to friction to accelerate charging and recharging.

Citation List

Patent Literature

[0004]

Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2012-47353

Summary of Invention

Technical Problem

[0005]

In the related-art electrostatic force imparting technology, an electrostatic force is imparted to the surface of the dust-collecting filter through surface friction of the dust-collecting filter. However, in the related-art electrostatic force imparting technology, it is difficult to further increase an electric charge amount to be given to the dust-collecting filter. This is because there is a limit to the electric charge amount which the surface of the dust-collecting filter can hold.

[0006]

The present invention has been made in view of the above-mentioned circumstances, and an object of the present invention is to provide a dust-collecting apparatus, a dust-collecting method, and a dust-collecting system, which can increase an electric charge amount to be given to a dust-collecting filter.

Solution to Problem

[0007]

According to one embodiment of the present invention, there is provided a dust-collecting apparatus for collecting dust contained in air flowing in an air flow direction by using a dust-collecting filter, including: a pressurizing unit configured to pressurize the dust-collecting filter in the air flow direction; a support unit configured to be movable, and to support the pressurizing unit against the dust-collecting filter; and a drive unit configured to be driven to move the support unit along a crossing direction crossing the air flow direction when the pressurizing unit pressurizes the dust-collecting filter. The dust-collecting filter includes fiber materials that cause an electrostatic force by friction with the pressurizing unit, the pressurizing unit is connected to the support unit, and is moved by the drive unit through the support unit, the duct-collecting filter contains an electret material that causes polarization, the

electret material includes a first fiber material having a first triboelectric series, and a second fiber material having a second triboelectric series different from the first triboelectric series, and the pressurizing unit is configured to travel along the dust-collecting filter through drive of the drive unit, and to roll along a direction perpendicular to a pressurizing direction in which the pressurizing unit pressurizes the dust-collecting filter.

[0008]

According to one embodiment of the present invention, provided is a dust-collecting method of collecting dust contained in air flowing in an air flow direction by using a dust-collecting filter, the method including: a preparation step of preparing a pressurizing unit configured to pressurize the dust-collecting filter in the air flow direction, a dust-collecting filter including fiber materials that cause an electrostatic force by friction with the pressurizing unit, and containing an electret material that causes polarization and that includes a first fiber material having a first triboelectric series and a second fiber material having a second triboelectric series different from the first triboelectric series, and a support unit connected to the pressurizing unit and configured to support the pressurizing unit against the dust-collecting filter; a first step of moving the support unit along a crossing direction crossing the air flow direction when the pressurizing unit pressurizes the dust-collecting filter; and a second step of moving the pressurizing unit in which the pressurizing unit travels along the dust-collecting filter through movement of the support unit in the first step, and rolls along a direction perpendicular to a pressurizing direction in which the pressurizing unit pressurizes the dust-collecting filter.

[0009]

According to one embodiment of the present invention, there is provided a dust-collecting system for collecting dust contained in air flowing through an air passage in an air flow direction, including: a dust-collecting filter configured to collect the dust by causing the air to pass through the dust-collecting filter; a treatment apparatus configured to treat the air after passing through the dust-collecting filter; a pressurizing unit configured to pressurize the dust-collecting filter in the air flow direction; a support unit configured to be movable, and to support the pressurizing unit against the dust-collecting filter; and a drive unit configured to move the support unit when the pressurizing unit pressurizes the dust-collecting filter, to thereby move the pressurizing unit along a crossing direction crossing the air flow direction. The dust-collecting filter includes fiber materials that cause an electrostatic force by friction with the pressurizing unit, the pressurizing unit is connected to the support unit, and is moved by the drive unit through the support unit, the duct-collecting filter contains an electret material that causes polarization, the electret material includes a first fiber material having a first triboelectric series, and a second fiber material having a second triboelectric series different from the first triboelectric series, and the pressurizing unit is configured to travel along the dust-collecting filter through drive of the drive unit, and roll along a direction perpendicular to a pressurizing direction in which the pressurizing unit pressurizes the dust-collecting filter.

