CLAIMS

[Claim 1]

An axial flow fan comprising a plurality of blades and being configured to rotate about a rotation axis of the blades to convey a fluid,

the plurality of blades each having a leading edge at a leading side in a rotational direction, a trailing edge at a trailing side in the rotational direction, and an outer peripheral edge connecting the leading edge and the trailing edge,

the leading edge of one of the plurality of blades and the trailing edge of another blade adjacent to the leading edge of the blade in the rotational direction being connected by a plate-shaped connection portion,

the plurality of blades each having at least one plate-shaped reinforcement rib extending from a periphery of the rotation axis toward the outer peripheral edge of the blade.

[Claim 2]

The axial flow fan of claim 1, wherein

the rotation axis is surrounded by a minimum radius portion having a radius defined by a shortest distance between the rotation axis and a peripheral edge of the connection portion,

a cylindrical portion with the rotation axis as a central axis and having an outer radius smaller than the radius of the minimum radius portion is provided in the minimum radius portion, and

the reinforcement ribs connect an outer peripheral surface of the cylindrical portion and the plurality of blades.

[Claim 3]

The axial flow fan of claim 1, wherein

the reinforcement ribs provided at the plurality of blades intersect at the rotation axis to form an axial portion, and

the reinforcement ribs connect the axial portion and the plurality of blades.

[Claim 4]

The axial flow fan of claim 1, wherein

the rotation axis is surrounded by a minimum radius portion having a radius defined by a shortest distance between the rotation axis and a peripheral edge of the connection portion,

a circular opening with the rotation axis as a central axis and having a radius smaller than the radius of the minimum radius portion is provided in the minimum radius portion, and

the reinforcement ribs connect an opening edge of the circular opening and the plurality of blades.

[Claim 5]

The axial flow fan of any one of claims 1 to 4,

wherein the reinforcement ribs are provided radially about the rotation axis.

[Claim 6]

The axial flow fan of any one of claims 1 to 4,

wherein the reinforcement ribs are convex toward the leading edges.

[Claim 7]

The axial flow fan of any one of claims 1 to 4,

wherein the reinforcement ribs are convex toward the trailing edges.

[Claim 8]

The axial flow fan of any one of claims 1 to 7,

wherein an end of each reinforcement rib at a side of the outer peripheral edge is provided with an expansion portion having an increased area of joint, per unit length, with the corresponding blade.

[Claim 9]

The axial flow fan of any one of claims 1 to 8, wherein each reinforcement rib has an upper edge at one end facing the corresponding blade, and

a flat surface constituting the reinforcement rib is inclined such that the upper edge is inclined toward the leading edge.

[Claim 10]

The axial flow fan of any one of claims 1 to 8, wherein

each reinforcement rib has an upper edge at one end facing the corresponding blade, and

a flat surface constituting the reinforcement rib is inclined such that the upper edge is inclined toward the trailing edge.

[Claim 11]

The axial flow fan of any one of claims 1 to 10,

wherein the reinforcement ribs at least include an upstream rib and a downstream rib for each of the plurality of blades, the upstream rib being located at an upstream side in the rotational direction, the downstream rib being located at a downstream side in the rotational direction, and

when the blades rotate, the downstream ribs are configured to pass through a region through which the upstream ribs do not pass.

[Claim 12]

The axial flow fan of claim 11, wherein

the upstream rib and the downstream rib each have an upper edge at an end facing the corresponding blade, and

an upstream-rib contact point serving as an intersection point between the blade and the upper edge of the upstream rib is located upstream in a conveying direction of the fluid relative to a downstream-rib contact point serving as an intersection point between the blade and the downstream rib.

[Claim 13]

The axial flow fan of any one of claims 1 to 12, wherein each blade has a pressure surface against which the fluid collides and a suction surface located at a reverse side of the pressure surface, and

each reinforcement rib is provided erect on a side of the pressure surface.

[Claim 14]

The axial flow fan of any one of claims 1 to 13, wherein each reinforcement rib has an upper edge at an end facing the corresponding blade, and

the upper edge of the reinforcement rib has a cross-sectional shape having a first circular arc and a second circular arc, the first circular arc being provided at an upstream side in the rotational direction, the second circular arc being provided at a downstream side in the rotational direction, and

the first circular arc has a cross-sectional radius larger than a cross-sectional radius of the second circular arc.

[Claim 15]

The axial flow fan of any one of claims 1 to 14, wherein

the connection portion is inclined upstream in a conveying direction of the fluid from the leading edge of the neighboring blade toward the trailing edge.

[Claim 16]

The axial flow fan of claim 2 or any one of claims 5 to 15 as dependent on claim 2,

wherein each blade has a rearward-inclined shape in which a blade chord center line is located downstream, in a conveying direction of the fluid, of an orthogonal plane defined in a direction orthogonal to the rotation axis from a contact point where the blade chord center line of the blade is in contact with the outer peripheral surface of the cylindrical portion.

[Claim 17]

The axial flow fan of claim 2 or any one of claims 5 to 16 as dependent on claim 2, wherein

an indicator indicating a position where a drive shaft is to be secured within the cylindrical portion is provided between the reinforcement ribs at the outer peripheral surface of the cylindrical portion.

