indication control unit **50**, in which the haptic presentation unit **52** is driven according to a state of the vehicle or conditions outside the vehicle detected by the state sensor unit **4**. Therefore, only operations of the haptic presentation unit **52** shown in **FIGS. 8 and 9** under the control of a control section will be described here.

[**0068**] Under the control of the control section, the rotary motor **62** rotates the rotating shaft **64** to turn the housing **70** coupled to the rotating shaft **64** in the direction indicated by arrow B. This can move the operating member **12** in the direction of the rotation. When an electric current is passed through the coil **82** in a predetermined direction under the control of the control section, the slider **74** in a movable state slides on the rail **72** according to Fleming's left-hand rule. This causes the arm **76** to move with the sliding of the slider **74** in the direction along the rail **72** (the direction indicated by arrow A). When viewed from the housing **70**, the arm **76** looks like expanding and contracting in the direction indicated by arrow A. In this way, the operating member **12** can be moved in the linear directions.

[**0069**] According to the present embodiment, the two-degree-of-freedom haptic interface device is provided to allow complex haptic stimuli to be provided to the driver.

[**0070**] In the structure described with reference to **FIG. 8**, the arm **76** moves in the direction along the circumference of the steering wheel. The arm **76** can be arranged so as to move in directions approximately orthogonal to the circumference of the steering wheel. **FIG. 10** shows a schematic perspective view of a haptic interface device equivalent to the one shown in **FIG. 8**. Rather than connecting the rotating shaft of a rotary motor contained in the housing **60** to the housing **70**, the rotating shaft can be arranged so as to change its rotation direction by 90 degrees by means of a bevel gear to provide a haptic interface device that moves its operating member **12** up and down (in the direction indicated by arrow C). While the present embodiment is described with respect to a two-degree-of-freedom haptic interface device by way of example, the device according to the present invention may have more than two degrees of freedom. In such a case, more information can be provided to the driver and the operating member can be caused to perform an action according to information to be indicated to the driver or moved in a direction relating to the information to be indicated to the driver. Thus, a more intuitive haptic presentation can be achieved.

[**0071**] While the haptic interface device suited to be embedded in the steering wheel of a vehicle has been described, the present embodiment is not limited to this. The haptic interface device can, for example, be applied to devices other than steering wheels or devices other than vehicles.

What is claimed is:

1. A haptic interface device comprising:

state sensing means for sensing at least one of a state of a vehicle and a state outside the vehicle;

indication control means for determining whether or not information sensed by said state sensing means should be indicated to an operator and for generating haptic information representing said information when it determines that the information should be indicated to the operator; and

haptic experience presentation means for moving based on the haptic information provided from said indication control means.

2. The haptic interface device according to claim 1, wherein said haptic presentation means has two or more degrees of freedom of movement].

3. The haptic interface device according to claim 2, wherein said haptic experience presentation means comprises:

a base member;

an operating member to be operated by the operator;

a moving member movably attached to said base member and to which said operating member is fixed; and

operating member drive control means for driving said operating member in at least two degrees of freedom by moving said moving member drive; and

said operating member control means controls said moving member in a movement pattern according to information to be provided to the operator.

4. The haptic interface device according to claim 3, further comprising immobilization means for forcibly immobilizing said moving member when a condition which may require strong gripping of a steering wheel on which the haptic interface device is installed is detected.

5. The haptic interface device according to claim 4, wherein

said immobilization means has a lock mechanism for physically inhibiting a movable state of said moving member.

6. The haptic interface device according to claim 3, wherein

said operating member drive control means drives said operating member in a direction relating to information to be indicated to the operator as haptic information.

7. The haptic interface device according to claim 1, wherein

said state sensing means has an information receiving unit for receiving traffic information sent from a provider as a state outside the vehicle.

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