effectiveness is greatly improved if the touchpad user is touching, or in close, proximity to the conductive medium, as the user acts as the ground reference. For example, if the whole case of a mobile phone were made of a conductive medium, the act of the holding the phone would serve as a very effective ground. All surfaces, edges and corners of a mobile phone could, in fact, be made touch-interactive, and any parts intended to be held by the hand of a user could be de-activated as a keypad but used instead as a reference ground. When the hand is removed, that part would be re-activated. The scanning apparatus of U.S. Pat. No. 6,137,427 continually adjusts to environmental conditions and could therefore be modified for use in the mobile phone application.

[0111] In some preferred embodiments, the conductive medium **4** may be larger than the membrane **3** and can wrap around the membrane **3** to cover at least a portion of the reverse side of the membrane **3**. The conductive medium **4** may also act as a reference ground.

[0112] The remaining features of the scanning mechanism are well described in the cited documents and will not be discussed further here.

[0113] In a preferred embodiment, the touchpad of the present invention may be connected to a sensing circuit, which is used to indicate the exact time the touchpad is touched. The sensing circuit may, induce a voltage, or varying voltage on the conductive layer **4**. The combination of the touchpad and sensing circuit enables a very rapid touch detection, which is considerably faster than the prior art systems. In the present invention, the time of a touch may be detected within about 2 to about 3 microseconds as opposed to about 10 milliseconds in the touch detection system of U.S. Pat. No. 6,137,427. This amounts to about a 1000 times increase in detection response time, since the U.S. Pat. No. 6,137,427 apparatus undertakes a complete scan of the touchpad before determining if a touching action has occurred. The scanning apparatus of U.S. Pat. No. 6,137,427 would, however, be needed determine the exact position of a touch.

[0114] Preferably, the sensing circuit comprises a touch detector circuit **9** and a wake up circuit **10**, as shown in **FIG. 23**, with the sensing circuit normally 'sleeping' (i.e. in a stand-by mode) and periodically waking to measure the state of the touchpad. The touch detector circuit **9** would preferably be connected to the conductive layer **4**. In response to a touching action, the touch detector circuit **9** signals the wake up circuit **10**, which wakes up the sensing circuit, if in sleep mode, which then scans the surface, via a processor **12** and position detect circuit **11**, to determine the touch position. The sensing circuit preferably consumes about 2 milliamps when awake, and about 10 microamps when normally sleeping. Hence, a 100 fold decrease in power requirement is potentially possible with a 1000 fold increase in response time. The sensing circuit can therefore be powered by a solar cell or by a small battery for instance.

[0115] Conductive earthed/grounded or active backplanes (not shown) may preferably be incorporated in the touchpad of the present invention. An insulated layer may be required between the conductive layer and any such backplane, in order to prevent short circuiting between the two.

[0116] Backplanes have to be connected to ground, or an active backplane driver, and generally need to have a very low resistance as compared to the preferred range of resistances of the conductive layer **4** in the touchpad of the present invention. An anti-static shield needs to be connected to Earth, otherwise it is found to accumulate charge, which diminishes its function as an anti-static shield. In order to operate correctly, anti-static shields need to have a very high resistance as compared to the preferred range of resistances of the conductive layer **4** in the touchpad of the present invention.

[0117] A further application of the present invention is as a solid state touch-interactive sheet, that can be touched independently on both sides. This sheet could preferably comprise a grounded or active backplane sandwiched between a pair of conductive layers.

[0118] A number of independent touch systems could also exist on a single surface, and could be used to create a substantially flat shop counter, having a plurality of epos machines configured within the single surface. To avoid any possible interference between adjacent machines, earthed or grounded backplanes may preferably be incorporated between each machine.

[0119] If a suitable doped plastic is used, such as the one described in relation to the embodiment of **FIG. 5**, the conductive support and sensing layer **4**A may preferably be additionally used as a resonant surface for a speaker. This functionality would be temporarily suspended, while the surface was being touched e.g. while operating as a touchpad, but would be resumed following completion of the touching action, thereby once more generating sounds. A suitable speaker driver technology for this application would be a NXT system.

[0120] In addition, the conductive support and sensing layer **4**A may be used as a microphone, for example, using a reverse NXT system.

[0121] In a further embodiment of the touchpad of the present invention, a thin, flexible display layer could be included as a layer in the touchpad. This would provide a complete, touch-interactive, display system. Suitable technologies for the display layer include, but are not limited to, e-ink, oled (organic light emitting displays) and leps (light emitting polymers).

[0122] Other applications of the touchpad of the present invention include a simple slide mechanism, wherein two sensing conductors are capacitively linked by a conductive layer in the form of a track (as shown in **FIG. 26**), in which the user runs his finger forwards and backwards along the track mimicking the action of a slide switch. The track is preferably about 10 cm in length by about 1 cm in width and has a resistivity of about 10 k ohms per square. The resistivity can be decreased for longer tracks and/or further sensing conductors may be located along the length of the track (as shown in **FIG. 27**).

[0123] Another application is as a simple input device for a computer, such as a mouse. Preferably, at least three sensing conductors are arranged in a triangle configuration and are capacitively linked by a conductive layer in the form of a conductive film (as shown in **FIG. 28**). Movement of a user's finger within the proximity of the triangular sensing region, gives rise to interpolated positions referenced to the sensing conductors, which can be supplied to a computer to control the movement of a cursor on a display screen. A