sets or spacing means of roughly the same perpendicular extent as the gap spacing itself.

[0180] Capacitive force sensor stiffness in the direction of measurement may be inversely related to the gap width. Thus, sensors according to various embodiments of the invention provide very high stiffness, raising the resonant frequencies of the supported structure and improving the performance of the unit housing the force sensor. Keeping sensor motions very small also reduces the problem of force transmission on parasitic paths (those not passing through a sensor).

[0181] Some variations of the sensor of the invention further exploit an interconnect, such as a PC board, to provide both a substantially planar support surface and coplanar second capacitor plate for a principal element.

[0182] It is to be understood that although the invention has been described above in terms of particular embodiments, the foregoing embodiments are provided as illustrative only, and do not limit or define the scope of the invention. Other embodiments are also within the scope of the present invention, which is defined by the scope of the claims below.

What is claimed is:

1. A force sensor for sensing a touch force applied to a touch surface, the force sensor comprising:

a first element including an elastic element and a first capacitor plate having a first capacitive surface, the elastic element including at least part of the first capacitor plate; and

a second element including a second capacitor plate opposed to the first capacitor plate;

wherein transmission of at least part of the touch force through the elastic element contributes to a change in capacitance between the first capacitor plate and the second capacitor plate.

2. The force sensor of claim 1, wherein the first element is substantially planar.

3. The force sensor of claim 1, wherein the first capacitor plate and the elastic element are integral.

4. The force sensor of claim 3, wherein the first capacitor plate and the elastic element are composed of the same substrate.

5. The force sensor of claim 3, wherein the elastic element comprises an elevated feature of the first capacitor plate.

6. The force sensor of claim 5, wherein the elevated feature is located at the elastic center of the first element.

7. The force sensor of claim 1, further comprising force-receiving means for receiving at least part of the touch force into the first element.

8. The force sensor of claim 7, wherein the force-receiving means comprises the elastic element.

9. The force sensor of claim 7, wherein the force-receiving means comprises a feature formed into the first element.

10. The force sensor of claim 9, wherein the force-receiving means comprises an elevated feature of the first capacitor plate.

11. The force sensor of claim 7, wherein the touch surface is in communication with a region of a surface of the force-receiving means, and wherein the touch surface tends to remain in contact with the region of the surface of the force-receiving means when the position of the touch surface changes with respect to the force-receiving means.

12. The force sensor of claim 1, further comprising force transmission means for transmitting at least part of the touch force to at least one structure other than the first element.

13. The force sensor of claim 1:

wherein the second element comprises a planar support surface that includes a plurality of electrically conductive mechanical bearing contacts;

and wherein at least portions of the first capacitor plate are in contact with the plurality of mechanical bearing contacts to transmit force thereto.

14. The force sensor of claim 13, wherein the second capacitor plate includes a second capacitive surface that is coplanar with the plurality of mechanical bearing contacts.

15. The force sensor of claim 14, wherein the second capacitive surface and the plurality of mechanical bearing contacts are composed of the same substrate.

16. The force sensor of claim 13, wherein the planar support surface is part of an interconnect system to transmit a signal developed in response to the change in capacitance between the first capacitor plate and the second capacitor plate.

17. The force sensor of claim 1, wherein the first and second capacitor plates are separated by a volume, and wherein the ratio of the height of the volume to the volume's greatest breadth is less than 0.05.

18. The force sensor of claim 1, further comprising:

force signal development means for developing a signal in response to the change in capacitance between the first capacitor plate and the second capacitor plate.

19. The force sensor of claim 1, wherein the force sensor includes an axis of sensitivity that passes through the elastic center of the elastic element.

20. The force sensor of claim 1, further comprising:

the touch surface, wherein the touch surface is a touch surface of a handheld device.

21. The force sensor of claim 1, wherein the second capacitor plate is separated by a capacitive gap from the first capacitor plate, the length of the mechanical path defining the capacitive gap being no greater than one-fifth of the maximum distance between any two force sensors that are used in the touch location device to measure the touch force.

22. A force sensor for sensing a touch force applied to a touch surface, the force sensor comprising:

a first substantially planar element comprising:

a first capacitor plate having a first capacitive surface; and

an elastic element comprising an integral elevated feature of the first capacitor plate, the elastic element receiving at least part of the touch force into the first element; and

a second element including a second capacitor plate opposed to the first capacitor plate;

wherein transmission of at least part of the touch force through the elastic element contributes to a change in capacitance between the first capacitor plate and the second capacitor plate.