further coupled to coils **114***a*, **114***b* to form magnetic devices. Coils **114***a*, **114***b* are coupled to one or more current sources for creating magnetic flux in pole pieces **110**, **112**. Biasing elements **106**, **108** may be implemented as discussed above and may be made of elastic materials that may be compressed or stretched within a predefined range.

[**0038**] Referring to **FIG. 5**, one side of actuator **100** is coupled to the case **502** while another side of actuator **100** is coupled to the touch-sensitive panel **504**. Structural element **102**, as shown in **FIG. 5**, is fastened to the case **502**. In this embodiment, the case **502** is rigid and does not move easily. In one embodiment, appertures **120**, **122** may be used by fasteners to couple the structural element **102** to the case **502**. Structural element **104** is, in turn fastened to a touch-sensitive panel **504**. Touch-sensitive panel **504**, in one embodiment, may be made of relatively flexible transparent materials. In one embodiment, holes **124**, **126** may be used to fasten the structural element **104** to the touch-sensitive panel **504**.

[**0039**] When power is applied and input current begins to pass through the coils **114***a*, **114***b*, the attractive gap-closing force between pole pieces **110** and **112** starts to increase. The attractive force causes the pole piece **112** to be attracted to the pole piece **110** where pole piece **110** is held fixed. Pole piece **112** begins to move toward the pole piece **110** to close the gaps **140**, **142** until it reaches a second equilibrium position as illustrated in **FIG. 6**. When power is reduced or removed, the attractive force between pole pieces **110** and **112** begins to reduce and consequently, the pole piece **112** begins to move back to its original position in response to the return force provided by the biasing elements **106**, **108**. The biasing elements **106**, **108** continue to force the pole piece **112** to move back until it reaches the first equilibrium position as shown in **FIG. 1**. The movements between the pole pieces **110**, **112** cause similar movements between the structural elements **102**, **104**. In one embodiment, the movements between the structural elements **102**, **104** generate haptic effects or haptic sensation. Since touch-sensitive panel **504** is fastened to structural element **104**, haptic effects on the touch-sensitive panel **504** occur when the movement between the structural elements **102**, **104** occurs. Depending on the orientation of the actuator **100** with respect to the touch-sensitive panel **504**, haptic effects may excite either in-plane or out-of-plane motion with respect to the touch-sensitive panel **504**.

[**0040**] **FIG. 6** illustrates, in a somewhat exaggerated manner to improve visibility, a second equilibrium position of an actuator **600** in accordance with one embodiment of the present invention. Actuator **600**, which is similar to actuator **100**, includes two L-shaped pole pieces **110**, **112**, structural elements **102**, **104**, and biasing elements **602**, **604**. Pole pieces **110**, **112** are further coupled to coils **114***a*, **114***b* to form magnetic devices. Coils **114***a*, **114***b* are coupled to one or more current sources for generating magnetic flux in pole pieces **110**, **112**.

[**0041**] When power is off, the biasing elements **602**, **604** provide minimal force to keep the actuator **600** in the first equilibrium position as described and shown in **FIG. 1**. When power is on, the input current passes through the coils **114** and generates magnetic flux in the pole pieces **110**, **112**. Magnetic flux causes an attractive magnetic force between the pole pieces **110**, **112** across gaps **140**,**142**. The attractive magnetic force acts against the biasing elements **602**, **604** and pulls the pole pieces **110**, **112** closer together at the gaps **140**, **142**. Pole piece **110**, in this embodiment, may be secured to a case via the structural element **102**, while pole piece **112** is secured to a touch-sensitive panel via the structural element **104**. The attractive magnetic force causes the pole piece **112** to move from right to left (as indicated by **138**) toward the pole piece **110**. When the pole piece **110** is displaced enough distance, a second equilibrium position is reached as shown in **FIG. 6**. When power is reduced or removed, the biasing elements **602**, **604** force the pole piece **112** back to the first equilibrium position as discussed earlier.

[**0042**] **FIG. 7** illustrates a system configuration having an actuator in accordance with one embodiment of the present invention. The system configuration includes a touch-sensitive panel **702**, a display panel **704**, and a case **706**. Touch-sensitive panel **702**, in one embodiment, is made of substantially transparent materials, and is capable of transmitting light so that objects or images displayed in the display **704** may be seen through the touch-sensitive panel **702**. The display **704** can be any type of display such as a cathode ray tube (CRT), liquid crystal display (LCD), plasma display, flat panel display or the like or could even be a static illustration. Both touch-sensitive panel **702** and display **704** may be installed in the case **706**. In an alternative embodiment, the touch-sensitive panel **702** and the display **704** may be located separately with the actuator mounted between the touch-sensitive panel **702** and a relatively fixed location so that haptic effects are provided to the touch-sensitive panel but the display is located elsewhere.

[**0043**] In one embodiment, touch-sensitive panel **702** is further divided into various regions **720** and the regions are further separated by borders **722**. Touch-sensitive panel **702** accepts a user's selection when only a region **720** is touched. Conversely, touch-sensitive panel **702** rejects a user's selection when a border **722** is touched. Touch-sensitive panel **702** further includes four actuators **710** and, depending on their orientation, actuators **710** can excite either in-plane or out-of-plane motion with respect to the touch-sensitive panel **702** for haptic sensation. Actuators **710** may be installed to move touch-sensitive panel for relative to display **704**.

[**0044**] **FIG. 8** is a flow diagram illustrating a method for generating a haptic effect in accordance with one embodiment of the present invention. A process for generating haptic sensation starts at block **802**. In one embodiment, the process can be activated by a user who touches a touch-sensitive panel possibly in a predetermined location or locations. In another embodiment, the process is activated by a touch signal or contact signal sent by the touch-sensitive panel, which indicates that a selection has been made by a user.

[**0045**] At block **804**, the process receives a contact signal from the touch-sensitive, which may be sent by a touch-sensitive panel according to a selection made by a user. In another embodiment, a computer or controller sends a contact signal. Upon receipt of the contact signal, the process moves to the next block **806**.

[**0046**] At block **806**, the process instructs a controller to provide an input current according to the contact signal. In one embodiment, the input current is passing through at least one electromagnet device of an actuator to generate magnetic flux in a pair of pole pieces.