

## TOUCH SENSITIVE DISPLAY WITH TACTILE FEEDBACK

### BACKGROUND OF THE INVENTION

**[0001]** Implementations described herein relate generally to input devices, and more particularly, to handheld input devices that may provide tactile feedback.

**[0002]** Devices, such as handheld mobile communication devices, conventionally include input devices that provide some form of tactile feedback to a user indicating that an input has been detected by the communication device. These conventional keypads are formed of physically distinct keys. Currently, there are no adequate solutions of providing tactile feedback to keypads formed of a single physical device or surface, such as a touch sensitive surface.

### SUMMARY OF THE INVENTION

**[0003]** According to one aspect, a mobile communication device is provided. The mobile communication device may comprise a keypad assembly comprising a touch sensitive cover, a paraffin layer, a heating element and a display for displaying information, and logic configured to sense an input on the touch sensitive cover and activate the heating element based on the sensed input to provide tactile feedback to a user.

**[0004]** Additionally, the keypad assembly further comprises an enclosure that contains the paraffin layer and the heating element.

**[0005]** Additionally, the heat provided by the heating element produces an expansion of the paraffin layer to provide the tactile feedback to a user.

**[0006]** Additionally, the logic may be further configured to determine a position of input on the touch sensitive cover and provide tactile feedback to a user in an area on the touch sensitive cover associated with the determined position.

**[0007]** Additionally, the logic may be further configured to output a character to the display based on the determined position of input on the touch sensitive cover.

**[0008]** According to another aspect, a method may be provided. The method may comprise receiving input on a touch sensitive surface of a device and heating a substance to produce an expansion of the substance in response to the received input, where the expansion of the substance provides tactile feedback to a user indicating that the device has received the input.

**[0009]** Additionally, the method may further comprise sensing the input on a touch sensitive surface by a capacitive, resistive or inductive film.

**[0010]** Additionally, the receiving input on a touch sensitive surface comprises detecting a finger of the user on the touch sensitive surface.

**[0011]** Additionally, the method may further comprise determining a position of the received input on the touch sensitive surface and providing tactile feedback in an area on the touch sensitive surface corresponding to the determined position.

**[0012]** Additionally, the method may further comprise displaying a character based on the determined position of the received input on the touch sensitive surface.

**[0013]** According to yet another aspect, a mobile communications device may comprise means for providing a plurality of keypad elements; means for sensing a position of input relative to the plurality of keypad elements; means for providing an expansion of a gel to provide tactile feedback to a

user based on the sensed position of input and means for displaying a character based on the sensed position of input relative to the plurality of keypad elements.

**[0014]** Additionally, the means for providing a plurality of keypad elements includes a liquid crystal display (LCD).

**[0015]** Additionally, the means for sensing a position of input relative to the plurality of keypad elements includes a capacitive, inductive, resistive or pressure sensitive film.

**[0016]** Additionally, the means for providing an expansion of a gel to provide tactile feedback to a user based on the sensed position of input includes a heating element.

**[0017]** Additionally, the means for displaying a character based on the sensed position of input relative to the plurality of keypad elements further comprises a liquid crystal display (LCD).

**[0018]** According to yet another aspect, a device may comprise a keypad assembly comprising: a touch sensitive surface and an enclosure that contains a substance and a heating element; and logic configured to: determine an input position on the touch sensitive surface, and activate the heating element to produce an expansion of the substance to provide tactile feedback to a user in response to the determined input position on the touch sensitive surface.

**[0019]** Additionally, the touch sensitive surface is glass.

**[0020]** Additionally, the enclosure is in contact with the bottom of the touch sensitive surface.

**[0021]** Additionally, the substance comprises a paraffin wax or a gel.

**[0022]** Additionally, the enclosure includes a plurality of heating element.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0023]** The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate an embodiment of the invention and, together with the description, explain the invention. In the drawings,

**[0024]** FIG. 1 is a diagram of an exemplary implementation of a mobile terminal;

**[0025]** FIG. 2 illustrates an exemplary functional diagram of a mobile terminal;

**[0026]** FIG. 3 illustrates an exemplary functional diagram of the keypad logic of FIG. 2;

**[0027]** FIGS. 4A-4B illustrate an exemplary keypad assembly; and

**[0028]** FIG. 5 is a flowchart of exemplary processing.

### DETAILED DESCRIPTION OF THE INVENTION

**[0029]** The following detailed description of the invention refers to the accompanying drawings. The same reference numbers in different drawings may identify the same or similar elements. Also, the following detailed description does not limit the embodiments.

**[0030]** Exemplary implementations of the embodiments will be described in the context of a mobile communication terminal. It should be understood that a mobile communication terminal is an example of a device that can employ a keypad consistent with the principles of the embodiments and should not be construed as limiting the types or sizes of devices or applications that can use implementations of keypads described herein. For example, keypads consistent with the principles of the embodiments may be used on desktop communication devices, household appliances, such as microwave ovens and/or appliance remote controls, automo-