DETECTOR CONSTRUCTED FROM FABRIC

REFERENCE TO RELATED APPLICATIONS

[0001] The present invention was made by Mr David Lee Sandbach who is resident in the United Kingdom. A permit to file a first application outside the United Kingdom under Section 23(1) of the Patent Act 1977 was obtained on May 19, 1999. The present application claims priority from U.S. patent application No. 09/315,139. With respect to the United States's designation, the present application is filed as a continuation-in-part.

FIELD OF THE INVENTION

[0002] The present invention relates to a position sensor for detecting the position of a mechanical interaction.

BACKGROUND OF THE INVENTION

[0003] A position sensor for detecting the position of a mechanical interaction is disclosed in European Patent publication 0 989 509, equivalent to U.S. patent application Ser. No. 09/298,172, Korean patent application number 99-40363, Japanese patent application number 11-272,513 and Australian patent application 48770/99, all assigned to the present Assignee. The position detector is configured to determine the position of a mechanical interaction. In addition, the detector is also configured to measure the extent of a mechanical interaction in which said representation of the extent of a mechanical interaction is usually made up from components representing the force of the mechanical interaction and the area over which the mechanical interaction takes effect.

[0004] A problem with the known position sensor disclosed in the aforesaid patent applications is that it is possible for incorrect measurements to be obtained if the detector is folded in certain orientations. Thus, with the known detector, satisfactory results are obtained if the detector is placed over a flat surface, such as a desk or table etc. However, if the detector is folded over a curvilinear surface, it is possible for erroneous results to be obtained at positions where the detector is folded.

[0005] The known detector is fabricated from two conducting layers of fabric with a non-conducting layer positioned therebetween. In order to reduce occurrences of erroneous results, due to folding, it is known to strengthen and thicken the intermediate non-conducting layer. However, when the intermediate layer is strengthened in this way, the response of the detector changes in that it becomes less sensitive to mechanical interactions. Thus, if a mechanical interaction takes the form of a manual operation of a finger upon the detector, for example in order for a position to be determined from which action can then follow, it becomes difficult for the detector to be pressed manually. Similarly, if the intermediate layer is modified so as to make mechanical interactions easier to accomplish, there is then a greater likelihood that erroneous contact may result.

BRIEF SUMMARY OF THE INVENTION

[0006] According to an aspect of the present invention, there is provided a position sensor for detecting the position of a mechanical interaction, including: a first fabric layer having electrically conductive fibres machined therein to provide a first conductive outer layer allowing conduction in all directions along said first layer; a second fabric layer having electrically conductive fibres machined therein to provide a second conductive outer layer allowing conduction in all directions along said second layer; a central layer disposed between said first outer layer and said second layer, said central layer including conducting means; a first insulating separating means disposed between said first conductive outer layer and said conducting means; and a second insulating separating means disposed between said second conductive outer layer and said conducting means; wherein said conducting means provides a conductive path between said first conducting outer layer and said second conducting outer layer at a position of a mechanical interaction.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0007] FIG. A illustrates a known position sensor as described in the prior art;

[0008] **FIG. 1** shows a position sensor embodying the present invention;

[0009] **FIG. 2** details the sensor shown in **FIG. 1**;

[0010] **FIG. 3** illustrates upper and lower fabric layers of the sensor shown in **FIG. 2**;

[0011] **FIG. 4** shows an alternative embodiment of that shown in **FIG. 3**;

[0012] **FIG. 5** shows a portion of the sensor shown in **FIG. 2**, in cross section;

[0013] **FIG. 6** shows a cross-sectional view of a preferred embodiment;

[0014] **FIG. 7** shows a cross-sectional view of a first alternative embodiment;

[0015] **FIG. 8** shows a cross-sectional view of a second alternative embodiment;

[0016] **FIG. 9** shows a cross-sectional view of a third alternative embodiment;

[0017] **FIG. 10** shows a cross-sectional view of a fourth alternative embodiment;

[0018] **FIG. 11** shows a cross-sectional view of a further preferred embodiment;

[0019] **FIG. 12** shows a cross-sectional view of a further alternative embodiment

[0020] **FIG. 13** shows a cross-sectional view of a further alternative embodiment;

[0021] **FIG. 14** shows a detector for detecting force and area separately;

[0022] **FIGS. 15A, 15E, 15**C and **15**D illustrate procedures for measuring the position of a force applied to the position sensor,

[0023] **FIG. 16** shows an interface circuit of the type identified in **FIG. 1**;

[0024] **FIG. 17** illustrates a program executed by the interface circuit shown in **FIG. 16**;

[0025] **FIG. 18** details a portion of the procedure identified in **FIG. 17**;