

[0121] In the embodiment described above, the example in which a transparent touch panel is provided over the upper surface of the tactile-visual UI panel is illustrated. One example of the transparent touch panel is a touch panel of the so-called capacitance detection system. Of course, the present invention is not limited to the example. The present invention is applicable to, for example, a touch panel of the method which detects change of resistance by depression pressure such as the so-called resistance wire type, an optical type touch panel which detects a light interrupted with a finger etc. or a light reflected with a finger, etc., a magnetic induction type touch panel which detects change of magnetism using a dedicated pen such as a stylus pen, and other touch panels. The transparent touch panel may be provided between the display panel and the tactile-visual UI panel, i.e., the underface side of the tactile-visual UI panel. When the transparent touch panel is especially provided in the underface side of a tactile-visual UI panel, it becomes unnecessary for the transparent touch panel concerned to possess flexibility as needed in the above-described embodiment. When the transparent touch panel of the method which can detect the external pressure applied with a finger etc. is employed, the pressure variation by expansion, etc. of the deformation section of the tactile-visual UI panel may be accidentally detected as if the external pressure with a finger etc. were applied. However, in such a case, it may be possible, as an example, to judge the difference between the pressure value by expansion of the deformation section and the pressure value by external pressure with a finger etc. and to avoid the misjudgment to accidentally detect the pressure value by the expansion of the deformation section as the external pressure with the finger etc.

[0122] In addition, the user interface device of the present embodiment may be formed not only in a compact apparatus such as a personal digital assistant, but also with a large-sized display or screen and a user interface panel (UI panel) arranged over the upper surface of the large-sized display or screen. The large-sized display or screen includes, for example, a super-large screen display panel arranged on the roof of a building, on an outer wall surface, or on an indoor inner wall surface, a large screen of a stadium, and a large screen display panel arranged on the ground of recreation facilities etc. In the case of the large-sized user interface device provided with such a large screen display panel of size of from tens of inches to hundreds of inches or beyond, the concavo-convex part formed by the deformation section of the UI panel may possess a width in scale of from several centimeters to several meters, for example, and a height in scale of from several centimeters to several meters. It is desirable to set the hardness of the deformation section to a desired degree of hardness, corresponding to the size of the user interface device concerned.

[0123] It should be understood by those skilled in the art that various modifications, combinations, sub-combinations and alterations may occur depending on design requirements and other factors insofar as they are within the scope of the appended claims or the equivalents thereof.

What is claimed is:

1. A user interface device comprising:

a transparent panel unit including a plurality of layers, each of the layers being provided with a plurality of transparent deformation sections operable to be deformed to a specified shape by one of injection of fluid and discharge of fluid;

- a fluid channel unit possessing one of structure forming a first channel and a second channel in common and structure forming the first channel and the second channel separately, the first channel being a transparent fluid channel operable to supply fluid to be injected to the deformation sections and the second channel being a transparent fluid channel operable to pass fluid discharged from the deformation sections;
- a fluid pump unit operable to perform one of discharge of fluid at least to the fluid channel unit and suction of fluid at least from the fluid channel unit;
- a display panel unit including the transparent panel unit provided over an upper surface of the display panel unit and a screen surface operable to display at least an image; and
- a controller operable to control one of injection of the fluid to the deformation sections of the transparent panel unit and discharge of the fluid from the deformation sections of the transparent panel unit, according to an image to be displayed on the screen surface of the display panel unit.
2. The user interface device of claim 1, further comprising: a touch detection panel unit arranged in one of an upper surface side and a lower surface side of the transparent panel unit and operable to detect a touch position of an object to generate a detection signal.
3. The user interface device of claim 1, wherein the deformation sections provided in each of the layers of the transparent panel unit are operable to be deformed to a differently specified shape for at least each of the layers.
4. The user interface device of claim 1, wherein the deformation sections provided in each of the layers of the transparent panel unit are arranged in matrix in each of the layers.
5. The user interface device of claim 1, further comprising: a valve unit operable to limit one of injection of the fluid to each of the deformation sections and discharge of the fluid from each of the deformation sections.
6. The user interface device of claim 1, wherein the controller is operable to generate information on height in a perpendicular direction from a screen surface of the display panel unit at each specified position of the screen surface of the display panel unit, based on an image in a three-dimensional space virtually displayed on a two-dimensional display screen of the display panel unit, and wherein the controller is operable to control one of injection of the fluid to the deformation sections and discharge of the fluid from the deformation sections, based on the information on height in the perpendicular direction at each specified position of the screen surface of the display panel unit.
7. A personal digital assistance comprising: a display panel unit possessing a display screen operable to display at least an image; a transparent panel unit provided over an upper surface of the display screen of the display panel unit and including a plurality of layers, each of the layers being provided with a plurality of transparent deformation sections operable to be deformed to a specified shape by one of injection of fluid and discharge of fluid; a fluid channel unit possessing one of structure forming a first channel and a second channel in common and structure forming the first channel and the second channel separately, the first channel being a transparent fluid channel operable to supply fluid to be injected to the