As illustrated in FIG. **8**, in one embodiment, transparent touch sensitive layer **120** comprises two transparent spaced sub-layers **122**. The facing inside surfaces of the spaced sub-layers **122** are at least partially coated with transparent (see through) conductive materials **128**. An example of a suitable substantially transparent conductive material is indium-tin oxide.

Each sub-layer **122** also includes a number of leads **124** to facilitate determination of the contact point, i.e. the point touched by a user.

For the embodiment, both sub-layers **122** are flexible, such that when pistons **106** are selectively activated to tactilely enhanced a visual image rendered in a corresponding area on flexible visual display **102**, the tactile enhancement will "show through" the added transparent touch sensitive layer **120**.

For the embodiment, the two facing inside surfaces of sub-layers **122** are coated with the transparent conductive materials in the perimeter area surrounding the core effective area of tactile display layer **104** only. Thus, when pistons **106** of tactile display layer **104** are employed to tactilely enhanced visual images rendered in the corresponding core area of flexible visual display layer **102**, pushing against flexible visual display layer **102** and transparent touch sensitive layer **120**, touch sensitive layer **120** would not report touching by the user. For the core area, touching by the user will continue be reported by tactile display layer **104**.

Thus, for devices employing sub-assembly **100**, conventional touching sensing for the area surrounding the effective area of tactile display layer **104** may also be provided. In other words, conventional touch sensing for sub-assembly **100'** has essentially a hollowed effective area, surrounding the effective core area of tactile display layer **104**.

In alternate embodiments, the facing inside surfaces of sub-layers **122** may be fully coated with transparent conductive materials as conventional touch sensitive layer, but complemented with a limiting circuit to exclude the reporting of user touching for the effective core area of tactile display layer **106**.

For these embodiments, the electrical models of touch sensing are re-calibrated for the various activations of pistons **106**, and detection of user touching by touch sensitive layer **120** further factors into consideration whether any of pistons **106** are activated.

In other words, for these embodiments, transparent touch sensitive layer **120** has a nominal effective area with an area size equals to the total surface of the layer. This size of this effective area is larger than the size of the effective core area of tactile display layer **104**. However, the limiting circuit modifies the nominal effective area to a hollowed effective area surrounding the effective core area of tactile display layer **104**.

In other alternate embodiments, touch sensitive layer **120** is capacitance based instead. That is, touch sensitive layer **120** is a "field sensitive" touch layer instead.

An example limiting circuit suitable for practicing with these embodiments of the present invention is illustrated in FIG. **9**. Limiting circuit **140** includes a number of comparison circuits **142**, an OR gate **144** and a number of AND gates **146**.

Comparison circuits **142** are employed to determine whether the location of a sensed contact is within the effective core area of tactile display layer **104**. Preferably, the coordinates of the effective core area of tactile display layer **104** are configurable. The results of the comparisons are provided to OR gate **144**.

OR gate **144** is employed to combine the two signals together, producing a true signal if at least one of the x or y coordinate of the sensed contact point is within the effective core area of tactile display layer **104**. For the embodiment, the invert of the true signal is provided to AND gates **146**.

AND gates **146** are employed to negate any reporting, if it is determined that at least one of the coordinate values is within the effective core area of tactile display layer **104**.

Thus, it can be seen from the foregoing further description that tactilely enhanced visual image display with touch sensing may also be provided with conventional touch sensing for non-tactilely enhanced visual images.

FIG. **10** illustrates an assembled perspective view of a tactilely enhanced visual image display device of the present invention, in accordance with one embodiment. As illustrated, display **160** includes either the tactilely enhanced visual image sub-assembly **100** of FIG. **1** or the tactilely enhanced visual image sub-assembly **100** of FIG. **7** or an equivalent sub-assembly. Subassembly **100**, or **100'** or its equivalent is encased in body **162**, and supported by support mechanism **164**.

Display **160** may be employed in any one of a number of computing applications. As those skilled in the art would appreciate, sub-assembly **100** or **100'** or its equivalent may be employed in other display applications, including but not limited to palm size computing devices, tablet computing devices, laptop computing devices, set-top boxes, media players and so forth.

CONCLUSION AND EPILOGUE

Thus, it can be seen from the above descriptions, a novel tactilely enhanced visual image display sub-assembly and device have been described.

While the present invention has been described in terms of the foregoing embodiments, those skilled in the art will recognize that the invention is not limited to the embodiments described. The present invention can be practiced with modification and alteration within the spirit and scope of the appended claims. Thus, the description is to be regarded as illustrative instead of restrictive on the present invention.

What is claimed is:

1. A display comprising:

a transparent touch sensitive layer having a touching side and a back side, and a hollowed effective area;

a flexible visual display layer having a viewing side and a back side, disposed adjacent to the transparent touch sensitive layer on the back side of the transparent touch sensitive layer; and

a tactile display layer having tactile pistons, disposed adjacent the flexible visual display layer on the back side of the flexible visual display layer, to facilitate selective tactile pushing against different portions of the flexible visual display, the tactile display layer having an effective area substantially aligned with the ineffective portion of the transparent touch sensitive layer.

2. The display of claim **1**, wherein the flexible visual display layer comprises a plurality of tin film transistors.

3. The display of claim **1**, wherein the flexible visual display layer comprises a plurality of plastic transistors.

4. The display of claim **1**. wherein the flexible visual display layer having a thickness in the range of 0.1 mm to 1.0 mm.