Advantageous Effects of Invention

[0010]

In the dust-collecting apparatus according to one embodiment of the present invention, the support unit is moved under a state in which the pressurizing unit pressurizes the dust-collecting filter. The pressurizing unit pressurizing the dust-collecting filter can be moved on the dust-collecting filter while keeping a pressurizing

CLAIMS

1. A dust-collecting apparatus for collecting dust contained in air flowing in an air flow direction by using a dust-collecting filter, the dust-collecting apparatus comprising:

a pressurizing unit configured to pressurize the dust-collecting filter in the air flow direction;

a support unit configured to be movable, and to support the pressurizing unit against the dust-collecting filter; and

a drive unit configured to, when the pressurizing unit pressurizes the dust-collecting filter, move the support unit along a crossing direction crossing the air flow direction, wherein

the dust-collecting filter includes fiber materials that cause an electrostatic force by friction with the pressurizing unit,

the pressurizing unit is connected to the support unit, and is moved by the drive unit through the support unit,

the duct-collecting filter contains an electret material that causes polarization,

the electret material includes

a first fiber material having a first triboelectric series, and

a second fiber material having a second triboelectric series different from the first triboelectric series, and

the pressurizing unit is configured to

travel along the dust-collecting filter through drive of the drive unit, and

roll along a direction perpendicular to a pressurizing direction in which the pressurizing unit pressurizes the dust-collecting filter.

2. The dust-collecting apparatus of claim 1, wherein the pressurizing unit is configured to travel along a direction perpendicular to the pressurizing direction in which the pressurizing unit pressurizes the dust-collecting filter.

3. The dust-collecting apparatus of claim 1, wherein the pressurizing unit is configured to vibrate along a direction perpendicular to the pressurizing direction in which

the pressurizing unit pressurizes the dust-collecting filter.

4. The dust-collecting apparatus of any one of claims 1 to 3, wherein the pressurizing unit has a cylindrical shape.

5. A dust-collecting apparatus for collecting dust contained in air flowing in an air flow direction by using a dust-collecting filter, the dust-collecting apparatus comprising:

a pressurizing unit configured to pressurize the dust-collecting filter in the air flow direction;

a support unit configured to be movable, and to support the pressurizing unit against the dust-collecting filter; and

a drive unit configured to, when the pressurizing unit pressurizes the dust-collecting filter, move the support unit along a crossing direction crossing the air flow direction, wherein

the dust-collecting filter includes fiber materials that cause an electrostatic force by friction with the pressurizing unit,

the pressurizing unit is connected to the support unit, and is moved by the drive unit through the support unit,

the duct-collecting filter contains an electret material that causes polarization,

the electret material includes

a first fiber material having a first triboelectric series, and

a second fiber material having a second triboelectric series different from the first triboelectric series,

the pressurizing unit includes

a first pressurizing part configured to pressurize the dust-collecting filter by being brought into contact with one surface of the dust-collecting filter, and

a second pressurizing part configured to pressurize the dust-collecting filter by being brought into contact with an other surface of the dust-collecting filter,

the support unit includes

a first support part arranged on the one surface and configured to support the first pressurizing part, and

a second support part arranged on the other surface and configured to support the second pressurizing part, and

the drive unit is configured to move the first pressurizing part at a first movement speed and move the second pressurizing part at a second movement speed different from the first movement speed.

6. The dust-collecting apparatus of claim 5, wherein the pressurizing unit is configured to travel along the dust-collecting filter through drive of the drive unit.

7. A dust-collecting method of collecting dust contained in air flowing in an air flow direction by using a dust-collecting filter,

the method comprising:

a preparation step of preparing a pressurizing unit configured to pressurize the dust-collecting filter in the air flow direction, a dust-collecting filter including fiber materials that cause an electrostatic force by friction with the pressurizing unit, and containing an electret material that causes polarization and that includes a first fiber material having a first triboelectric series and a second fiber material having a second triboelectric series different from the first triboelectric series, and a support unit connected to the pressurizing unit and configured to be movable, and to support the pressurizing unit against the dust-collecting filter;

a first step of moving the support unit along a crossing direction crossing the air flow direction when the pressurizing unit pressurizes the dust-collecting filter; and

a second step of moving the pressurizing unit in which the pressurizing unit travels along the dust-collecting filter through movement of the support unit in the first step, and rolls along a direction perpendicular to a pressurizing direction in which the pressurizing unit pressurizes the dust-collecting filter.

