conductive or nonconductive stylus, a gloved hand, or any implement that pushes one conductive layer towards the other. Second, because of the internally closed circuit, the stray capacitance is reduced and fixed. Third, because the circuitry does not depend upon an earth ground connection, the touch sensor may be used for various portable applications, such as PDAs, and cell phones. Fourth, only two conductive layers are used for two-dimensional position sensing, which is important because conductive layers typically have high values of refractive index compared to the surrounding layers, which introduces optical losses. The use of only two conductive layers with a closed-circuit detection system maintains low optical losses while maintaining device portability.

[0070] Turning now to **FIG. 8, a** block diagram of a data processing system **800** using an integrated touch screen and display is shown in accordance with an embodiment of the present invention. The system **800** uses a transparent touch screen **806** arranged above a display **808** suitable for data processing applications, such as an LCD display. Other displays may be used, such as a CRT display, plasma display, LED display or the like. The display **808** may require display controller circuitry **809** for interfacing the display with the data processor **810**. The touch screen controller **807** includes the drive/sense circuitry described above in addition to a touch screen processor according to an embodiment of the present invention.

[0071] The data processor **810** may include various components depending upon the computer system application. For example, the data processor may include a microprocessor **812**, various types of memory circuitry **814**, a power supply **818** and one or more input/output interfaces **816**. The input/output interfaces **816** allow the data processing system to connect to any number of peripheral I/O devices such as keyboards **821**, pointing devices **822**, and sound devices **823**, including microphone and speakers. The data processing system may additionally include a mass data storage device **830**, for example, a hard disk drive or CD ROM, and may be networked to other data processing systems through a physical or wireless network connection **840**.

[0072] A touch sensing method and system in accordance with the principles of the present invention provides several advantages. For example, the touch sensor is coupled through a low impedance reference connection instead of the tenuous connection to earth ground used for conventional capacitive touch sensors. Further, the touch sensor structure described herein reduces and stabilizes the effect of external capacitive coupling to earth ground. Reduction of tracking and compensation circuitry for external capacitive effects allows the touch sensor to operate with a simplified controller. Finally, the touch sensing method and system of the present invention allows detection of either a finger touch, gloved hand, fingernail, conductive or nonconductive stylus. The touch sensing approach described herein is well-suited for use with various data processing systems, including personal data assistants (PDAs), electronic instruments, cell phones, and computers, including handheld, laptop and desktop computers. The touch sensor can provide enhanced optical transmission and improved durability because it does not require actual contact between conductive layers.

[0073] The present invention should not be considered limited to the particular examples described above, but rather should be understood to cover all aspects of the invention as fairly set out in the attached claims. Various modifications, equivalent processes, as well as numerous structures to which the present invention may be applicable will be readily apparent to those of skill in the art to which the present invention is directed upon review of the present specification. The claims are intended to cover such modifications and devices.

We claim:

1. A method for sensing a two-dimensional location of a touch on a touch sensor, comprising:

sensing a change in capacitance between a first transparent, conductive sheet and a second transparent, conductive sheet when at least a portion of the first transparent, conductive sheet is moved towards the second transparent, conductive sheet; and

determining the two-dimensional location of the touch from signals derived from the change in capacitance between the two transparent conductive sheets.

2. The method of claim 1, wherein the first transparent, conductive sheet is flexible, and moving the first transparent, conductive sheet towards the second transparent, conductive sheet at the location of the touch includes flexibly deflecting the first transparent, conductive sheet towards the second transparent, conductive sheet.

3. The method of claim 1, wherein sensing the change in capacitance further includes:

driving one of the transparent, conductive sheets with an electrical signal referenced to the other transparent, conductive sheet; and

measuring capacitive current flow between the first and second transparent, conductive sheets.

4. The method of claim 3, wherein measuring current flow includes measuring capacitive current flow at two or more peripheral locations on at least one of the first and second transparent, conductive sheets.

5. The method of claim 4, further comprising taking a ratio of the capacitive currents measured at two of the two or more peripheral locations and determining the two-dimensional location includes assigning a touch location to a position between the two peripheral locations based on the ratio of the capacitive currents

6. The method of claim 1, further comprising shielding the touch sensor from electromagnetic interference caused by a display device disposed on a display side of the touch sensor using the second transparent, conductive sheet.

7. The method of claim 1, further comprising detecting a touch force at the location of the touch.

8. The method of claim 1, wherein moving the first transparent, conductive sheet toward the second transparent, conductive sheet layer includes touching an outer surface of the touch sensor.

9. A method as recited in claim 1, further comprising touching the touch sensor with a touching object to deflect the first transparent, conductive sheet of the touch sensor towards the second transparent, conductive sheet.

10. The method of claim 9, wherein the touching object is substantially electrically insulating.

11. A touch sensor, comprising:

a first transparent, conductive sheet supported on a flexible, transparent supporting layer;