deformation that may be felt by a user, and providing tactile guidance for the user. The expanded particular region **113** preferably also provides tactile feedback when the user applies force onto the particular region **113** to provide input. However, any other arrangement of the user interface system **100** suitable to providing tactile guidance and/or detecting user input may be used.

[0029] As shown in FIGS. **3***a*, **3***b* and **3***c*, the cavities **125** of the preferred embodiment functions to hold a fluid and to have at least two volumetric settings: a retracted volume setting (shown in FIG. **3***a*) and an expanded volume setting (shown in FIG. **3***b*), both of which are actuated by the displacement device **130**. When in the expanded volume setting, the user may inwardly deform (or "actuate") the particular region **113** to provide a user input (shown in FIG. **3***c*). The fluid is preferably a liquid (such as water, glycerin, or ethylene glycol), but may alternatively be a gas (such as air, nitrogen, or argon) or any other substance (such as a gel or aerogel) that expands the cavity **125** and deforms the surface **115**. In the expanded volume setting, the cavity **125** expands above the plane of the surface **115**, thereby deforming a particular region of the surface **115**. The deformation of the particular region **113** functions to provide tactile guidance and/or tactile feedback on the surface **115** for the user. The deformation of the particular region **113** also preferably functions to inform the user of the type of input the deformation represents. For example, the deformation of the particular region **113** may be of a shape that indicates the type of input that the deformation represents. Alternatively, the sheet **110** may include tactile instructions, for example, a pattern of beads or substantially small protrusions that may be felt by the user on the particular region **113** that indicate the type of input the deformation represents. The tactile instructions on the particular region **113** may alternatively be any other type of feature that is able to be felt tactilely by the user.

[0030] The layer no and the substrate **120** of the preferred embodiment function to cooperatively define the cavity **125**. The layer no and substrate **120** are preferably similar to the layer and substrate disclosed and taught in U.S. application Ser. No. 12/319,334, but may alternatively be any suitable type. The layer no is preferably more pliable than the substrate **120** such that, as the cavity **125** expands, the layer no deforms while the substrate no remains relatively undeformed. If the user interface system **100** includes a display **150**, then the layer no and the substrate **120** are preferably both relatively transparent to allow the images displayed by the display **150** to be seen through the layer no and the substrate **120**. The layer no and the substrate **120** may also be index matched to allow light transmitted through without interruption. However, the layer **110** and the substrate **120** may be of any other suitable property. The layer no is preferably directly coupled to the substrate **120**. Alternatively, the user interface system **100** may include an additional layer in that is in arranged in between the layer no and the substrate **120**. The additional layer **111** may function as a support layer that includes perforations that allow for the fluid to expand the cavity **125** and deform the layer no and the particular region of the surface **113**. In this variation, the attachment point **112** is preferably arranged to couple the layer **110** to the additional layer **111**. Alternatively, the additional layer **111** may deform with the layer **110** and the particular region of the surface no. In this variation, the attachment point **112** is preferably arranged to couple the additional layer **111** to the substrate **120**. However, any other suitable arrangement of the layer no, the substrate **120**, and the attachment point **112** may be used.

[0031] As shown in FIGS. **21***a* and **21***b*, the substrate **120** may include a lattice-like support member **119** under the particular region of the surface **115**. When the cavity **125** is expanded and the deformation is present in the surface **115**, the support member **119** functions to prevent a user from "pressing too far" into the deformation below the plane of the surface **115**. When the cavity **125** is not expanded and the deformation is not present in the surface **115**, the support member **119** functions to reduce (or potentially eliminate) the user from feeling "divots" in the surface **115** when swiping a finger across the surface **115**. As shown in FIG. **21***c*, the support member **119** preferably includes holes or channels that allow for the expansion of the cavity **125** and the deformation of the surface **115**. The support member **119** is preferably integrally formed with the substrate **124**, but may alternatively be formed with the layer **110** or may be separately formed and later attached to the substrate **120**. Finally, as shown in FIG. **21***d*, the support member **119** may alternatively partially define the cavity **125**. The substrate **120** is preferably rigid, but may alternatively be flexible in one or more directions. The substrate **120**—if located above the display **150**—is preferably optically transparent, but may—if located below the display **150** or if bundled without a display **150**—be translucent or opaque. The substrate **120** is preferably made from a material including polymers or glass, for example, elastomers, silicon-based organic polymers such as poly-dimethylsiloxane (PDMS), thermoset plastics such as polymethyl methacrylate (PMMA), and photocurable solvent resistant elastomers such as perfluropolyethers. The substrate **120** may, however, be made of any suitable material that supports the layer **110** and at least partially defines the cavity **125**. In the preferred version, the substrate **120** is a single homogenous layer approximately 1 mm to 0.1 mm thick and can be manufactured using well-known techniques for micro-fluid arrays to create one or more cavities and/or micro channels. In alternative versions, the substrate **120** may be constructed using multiple layers from the same material or from different suitable materials.

[0032] As shown in FIG. **2**, the touch sensor **140** of the preferred embodiment functions to detect the presence of a user input proximate to the particular region **113** of the surface **115**. The touch sensor **140** preferably detects the presence of a user touch by detecting a force that inwardly deforms the deformed particular region **113** or any other portion of the surface **115**, but may alternatively detect the presence of a user touch by detecting the presence of the finger at a location proximate to the particular region **113**. The touch sensor **140** may be a capacitive sensor, a resistive sensor, a pressure sensor, or any other suitable type of sensor.

[0033] As shown in FIGS. **4-6**, the shape of the deformation of the particular region **113** is preferably one that is felt by a user through their finger (or multiple fingers). In a first variation, the shape of the deformation of the particular region **113** preferably acts as and provides the feeling of a button that can be pressed by the user, such as a keyboard (shown in FIGS. **4**, **5***a*, and **5***b*). In a second variation, the shape preferably acts and provides the feeling of a slider that can be pressed by the user in one location along the slider or that can be swept in a sliding motion along the slider, such as the "click wheel" of the Apple iPod—second generation (shown in FIG. **6**). In a third variation, the shape preferably acts and provides the feeling of a pointing stick that can be pressed by the user from