

[0056] Operation 616 can be an optional operation of flowchart 600. That is, if the first and second substantially transparent insulating layers can be deposited where it is desired, there is really no need to perform operation 616. For example, the first and second substantially transparent insulating layers can be deposited over the first and second set of conductive traces in such a manner as to leave exposed electrical contact pad areas of the first and second sets of conductive traces to enable coupling of test equipment and/or sensing circuitry of the capacitive sensing device.

[0057] At operation 618, if several capacitive sensing devices are being manufactured on a single substantially transparent substrate, the substantially transparent substrate can be cut to separate the capacitive sensing devices. It is appreciated that the cutting at operation 618 can be implemented in diverse ways. For example, a small rotary wheel can be used to roll across the substantially transparent substrate to scratch its surface to enable it to be broken or separated along the scratches. Alternatively, a laser can be used to move across the substantially transparent substrate to provide enough thermal expansion to cut it. However, either of these cutting techniques leaves a fairly square edge that can easily be chipped. As such, each of the cut edges (and others if desired) of the substantially transparent substrate can be edge ground at operation 618 in order to protect the edges of the capacitive sensing device from casual contact damage. The edge grind at operation 618 can be performed to create 45 degree bevels along the desired edges of the substantially transparent substrate. Furthermore, at operation 618, the dust created by the edge grinding can also be washed away. Once operation 618 is completed, the process exits flowchart 600. It is noted that operation 618 can be an optional operation of flowchart 600. For example, if a single capacitive sensing device is being manufactured on a single substantially transparent substrate, there may not be a need to perform operation 618.

[0058] FIG. 7 is a cross sectional view of an exemplary capacitive sensing device 700 in accordance with an embodiment of the present invention. It is appreciated that capacitive sensing device 700 may have been manufactured utilizing the process represented by flowchart 200 of FIG. 2 or flowchart 600 of FIG. 6. Specifically, capacitive sensing device 700 includes a substantially transparent substrate 703 having metal layers 701 and 713 which are separated by a substantially transparent insulating material layer 702. Additionally, a second substantially transparent insulating material layer 704 can be used in order to provide an abrasion resistance layer for metal layer 713. Metal layers 701 and 713 have each been patterned to provide conductive traces 705, 707, 709 and 711 that can be coupled to sensory circuitry (not shown) of capacitive sensing device 700. It is understood that conductive traces 707 and 709 may also be referred to as electrical contact pads that are located outside of the sensing area (not shown) of capacitive sensing device 700. It is noted that substantially transparent insulating layers 702 and 704 are each patterned so that electrical contacts can be made to metal layers 701 and 713.

[0059] Within the present embodiment, conductive traces 705 and 707 have been deposited and patterned above the substantially transparent substrate 703. It is noted that conductive traces 705 and 707 each includes three layers of material. Specifically, conductive traces 705 and 707 each includes a layer of black chrome 706, a layer of aluminum

708 and a layer of titanium 710. Additionally, substantially transparent insulating layer 702 has been deposited above conductive traces 705 and 707 and substantially transparent substrate 703.

[0060] Within FIG. 7, conductive traces 709 and 711 have been deposited and patterned above the substantially transparent insulating layer 702. It is appreciated that conductive traces 709 and 711 each includes three layers of material. Specifically, conductive traces 709 and 711 each includes a layer of black chrome 712, a layer of aluminum 714 and a layer of titanium 716. Furthermore, substantially transparent insulating layer 704 has been deposited above conductive traces 709 and 711 and substantially transparent insulating layer 702.

[0061] The substantially transparent insulating layer 704 of the capacitive sensing device 700 has been patterned to form an opening 722 above conductive trace 709. Moreover, substantially transparent insulating layers 704 and 702 have been patterned to form an opening 720 above conductive trace 707. As such, electrical contact may be made with metal layers 701 and 713. It is noted that openings 720 and 722 can be located on or near the perimeter of substantially transparent substrate 703. A user view 718 represents the direction from which users can view the capacitive sensing device 700. As such, an underlying image or an information display device (not shown) could be located behind the capacitive sensing device 700 facing the user view 718. In this manner, a user would be viewing the underlying image or information display device through capacitive sensing device 700. Within the present embodiment, capacitive sensing device 700 is separate from active components used to comprise the information display device.

[0062] Within FIG. 7, it is appreciated that aluminum layer 708 and titanium layer 710 of conductive traces 705 and 707 are hidden or obscured by black chrome layer 706 (e.g., chromium oxynitride). Furthermore, aluminum layer 714 and titanium layer 716 of conductive traces 711 and 709 are hidden or obscured by black chrome layer 712. If black chrome layers 706 and 712 were not included within capacitive sensing device 700, aluminum layers 708 and 714 may reflect unwanted ambient light towards the user. As such, a black matrix material (e.g., black chrome layers 706 and 712) is placed between the reflective conductive traces (e.g., 708 and 714) and the user of capacitive sensing device 700. The black chrome layers 706 and 712 have low reflectance and high absorbency so that they appear black and return little of the light that impinge onto them. A reactive sputtering of chromium with oxygen and nitrogen can be used to create black chrome layers 706 and 712. However, other metals and organics like polyimide can also be used to form light absorbing black matrix layers like black chrome layers 706 and 712. Within one embodiment, black chrome layers 706 and 712 may each be deposited at a depth of 50-100 nanometers (nm) while aluminum layers 708 and 714 may each be deposited at a depth of 1000 nm. Additionally, titanium layers 710 and 716 may each be deposited at a depth of 50 nm. The three materials may be patterned with substantially the same pattern as described herein. Conversely, each layer of the conductive traces 705, 707, 709 and 711 may be patterned with a different pattern.

[0063] It is noted that user view 718 can be on the other side of capacitive sensing device 700. In response to this