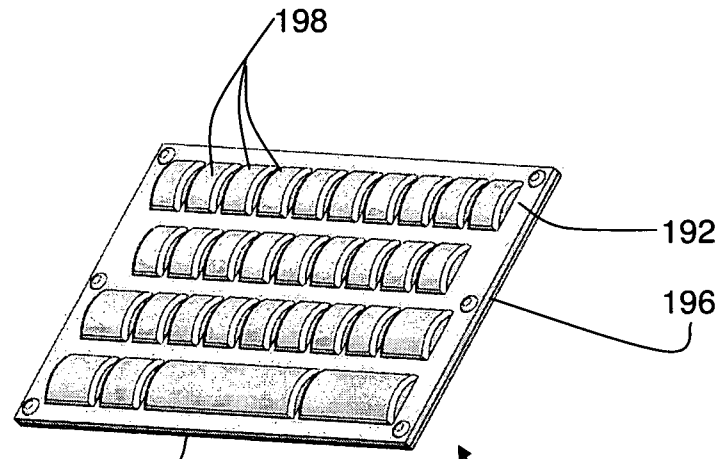

Figure 12a

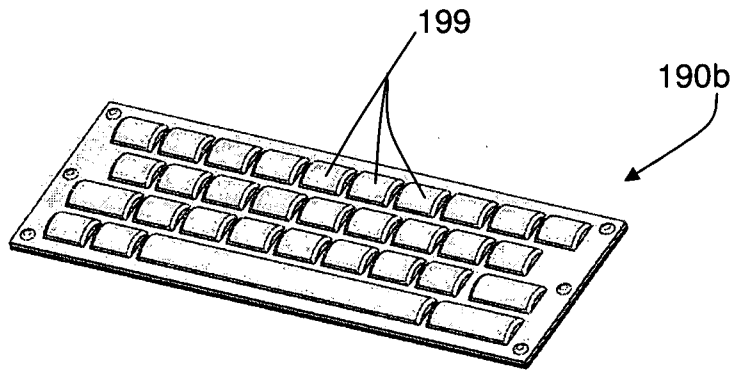

Figure 12b

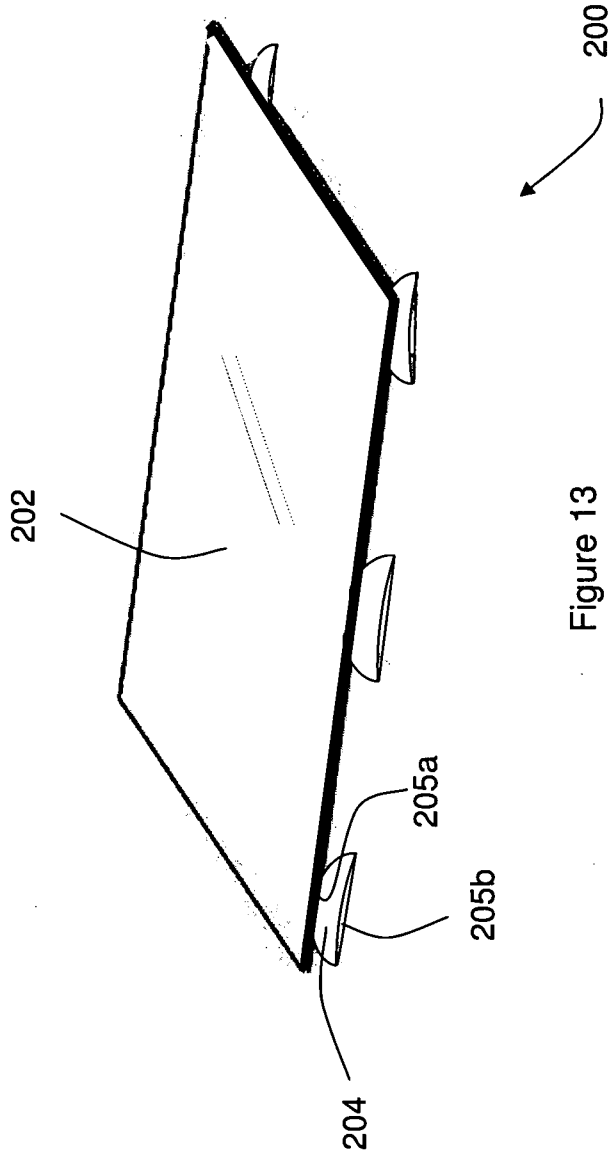

Figure 13

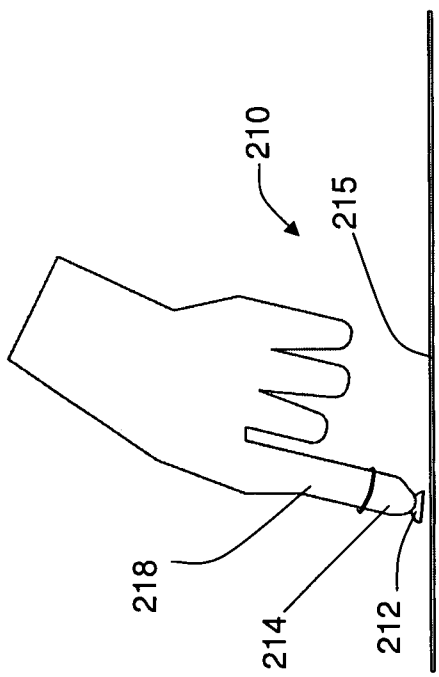

Figure 14a

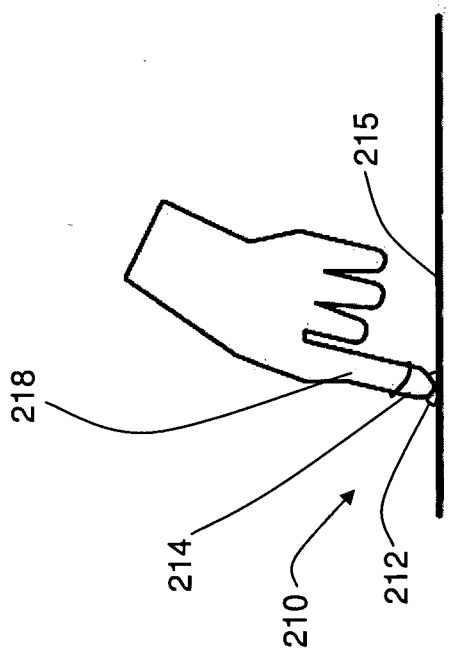

Figure 14b