

## USER INTERFACE INPUT DEVICE

### TECHNICAL FIELD

**[0001]** The present invention relates generally to input devices and more specifically with haptic/tactile input devices and more particularly with haptic/tactile user interface input devices for electronic devices.

### BACKGROUND OF THE INVENTION

**[0002]** There is a strong demand to create electronic devices that have selectable multiple functions, particularly mobile telephone devices, all of which functions require a user interface typically provided by a haptic/tactile input device including buttons, sliders, levers and touch elements that are permanently present on the user interface surface of the device. The status, availability and function of the device is generally identified visually, e.g. with lights and labels that are controlled by software in the device. The input devices are permanently present on the surface of the user interface and available in all contexts and conditions which leads to user errors and confusion, due to the need to indicate that the function is not available or that a given command (of several available) was executed. Visual identification is not suitable for visually impaired users which affects the accessibility of the device for such users. Hiding or making certain input devices not visible in certain modes by a mechanical change in the device for example, by a slide, hinge or twist or body parts, adds size and cost to the device. From the user's cognitive load and also styling points of view there is a need to make devices as uncluttered as possible

### SUMMARY OF THE INVENTION

**[0003]** In accordance with a broad aspect of the invention, a novel concept of a haptic/tactile input device is presented in which the behavior and/or appearance of the mechanical user interface input is configured to be adapted by the software components to the function and context of an electronic device to give feedback and cues to the user. The mechanical input embodying the invention, for example, buttons, sliders, levers, and other input devices are made appear on the surface of the user interface when needed.

**[0004]** In a further aspect, the input is configured to change its behavior based on context, for example: a button is not made available at the user interface surface when the function is not available and is brought up and made available at the user interface surface only when the corresponding function is available; a button cannot be pressed or operated and it is frozen or made rigid for movement when the function is not available; the touching pressure is variable as a button is made more resistive to movement as the value of an associated parameter is high or a limit is approached.

**[0005]** In a further aspect, the topography of the surface or contact surface area of an input such as for example, a given key or button alters its contact surface characteristic in accordance with a given function of an electronic device for providing a haptic/tactile input when the input is active. In essence the surface area of the input is flat or recessed when the input is inactive and bulges out when the input is active. The input surface topology may also be made to change repetitively to guide a user, for example, a user with impaired vision, to attract the user's attention, to direct the

user's attention to a certain desired direction on the display screen or on the electronic device. The input device surface topology may also be made to perform a secondary task by providing simulative feedback to a user by controlled rhythmic movement to create user delight and/or to support the notion of a living object.

**[0006]** The electronic device may be configured for example, for operation as a mobile terminal, music player, personal assistant, gaming unit or other such electronic devices and include features and functions such as camera functionality, GPS functionality and other functions and features well know by the purchasing public.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0007]** Additional features and benefits of the user interface input embodying the present invention will become readily apparent from the following description taken in conjunction with the drawings wherein:

**[0008]** FIG. 1 is a schematic perspective fragmentary view of an input device embodying the present invention shown in an unavailable operative position;

**[0009]** FIG. 2 is a schematic perspective fragmentary view of the input device of FIG. 1 shown in an available operative position;

**[0010]** FIG. 3 is a schematic side view of an electronic device embodying the input device of the present invention;

**[0011]** FIG. 4 is a top plan view of the electronic device shown in FIG. 3;

**[0012]** FIG. 5 is a schematic cross-section view taken along the line 5-5 in FIG. 4 showing the input device embodying the present invention in an unavailable operative position;

**[0013]** FIG. 6 is a schematic side view of the electronic device presented in Fig.3 showing the input device of the present invention in an available operative position;

**[0014]** FIG. 7 is a top plan view of the electronic device shown in FIG. 6;

**[0015]** FIG. 8 is a schematic cross-section view taken along the line 8-8 in FIG. 7 showing the input device embodying the present invention in an available operative position;

**[0016]** FIG. 9 is an exploded schematic view of an embodiment of the input device of the present invention as viewed from the underside of an electronic device with which the input device may be used;

**[0017]** FIG. 10 is an exploded schematic view of an embodiment of the input device of the present invention as viewed from the upperside of an electronic device with which the input device may be used;

### WRITTEN DESCRIPTION OF PREFERRED EMBODIMENTS

**[0018]** Turning now to the drawings and considering the invention in further detail, a schematic perspective fragmentary view of an input device embodying the present invention is illustrated in FIGS. 1 and 2 and generally designated at 10, wherein the input device 10 is shown in an unavailable operative position in FIG. 1 and is shown in an available operative position in FIG. 2. In this example, an electronic device, such as a mobile telephone, includes a printed circuit board, generally designated at 12, which carries various electrical components, memory devices, controllers, and other associated components necessary to carry out the