

TOUCH SENSITIVE KEYPAD WITH TACTILE FEEDBACK

FIELD OF THE INVENTION

[0001] The present invention relates to keypads and keyboards for electronic devices, in particular to keypads and keyboards that use touch sensors.

BACKGROUND OF THE INVENTION

[0002] Electronic devices with a user interface often face heavily contradicting requirements. On one hand the devices are required to be compact and light, whilst on the other hand the user interface should be user friendly and comfortable. These requirements are especially contradicting for mobile devices which place extra high requirements on the size and weight aspect. Increased complexity of mobile devices, such as mobile phones or smart phones have led to an increasing need for large displays. The "front" surface of the mobile device is typically completely occupied by the display and the keypad. Thus, additional space for the display can often only be obtained by allocating less space to the keypad.

[0003] The display of a conventional mobile phone is typically a flat LCD color screen for example with TFT technology. The keypad of a conventional mobile phone typically includes a key mat with a plurality of discrete keys thereon and an equal plurality of dome switches there below.

[0004] These two elements of the user interface of these electronic devices make up the major part of the front of the device. The front of the device can of course be divided into two separate parts in case the device is of the folding or sliding type. Common for any of these types is the requirement that the device is small and the display is large.

[0005] Thus, there is a need to provide a more compact keypad.

[0006] Further, there is a need to enhance the design of mobile devices since the looks of the device are a very important competitive factor on the market. Thus, there is also a need for a keypad that provides designers with increased design freedom and flexibility.

DISCLOSURE OF THE INVENTION

[0007] On this background, it is an object of the present invention to provide a compact, design-and user friendly keypad. This object is achieved by providing a keypad for use with an electronic device, said keypad comprising a plurality of discrete keys formed by touch sensors or a plurality of virtual keys in a touch sensitive area, said plurality of discrete or virtual keys being mechanically coupled to a biased switch that is activated by pressing any of said discrete or virtual keys.

[0008] Through the use of touch sensors the surface area required for providing the keys can be kept small and without parting lines, thereby also giving designers a greater freedom to operate, whilst the use of a biased switch provides users with tactile feedback and reduces inadvertent keystrokes from being inadvertently recorded when an object comes into contact with any of the touch sensors.

[0009] Preferably, the biased switch provides tactile and/or aural feedback. The biased switch may be supported by other resilient elements to provide tactile feedback to the

user. The biased switch may be supported by sounds from a loudspeaker in the device in which the keypad is used to support aural feedback.

[0010] The biased switch may act with a snap action, to further improve tactile feedback. The biased switch can be a dome switch.

[0011] Preferably, the discrete keys form a flush surface substantially without part lines. The keys, or the flush surface forming the keys is preferably provided with key graphics.

[0012] The key graphics can be coupled to a lighting system, and the key graphics are substantially invisible when said lighting system is not active. Thus, the lighting system can be used to provide optical feedback to the user.

[0013] The touch sensors may include capacitive elements operatively coupled to said discrete keys.

[0014] The touch sensitive area can be formed by a capacitive touch pad or by a touchscreen.

[0015] Preferably, the touch sensors or the touch sensitive area are disposed on one side of a plate member, and the plate member is coupled to the biased switch. Thus, a simple construction is obtained in which a plate member moves to activate the biased switch.

[0016] Preferably, the biased switch is disposed under the plate member and pressure applied on the plate member results in pressure on the biased switch.

[0017] The biased switch may be disposed between said plate member and a substrate. Thus, a simple and compact keypad construction is obtained.

[0018] The biased switch may include a collapsible member disposed between the plate member and the substrate. Preferably, the collapsible member comprises a thin walled collapsible ring. The collapsible ring preferably comprises two ring members connected to one another by a fold line.

[0019] The biased switch may be configured to establish an electrical contact when the collapsible member collapses. Alternatively, a reverse construction with an electrical contact being interrupted when the collapsible member collapses could also be used.

[0020] The biased switch may comprise a resilient element that urges the plate member to an idle position. Thus, the mechanical construction of the keypad can be kept simple.

[0021] Preferably, a force with a magnitude above a given threshold on said plate member causes said plate member to move from an idle position to a lower position or to a tilted position in which said biased switch establishes an electrical contact.

[0022] The plate member may have a substantial amount of travel between the idle position and a position in which the biased switch establishes an electrical contact. Thus, the user can experience a real keypad travel for improved user friendliness and confidence.

[0023] The keypad preferably includes a link mechanism converting a downward movement of one or of plurality of discrete keys or of a plate member with virtual keys into a sideways movement or into a rotational movement.

[0024] Preferably, the link mechanism acts on the biased switch and the link mechanism may include a transversely sliding plate member for translating a downward movement of the keys into a transverse movement.

[0025] The sliding plate member is preferably slidably suspended between two oppositely disposed guide rails to obtain this mostly sliding mechanism. The biased switch can be disposed to face an edge of the sliding plate member.