22 and 24 may be a polymer with embedded magnetic particles to further aid in providing an audible click and tactile feedback.

[**0061**] **FIG. 26** provides tactile feedback of switch actuation using a rocker **132** having a magnet **130** mounted on a surface of the rocker **132** on a first side of a pivot point **133** and having an acoustic wave absorber **134** mounted on a surface of the rocker **132** on a second side of the pivot point **133**. The magnet **130** is held against a substrate **14** formed of a steel plate or the like, so as to maintain the switch in an unactuated state. When the force on the rocker **132** above the absorber **134** overcomes a threshold, the rocker **132** pivots about the point **133** so that the acoustic wave absorber **134** contacts the touch surface **28** of the acoustic wave switch **12** so as to actuate the switch. Upon release of the rocker end above the absorber, the magnet **130** is attracted to the steel substrate **14** so as to return the rocker **132** to the unactuated switch position.

[**0062**] **FIG. 27** illustrates another embodiment that provides feedback of switch actuation using a plunger **140** that extends through an aperture **144** in a steel plate **146**. The plunger is held in an unactuated position above the touch surface **28** of an acoustic wave switch **12** by magnets **142** that are mounted on a flange **148** of the plunger. In the unactuated position, the magnets **142** are held against the steel plate **146** which is spaced above the substrate **14** by a sufficient distance so that an acoustic wave absorber **149** mounted on an end of the plunger **140** does not contact the touch surface **28** in an unactuated switch position. When a force is applied to the top of the plunger **140**, overcoming the holding force of the magnets **142**, the plunger moves downward so that the absorber **149** contacts the touch surface **28** actuating the switch. When the plunger **140** is released, the magnets **142** are attracted back to the steel plate **146** to return the plunger back to the unactuated position as shown in **FIG. 27**.

[**0063**] **FIG. 28** illustrates an embodiment to provide feedback with no mechanism overlying the touch surface **28**. In this embodiment, a solenoid **150** is mounted on a back surface of the substrate **14**. When a touch on a surface **28** is detected as discussed above, current is applied to the solenoid **150**. When current is applied to the solenoid **150**, a rod **152** of iron, steel or the like, forming a striker is moved upward hitting the substrate **14** with sufficient force so that a finger on a nearby touch surface **28** feels motion or vibration of the substrate **14**. The impact of the rod **152** against the substrate **14** can also provide audible feedback as well if desired. It is noted that the substrate **14** acts as a load spreader so that the substrate motion on impact by the rod **152** is not localized. As such, one solenoid can provide feedback for a number of acoustic wave switches formed on the substrate **14**.

[**0064**] Because the acoustic wave cavity of the switch **12** in accordance with the present invention is formed at least in part integrally with the substrate **14**, the switch **12** can be readily incorporated into a wall of a housing for a device. As such, the switch **12** is extremely rugged and does not have any sealing problems. The acoustic wave switch **12** utilizing a shear wave is insensitive to liquids and other contaminants on the touch surface **28** so that it is operable in the presence of liquids and other contaminants. Moreover, the switch **12** is explosion proof. The high Q of the switch **12** enables a touch to be detected by extremely simple, inexpensive circuitry. It should be apparent that touch detection circuits other than the oscillator circuit depicted in the drawings can be used with the acoustic wave switch of the present invention. Moreover, the switch has a low enough power consumption to be suitable for portable or hand held devices. Although the switch **12** has been described above with indicia **16** to identify the position of the switch, by eliminating the indicia, a covert switch is provided.

[**0065**] Many modifications and variations of the present invention are possible in light of the above teachings. For example, the cut-off frequency of the cavity region can be made less than the adjacent area surrounding the cavity by other methods than described herein. Thus, it is to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as described hereinabove.

What is claimed and desired to be secured by Letters Patent is:

1. An acoustic wave switch comprising:

a substrate;

a mesa formed on the substrate, the mesa defining an acoustic wave cavity;

a driver generating an acoustic wave in the acoustic wave cavity wherein a touch on a touch surface of the acoustic wave cavity produces a detectable change in the acoustic wave in the cavity; and

a feedback mechanism to provide tactile and/or audible and/or visual feedback to a user that a switch has been actuated by a touch on the touch surface.

2. An acoustic wave switch as recited in claim 1 wherein the feedback mechanism includes a member that overlies the touch surface of the acoustic wave cavity and is spaced therefrom in an unactuated position, the member moving into contact with the touch surface by a force acting thereon to actuate the switch.

3. An acoustic wave switch as recited in claim 1 wherein the member includes a deformable dome.

4. An acoustic wave switch as recited in claim 3 wherein the dome has an acoustic wave absorber on a surface moved into contact with the touch surface of the acoustic wave cavity.

5. An acoustic wave switch as recited in claim 3 further including a sheet of acoustic wave absorbing material overlying the touch surface, the dome contacting the acoustic wave absorbing material to actuate the switch.

6. An acoustic wave switch as recited in claim 2 wherein the member includes an acoustic wave absorber on a surface thereof overlying the touch surface and at least one magnet to hold the member in an unactuated position until a force acting on the member actuates the switch, and the magnet returning the member to an unactuated position when the force is removed.

7. An acoustic wave switch as recited in claim 6 wherein the member includes a rocker having a pivot with the absorber mounted on the rocker on one side of the pivot and the magnet mounted on the rocker on another side of the pivot.

8. An acoustic wave switch as recited in claim 6 wherein the member includes a plunger extending through an aperture in a metal plate spaced from the substrate, the absorber