DESCRIPTION

BRUSHLESS DC MOTOR

TECHNICAL FIELD

[0001] The present disclosure relates to a brushless DC motor provided on a ceiling fan.

BACKGROUND ART

[0002] A ceiling fan on which a brushless DC motor is mounted has been known. For example, PTL 1 describes a ceiling fan in which blades for blowing air is provided at a distal end of a cylindrical housing extending downward from a ceiling. The ceiling fan includes a brushless DC motor for rotating the blades. The brushless DC motor includes a motor body including a stator and a rotor, and a drive circuit that drives the motor body. The drive circuit is disposed above the motor body in the housing.

Citation List

Patent Literature

[0003] PTL 1: Unexamined Japanese Patent Publication No. 2016-063678

SUMMARY

[0004] In a ceiling fan on which the brushless DC motor is mounted, it is desirable to provide a height of a blade from a floor surface at a high position from the viewpoint of dispersing an air flow in a wide range. Thus, when a ceiling height is determined, it is advantageous that a housing of the ceiling fan is vertically short. In order to shorten the housing up and down, it is necessary to reduce a thickness of the brushless DC motor in which the motor body and the drive circuit are combined.

[0005] Embodiments of the present disclosure provide a brushless DC motor capable of reducing a thickness of a ceiling fan.

[0005a] In an aspect, the present disclosure refers to a brushless DC motor provided on a ceiling fan, comprising:

a stator including a stator core around which a coil is wound;

a shaft fixed to a central portion of the stator core;

a bearing;

a rotor including a magnet surrounding the stator core; and

a circuit board including, between the stator core and the bearing in an axial direction:

a primary-side power supply circuit;

a secondary-side power supply circuit that converts a voltage supplied from the primary-side power supply circuit;

a motor drive circuit that supplies a drive current to the coil based on a power supplied from the secondary-side power supply circuit;

a board holder that holds the circuit board by the stator core;

a heat dissipating portion that dissipates heat of the motor drive circuit, wherein the heat dissipating portion is interposed between the board holder and the circuit board; and

a support column that holds the circuit board, wherein the support column is provided on a surface of the board holder opposite to the stator core,

wherein

the board holder is positioned between the stator core and the circuit board, and has substantially a same shape as a shape of an end of the stator core in an axial direction in axial view, and

the support column holds the heat dissipating portion and the circuit board.

[0006] A brushless DC motor according to an example of the present disclosure is a brushless DC motor provided on a ceiling fan. The brushless DC motor includes a stator that has a stator core around which a coil is wound, a shaft that is fixed to a central portion of the stator core, a bearing, a rotor that has a magnet surrounding the stator core, and a circuit board that has a primary-side power supply circuit

CLAIMS

1. A brushless DC motor provided on a ceiling fan, comprising:

a stator including a stator core around which a coil is wound;

a shaft fixed to a central portion of the stator core;

a bearing;

a rotor including a magnet surrounding the stator core; and

a circuit board including, between the stator core and the bearing in an axial direction:

a primary-side power supply circuit;

a secondary-side power supply circuit that converts a voltage supplied from the primary-side power supply circuit;

a motor drive circuit that supplies a drive current to the coil based on a power supplied from the secondary-side power supply circuit;

a board holder that holds the circuit board by the stator core;

a heat dissipating portion that dissipates heat of the motor drive circuit, wherein the heat dissipating portion is interposed between the board holder and the circuit board; and

a support column that holds the circuit board, wherein the support column is provided on a surface of the board holder opposite to the stator core,

wherein

the board holder is positioned between the stator core and the circuit board, and has substantially a same shape as a shape of an end of the stator core in an axial direction in axial view, and

the support column holds the heat dissipating portion and the circuit board.

2. The brushless DC motor according to Claim 1, wherein the board holder includes a cylindrical portion that circumscribes an outer peripheral surface of the shaft.

3. The brushless DC motor according to Claim 1, wherein

the support column includes two arrangement surfaces that share a central axis and have different lengths in a radial direction and different heights in an axial direction

from the central axis,

the heat dissipating portion is disposed on one of the two arrangement surfaces, and

the circuit board is disposed on another arrangement surface.

4. The brushless DC motor according to any one of Claims 1 to 3, further comprising a wiring connection component for connecting a wiring to a surface of the circuit board opposite to the stator core.

5. The brushless DC motor according to any one of Claims 1 to 4, further comprising an electronic component constituting the primary-side power supply circuit on the surface of the circuit board opposite to the stator core.

6. The brushless DC motor according to Claim 5, further comprising a lead wire holder that holds a plurality of lead wires passing through a hollow space of the shaft and connected onto the circuit board, wherein the lead wire holder is provided on a surface of the board holder opposite to the stator core, wherein an end of the lead wire holder opposite to the stator core penetrates through an inner peripheral side space of the circuit board, and extends up to an arrangement surface of the primary-side power supply circuit in the circuit board.

7. The brushless DC motor according to any one of Claims 1 to 6, wherein the board holder includes positioning protrusions engaging with an opening of the stator core.

8. The brushless DC motor according to Claim 7, wherein the positioning protrusions are provided at a position near a Hall element that detects a magnetic flux of the magnet and a position opposite to the position near the Hall element in a circumferential direction.

9. The brushless DC motor according to Claim 7 or 8, wherein each of the positioning protrusions has a shape along a wall surface of the opening.

10. The brushless DC motor according to any one of Claims 1 to 9, wherein a

radial rib is provided on a surface of the board holder facing the stator core at a position where the coil is avoided.

11. The brushless DC motor according to any one of Claims 1 to 10, wherein a peripheral rib is provided on an outer peripheral side of the surface of the board holder facing the stator core.