[0006] Furthermore, an inner ring of bearing 104b is fixed to shaft 103 on a side opposite to bearing 104a, and rotor cover 108 is fixed to an outer ring of bearing 104b. Rotor yoke 105 and rotor cover 108 are fixed so that rotor yoke 105 and rotor cover 108 enclose stator core 101, and thus, brushless DC motor 109 is configured.

Citation List

[0007] Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2016-63678

SUMMARY

[0008] However, such conventional brushless DC motor has the following problem.

[0009] To realize a ceiling fan having a larger blade-diameter and configured to supply high airflow, a stator core and a magnet that serve as constituents of a motor need to be increased in size. In other words, such ceiling fan can be realized by, for example, making the outer diameter of a stator core larger, increasing the thickness in the direction of stacking, or making a magnet axially longer. However, to newly design each of the constituents of the motor, new equipment and molds and dies are needed, so that development investment costs increase.

[0010] The present disclosure is devised to solve the above-described problem, and provide a brushless DC motor capable of reducing investment in new equipment and molds and dies and achieving higher output at low cost and with high driving torque.

[0011] In one aspect, the present disclosure includes a brushless DC motor, comprising: a shaft defining a rotation axis; a first

stator having a cylindrical shape with a top face and a bottom face, wherein a center of a circle of the cylindrical shape is fixed to the shaft; a second stator having a cylindrical shape with a top face and a bottom face and being adjacent to the first stator, wherein a center of a circle of the cylindrical shape is fixed to the shaft; a first rotor yoke including a first flange provided on a face perpendicular to the rotation axis, and rotatably attached to the shaft to face a side face of the first stator; a second rotor yoke including a second flange provided on a face perpendicular to the rotation axis, and rotatably attached to the shaft to face a side face of the second stator; a coupling unit configured to axially couple the first rotor yoke to the second rotor yoke; a wiring board provided on a face of the first stator opposite to a face adjacent to the second stator; and a motor lead line, wherein each of the first stator and the second stator includes: a core including salient poles radially formed from the center; and a connection coil wound around each of the salient poles, the motor lead line is passed through a slit between adjacent salient poles of the salient poles on the first stator from the wiring board to which the connection coil of the first stator is connected, to connect the connection coil of the first stator to the connection coil of the second stator, and the coupling unit is coupled to the first flange and the second flange.

[0012] According to the present disclosure, a brushless DC motor capable of achieving high output at low cost can be provided.

BRIEF DESCRIPTION OF DRAWINGS

CLAIMS

1. A brushless DC motor, comprising:

a shaft defining a rotation axis;

a first stator having a cylindrical shape with a top face and a bottom face, wherein a center of a circle of the cylindrical shape is fixed to the shaft;

a second stator having a cylindrical shape with a top face and a bottom face and being adjacent to the first stator, wherein a center of a circle of the cylindrical shape is fixed to the shaft;

a first rotor yoke

including a first flange provided on a face perpendicular to the rotation axis, and

rotatably attached to the shaft to face a side face of the first stator;

a second rotor yoke

including a second flange provided on a face perpendicular to the rotation axis, and

rotatably attached to the shaft to face a side face of the second stator;

a coupling unit configured to axially couple the first rotor yoke to the second rotor yoke;

a wiring board provided on a face of the first stator opposite to a face adjacent to the second stator; and

a motor lead line,

wherein

each of the first stator and the second stator includes:

a core including salient poles radially formed from the center; and

a connection coil wound around each of the salient poles,

the motor lead line is passed through a slit between adjacent salient poles of the salient poles on the first stator from the wiring board to which the connection coil of the first stator is connected, to connect the connection coil of the first stator to the connection coil of the second stator, and

the coupling unit is coupled to the first flange and the second flange.

2. The brushless DC motor according to claim 1, wherein the slit between the adjacent salient poles on the first stator includes an insulating film.

3. The brushless DC motor according to claim 1 or 2, wherein the wiring board includes a movement restriction member configured to restrict movement of the motor lead line in an outer circumferential direction of the first stator.

4. The brushless DC motor according to claim 3, wherein

the movement restriction member includes

a recess through which the motor lead line is passed; and

a protrusion provided to extend in a circumferential direction of the first stator and to be positioned closer to an outer circumferential side of the first stator than the recess is.

5. The brushless DC motor according to any one of claims 1 to 4, wherein

each of the first stator and the second stator includes a core including 3n salient poles radially formed from the center, where n is integer of 1 or more,

the connection coil is a star connection coil including three phase windings and wound around each of the salient poles,

the star connection coil is configured to connect phases of the first stator to phases of the second stator in parallel so that each of the phases of the first stator coincides with a corresponding one of the phases of the second stator, and

the first stator and the second stator are drive-controlled by one motor drive circuit.

6. The brushless DC motor according to any one of claims 1 to 4, wherein

each of the first stator and the second stator includes a core including 3n salient poles radially formed from the center, where n is integer of 1 or more,

the connection coil is a star connection coil including three phase windings and wound around each of the salient poles,

the star connection coil is configured to connect phases of the first stator to phases of the second stator in parallel so that one of the phases of the first stator coincides with a corresponding one of the phases of the second stator and so that remaining two phases of the first stator and remaining two phases of the second stator corresponding to the remaining two phases of the first stator are transposed in phases, and

the first stator and the second stator are drive-controlled by one motor drive circuit.

7. The brushless DC motor according to any one of claims 1 to 6, wherein with directions of magnetization of magnets adjacent to each other between the first rotor yoke and the second rotor yoke being identical to each other, the coupling unit axially couples the first flange to the second flange.

8. The brushless DC motor according to any one of claims 1 to 7, further comprising one temperature detector configured to detect ambient temperatures of both of the first stator and the second stator.

9. The brushless DC motor according to any one of claims 1 to 8, further comprising one position detector configured to detect rotation positions of both of the first rotor yoke and the second rotor yoke.