DETECTOR CONSTRUCTED FROM FABRIC HAVING PLANES WITH DIFFERING CONDUCTANCE

FIELD OF THE INVENTION

[0001] The present invention relates to a detector constructed from fabric having electrically conductive elements to define at least two electrically conductive planes.

INTRODUCTION TO THE INVENTION

[0002] A fabric touch sensor for providing positional information is described in U.S. Pat. No. 4,659,873 of Gibson. The sensor is fabricated using at least one resistive fabric layer in the form of conducting threads. This fabric is constructed using either uni-directional threads or crossed threads formed by overlaying one set with another or weaving the two sets together. The fabric is separated from a second resistive layer to prevent unintentional contact by separators in the form of non-conducting threads, insulator dots or with an air gap. Both resistive layers are fabrics formed from conductive threads such that no pre-forming is required in order to adapt the sensor to a contoured object.

[0003] A problem with the sensor described in the aforesaid United States patent is that it is only capable of identifying the location of the mechanical interaction and cannot provide additional information about the interaction.

[0004] A touch sensor for providing positional information is described in U.S. Pat. No. 4,487,885 of Talmage, which also provides a signal dependent upon the pressure or force applied. However, the sensor described is made from a printed circuit board and a flexible sheet of rubber, elastomer or plastic and as such it does not have the many physical qualities that a fabric may provide.

SUMMARY OF THE INVENTION

[0005] According to a first aspect of the present invention, there is provided a position detector constructed from fabric having electrically conductive elements, comprising at least two electrically conducting planes, wherein an electric potential is applied across at least one of said planes to determine the position of a mechanical interaction; and a second electrical property is determined to identify additional properties of said mechanical interaction.

[0006] In a preferred embodiment, the position detector is configured to measure current or resistance as said second electrical property. Furthermore, applied force, applied pressure, area of contact or orientation of an object may be determined as the additional property of mechanical interactions.

[0007] In a preferred embodiment, the detector interacts mechanically with parts of a human body; a first electrical property determines the position of a mechanical interaction and a second electrical property determines the area of coverage.

[0008] According to a second aspect of the present invention, there is provided a method of detection, performed with respect to a detector constructed from fabric and having electrically conductive elements configured to provide at least two electrically conducting planes, comprising the steps of applying a potential across at least one of said planes to determine the position of a mechanical interaction, and measuring a second electrical property to identify additional properties of said mechanical interactions.

[0009] According to a third aspect of the present invention, there is provided a detector constructed from fabric having electrically conductive elements and configured to produce electrical outputs in response to mechanical interactions, wherein said detector is divided into a plurality of regions; each of said regions includes a first conducting plane and a second conducting plane; a mechanical interaction results in conducting planes of at least one of said regions being brought closer together; and a potential is applied across at least one of said planes to determine the position of said mechanical interaction.

[0010] According to a fourth aspect of the present invention, there is provided a detector constructed from fabric having electrically conductive elements to define at least two electrically conducting planes and configured to produce an electrical output in response to a mechanical interaction, wherein a potential is applied across at least one of said planes to determine the position of a mechanical interaction and said second electrical property is determined to identify additional properties of said mechanical interactions; and a conductivity non-uniformity is included in at least one of said planes so as to modify an electrical response to a mechanical interaction.

[0011] In a preferred embodiment, the conductivity non-uniformity includes a co-operating pair of conducting strips configured to generate a substantially linear electric field within the conducting planes. Preferably, the strips are applied to each of the conducting planes at orthogonal locations.

[0012] According to an alternative preferred embodiment, all edges of the conducting planes are modified. The conductivity non-uniformity may be defined by adjusting the density of conducting threads or it may be created by printing conductive materials onto the detector.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] **FIG. 1** shows a position detector constructed from fabric;

[0014] **FIG. 2** shows a control circuit identified in **FIG. 1**;

[0015] **FIG. 3** details operations performed by the microcontroller identified in **FIG. 2**;

[0016] **FIG. 4** details planes identified in **FIG. 1**;

[0017] **FIG. 5** details current flow due to mechanical interaction;

[0018] **FIG. 6** details an alternative construction for conducting fabric planes;

[0019] **FIG. 7** shows an alternative configuration of conducting planes;

[0020] **FIG. 8** shows an alternative configuration of conducting planes;

[0021] **FIG. 9** details a composite configuration of conducting planes; and

[0022] **FIG. 10** shows an asymmetric object interacting with conducting planes.