Likewise, one end of each second-layer sensor bar **290** is connected to one end of a corresponding lead line in a plurality of lead lines **285**. The other ends of the lead lines **280/285** are coupled to a control circuit **130** (**FIG. 1**). The lead lines **280/285** are electrical conduits that allow signals to travel between control circuit **130** and sensor bars **270/290**. The lead lines **280/285** are illustrated in **FIG. 2** as a single line for simplicity of illustration only. It should be appreciated that each lead line may individually extend from the sensor bars **279/290** to the control circuit **130**, or that more than one sensor bar **270/290** may be connected to the same lead line **280/290** if an alternative addressing mechanism is used to uniquely identify each sensor bar on a particular layer. Lead lines **280** may be made of any conductive material, such as copper, silver, gold, or the like.

[**0029**] The dielectric layer **250** is a non-conductive layer that separates the first sensor layer **240** and the second sensor layer **260**. The dielectric layer **250** may be an adhesive manufactured from any non-conductive, transparent material. The dielectric layer **250** serves as electrical insulator, which prevents sensor bars **270** of the first sensor layer **240** and sensor bars **290** of the second sensor layer **260** from coming into direct contact.

[**0030**] Briefly stated here, and described in greater detail in conjunction with **FIGS. 3 and 4**, the sensor bars **270/290** receive an excitation signal via the lead lines **280/285** from the control circuit **130**. The excitation signal sets up an electric field on each sensor bar **270/290**. A touch to the touch-sensitive screen **210** results in a capacitive coupling between the touching object and the sensor bars **270/290** of both layers in the area proximate to the touch. The capacitive coupling between the touching object and the sensor bars near the touch causes an AC current to flow from the controller via the lead lines through the coupled sensor bars to ground. Since the magnitude of the current on each lead line depends on the extent of the coupling of the touching object with the bar (or bars) connected to that lead line, the controller can accurately determine the touched bars on each sensing layer by determining which bar on each sensor layer has the highest signal. The touch position on each layer may be further refined by also examining the strength of the signals on the lead lines connected to the bars in the immediate neighborhood of the sensor bars having the highest signal. The inventors have determined that interpolating between two or more strong signals on each sensing layer can improve the accuracy of the coordinate determination. The signals from each sensing layer determine the touch position along an axis perpendicular to the bars in that layer. Since the bars on the two sensing layers are perpendicular to each other the axes on which the touch position are calculated are also perpendicular to each other. Therefore, the touch position is uniquely determined by knowing the touch coordinates on the two orthogonal axes.

[**0031**] **FIG. 2** illustrates an exemplary touch-sensitive screen **215** in which only one end of first-layer sensor bar **270** is electrically connected to one end of a corresponding lead line in a plurality of lead lines **280**, and one end of each second-layer sensor bar **290** is connected to one end of a corresponding lead line in a plurality of lead lines **285**. In an alternative example, either first-layer sensor bar **270**, second-layer sensor bar **290**, or both, could be electrically connected at both ends. With both ends of one or both sensor bars electrically connected, extra information can be obtained. For example, electrically connecting both ends of the sensor bars could be used for greater resolution. Alternatively, electrically connecting to both ends of the sensor bars could be used for the recognition of multiple touches. Recognition of multiple touches could be used in a gaming application, for example. In another alternative, electrically connecting both ends of the sensor bar could be used in the rejection of multiple touches.

[**0032**] **FIG. 3** is a simplified schematic representation of one embodiment of sensor bars **315** in a first layer **305** and sensor bars **320** in a second layer **310** of a touch-sensitive screen, configured as described in conjunction with **FIG. 2**, to further illustrate the concepts of this invention. In this implementation, the sensor bars **315** of the first layer **305** and the sensor bars **320** of the second layer **310** are oriented substantially orthogonal to each other. Other orientations may be used without deviating from the principles of the invention. To facilitate discussion, the sensor bars **315** of the first layer **305** are parallel to an arbitrarily drawn X-axis **323**. The sensor bars **320** of the second layer **310** are parallel to an arbitrarily drawn Y-axis **325**.

[**0033**] Each of the sensor bars **315** and sensor bars **320** has one end electrically connected to corresponding lead lines **330** and lead line **335**, respectively. In the example illustrated in **FIG. 3**, sensor bars **315** and sensor bars **320** may or may not be electrically connected at the other end. Lead lines **330** and lead lines **335** may be connected to a control circuit, such as the control circuit **130** shown in **FIG. 1**. It should be appreciated that the number of lead lines on each layer is always less than or equal to the number of sensor bars on that layer.

[**0034**] When in operation, the control circuit **130** sets up an electric potential on sensor bars **315** and sensor bars **320** via the corresponding lead lines **330** and **335**. The excitation signal electrically energizes sensor bars **315** and sensor bars **320**. The excitation of the sensing layers may be simultaneous or sequential. In another embodiment, the sensing bars of each layer may be excited one at a time, while the sensing bars of the other layer are kept at a fixed potential or driven with some other signal, such as a guard signal.

[**0035**] **FIG. 3** illustrates an example in which the sensor bars of each layer are electrically connected at one end. However, in another embodiment, the sensor bars of one or both layers may be electrically connected at both ends. Having the sensor bars connected at both ends in one or both layers provides certain benefits over the single-ended embodiments. Each sensor layer could provide more detailed information, including the touch location in both directions. This extra information could greatly improve multiple touch rejection, or, conversely, to enable multiple touch recognition. For instance, a two-layer touch sensor could be used in combination with a gaming application that allowed two players to simultaneously touch the touch sensor. In addition, the improved performance of a dual-layer double-end-connected design would allow weaker signals to be accurately detected, such as those experienced by users wearing gloves or the like. These and other advantages and applications will be apparent to those skilled in the art.

[**0036**] **FIG. 4** is a simplified schematic representation of the touch-sensitive screen of **FIG. 3** in operation responding to a touch. To illustrate the principles of this invention,