ELECTRONIC DEVICE WITH PHYSICAL ALERT

BACKGROUND

[0001] 1. Technical Field

[0002] This invention relates generally to an electronic device configured to physically alert the user that an event has occurred, and more particularly to an electronic device for altering the physical form factor of the electronic device by tactile presentation of an actuation element.

[0003] 2. Background Art

[0004] Mobile telephones and their audible ring tones have become commonplace in today's society. In the grocery store, bank, train, or bus, ring tones of mobile telephones have become a familiar sound. Ring tones have become so prevalent in fact, that some institutions, such as movie theaters and schools, have begun to restrict the use of audible ring tones.

[0005] Mobile telephone developers permit users to selectively silence ring tones. Two frequently implemented features are the silent mode and vibration mode. The silent mode mutes all audible ring tones, thus preventing the user from receiving any notice of an incoming communication. The vibration mode provides the user with a physical alert, as the mobile telephone vibrates rather than producing ring tone. The vibration is caused when a motor connected to an eccentric weight moves, thereby alerting the user that an incoming call or text message is pending.

[0006] Both the silent mode and the vibrating mode have limitations when in use. For example, as noted above, when a phone is in the silent mode, no alert is given for incoming communications. As such, the user may miss an important telephone call or text message. When in vibration mode, an audible noise may result from the vibration, which can sometimes frustrate the intended purpose of turning off the audible alert. This noise can be exacerbated when the mobile telephone rests upon a wooden or metal surface. For example, when resting on a hard surface, such as a school desk, the vibration of the mobile telephone may cause significant audible noise.

[0007] There is therefore a need for an electronic device, such as a mobile telephone, to provide physical, inaudible indicia to a user upon the occurrence of a device event, such as an incoming electronic communication.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The accompanying figures, where like reference numerals refer to identical or functionally similar elements throughout the separate views and which together with the detailed description below are incorporated in and form part of the specification, serve to further illustrate various embodiments and to explain various principles and advantages all in accordance with the present invention.

[0009] FIG. **1** illustrates one embodiment of an electronic device comprising an actuation element configured to alter an actuation element profile relative to a housing in response to a device event in accordance with the invention.

[0010] FIG. **2** illustrates one embodiment of an actuation element distally extending in accordance with the invention.

[0011] FIG. **3** illustrates one embodiment of an actuation element telescopically extending in accordance with the invention in response to an incoming electronic communication.

[0012] FIG. **4** illustrates one embodiment of an actuation element comprising a navigation key in accordance with the invention.

[0013] FIG. **5** illustrates one embodiment of an electronic device comprising a deformable cover layer in accordance with the invention.

[0014] FIG. **6** illustrates one embodiment of an actuation element profile driver implemented to distally extend an actuation element as to alter an actuation element profile with respect to a housing in accordance with the invention.

[0015] FIG. **7** illustrates one embodiment of an electromagnetic driver implemented to distally extend an actuation element in accordance with the invention.

[0016] FIG. **8** illustrates one embodiment of an actuation element motor implemented to distally extend an actuation element in accordance with the invention.

[0017] FIG. **9** illustrates one embodiment of altering a form factor of an actuation element in accordance with the invention.

[0018] Skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions of some of the elements in the figures may be exaggerated relative to other elements to help to improve understanding of embodiments of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0019] Embodiments of the invention are now described in detail. Referring to the drawings, like numbers indicate like parts throughout the views. As used in the description herein and throughout the claims, the following terms take the meanings explicitly associated herein, unless the context clearly dictates otherwise: the meaning of "a," "an," and "the" includes plural reference, the meaning of "in" includes "in" and "on." Relational terms such as first and second, top and bottom, and the like may be used solely to distinguish one entity or action from another entity or action without necessarily requiring or implying any actual such relationship or order between such entities or actions. Also, reference designators shown herein in parenthesis indicate components shown in a figure other than the one in discussion. For example, talking about a device (**10**) while discussing figure A would refer to an element, **10**, shown in figure other than figure A.

[0020] Turning to FIG. **1**, illustrated therein is an electronic device **100** in accordance with one embodiment of the invention. The electronic device **100** may be, but is not limited to, any of a radiotelephone, a personal digital assistant, a pager, a computer, a portable computer, or other similar mobile communication device.

[0021] The electronic device **100** comprises, in addition to the elements discussed below, standard components for communication. For example, where the electronic device **100** is a radiotelephone, the electronic device **100** comprises a transmitter and a receiver (or a transceiver), a controller, a user interface, and a memory. The electronic device **100** also comprises a housing **102**. In one embodiment, the housing **102** covers the entire electronic device **100** and defines at least a front surface, which may be planar or radiused, on one face of the electronic device **100**.

[0022] The electronic device **100** has a user interface **104** on the front surface. The user interface **104** is configured to provide input and output capabilities for responding to device events, often incorporating one or more user actuatable ele-