8. A dust-collecting method of collecting dust contained in air flowing in an air flow direction by using a dust-collecting filter,

the method comprising:

a preparation step of preparing a pressurizing unit configured to pressurize the dust-collecting filter in the air flow direction, a dust-collecting filter including fiber materials that cause an electrostatic force by friction with the pressurizing unit, and containing an electret material that causes polarization and that includes a first fiber material having a first triboelectric series and a second fiber material having a second triboelectric series different from the first triboelectric series, and a support unit connected to the pressurizing unit and configured to be movable, and to support the pressurizing unit against the dust-collecting filter;

a first step of moving the support unit along a crossing direction crossing the air flow direction when the pressurizing unit pressurizes the dust-collecting filter; and

a second step of moving the pressurizing unit through movement of the support unit in the first step, wherein

the pressurizing unit includes

a first pressurizing part configured to pressurize the dust-collecting filter by being brought into contact with one surface of the dust-collecting filter, and

a second pressurizing part configured to pressurize the dust-collecting filter by being brought into contact with an other surface of the dust-collecting filter, and

the support unit includes

a first support part arranged on the one surface and configured to support the first pressurizing part, and

a second support part arranged on the other surface and configured to support the second pressurizing part, and

in the pressurizing part, the first pressurizing part is moved at a first movement speed and the second pressurizing part is moved at a second movement speed different from the first movement speed.

9. A dust-collecting system for collecting dust contained in air flowing through an air passage in an air flow direction, comprising:

a dust-collecting filter configured to collect the dust by causing the air to pass through the dust-collecting filter;

a treatment apparatus configured to treat the air after passing through the

dust-collecting filter;

a pressurizing unit configured to pressurize the dust-collecting filter in the air flow direction;

a support unit configured to be movable, and to support the pressurizing unit against the dust-collecting filter; and

a drive unit configured to move the support unit when the pressurizing unit pressurizes the dust-collecting filter, to thereby move the pressurizing unit along a crossing direction crossing the air flow direction, wherein

the dust-collecting filter includes fiber materials that cause an electrostatic force by friction with the pressurizing unit,

the pressurizing unit is connected to the support unit, and is moved by the drive unit through the support unit,

the duct-collecting filter contains an electret material that causes polarization,

the electret material includes

a first fiber material having a first triboelectric series, and

a second fiber material having a second triboelectric series different from the first triboelectric series, and

the pressurizing unit is configured to

travel along the dust-collecting filter through drive of the drive unit, and

roll along a direction perpendicular to a pressurizing direction in which the pressurizing unit pressurizes the dust-collecting filter.

10. A dust-collecting system for collecting dust contained in air flowing through an air passage in an air flow direction, comprising:

a dust-collecting filter configured to collect the dust by causing the air to pass through the dust-collecting filter;

a treatment apparatus configured to treat the air after passing through the dust-collecting filter;

a pressurizing unit configured to pressurize the dust-collecting filter in the air flow direction;

a support unit configured to be movable, and to support the pressurizing unit

against the dust-collecting filter; and

a drive unit configured to move the support unit when the pressurizing unit pressurizes the dust-collecting filter, to thereby move the pressurizing unit along a crossing direction crossing the air flow direction, wherein

the dust-collecting filter includes fiber materials that cause an electrostatic force by friction with the pressurizing unit,

the pressurizing unit is connected to the support unit, and is moved by the drive unit through the support unit,

the duct-collecting filter contains an electret material that causes polarization,

the electret material includes

a first fiber material having a first triboelectric series, and

a second fiber material having a second triboelectric series different from the first triboelectric series,

the pressurizing unit includes

a first pressurizing part configured to pressurize the dust-collecting filter by being brought into contact with one surface of the dust-collecting filter, and

a second pressurizing part configured to pressurize the dust-collecting filter by being brought into contact with an other surface of the dust-collecting filter,

the support unit includes

a first support part arranged on the one surface and configured to support the first pressurizing part, and

a second support part arranged on the other surface and configured to support the second pressurizing part, and

in the pressurizing part, the first pressurizing part is moved at a first movement speed and the second pressurizing part is moved at a second movement speed different from the first movement speed.

11. The dust-collecting system of claim 9, further comprising a sensing device configured to detect the dust contained in the air,

wherein the drive unit is configured to move the pressurizing unit when the sensing device detects the dust contained in the air.

12. The dust-collecting system of claim 10, further comprising a sensing device configured to detect the dust contained in the air,

wherein the drive unit is configured to move the pressurizing unit when the sensing device detects the dust contained in the air.