

[0088] The push-button switch **11** is mounted on the printed wiring board **10** and is provided so as to be manipulated when the rotary shaft **3** that holds the manipulation knob **2** is moved in its axial direction. That is, when the manipulation knob **2**, and hence the rotary shaft **3**, is moved in the axial direction, the tip portion of the rotary shaft **3** manipulates the push button **11b** of the push-button switch **11**.

[0089] An illumination lamp **12**, which is a light-emitting diode (LED), for example, is composed of a light-emitting portion **12a** and a terminal **12b** that extends downward from the light-emitting portion **12a**. The light-emitting portion **12a** of the illumination lamp **12** is housed in the manipulation knob **2**, and the terminal **12b** is mounted on the printed wiring board **10** and is connected to the circuit pattern formed thereon.

[0090] Therefore, when the light-emitting portion **12a** emits light, the manipulation knob **2** is illuminated from inside.

[0091] As described above, the push-button switch **11**, the illumination lamp **12**, and the rotation detecting means that consists of the photointerrupter **13** and the coding member **6** are mounted on the single printed wiring board **10**.

[0092] A controller **14**, which is a central processing unit (CPU), for example, produces a prescribed output signal (e.g., a signal to be supplied to the motor **4**) when receiving a prescribed input signal (e.g., a signal supplied from the photointerrupter **13** or the push-button switch **11**). The output signal is used for controlling a haptic sense that is generated by the motor **4**.

[0093] For example, when a proper output signal is output from the controller **14**, the motor shaft **4b** of the motor **4** is driven so as to produce a desired haptic sense. The haptic sense that is transmitted to the manipulation knob **2** can be changed depending on how the motor shaft **4b** is driven.

[0094] For example, function selection switches **15** are a plurality of (e.g., three) push-button switches **15a**, **15b**, and **15c**. A desired function can be selected by manipulating one of the push-button switches **15a**, **15b**, and **15c**. Output signals of the respective function switches **15** are input to the controller **14**.

[0095] For example, by using the function selection switches **15**, selection can be made among such functions as tuning of a radio receiver, song selection of a compact disc (CD) player, and route setting of a navigation system. The function selection switches **15** are provided at prescribed locations.

[0096] The motor **4** generates a prescribed haptic sense based on an output signal of each of the function selection switches **15**.

[0097] A monitor **16** is a liquid crystal display device, for example, and has a display screen. The monitor **16** is provided at a prescribed location and displays a picture that relates to a desired function on the display screen based on a control signal for the desired function that is supplied from the controller **14**.

[0098] Next, among the operations of the various functions that are performed by the haptic-sense-generation input device according to the invention, a radio tuning operation,

a radio sound volume control operation, a CD song selection operation, and an air-conditioner temperature setting operation will be described with reference to FIGS. 3-7. FIG. 3 illustrates a function of the haptic-sense-generation input device according to the embodiment of the invention and specifically shows a haptic sense that is generated during a radio tuning operation. FIG. 4 illustrates another function of the haptic-sense-generation input device according to the embodiment and specifically shows a haptic sense that is generated during a radio sound volume control operation. FIG. 5 illustrates still another function of the haptic-sense-generation input device according to the embodiment and specifically shows a haptic sense that is generated during a CD song selection operation. FIG. 6 illustrates a further function of the haptic-sense-generation input device according to the embodiment and specifically shows a haptic sense that is generated during an air-conditioner temperature setting operation. FIG. 7 is a chart showing the radio tuning operation in detail.

[0099] Each of FIGS. 3-6 outlines an operation that is performed after establishment of a state that a desired function (e.g., a tuning of a radio, song selection of a CD player, or route selection of a navigation system) has been selected by manipulating one of function selection switches **15** that are the plurality of (e.g., three) push-button switches **15a**, **15b**, and **15c**.

[0100] First, the radio tuning operation will be described with reference to FIG. 3. As the manipulation knob **2** is rotated clockwise or counterclockwise, the motor **4** (see FIG. 1) is driven by the controller **14** so as to generate, in order, haptic senses that are one-click feels at prescribed intervals. The radio is tuned, in order, to radio stations such as NHK First, NHK Second, TBS, and Nippon Broadcasting System that are assigned to the respective haptic senses.

[0101] Next, the radio tuning operation of the haptic-sense-generation input device according to the embodiment as well as related haptic senses that are transmitted to the manipulation knob **2** will be described in detail with reference to FIG. 7.

[0102] As shown in FIG. 7, first, one of the function selection switches **15** (push-button switches) corresponding to the function of radio tuning is pushed (selected) (indicated by numeral **31** in FIG. 7), whereupon the controller **14** recognizes that a radio tuning operation should be performed.

[0103] Then, a rotation angle of the rotation detecting means that is rotated by rotating the manipulation knob **2** (see FIG. 1) is detected (indicated by numeral **32** in FIG. 7) and the detected rotation angle is input to the controller **14** as a control signal.

[0104] Then, a list of radio stations (e.g., NHK First, NHK Second, TBS, and Nippon Broadcasting System) to which the radio can be tuned is displayed on the screen of the monitor **16** based on a monitor control signal that is supplied from the controller **14** (indicated by numeral **33** in FIG. 7).

[0105] Then, as the manipulation knob **2** is rotated, the controller **14** supplies the motor **4** with a haptic sense control signal. The motor **4** generates a prescribed haptic sense based on the haptic sense control signal (indicated by numeral **34** in FIG. 7). The generated haptic sense is transmitted to the manipulation knob **2** via the first gear **2f**