

[0115] FIG. 9A shows a shape example of a flow-out port Q5 as a modification example (No. 4) and FIG. 9B is a cross-section view thereof taken along an arrow of X5-X5 shown in FIG. 9A. The flow-out port Q5 shown in FIG. 9A has many holes which are dispersed. The flow-out port Q5 is constituted by including, for example, a small hole at a center region, a plurality of radially arranged holes on the concentric circle thereof and, a plurality of further radially arranged holes in the periphery thereof. It should be noted that as shown in FIG. 9B, they are set such that the aperture diameter of the outside hole becomes larger than the aperture diameter of the inside hole. In this embodiment, it is possible to obtain a unique sense of touch by a mass of air blown out of the flow-out port Q5 in the plural dispersing manner as compared with a mass of air blown out of the base flow-out port Q1 in a single manner.

[0116] FIG. 10A shows a shape example of a flow-out port Q6 as a modification example (No. 5) and FIG. 10B is a cross-section view thereof taken along an arrow of X6-X6 shown in FIG. 10A. The flow-out port Q6 shown in FIG. 10A has a single hole which has a conical shaped inner section. In this embodiment, it is possible to obtain a unique sense of touch by a mass of air blown out of the flow-out port Q6 at high speed as compared with a mass of air blown out of the base flow-out port Q1 in a single manner.

[0117] FIG. 11A shows a shape example of a flow-out port Q7 as a modification example (No. 6) and FIG. 11B is a cross-section view thereof taken along an arrow of X7-X7 shown in FIG. 11A. The flow-out port Q7 shown in FIG. 11A has a single hole which has a reverse dish shaped inner section. In this embodiment, it is possible to obtain a unique sense of touch by the raised base member 1 in addition to a mass of air blown out of the flow-out port Q7 at high speed as compared with a mass of air blown out of the base flow-out port Q1 in a single manner.

[0118] FIG. 12A shows a shape example of a flow-out port Q8 as a modification example (No. 7) and FIG. 12B is a cross-section view thereof taken along an arrow of X8-X8 shown in FIG. 12A. The flow-out port Q8 shown in FIG. 12A has a shape of circular arcs. A center member C1 is engaged and supported to the base member 1 by beam portions. The aperture p1 or the like is formed by perforating it in the base member 1 shown in FIG. 12B. In this embodiment, it is possible to obtain a unique sense of touch by a mass of air blown out of the flow-out port Q8 in the circular shape as compared with a mass of air blown out of the base flow-out port Q1 in a single manner.

[0119] FIG. 13A shows a shape example of a flow-out port Q9 as a modification example (No. 8) and FIG. 13B is a cross-section view thereof taken along an arrow of X9-X9 shown in FIG. 13A. The flow-out port Q9 shown in FIG. 13A has many holes which are arranged as being a circle. The aperture p1 or the like is formed by perforating a plurality of small holes in the base member 1 shown in FIG. 13B. In this embodiment, it is possible to obtain a unique sense of touch by a plurality of masses of air blown out of the flow-out port Q9 as the circle as compared with a mass of air blown out from the base flow-out port Q1 in a single manner.

[0120] In this manner, according to the touch-sensitive sheet member 100 as the first embodiment, the flow channel panel 2 is provided which introduces the air to twenty four apertures p1 to p24 perforated in the base member 1 and the blower 3b utilizing the piezoelectric device is used as the air-circulation unit 3 and is connected to the flow channel

panel 2 so that the blower 3b sends the air to the apertures p1 to p24 of the base member 1 through the flow channel panel 2 for every group.

[0121] Consequently, even if the surface of the base member 1 is observed to be a flat shape, when the operator's hand (finger) touches the surface thereof actually and slides from the base member 1 to the apertures p1 or the like for representing a sense of touch, in the predetermined position of the base member 1, the apertures p1 to p24 can represent the sense of touch which gives the concave and convex touch feeling by the air blown out of the apertures p1 to p24 with respect to the operator's finger or the like (operation body). Such a touch-sensitive sheet member 100 may be applied to a programmable nonskid sheet at the grip portion of various kinds of electronic apparatus housing, a programmable touch-sensitive input sheet for icon touch in an input device or the like. Thus, it becomes possible to provide the input device including the programmable touch-sensitive input sheet.

Embodiment 2

[0122] FIGS. 14A and 14B show a configuration of a touch-sensitive sheet member 200 as a second embodiment. In this embodiment, the sense-of-touch-representing unit contains bag portions q1 to q24 for representing a sense of touch, each bag portion having a predetermined size and being arranged at a predetermined position of a base member 11.

[0123] The touch-sensitive sheet member 200 shown in FIG. 14A is applicable to an input device which is mounted on an electronic apparatus such as a digital camera, a video camera, a mobile phone, a mobile terminal device, a desk-top type PC, a note type PC, an automatic teller machine or the like. The touch-sensitive sheet member 200 includes the base member 11, the flow channel panel 2 and the air-circulation unit 3.

[0124] The air-circulation unit 3 constitutes the medium-supplying unit and operates such that the air is sent to the bag portions q1 to q24 (only q5, q8, q10 are shown in FIG. 14A). In this embodiment, the air-circulation unit 3 has a programmable function for sending the air to the plurality of bag portions q1 to q24 arranged in the base member 11 individually or for every group. In this embodiment, the flow channel panel 2 which introduces the air to the plurality of bag portions q1 to q24 arranged in the base member 11 is also provided. The air-circulation unit 3 contains a blower 3b (air pressure generator) utilizing a piezoelectric device.

[0125] The blower 3b is connected to the flow channel panel 2 through a flow channel changeover unit 3a shown in the FIG. 14B. The blower 3b sends compressed air to the plurality of bag portions q1 to q24 in the base member 11 by dividing those into two groups through the flow channel panel 2. It should be noted that in this embodiment, the members having the same name and numeral as those used in the first embodiment have also the same function, so that the explanation thereof will be omitted.

[0126] In the above-mentioned embodiment, when the valve body 304 is opened through the driving unit 3c, the air supplied from the blower 3b is introduced to the bag portions q1 to q3 (not shown in drawings), the bag portions q4 to q12 and the bag portions q13 to q17 (not shown in drawings) by passing through the air-exhaust port 306 and the flow channel 2a. Also, when the valve body 305 is opened, the air supplied from the blower 3b is introduced to the bag portions q18, q19,