TOUCH SCREEN STACK-UPS

FIELD OF THE INVENTION

[0001] This relates to touch screens, and more particularly, to the stack-up of materials comprising the touch screens.

BACKGROUND OF THE INVENTION

[0002] Many types of input devices are presently available for performing operations in a computing system, such as buttons or keys, mice, trackballs, touch panels, joysticks, touch screens and the like. Touch screens, in particular, are becoming increasingly popular because of their ease and versatility of operation as well as their declining price. Touch screens can include a touch panel, which can be a clear panel with a touch-sensitive surface. The touch panel can be positioned in front of a display screen so that the touch-sensitive surface covers the viewable area of the display screen. Touch screens can allow a user to make selections and move a cursor by simply touching the display screen via a finger or stylus. In general, the touch screen can recognize the touch and position of the touch on the display screen, and the computing system can interpret the touch and thereafter perform an action based on the touch event.

[0003] Touch panels can include an array of touch sensors capable of detecting touch events (the touching of fingers or other objects upon a touch-sensitive surface). Future panels may be able to detect multiple touches (the touching of fingers or other objects upon a touch-sensitive surface at distinct locations at about the same time) and near touches (fingers or other objects within the near-field detection capabilities of their touch sensors), and identify and track their locations. Examples of multi-touch panels are described in Applicant's co-pending U.S. application Ser. No. 10/842,862 entitled "Multipoint Touchscreen," filed on May 6, 2004 and published as U.S. Published Application No. 2006/0097991 on May 11, 2006, the contents of which are incorporated by reference herein.

[0004] Various materials, adhesives, and processing steps are required to make a touch screen stackup that can be functional, cost-effective, and space-efficient.

SUMMARY OF THE INVENTION

[0005] This relates to a multi-touch sensor panel that can include a glass subassembly that can have a plurality of column traces of substantially transparent conductive material formed on the back side, the glass subassembly also acting in some embodiments as a cover that can be touched on the front side. Row traces of the same or different substantially transparent conductive material can then be located near the column traces, with a layer of dielectric material that can be coupled between the column traces and the row traces. The row and column traces can be oriented to cross over each other at crossover locations separated by the dielectric material, wherein the crossover locations can form mutual capacitance sensors for detecting one or more touches on the front side of the glass subassembly.

[0006] Alternative touch screen sensor panel embodiments can be fabricated with (1) rows and columns on the back side of a cover glass, (2) columns on the back side of a cover glass and rows on the bottom side of a separate polyethylene terephthalate (PET) film, (3) columns and rows formed on opposite sides of a single substrate, (4) columns and rows formed on two separate PET films, and (5) columns on the back side of a cover glass and rows on the top side of a separate PET film.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIGS. **1***a*-**1***d* illustrate various exemplary touch screen sensor panel stackups with rows and columns that can be formed on the back side of a cover glass according to one embodiment of this invention.

[0008] FIGS. **2***a*-**2***d* illustrate various exemplary touch screen sensor panel stackups with columns that can be formed on the back side of a cover glass and rows that can be formed on the bottom side of a separate PET film according to one embodiment of this invention.

[0009] FIGS. **3***a*-**3***c* illustrate various exemplary touch screen sensor panel stackups with columns and rows that can be formed on opposite sides of a single substrate according to one embodiment of this invention.

[0010] FIGS. **4***a*-**4***d* illustrate various exemplary touch screen sensor panel stackups with rows and columns that can be formed on the back side of a cover glass according to one embodiment of this invention.

[0011] FIGS. **5***a* and **5***b* illustrate various exemplary touch screen sensor panel stackups with columns that can be formed on the back side of a cover glass and rows that can be formed on the bottom side of a separate PET film according to one embodiment of this invention.

[0012] FIGS. **6***a* and **6***b* illustrate various exemplary touch screen sensor panel stackups with columns that can be formed on the back side of a cover glass and rows that can be formed on the bottom side of a separate PET film according to one embodiment of this invention.

[0013] FIGS. **7***a*-**7***d* illustrate various exemplary touch screen sensor panel stackups with columns and rows that can be formed on opposite sides of a single substrate according to one embodiment of this invention.

[0014] FIG. **8** illustrates an exemplary touch screen sensor panel stackup with columns that can be formed on the back side of a cover glass and rows that can be formed on the bottom side of a separate PET film according to one embodiment of this invention.

[0015] FIG. **9** illustrates an exemplary touch screen sensor panel stackup with columns and rows that can be formed on opposite sides of a single substrate according to one embodiment of this invention.

[0016] FIG. **10** illustrates an exemplary touch screen sensor panel stackup with columns that can be formed on the back side of a cover glass and rows that can be formed on the top side of a separate glass substrate according to one embodiment of this invention.

[0017] FIGS. **11***a*-**11***c* illustrate various exemplary touch screen sensor panel stackups with columns and rows that can be formed on opposite sides of a single substrate according to one embodiment of this invention.

[0018] FIG. **12** illustrates a side view of an exemplary flexible printed circuit (FPC) stackup according to one embodiment of this invention.

[0019] FIGS. **13***a* and **13***b* illustrate top views of an exemplary FPC design according to one embodiment of this invention.

[0020] FIG. **14** illustrates top views of exemplary FPC designs that can connect to the rows and columns of the sensor panel according to one embodiment of this invention.