CLAIMS

1. A centrifugal compressor comprising:

a main shaft which rotates around an axis line;

a bladed wheel mounted on the main shaft; and

a vane device which adjusts a flow rate of a fluid in an inflow flow path to the bladed wheel, wherein

the vane device comprises:

a plurality of vane main bodies provided at intervals in a circumferential direction with respect to the axis line of the main shaft in the inflow flow path and each of a rotary shaft extending in a radial direction with respect to the axis line of the main shaft, wherein a mounting angle of the plurality of vane main bodies is changed by rotating the rotary shaft;

a plurality of link members which is rotated along with the rotary shaft, wherein a first end of the plurality of link members is connected to each of the rotary shaft;

an annular member which is formed with an annular shape centered on the axis line and is moved in a moving direction along a rotation locus of the link member, wherein the moving direction is both a axial direction and the circumferential direction, the rotation locus is generated by rotating with the vane main body, and the annular member is connected to a second end of the plurality of link members; and

a drive mechanism which is connected to the annular member and transmits a force in a tangential direction to the annular member,

the drive mechanism comprises:

an output shaft which is rotationally driven; and

a transmission arm transmitting a rotational force from the output shaft

to the annular member as a force in the tangential direction, wherein the a first end of the transmission arm is connected to the output shaft, and the second end of the transmission arm is connected to the annular member,

the transmission arm comprises:

a driving lever which is fixed to the output shaft, extends in a radial direction of the output shaft, and rotates along with the output shaft; and

a driving link bar, wherein a first end of the driving link bar is connected to the driving lever, and a second end of the driving link bar is connected to the annular member,

the driving link bar is provided with:

a connecting rod-shaped portion extending along the circumferential direction with respect to the axis line of the main shaft; and

universal joints provided at both ends of the connecting rod-shaped portion, and

a first end of the transmission arm is connected to the driving lever via the universal joint, and a second end of the transmission arm is connected to the annular member via the universal joint.

2. The centrifugal compressor according to Claim 1, wherein

the universal joints comprises:

two spherical bearings which are connected to the driving lever and the annular member; and

rod-shaped portions extending toward the connecting rod-shaped portion from the respective spherical bearings, thereby coming into contact with the connecting rod-shaped portion, and having a first threaded portion provided in a portion

which is brought into contact with the connecting rod-shaped portion, and

the connecting rod-shaped portion is provided with a second threaded portion which is screwed with the first threaded portion.

3. The centrifugal compressor according to Claim 1, wherein

the transmission arm comprises:

a driving lever which is fixed to the output shaft, extends in a radial direction of the output shaft, and rotates along with the output shaft; and

a driving link member, wherein a first end of the driving link member is connected to the driving lever, and a second end of the driving link member is connected to the annular member,

the driving link member is provided with:

a connection portion extending in a direction away from the annular member; and

two universal joints provided at the connection portion so as to be spaced apart from each other in at least one of the axial direction and a radial direction with respect to the axis line of the main shaft, and

a first end of the transmission arm is connected to the driving lever via the universal joint on one side, and a second end of the transmission arm is connected to the annular member via the universal joint on the other side.

4. A centrifugal compressor comprising:

a main shaft which rotates around an axis line;

a bladed wheel mounted on the main shaft; and

a vane device which adjusts a flow rate of a fluid in an inflow flow path to the

bladed wheel, wherein

the vane device comprises:

a plurality of vane main bodies provided at intervals in a circumferential direction with respect to the axis line of the main shaft in the inflow flow path and each of a rotary shaft extending in a radial direction with respect to the axis line of the main shaft, wherein a mounting angle of the plurality of vane main bodies is changed by rotating the rotary shaft;

a plurality of link members which is rotated along with the rotary shaft, wherein a first end of the plurality of link members is connected to each of the rotary shaft;

an annular member which is formed with an annular shape centered on the axis line and is moved in a moving direction along a rotation locus of the link member, wherein the moving direction is both a axial direction and the circumferential direction, the rotation locus is generated by rotating with the vane main body, and the annular member is connected to a second end of the plurality of link members; and

a drive mechanism which is connected to the annular member and transmits a force in a tangential direction to the annular member,

the drive mechanism comprises:

an output shaft which is rotationally driven; and

a transmission arm transmitting a rotational force from the output shaft to the annular member as a force in the tangential direction, wherein the a first end of the transmission arm is connected to the output shaft, and the second end of the transmission arm is connected to the annular member,

the transmission arm comprises:

a driving lever which is fixed to the output shaft, extends in a radial

direction of the output shaft, and rotates along with the output shaft; and

a driving link member, wherein a first end of the driving link member is connected to the driving lever, and a second end of the driving link member is connected to the annular member,

the driving link member is provided with:

a damping member which is damping a force acting on the driving link member, and is provided between the first end of the driving link member and the second end of the driving link member; and

two universal joints provided at the damping member, and

a first end of the transmission arm is connected to the driving lever via the universal joint on one side, and a second end of the transmission arm is connected to the annular member via the universal joint on the other side.

5. The centrifugal compressor according to any one of Claims 2 to 4, further comprising:

a torque detection section which detects a torque of an electric motor; and

a control section which reversely rotates the output shaft of the electric motor in a case where a detected value in the torque detection section exceeds a threshold value set in advance.

6. The centrifugal compressor according to any one of Claims 2 to 5, wherein the vane main body comprises a torque limiter section which allows the rotary shaft to perform relative rotation between the rotary shaft and the link member in a case where torque acting on the vane main body exceeds a threshold value set in advance.

