

curved or have other shapes, and the touch can be sensed by methods other than a touch sensitive surface, such as dome switches, membranes, etc.

**[0026]** The touch or contact of the user's finger on a key or other object on touch sensitive surface **15** is sensed (**102**). For a non-touch sensitive surface, a key may be pressed.

**[0027]** The location (e.g., x and y coordinates, or a determination of a key press for a non-touch sensitive embodiment) of the sensed touch is determined (**104**).

**[0028]** It is determined whether the location of the sensed touch from **104** is in a designated area associated with the reference key (**106**). For example, in the embodiment of FIG. 1, does the location coincide with reference key **32**?

**[0029]** If the sensed location is within the designated reference key area, a first haptic effect signal is output to the actuator or actuators (**112**).

**[0030]** If the sensed location is not within the designated reference key area, it is determined whether the sensed location is in a haptic key area other than the reference key (**108**). If so, a second haptic effect signal is output to the actuator or actuators (**110**). If not, no haptic effect is output by touch system **10**.

**[0031]** As disclosed, embodiments of the present invention haptically enable a one or more reference keys and non-reference keys on a touch panel. This allows a user to locate the reference key(s) and subsequently the remaining keys without requiring visual contact with the touch panel. As a result, a visually impaired user will more easily utilize the touch panel, as well as a user who cannot easily view the touch panel, such as when the touch panel is implemented in a vehicle and it is desirable for the user to maintain eye contact with the road rather than the touch panel.

**[0032]** Several embodiments of the present invention are specifically illustrated and/or described herein. However, it will be appreciated that modifications and variations of the present invention are covered by the above teachings and within the purview of the appended claims without departing from the spirit and intended scope of the invention.

**[0033]** For example, although the haptic effect of vibration is disclosed in the above embodiments, any type of haptic effect involving forces, vibrations and/or motions (e.g., deformable surfaces) can be used.

What is claimed is:

1. A method of operating a touch panel comprising: sensing a contact on the touch panel; determining a location of the contact; generating a first haptic effect if the location is a reference key on the touch panel; and generating a second haptic effect if the location is a non-reference key on the touch panel.
2. The method of claim 1, wherein said touch panel comprises a standardized keyboard.
3. The method of claim 1, wherein said touch panel comprises a plurality of keys, further comprising: generating a third haptic effect if the location is a portion of said touch panel other than the plurality of keys.
4. The method of claim 1, wherein said first and second haptic effects are vibrotactile effects.
5. The method of claim 1, further comprising: generating a third haptic effect if the contact indicates a sliding contact on the touch panel.

6. The method of claim 1, wherein said determining the location comprises determining an x and y coordinate of a location of the contact.

7. The method of claim 2, further comprising determining an identity of the non-reference key based on the second haptic effect and a knowledge of the standardized keyboard.

8. A touch panel comprising:

a touch sensitive surface having a plurality of graphical objects representing a keyboard;

an actuator coupled to said touch sensitive surface; and a controller coupled to said actuator;

wherein said keyboard has a reference key and a non-reference key, and said controller is configured to generate a first haptic signal when said reference key is contacted and a second haptic signal when said non-reference key is contacted.

9. The touch panel of claim 8, wherein said actuator generates a first haptic effect in response to said first haptic signal, and generates a second haptic effect in response to said second haptic signal.

10. The touch panel of claim 8, further comprising a video screen that generates said graphical objects coupled to said touch sensitive surface.

11. The touch panel of claim 8, wherein said keyboard is a standardized QWERTY keyboard.

12. The touch panel of claim 8, wherein said keyboard is a standardized numeric keypad.

13. The touch panel of claim 8, wherein said actuator comprises a vibration generating device.

14. A computer readable medium having instructions stored thereon that, when executed by a processor, causes the processor to:

sense a touch on a touch panel;

determine a location of the touch;

generate a first haptic effect if the location is a reference key on the touch panel; and

generate a second haptic effect if the location is a non-reference key on the touch panel.

15. The computer readable medium of claim 14, wherein said touch panel comprises a standardized keyboard.

16. The computer readable medium of claim 14, wherein said touch panel comprises a plurality of keys, said instructions further causing said processor to:

generate a third haptic effect if the location is a portion of said touch panel other than the plurality of keys.

17. The computer readable medium of claim 14, wherein said first and second haptic effects are vibrotactile effects.

18. The computer readable medium of claim 14, said instructions further causing said processor to:

generate a third haptic effect if the touch indicates a sliding contact on said touch panel.

19. A method of interfacing with a user of a touch panel comprising:

determining whether the user has selected a reference key of the touch panel; and

generating a first haptic effect on the touch panel if the reference key has been selected.