electronics, and other suitable such miniature devices and can have various gears, cams, and other electromechanical devices to help deform the surface.

[0157] FIG. **25** illustrates an exemplary user interface that can change topography using shape changeable nodes to raise portions of the user interface surface according to embodiments of the invention. In the example of FIG. **25**, one or more shape changeable nodes **258**-*a* can be selectively stimulated to change shape to push against their corresponding regions **251** -*a* of the surface **251** and deform the corresponding regions into discrete arcs above the initial surface. The other regions of the surface **251** can remain undeformed in the initial surface when their nodes **258** are not stimulated to change shape.

[0158] FIG. **26** illustrates an exemplary user interface that can change topography using shape changeable nodes to lower portions of the user interface surface according to embodiments of the invention. In the example of FIG. **26**, one or more shape changeable nodes **268**-*a* can be selectively stimulated to change shape to pull away from their corresponding regions **261** -*a* of the surface **261** and deform the corresponding regions into discrete hollows below the initial surface, where the other regions corresponding to unstimulated nodes can remain undeformed in the initial surface.

[0159] FIG. **27** illustrates an exemplary circuit for changing the user interface topography using shape changeable nodes according to embodiments of the invention. The circuit can for example generally be used with the user interface shown in FIGS. **24** through **26**. The circuit **270** can include ASIC **277** that can be operatively coupled to PCB **276** that can be operatively coupled to a plurality of the shape changeable nodes **248**, **258**, **268** of FIGS. **24** through **26**, respectively. In FIG. **27**, the PCB **276** and/or ASIC **277** can cause a stimulus, e.g., an electrical current, to be applied to the nodes **278**. The nodes **278** can change shape when stimulated by the stimulus and can remain unchanged when not. The connections between the PCB **276** and/or ASIC **277** and the nodes **278** can include, for example, individual switches for each nodes, where a particular node's switch can close when the node is selected to be stimulated so as to transmit the stimulus and can remain open when not.

[0160] In the examples of FIGS. **24** through **26**, the shape changeable nodes **248**, **258**, **268**, respectively, can be proximate to their respective dynamic surfaces **241**, **251**, **261** that can be stretched, retracted, or otherwise flexed by the underlying nodes. The dynamic surfaces can be replaced with individual nodes or with a shape changeable membrane proximate to the nodes. Alternatively, both the nodes and the dynamic surfaces can be replaced with the shape changeable membrane that itself can change shape to alter the user interface.

[0161] In some embodiments, portions of the dynamic surfaces can be fixed or anchored to prevent either upward or downward deformation in those areas. These portions can be interspersed with and around nodes, depending on the needs of the system.

[0162] In order to generate inputs at the user interface of FIGS. **24** through **26**, the user interface can include a sensing device capable of detecting a touch or near touch at the user interface surface. FIGS. **30** through **32** illustrate exemplary user interfaces that can change topography having sensing devices according to embodiments of the invention. In the example of FIG. **30**, user interface **300** can include surface **301** and sensing device **307** integrated within the surface. In the example of FIG. **31**, user interface **310** can include surface **311** and sensing device **317** applied to the surface as a coating or layer. In the example of FIG. **32**, user interface **320** can include surface **321** and sensing device **327** separated from the surface by distance d, which can be any distance suitable for operating the user interface according to embodiments of the invention. In one example, the sensing device can be a touch sensing device. If applied to or integrated within the user interface surface, the sensors of the touch sensing device can be configured to be flexible. The sensors can be embodied as lines (drive lines, sense lines, or electrodes). These sensors can be coated onto the surface of the membrane. These sensors can also be disposed inside the membrane. The lines and/or electrodes can be physical traces or wires, can be incorporated in a flex circuit, or can be deposited.

[0163] FIG. **33** illustrates an exemplary user interface that can change topography by selectively altering shape changeable nodes according to embodiments of the invention. The user interface can for example correspond to the user interface shown in FIGS. **24** through **32**. In the example of FIG. **33**, nodes **338** can be selectively controlled to form a physical button or key at deformable membrane **331** forming the user interface surface. This can be accomplished by activating a first set of nodes **338**-*a* (symbolically illustrated by circles with "X" thereon), while leaving a second set of nodes **338**-*b* unactivated. The first set of nodes **338**-*a* can create a raised area in the deformable membrane **331**. The raised section can represent the area to be pressed in order to actuate the button or key (i.e., the raised section can flex under force of a finger pressing thereon). More particularly, the first set of nodes **338**-*a* can form outer nodes while the second set of nodes **338**-*b* can form inner nodes. The nodes **338**-*a* of the first set can be stimulated to change shape, while the node(s) **338**-*b* of the second set can remain unchanged, thereby leaving a pliable portion of the surface within the area formed by the activated first set of nodes **338**-*a* and above the second set of nodes **338**-*b* within that area.

[0164] The raised area can form the physical button. Because the outer nodes **338**-*a* can span an extended area, the deformable membrane **331** can include a plateau section stretched across the outer nodes. As shown, one or more inner nodes **338**-*b* can be disposed under the plateau section.

[0165] FIG. **34** illustrates an exemplary user interface that can change topography by selectively pressing on shape changeable nodes according to embodiments of the invention. In the example of FIG. **34**, user interface **340** can include a raised section of deformable membrane **341** that forms the user interface surface. The raised section can be formed by the activation of a first set of nodes **348**-*a* (symbolically illustrated by circles with "X" therein) to form a plateau section within raised section and above a second set of nodes **348**-*b* that can be unactivated. The space provided between the plateau second and second set of nodes **348**-*b* can allow a user to press finger **346** against and move the flexible plateau section to be in close proximity to or in contact with the second set of nodes **348**-*b*.

[0166] FIG. **35** illustrates an exemplary user interface that can change topography by selectively altering shape changeable nodes in response to pressure thereon according to embodiments of the invention. In the example of FIG. **35**, user interface **350** can detect a touch by finger **356** on a raised section of deformable membrane **351** forming the user interface surface and register the touch as a button input. The touch can be a press on a unactivated node (such as node **348**-*b* of