[Claim 18]

An air-conditioning apparatus comprising the axial flow fan of any one of claims 1 to 17.

CLAIMS

[Claim 1]

An axial flow fan comprising a plurality of blades and being configured to rotate about a rotation axis of the blades to convey a fluid,

the plurality of blades each having a leading edge at a leading side in a rotational direction, a trailing edge at a trailing side in the rotational direction, and an outer peripheral edge connecting the leading edge and the trailing edge,

the leading edge of one of the plurality of blades and the trailing edge of another blade adjacent to the leading edge of the blade in the rotational direction being connected by a plate-shaped connection portion,

the plurality of blades each having at least one plate-shaped reinforcement rib extending from a periphery of the rotation axis toward the outer peripheral edge of the blade,

the reinforcement ribs being provided radially about the rotation axis, or being convex toward the leading edges.

[Claim 2]

The axial flow fan of claim 1, wherein

the rotation axis is surrounded by a minimum radius portion having a radius defined by a shortest distance between the rotation axis and a peripheral edge of the connection portion,

a cylindrical portion with the rotation axis as a central axis and having an outer radius smaller than the radius of the minimum radius portion is provided in the minimum radius portion, and

the reinforcement ribs connect an outer peripheral surface of the cylindrical portion and the plurality of blades.

[Claim 3]

The axial flow fan of claim 1, wherein

the reinforcement ribs provided at the plurality of blades intersect at the rotation axis to form an axial portion, and

the reinforcement ribs connect the axial portion and the plurality of blades.

[Claim 4]

The axial flow fan of claim 1, wherein

the rotation axis is surrounded by a minimum radius portion having a radius defined by a shortest distance between the rotation axis and a peripheral edge of the connection portion,

a circular opening with the rotation axis as a central axis and having a radius smaller than the radius of the minimum radius portion is provided in the minimum radius portion, and

the reinforcement ribs connect an opening edge of the circular opening and the plurality of blades.

[Claim 5]

The axial flow fan of any one of claims 1 to 4,

wherein an end of each reinforcement rib at a side of the outer peripheral edge is provided with an expansion portion having an increased area of joint, per unit length, with the corresponding blade.

[Claim 6]

The axial flow fan of any one of claims 1 to 5, wherein each reinforcement rib has an upper edge at one end facing the corresponding blade, and

a flat surface constituting the reinforcement rib is inclined such that the upper edge is inclined toward the leading edge.

[Claim 7]

The axial flow fan of any one of claims 1 to 5, wherein

each reinforcement rib has an upper edge at one end facing the corresponding blade, and

a flat surface constituting the reinforcement rib is inclined such that the upper edge is inclined toward the trailing edge.

[Claim 8]

The axial flow fan of any one of claims 1 to 7,

wherein the reinforcement ribs at least include an upstream rib and a downstream rib for each of the plurality of blades, the upstream rib being located at

an upstream side in the rotational direction, the downstream rib being located at a downstream side in the rotational direction, and

when the blades rotate, the downstream ribs are configured to pass through a region through which the upstream ribs do not pass.

[Claim 9]

The axial flow fan of claim 8, wherein

the upstream rib and the downstream rib each have an upper edge at an end facing the corresponding blade, and

an upstream-rib contact point serving as an intersection point between the blade and the upper edge of the upstream rib is located upstream in a conveying direction of the fluid relative to a downstream-rib contact point serving as an intersection point between the blade and the downstream rib.

[Claim 10]

The axial flow fan of any one of claims 1 to 9, wherein each blade has a pressure surface, the pressure surface being on a downstream side of the fluid and a suction surface located at a reverse side of the pressure surface, and

each reinforcement rib is provided erect on a side of the pressure surface.

[Claim 11]

The axial flow fan of any one of claims 1 to 10, wherein each reinforcement rib has an upper edge at an end facing the corresponding blade, and

the upper edge of the reinforcement rib has a cross-sectional shape having a first circular arc and a second circular arc, the first circular arc being provided at an upstream side in the rotational direction, the second circular arc being provided at a downstream side in the rotational direction, and

the first circular arc has a cross-sectional radius larger than a cross-sectional radius of the second circular arc.

[Claim 12]

The axial flow fan of any one of claims 1 to 11, wherein

the connection portion is inclined upstream in a conveying direction of the fluid from the leading edge of the neighboring blade toward the trailing edge.

[Claim 13]

The axial flow fan of claim 2 or any one of claims 5 to 12 as dependent on claim 2,

wherein each blade has a rearward-inclined shape in which a blade chord center line is located downstream, in a conveying direction of the fluid, of an orthogonal plane defined in a direction orthogonal to the rotation axis from a contact point where the blade chord center line of the blade is in contact with the outer peripheral surface of the cylindrical portion.

[Claim 14]

The axial flow fan of claim 2 or any one of claims 5 to 13 as dependent on claim 2, wherein

an indicator indicating a position where a drive shaft is to be secured within the cylindrical portion is provided between the reinforcement ribs at the outer peripheral surface of the cylindrical portion.

[Claim 15]

An air-conditioning apparatus comprising the axial flow fan of any one of claims 1 to 14.