[0036] The deformation of the surface **115** functions to provide a tactile feedback that signals the location of the particular region of the surface **115**. When used in conjunction with an input graphic on the display **150**, the deformation of the surface **115** preferably signals the location of an input on the touch sensor **140**. The deformation preferably acts as (1) a button that can be pressed by the user and that signals the location of a single input on the touch sensor **140** under the button, (2) a slider that can be pressed by the user and that signals the location of multiple inputs on the touch sensor **140** under the slider, (3) a guide that signals the location of multiple inputs on the touch sensor **140** adjacent the guide, and (4) a pointing stick that signals the location of multiple inputs on the touch sensor **140** under and adjacent the pointing stick. The deformation may, however, act as any other suitable device or method that signals the location of a particular region of the surface **115**. The button, as shown in FIG. **11**, preferably has a dome-like shape, but may alternatively have a cylindrical-like shape (with a flat top surface), a pyramid-like shape, a cube-like shape (with a flat top), or any other suitable button shape. The touch sensor **140** preferably recognizes any user touch **145** into the button as a user input. The slider, as shown in FIGS. **12** and **13**, preferably has a ridge like shape (shown in FIG. **12**), but may alternatively have a ring like shape (shown in FIG. **13**), a plus-like shape, or any other suitable slider shape. The touch sensor **140** preferably recognizes user touches **145** at different locations into the slider and distinguishes these user touches as different user inputs. As an example, the slider with the ring like shape may act like the "click wheel" of the Apple iPod (second generation). The guide, as shown in FIG. **14**, preferably has a double ridge shape or a double ring shape. Unlike the button and the slider, which are meant to be pressed by the user, the guide is meant to signal the location next to the area meant to be pressed by the user. The touch sensor **140** preferably recognizes user touches **145** at different locations between the two ridges and distinguishes these user touches as different user inputs. In another version, the guide may omit the second ridge. The pointing stick, like the button, preferably has a dome-like shape, as shown in FIG. **15**, but may alternatively have a cylindrical-like shape (with a flat top surface), a pyramid-like shape, a cube-like shape (with a flat top), or any other suitable button shape. The pointing stick is meant to signal the location under and adjacent the area meant to be pressed by the user. The touch sensor **140** preferably recognizes user touches **145** at different locations under and around the pointing stick and distinguishes these user touches as different user inputs. As an example, the point stick may act like the pointing stick trademarked by IBM as the TRACKPOINT and by Synaptics as the TOUCHSTYK (which are both informally known as the "nipple").

3. The Touch Sensor and the Display

[0037] The touch sensor **140** of the preferred embodiments functions to sense a user touch proximate the particular region of the surface **115**. The touch sensor **140** is preferably located under the substrate **120** (as shown in FIGS. **3***a* and **3***b*), but may alternatively be located above the substrate **120** (as shown in FIGS. **4***a* and **4***b*). If located above the substrate **120**, in addition to sensing a user touch, the touch sensor **140** also functions to deform upon an expansion of the cavity **125** and therefore the touch sensor **140** preferably has elastic properties similar to the layer **110**. As a variation of this version, the touch sensor **140** may act as the layer **110** to partially define the cavity **125**. The touch sensor **140** preferably senses a user touch in a continuous or multiple step manner. For example, the touch sensor **140** preferably distinguishes a resting user touch (that does not significantly modify the deformation of the surface **115**), a gentle user touch (that partially pushes the surface **115** back to the normal, unexpanded plane of the surface **115**), and a hard user touch (that completely pushes the surface **115** back to the normal, unexpanded plane of the surface **115**). In other words, the touch sensor **140** preferably senses different "heights" of the deformation. The touch sensor **140** may, however, simply sense a user touch in a binary manner ("on" or "off"). In one example, the touch sensor **140** is preferably a conventional capacitance-based touch sensor, such as the touch panel sold by Synaptics under the trademark CLEARPAD, but may be any suitable device that senses a user touch. The capacitance-based touch sensor preferably senses a user touch based on the change in capacitance between two locations within or near the cavity **125**. In another example, the touch sensor **140** is a pressure sensor either located in or coupled to the cavity **125**. The pressure sensor preferably senses a user touch based on a change in the pressure within the cavity **125** caused by a user touch on the deformation of the surface **115**. In yet another example, the touch sensor **140** is integrated with the displacement device **130** to sense either a fluid displacement or a pressure change caused by a user touch on the deformation of the surface **115**. While these are three examples, the touch sensor **140** can be any other suitable device or method that senses a user touch proximate the deformation of the surface **115**.

[0038] The display **150** of the preferred embodiments functions to interface with a user in a visual manner. The display **150** is preferably a conventional liquid crystal display (LCD), but may alternatively any suitable device that displays an output. In one version, as shown in FIGS. **3***a* and **3***b*, the display **150** is located under the substrate **120**. In another version, the touch sensor **140** and the display **150** may be integrated as a single structure that both senses a user input and displays an output. For example, an LCD with embedded optical sensors both touch screen and scanner functions was announced in a 2007 press release by Sharp Electronics of Japan. This combined touch sensor/display—if flexible—may be located above the substrate **120**, and—if not flexible—may be located below the substrate **120**. If the display **150** is located below the substrate **120** and the fluid, then the substrate **120** and the fluid are preferably transparent and are preferably chosen to have substantially similar (if not identical) refractive indexes. An example of a substrate **120** and fluid that have substantially similar refractive indexes include: PMMA (which has an index of refraction of 1.489) and the Cargille Laboratories Series A fluids (which cover the range of 1.460-1.640) or a mixture of Diethyl Phthalate and water. When used in mobile phones, "substantially similar" in this context preferably means +/−0.1 relative to each other. When used in this and other applications, "substantially similar" may alternatively mean similar enough to prevent viewing distortions of the display **150**. The display **150** preferably outputs several different visual outputs. One of the outputs is preferably an input graphic that is aligned with the particular region of the surface **115** that can be deformed by the cavity **125** in the extended volume setting. Examples of suitable input graphics include individual letters of a QUERTY keyboard, individual numbers in a dial pad, and different locations on a map.

4. The Processor

[0039] The user interface system **100** of the preferred embodiment also includes a processor, which is coupled to