

more, in the following detailed description of the present invention, numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be obvious to one of ordinary skill in the art that the present invention may be practiced without these specific details. In other instances, well known methods, procedures, components, and circuits have not been described in detail as not to unnecessarily obscure aspects of the present invention.

[0019] FIG. 1 is a flowchart 100 of operations performed in accordance with an embodiment of the present invention for fabricating a capacitive sensing device. Although specific operations are disclosed in flowchart 100, such operations are exemplary. That is, the present embodiment is well suited to performing various other operations or variations of the operations recited in FIG. 1.

[0020] The present embodiment provides a method for fabricating a capacitive sensing device. For example, a substantially transparent substrate (e.g., a glass, a plastic or a crystalline material) is utilized to fabricate the capacitive sensing device. A set of conductive traces is patterned above the substantially transparent substrate. Optionally, an insulating material can be deposited above the set of conductive traces. In one embodiment, the insulating material may act as protection for the set of conductive traces and also provide them electrical insulation from the outside world.

[0021] At operation 102 of FIG. 1, a substantially transparent substrate is utilized to fabricate a capacitive sensing device. It is noted that the substantially transparent substrate may include a wide variety of materials in accordance with the present embodiment. For example, the substantially transparent substrate may include, but is not limited to, a glass, a plastic or a crystalline material. Additionally, the substantially transparent substrate may be a component of an information display device. For example, the substantially transparent substrate can be implemented as a part of a casing or front cover of the information display device.

[0022] At operation 104, a set of conductive traces are patterned above the substantially transparent substrate. It is understood that the set of conductive traces may be implemented in diverse ways. For example, each of the set of conductive traces can have a width such that the capacitive sensing device does not have to be arranged with respect to an underlying image in order to avoid deleterious obstruction of that underlying image by the set of conductive traces. It is appreciated that the underlying image is separate from the capacitive sensing device and may be displayed on an information display device. Furthermore, the underlying image is not a component of the capacitive sensing device. Additionally, the capacitive sensing device is fabricated separately from active components of an information display device.

[0023] The patterning of the set of conductive traces may be implemented in a wide variety of ways at operation 104. For example, the patterning of the set of conductive traces can include, but is not limited to, a lithographic process, a printing process, electron beam lithography, screen printing, inkjet printing, offset printing, electroplating, stamping, and LIGA. It is noted that LIGA is the German abbreviation for Lithografie Galvanoformung Abformung which in English means lithographic :electrodeposition. Furthermore, the patterning of the set of conductive traces can include patterning

a landing pad region above the substantially transparent substrate to enable coupling of one or more sensing circuit components to the substantially transparent substrate. For example, the landing pad region may include wiring for coupling integrated circuit (IC) chips, capacitors, resistors, connectors and other electronic components to the substantially transparent substrate. Additionally, to promote solderability, the landing pad region can be plated with gold, tin, copper or any other metal that is compatible with solder. Moreover, many processes can be used to assemble the capacitive sensing device with its circuit components. One example would be to screen print solder paste onto the appropriate wiring pads and then place the components. The assembly can then be heated to re-flow the solder, bonding the circuit components securely to the substantially transparent substrate.

[0024] At operation 104 of FIG. 1, the set of conductive traces may be implemented in diverse ways. For example, the set of conductive traces can include one or more layers of material. The set of conductive traces can include substantially opaque material and/or substantially non-reflective material. Furthermore, the set of conductive traces can be formed of at least one layer of material that is substantially non-reflective. It is noted that by locating a substantially opaque, non-reflective material such that it faces a user of the capacitive sensing device, it can optically obscure from the user any reflective materials included as part of the set of conductive traces. In this manner, the substantially non-reflective material makes the set of conductive traces more difficult to see by the user. It is noted that the set of conductive traces can include at least one layer of substantially opaque material.

[0025] Additionally, the set of conductive traces can be patterned such that each of the conductive traces has a width less than approximately 12 micrometers. It is noted that the width of each conductive trace can be understood to mean the width of each individual conductive element of the set of conductive traces. In this manner, when a user is approximately at arm's length from the capacitive sensing device, the user's eyes are substantially unable to view the set of conductive traces of the capacitive sensing device. It is understood that by decreasing the width of each trace of the set of conductive traces, there is a point at which they are no longer resolvable by a human eye. In this fashion, there is no deleterious obstruction of an underlying image by the set of conductive traces of the capacitive sensing device. Moreover, the set of conductive traces can be patterned at operation 104 such that each of them has a width that is substantially non-perceptible by a human user. Therefore, the set of conductive traces can be patterned such that each of them has a width such that each of them is not required to be formed of a substantially transparent material. Moreover, each of the set of conductive traces can have a width less than a pixel width of the underlying image. Also, each of the set of conductive traces can be a capacitive sensing element. It is noted that the set of conductive traces at operation 104 are not limited in any way to these different embodiments.

[0026] At operation 106, an insulating material is deposited above the set of conductive traces. It is noted that the insulating material deposited at operation 106 can act as protection (e.g., from handling damage) for the set of conductive traces and also provide them electrical insulation