CLAIMS

1. A centrifugal compressor comprising:

a main shaft which rotates around an axis line;

a bladed wheel mounted on the main shaft; and

a vane device which adjusts a flow rate of a fluid in an inflow flow path to the bladed wheel, wherein

the vane device comprises:

a plurality of vane main bodies provided at intervals in a circumferential direction with respect to the axis line of the main shaft in the inflow flow path and each of a rotary shaft extending in a radial direction with respect to the axis line of the main shaft, wherein a mounting angle of the plurality of vane main bodies is changed by rotating the rotary shaft;

a plurality of link members which is rotated along with the rotary shaft, wherein a first end of the plurality of link members is connected to each of the rotary shaft;

an annular member which is formed with an annular shape centered on the axis line and is moved in a moving direction along a rotation locus of the link member, wherein the moving direction is both a axial direction and the circumferential direction, the rotation locus is generated by rotating with the vane main body, and the annular member is connected to a second end of the plurality of link members; and

a drive mechanism which is connected to the annular member and transmits a force in a tangential direction to the annular member,

the drive mechanism comprises:

an output shaft which is rotationally driven; and

a transmission arm transmitting a rotational force from the output shaft to the annular member as a force in the tangential direction, wherein the a first end of the transmission arm is connected to the output shaft, and the second end of the transmission arm is connected to the annular member,

the transmission arm comprises:

a driving lever which is fixed to the output shaft, extends in a radial direction of the output shaft, and rotates along with the output shaft; and

a driving link bar, wherein a first end of the driving link bar is connected to the driving lever, and a second end of the driving link bar is connected to the annular member,

the driving link bar is provided with:

a connecting rod-shaped portion extending along the circumferential direction with respect to the axis line of the main shaft; and

universal joints provided at both ends of the connecting rod-shaped portion,

a first end of the transmission arm is connected to the driving lever via the universal joint, and a second end of the transmission arm is connected to the annular member via the universal joint, and

the vane main body comprises a torque limiter section which allows the rotary shaft to perform relative rotation between the rotary shaft and the link member in a case where torque

acting on the vane main body exceeds a threshold value set in advance.

2. The centrifugal compressor according to Claim 1, wherein
the universal joints comprises:
two spherical bearings which are connected to the driving lever and the annular member; and
rod-shaped portions extending toward the connecting rod-shaped portion from the respective spherical bearings, thereby coming into contact with the connecting rod-shaped portion, and having a first threaded portion provided in a portion which is brought into contact with the connecting rod-shaped portion, and
the connecting rod-shaped portion is provided with a second threaded portion which is screwed with the first threaded portion.

3. The centrifugal compressor according to Claim 1, wherein
the transmission arm comprises:
a driving lever which is fixed to the output shaft, extends in a radial direction of the output shaft, and rotates along with the output shaft; and
a driving link member, wherein a first end of the driving link member is connected to the driving lever, and a second end of the driving link member is connected to the annular member,
the driving link member is provided with:
a connection portion extending in a direction away from the annular member; and
two universal joints provided at the connection portion so as to be spaced apart from each other in at least one of the axial direction and a radial direction with respect to the axis line of the main shaft, and
a first end of the transmission arm is connected to the driving lever via the universal joint on one side, and a second end of the transmission arm is connected to the annular member via the universal joint on the other side.

4. A centrifugal compressor comprising:
a main shaft which rotates around an axis line;
a bladed wheel mounted on the main shaft; and
a vane device which adjusts a flow rate of a fluid in an inflow flow path to the bladed wheel, wherein
the vane device comprises:
a plurality of vane main bodies provided at intervals in a circumferential direction with respect to the axis line of the main shaft in the inflow flow path and each of a rotary shaft extending in a radial direction with respect to the axis line of the main shaft, wherein a mounting angle of the plurality of vane main bodies is changed by rotating the rotary shaft;
a plurality of link members which is rotated along with the rotary shaft, wherein a first end of the plurality of link members is connected to each of the rotary shaft;

an annular member which is formed with an annular shape centered on the axis line and is moved in a moving direction along a rotation locus of the link member, wherein the moving direction is both a axial direction and the circumferential direction, the rotation locus is generated by rotating with the vane main body, and the annular member is connected to a second end of the plurality of link members; and

a drive mechanism which is connected to the annular member and transmits a force in a tangential direction to the annular member,

the drive mechanism comprises:

an output shaft which is rotationally driven; and

a transmission arm transmitting a rotational force from the output shaft to the annular member as a force in the tangential direction, wherein the a first end of the transmission arm is connected to the output shaft, and the second end of the transmission arm is connected to the annular member,

the transmission arm comprises:

a driving lever which is fixed to the output shaft, extends in a radial direction of the output shaft, and rotates along with the output shaft; and

a driving link member, wherein a first end of the driving link member is connected to the driving lever, and a second end of the driving link member is connected to the annular member,

the driving link member is provided with:

a damping member which is damping a force acting on the driving link member, and is provided between the first end of the driving link member and the second end of the driving link member; and

two universal joints provided at the damping member, and

a first end of the transmission arm is connected to the driving lever via the universal joint on one side, and a second end of the transmission arm is connected to the annular member via the universal joint on the other side.

5. The centrifugal compressor according to any one of Claims 1 to 4, further comprising:

a torque detection section which detects a torque of an electric motor; and

a control section which reversely rotates the output shaft of the electric motor in a case where a detected value in the torque detection section exceeds a threshold value set in advance.