

and 32B show a configuration and a driving example of a touch-sensitive sheet member 151 that is applicable to the input device 500. The touch-sensitive sheet member 151 shown in FIG. 32A includes the electrode 51 for upper portion, the electrode 52 for lower portion, a sheet shaped base frame portion 531 and element muscle portions 541 each having C shape.

[0302] The base frame portion 531 constitutes the base member and forms C-shaped apertures 53b each having a predetermined aperture ring width. Each of the C-shaped element muscle portions 541 for presenting a sense of touch is inserted into this aperture 53b. As the base frame portion 531, a transparent soft silicon rubber member having the hardness of 20° to 40° is used.

[0303] The apertures 53b are arranged at predetermined positions of the base frame portion 531. As the element muscle portions 541, a same material as that used for ones of the touch-sensitive sheet member 150 is used. Each of the element muscle portions 541 which are inserted into the apertures 53b is sandwiched between the electrode 51 and the electrode 52 from the upward/downward directions. A predetermined driving voltage is applied between the electrodes 51, 52. As the electrodes 51, 52, a transparent ITO film is used. It should be noted that members having the same name and numeral as those used in the touch-sensitive sheet member 150 have the same functions, so that the explanation thereof will be omitted.

[0304] In the touch-sensitive sheet member 151 shown in FIG. 32B, the electrode 51 and the electrode 52 are also connected with the driving power supply which supplies the driving voltage to the electrodes 51, 52. The operation principle of this element muscle portion 541 is similar to that of the touch-sensitive sheet member 150, so that the explanation thereof will be omitted.

[0305] The touch-sensitive sheet member 151 is constituted in this manner so that when the driving power supply 55 supplies the driving voltage to the electrodes 51, 52 arranged in the upward/downward directions of each of the element muscle portions 541, each of the element muscle portions 541 may function as an electric conductive polymer actuator in which the expansion and contraction motion such as the swelling in the C-shape and the contraction is available for approximately two seconds. Consequently, in the spots of or the predetermined positions of the base frame portion 531, the element muscle portions 541 may present the sense of touch for giving the concave and convex feeling with respect to the operator's finger 30a by the protuberant shape depending on the pressure change of the element muscle portion 541 or by the original shape without supplying the driving voltage thereto. Thus, it becomes possible to provide the input device 500 or the like to which the touch-sensitive sheet member 151 is applied.

[0306] The following will describe a modification example (No. 2) of the touch-sensitive sheet member 150. FIGS. 33A and 33B show a configuration and a driving example of a touch-sensitive sheet member 152 that is applicable to the input device 500. The touch-sensitive sheet member 152 shown in FIG. 33A includes the electrode 51 for upper portion, the electrode 52 for lower portion, a sheet shaped base frame portion 532 and element muscle portions 542 each having a hemispheric shape.

[0307] The base frame portion 532 constitutes the base member and forms hemispheric shaped recess portions 53c each having a predetermined opening diameter. Each of the

hemispheric shaped element muscle portions 542 for presenting a sense of touch is inserted and held in the recess portion 53c. As the base frame portion 532, a transparent soft silicon rubber member having the hardness of 20° to 40° is used.

[0308] The recess portions 53c are arranged at predetermined positions of the base frame portion 532. As the element muscle portions 542, a same material as that used for ones of the touch-sensitive sheet member 150 is used. Each of the element muscle portions 542 which are inserted in the recess portions 53c is sandwiched between the electrode 51 and the electrode 52 from the upward/downward directions. A predetermined driving voltage is applied between the electrodes 51, 52. As the electrodes 51, 52, a transparent ITO film is used. It should be noted that members having the same name and numeral as those used in the touch-sensitive sheet member 150 have the same functions, so that the explanation thereof will be omitted.

[0309] In the touch-sensitive sheet member 152 shown in FIG. 33B, the electrode 51 and the electrode 52 are also connected with the driving power supply which supplies the driving voltage to the electrodes 51, 52. The operation principle of this element muscle portion 542 is similar to that of the touch-sensitive sheet member 150, so that the explanation thereof will be omitted.

[0310] The touch-sensitive sheet member 152 is constituted in this manner so that when the driving power supply 55 supplies the driving voltage to the electrodes 51, 52 arranged in the upward/downward directions of each of the element muscle portions 542, each of the element muscle portions 542 may function as an electric conductive polymer actuator in which the expansion and contraction motion such as the swelling in the hemispheric shape and the contraction in a concave shape is allowed. Consequently, in the spots of or the predetermined positions of the base frame portion 532, the element muscle portions 542 may present the sense of touch for giving the concave and convex feeling with respect to the operator's finger 30a by the protuberant shape depending on the pressure change of the element muscle portion 542 or by the original shape without supplying the driving voltage. Thus, it becomes possible to provide the input device 500 or the like to which the touch-sensitive sheet member 152 is applied.

[0311] The following will describe a modification example (No. 3) of the touch-sensitive sheet member 150. FIGS. 34A and 34B show a configuration and a driving example of a touch-sensitive sheet member 153 that is applicable to the input device 500. The touch-sensitive sheet member 153 shown in FIG. 34A includes the electrode 51 for upper portion, the electrode 52 for lower portion, a sheet shaped base frame portion 533 and element muscle portions 543 each having a mortar shape.

[0312] The base frame portion 533 constitutes the base member and forms reverse mortar shaped recess portions 53d each having a predetermined opening diameter. Each of the mortar shaped element muscle portions 543 for presenting a sense of touch is inserted and held in the recess portion 53d. As the base frame portion 533, a transparent soft silicon rubber member having the hardness of 20° to 40° is used.

[0313] The recess portions 53d are arranged at predetermined positions of the base frame portion 533. As the element muscle portions 543, a same material as that used for ones of the touch-sensitive sheet member 150 is used. Each of the element muscle portions 543 which are inserted in the recess portions 53d is sandwiched between the electrode 51 and the