[0046] Optional linear supporting means can be used to support certain regions of the touch-sensitive zone of the housing (not shown) as may be dictated by the outline of the user input buttons.

[0047] Metal sheets can be used to form the housing of the electronic device. Finite Element Analysis has indicated that for the best performance of this invention, the range of stainless steel sheet thickness usable to construct the housing is between 0.001 and 0.007 of an inch, preferably about 0.004-0.005 of an inch. For aluminum, this range is about 0.001 to 0.012 of an inch, and preferably about 0.006 to 0.008 of an inch. For plastics, this range is broader at about 0.001 to 0.040 of an inch, with the prefered range of about 0.015 to 0.025 of an inch depending on the polymer.

[0048] FIG. **4** shows a general example of an electronic device using a housing of the present invention. The housing **400** of the electronic device comprises a bottom half **415** and the top half having a deformable contact force-sensistive user input zone **430**. The zone **430** is made to have a conductive inside surface forming a first conductive layer. The rigid base **401** has button-shaped electrodes **440** forming a second conductive layer and facing the inside surface of the housing **400** while spaced apart therefrom. A capacitance sensor is therefore formed having a number of buttons therein. Each button location **440** is equipped with a separate electrical connection **441** connecting this location to a capacitance measuring circuit (not shown). The user input zone **430** may have an indicia indicating the location and size of the buttons to the user (not shown).

[0049] FIG. **5** shows a fourth embodiment of the invention combining a touch-sensitive proximity sensor functionality in addition to the housing as a contact force input device. This is achieved by making the first conductive layer of the inside surface of the housing to have a mesh or some other similar non-solid pattern defining areas of its presence and absence.

[0050] FIG. **5***a* shows the button-shaped pattern of electrodes for the second conductive layer on the rigid base made for example as a printed circuit board (PCB). FIG. **5***b* shows the corresponding traditional first conductive layer on the inside surface of the housing, which is a continuous metalized surface. By substituting the continuous first conductive layer of the housing with a mesh or non-continuous conductive surface, additional functionality of the proximity sensor can be obtained. An example of such mesh electrode design is shown on FIG. **5***c*. When the user moves their finger towards the housing, the finger acts as a ground electrode object thus allowing the circuitry of the device to detect the presence of the finger and its location and therefore generate an input signal. When force is applied to the housing, the mesh conductive layer deflects closer to the rigid base pcb thus increasing the capacitance even further as described previously. By selectively changing the mesh size, the percentage of the housing acting like a proximity sensor in the areas of absence of the first electrode layer or a force sensor in the areas of its presence can be tuned for the needs of a particular application. This dual mode of operation can provide the benefits of a light touch scroll realized by a proximity touch sensor while allowing a more definitive push button selection though the housing as a second input mode of operation. FIG. **6** shows an example of such sensor output—the first zone of input comes from proximity function and the second zone of input comes from capacitance measurement.

[0051] FIG. **7** shows two different designs of the present invention where the support stucture shape is optimized to provide more uniform and localized deformation. In panel A, due to a larger area not supported at the corners, pressing the lower left button causes a response from the adjacent upper button therefore potentially causing unwanted errors. This effect was reduced by making the support structures wider thus preventing the deformation into the upper portion of the housing as shown in panel C. Similar effects can be seen for panel B where a circular contact area created an elongated deformation due to the spacing of the support not being square. As shown in panel D, making the supports wider localized the deformation and made it more confined to the contact area while maintaining the non-square buttons typically found on cell phones.

[0052] Although the invention herein has been described with respect to particular embodiments, it is understood that these embodiments are merely illustrative of the principles and applications of the present invention. It is therefore to be understood that numerous modifications may be made to the illustrative embodiments and that other arrangements may be devised without departing from the spirit and scope of the present invention as defined by the appended claims.

I claim:

1. A housing for an electronic device with integrated user input capability comprising:

a housing body having a deformable user input zone having a conductive inside surface as a first conductive layer,

a rigid base spaced apart from said inside surface of the user input zone of the housing at a predetermined gap distance, said base having a second conductive layer facing said first conductive layer,

a capacitance measuring circuit connected to both said first and second conductive layers,

whereby a capacitance sensor is formed between said first and second conductive layers, said sensor is responsive to increasing levels of deformation of the housing towards said rigid base but without touching thereof at the user input zone caused by applying progressively increasing levels of force onto said zone, said increasing deformation causing a progressively increasing change in capacitance between said first and said second conductive layers, said progressively increasing change in capacitance being detected by said capacitance measuring circuit and transmitted as a progressively increasing user input signal to said electronic device.

2. The device as in claim **1** further comprising a support means separating said first and second conductive layers and defining the shape of the user input zone.

3. The device as in claim **2**, wherein said support means are made integral with the housing and protruding therefrom towards said rigid base.

4. The device as in claim **2**, wherein said support means are made integral with said rigid base and protruding therefrom towards said inside surface of said housing.

5. The device as in claim **2**, wherein said support means are made from a compressible material.

6. The device as in claim **1** further comprising a compressible dielectric layer filling the space between said first and said second conductive layers.

7. The device as in claim **1**, wherein said user input zone of said housing is made from a conductive material.

8. The device as in claim **1**, wherein said housing is made from a non-conductive material and said first conductive layer is made by applying a conductive material onto said inside surface or embedded into the housing.