180 degrees. The same applies to a jumper line between the coil pairs Lva and Lvb and a jumper line between the coil pairs Lwa and Lwb.

[0005] In order to achieve such a connection between the coil pairs, Patent Document 1 uses a printed circuit board. The printed circuit board is provided with lands to which the pins connected to the ends of the coils are connected, and the lands are connected to each other with a wiring pattern on the printed circuit board. In this way, in the related art, the jumper line is achieved by the pins and the wiring pattern on the printed circuit board.

Prior Art Documents

Patent Documents

[0006] Patent Document 1: Japanese Patent Application Laid-Open No. 2016-27781

Patent Document 2: Japanese Patent Application Laid-Open No. 2004-153973

Patent Document 3: Japanese Patent Application Laid-Open No. 2008-148533

Summary

Problem to be Solved by the Invention

[0007] However, solder necessary for electrically connecting the lands and the pins is also required to have mechanical strength to fix the printed circuit board to the pins. In other words, if the solder is damaged by an external force applied between the printed circuit board and the pins, the electrical connection may also be impaired due to such damage.

[0008] Embodiments of the present invention seek to provide a technique for arranging a jumper line without increasing an axial dimension of the armature and without using a printed circuit board.

supply line in the circumferential direction.

[0014] According to a fifth aspect of the present invention, in the insulator for an armature according to the fourth aspect, the second guide portion has at least one protrusion (32g, 32h) protruding toward the outer periphery along the radial direction.

[0015] According to a sixth aspect of the present invention, in the insulator for an armature according to the fourth or fifth aspect, the one end of the power supply line and the one end of one of the coils are targets to be bound to the power supply pin with another wire, at the power supply pin. The insulator for an armature is interposed between the binding position and the coil in the axial direction.

[0016] According to a seventh aspect of the present invention, in the insulator for an armature according to any one of the first to sixth aspects, one of the coils is wound around a second insulator (6). The insulator for an armature further includes an engagement part (39) to be engaged with the second insulator. The insulator for an armature is fixed to the second insulator in the axial direction by engagement between the second insulator and the engagement part in the axial direction.

[0016a] According to an eighth aspect of the present invention, there is provided an outer rotor motor employing an armature which is constituted by the plurality of coils annularly arranged on the insulator for an armature as defined in any one of the previous aspects.

Effects of the Invention

[0017] The insulator for an armature according to the first aspect of the present invention eliminates a need to use a printed circuit board for connection, and guides jumper lines without an increase in an axial dimension. Moreover, even if an external force is applied to the insulator for an armature, the connection between the coils is prevented from being impaired.

[0018] The insulator for an armature according to the second aspect of the present invention increases an insulation distance from the coils in many areas of the jumper lines.

[0019] The insulator for an armature according to the third aspect of the present invention inhibits the jumper lines from moving away from the coils.

[0020] The insulator for an armature according to the fourth aspect of the present invention eliminates a need to use a printed circuit board for connection, and guides the power supply line without an increase in an axial dimension.

[0021] The insulator for an armature according to the fifth aspect of the present invention inhibits the power supply line from moving away from the coils.

[0022] The insulator for an armature according to the sixth aspect of the present invention makes it easy to connect one end of the power supply line and one end of the coil.

[0023] The insulator for an armature according to the seventh aspect of the present invention is highly effective in preventing the connection between the coils from being impaired even if an external force is applied to the insulator for an armature.

[0024] The objects, features, aspects, and advantages of the present invention will become more apparent from the following detailed description and the accompanying drawings.

Brief Description of Drawings

[0025] Fig. 1 is a plan view showing an armature employing an insulator for an armature according to a first embodiment;

Fig. 2 is a plan view showing an armature from which the insulator for an armature is removed;

Fig. 3 is a front view of the insulator for an armature;

Fig. 4 is a rear view of the insulator for an armature;

Fig. 5 is a perspective view of the insulator for an armature;

Fig. 6 is a perspective view of the insulator for an armature;

Fig. 7 is a front view of an insulator;

Fig. 8 is a perspective view of the insulator;

Fig. 9 is an enlarged perspective view of a part of Fig. 8;

Fig. 10 is an enlarged perspective view of a part of Fig. 5;

Fig. 11 is a schematic diagram showing a mode for connecting a wire and a power supply line to a pin; and

Fig. 12 is a connection diagram showing connection of three-phase coils.

Description of Embodiments

[0026] First Embodiment.

Fig. 1 is a plan view showing an armature 100 employing an insulator 3 for an armature according to the first embodiment, as viewed along an axial direction J parallel to an axis J0 of the armature. The armature 100 has an inner edge 10 around the axis J0.

[0027] A plurality of coils Lu1 to Lu4, Lv1 to Lv4, and Lw1 to Lw4 are annularly arranged. These coils are concentratedly wound around teeth Tu1 to Tu4, Tv1 to Tv4, and Tw1 to Tw4, respectively. The coils Lu1, Lu2, Lw1, Lw2, Lv3, Lv4, Lu3, Lu4, Lw3, Lw4, Lv1, and Lv2 are arranged counterclockwise in this order. Note that, in Fig. 1, the wire constituting each coil is schematically shown as a unit.

[0028] <Connection relationship between coils>

These twelve coils are divided into six sets of coil pairs, each of which consists of a pair of coils adjacent to each other annularly. More specifically, the coils Lu1 and Lu2 form a coil pair Lua, the coils Lw1 and Lw2 form a coil pair Lwa, the coils Lv3 and Lv4 form a coil pair Lvb, the coils Lu3 and Lu4 form a coil pair Lub, the coils Lw3 and Lw4 form a coil pair Lwb, and the coils Lv1 and Lv2 form a coil pair Lva (see also Fig.

CLAIMS

1. An insulator for an armature in which a plurality of coils are annularly arranged and one ends of the coils are connected to pins which respectively correspond to the coils, the insulator being an insulator which is provided so as to align with the coils in an axial direction parallel to an axis of the armature and which guides three or more jumper lines that connect the coils with each other in a circumferential direction with respect to the axis,

the insulator comprising:

a plurality of holes that is penetrated by the pins in the axial direction; and

a plurality of first guide portions that guide at least three of the jumper lines in the circumferential direction with respect to the axis at different positions in a radial direction around the axis.

2. The insulator for an armature according to claim 1, wherein the insulator is interposed between the coils and connection portions between the jumper lines and the pins in the axial direction.

3. The insulator for an armature according to claim 2, wherein at least one of the first guide portions has at least one protrusion protruding toward an outer periphery along the radial direction.

4. The insulator for an armature according to any one of claims 1 to 3,

wherein at least one of the pins functions as a power supply pin to which one end of a power supply line is connected together with the one end of one of the coils, and

the insulator for an armature further comprises at least one second guide portion for guiding the power supply line in the circumferential direction.

5. The insulator for an armature according to claim 4, wherein the second guide portion has at least one protrusion protruding toward the outer periphery along the radial direction.

6. The insulator for an armature according to claim 4 or 5,

wherein, at the power supply pin, the one end of the power supply line and the one end of one of the coils are targets of clipping to the power supply pin with another wire, and

the insulator is interposed between the clipping position and the coil in the axial direction.

7. The insulator for an armature according to any one of claims 1 to 6,

wherein one of the coils is wound around a second insulator,

the insulator for an armature further comprises an engagement part to be engaged with the second insulator, and

the insulator for an armature is fixed to the second insulator in the axial direction by engagement between the second insulator and the engagement part in the axial direction.

8. An outer rotor motor employing an armature which is constituted by the plurality of coils annularly arranged on the insulator for an armature according to any one of claims 1 to 7.