

TOUCHPAD HAVING CAPABILITY OF INDUCING SENSATION OF TACTILE KEY

FIELD OF THE INVENTION

[0001] The present invention is generally related to a touchpad and, more particularly, to a touchpad having capability of inducing sensation of tactile key.

BACKGROUND OF THE INVENTION

[0002] Owing to small volume, low cost, low power consumption, and long lifetime, touchpads have been widely used in various electronic products, such as notebooks, mice, MP3 players, and even cellular phones, etc., to serve as input devices. Three types of touchpad including resistive, electromagnetic, and capacitive touchpads are known in the art. In operation, a pen tip is required to exert the force onto an extremely small area for a resistive touchpad, and a special pen equipped with battery is needed to perform input operations cooperatively for an electromagnetic touchpad. Thus, the capacitive touchpad is superior to the resistive and electromagnetic ones in view of function and cost. The working principle of a capacitive touchpad is understood to apply a capacitive effect generated at the moment when an object touches the touchpad, in such a way that the position where the object touches may be determined by the variance in capacitance. Thereby, unlike the electromagnetic touchpad necessarily being operated with the help of the input pen with power consumption, and also unlike the resistive touchpad requiring a concentrated pressurized point, a longer life-time may be thus obtained for a capacitive touchpad. Further, owing to simple construction, fewer elements, high yield of manufacture, the cost for the mass production of capacitive touchpad may be lower.

[0003] The capacitive touchpad may be operated in several ways, the most common one of which is the contact or sliding of a finger or pen on a surface of the touchpad, in such a way that a corresponding signal may be generated by a sensor of this touchpad. The sensor is a device including one-dimensional or two-dimensional traces, normally formed by a conductor etched on a printed circuit board having either single-layer, double-layer, or four-layer structure with essentially the same object-sense principal. For the protection and attractiveness of sensor, the sensor is covered thereon with a layer of smooth insulator commonly made of insulator adhesive material and plastic shell mainly. Referring to a flat touchpad illustrated in FIG. 1 and a curved touchpad illustrated in FIG. 2, for example, a cover 12 over a sensor 10 has an insulative function, and is provided with a smooth surface where the finger of a user may be allowed to contact and slide. Further detailed structure may be found by referring to U.S. Pat. No. 5,374,787 to Miller et al.

[0004] There are quite a few functions being provided by a touchpad. In U.S. Pat. No. 5,748,185 to Stephan et al., for example, a cursor control region, a scroll control region, and a pan control region are defined to be linked to commands or functions within a graphical user interface (GUI). Furthermore, in U.S. Pat. No. 5,943,052. to Allen et al., the sliding of a finger in a defined scroll region may be used for the scroll control of a window directly via a processor software. A touchpad may be also used to simulate keys in place of former mechanical keys, as illustrated in Taiwanese Utility Model No. 240,050, for example. When the touchpad

is applied to simulate keys, however, it is impossible for the user to receive feedback through his finger and then to perceive the press and release of the key when the virtual key of the touchpad is operated by this user, due to the fact that the touch sensation, similar to that occurring in the operation of the mechanical key, is impossibility provided by the insulator which covers on the sensor. In this case, moreover, there is no choice but waiting for the response from the control system; if no response is received, the action of re-pressing is required. Several merits, such as lifetime being longer than that of the key and improbability to damage the touchpad, as examples, may arise from the simulation of keys by means of the touchpad. For the user, however, the foregoing feature of difficulty in recognition may occur in the virtual keys of the touchpad. The generation of key signal for the mechanical key may take place when this key is compressed by means of the application of force, while the generation of signal in the operation of the touchpad may take place without any change in appearance. Thus, the aforementioned difficulty is hard to be overcome.

[0005] Therefore, it is desired a touchpad to have the capability of inducing sensation of tactile key while providing an extremely easy recognition and use of the function of virtual keys to a user.

SUMMARY OF THE INVENTION

[0006] One object of the present invention is to provide a touchpad having capability of inducing sensation of tactile key.

[0007] In accordance with the present invention, a touchpad having capability of inducing sensation of tactile key comprises a deformable cover provided over a sensor, the deformable cover having a key region.

[0008] In one embodiment, the key region is provided with a projecting structure.

[0009] In another embodiment, the key region is provided with a recessed structure.

[0010] In still another embodiment, the key region is provided with a flat structure.

[0011] In one embodiment, the key region is provided thereon with a pattern representative of a key.

[0012] In one embodiment, the touchpad further comprises a support member provided between the deformable cover and the sensor.

[0013] In one embodiment, the support member is provided underneath the key region with a recess.

[0014] In one embodiment, the deformable cover is presented as a flat shape.

[0015] In another embodiment, the deformable cover is presented as a curved shape.

[0016] The deformable cover may be fixed to the sensor or support member by means of gluing, screwing, insertion, or in other ways.

[0017] The sensation of the press and release of the key may be obtained for the user in operation, due to the deformable cover which generates deformation when the key region is pressed, while restores when it is released.