

ELECTROSTATIC FRICTION PULSE GENERATOR

Field of the invention

The invention relates to electrostatic frictional generators having a movable member in form of flow of substance particles.

Prior Art

There is a known electrostatic frictional generator comprising a channel of finite length inside a tube, a means for providing flow of substance particles in the channel along axis thereof, current collectors for draining opposite electric charges, including a current collector in form of a screen for draining charge from the substance particles and a current collector for draining charge from inner wall of the channel, where the current collector is connected to a load at a portion near an input opening (patent application RU2006117750, published on December 10, 2007). Material of the channel inner wall is selected so as to provide induction of opposite electric charges of the channel inner wall and the substance particles due to friction of the substance particle flow against the channel inner wall. A dielectric material, in particular a polymer material may be used as the material of the channel inner wall. The means for providing flow of substance particles may comprise a tank for storing and feeding the substance particles and a means for feeding gas with suspended substance particles into the input opening of the channel.

A drawback of the known device is that the electrostatic frictional generator is not able to operate in a pulsed mode.

Summary of the invention

The invention is directed to attaining a technical effect of providing an electrostatic frictional pulse generator having innovative configuration.

The technical effect is attained by an electrostatic frictional pulse generator implemented in form of a hollow cylinder and a means for providing a flow of air with substance particles along the cylinder surface. Material of the cylinder and material of the substance are selected so as to provide induction of opposite electric charges on the cylinder surface and on the substance particles due to friction of the substance particle flow against the cylinder surface. An electrode and a current collector connected to a load are spaced with a gap and located along axis of the cylinder. The means for providing the flow of air with substance particles is provided in form of screens located in upper and lower portions of the cylinder and configured to repel the flows of

air with substance particles, and an axial fan located under the upper screen, which intakes air and has blades of less diameter than inner diameter of the cylinder.

Preferably, the hollow cylinder is equipped with a device for inputting the substance particles or air with substance particles into the inner cavity.

Preferably, the hollow cylinder has round and straight shape.

Preferably, a dielectric material is used as the cylinder material.

Preferably, the electrode is provided in form of a metal rod.

Preferably, the electrode has a sharpened or rounded tip directed to the current collector.

Preferably, the current collector is provided in form of a metal rod having a sharpened or rounded tip directed to the electrode.

Preferably, the means for providing flow of substance particles along the cylinder surface assures the flow along inner surface of the cylinder.

Preferably, the cylinder has two layers with a grounded outer metal shell.

Preferably, the means for providing the flow of substance particles along inner surface of the cylinder is configured to simultaneously provide flow of substance particles in backward direction along the electrode after passing along inner surface of the cylinder.

Preferably, the hollow cylinder is positioned vertically.

Preferably, the upper screen is made solid.

Preferably, the upper screen is provided in form of a semi-sphere.

Preferably, the upper screen is made of metal and grounded.

In one embodiment, the lower screen is made solid.

Preferably, the lower screen is provided in form of a metal grill that is connected to the electrode and attached to the cylinder via an isolating member.

Preferably, the metal grill of the lower screen is made of metal strips, which are directed radially and connected to the electrode.

Preferably, plane of the metal strips is angularly oriented relative to surface of the lower screen grill.

Preferably, the lower screen grill is provided in form of a cone.

Brief description of drawings

The invention is explained with reference to the attached drawing.

Fig. 1 shows a schematic diagram of an electrostatic frictional pulse generator, where the following designators are used:

1 – metal shell;

2 – hollow cylinder;

3 – electrode;

- 4 – current collector;
- 5 – lower screen in form of a cone grill;
- 6 – upper screen in form of a semi-sphere;
- 7 – intake axial fan;
- 8 – flow of air containing substance particles 14, the flow directed along inner surface of cylinder;
- 9 – flow of air containing substance particles 14, the flow directed along surface of lower screen;
- 10 – flow of air containing substance particles 14, the flow directed along electrode;
- 11 – flow of air containing substance particles 14, the flow directed along surface of lower screen;
- 12 – load;
- 13 – isolating members;
- 14 – substance particles.

Detailed description of the invention

The electrostatic frictional pulse generator according to the invention is implemented as a device in form of a vertical hollow round and straight cylinder (2) filled with air containing substance particles (14). The cylinder (2) is made of a dielectric material with a grounded outer metal shell (1). An upper solid screen (6) provided in form of a grounded metal semi-sphere is attached to a top portion of the cylinder (2). A lower screen (5) provided in form of a cone grill is attached to a bottom portion of the cylinder (2). An electrode (3) is located along axis of the cylinder (2) and held in vertical position by the lower screen (5).

Material of the substance and material of the hollow cylinder are selected, based on fact of that, during friction of two chemically identical bodies, the most consistent one is charged positively. Metals are charged either positively or negatively during friction against a dielectric material. During friction of two dielectric materials, the most dielectrically permissive dielectric material is charged positively. Substances may be organized into triboelectrical series, where the previous body is charged positively and the subsequent body is charged negatively (Faraday series: (+) furs, flannel, elephant ivory, feathers, quartz crystal, flint glass, cotton fabric, silk, timber, metals, sulphur (–)). Dielectric materials placed in triboelectrical series show descent in hardness (Gezekhus series: (+) diamond (hardness of 10), topaz (hardness of 8), quartz crystal (hardness of 7), glossy glass (hardness of 5), mica (hardness of 3), calcite (hardness of 3), sulphur (hardness of 2), wax (hardness of 1) (–)). Metals are characterized by ascent in hardness.

The more surface of bodies in friction, the more electrostatic charging thereof is observed. Dust sliding over body surface is charged negatively, when the dust is formed of the same body (marble, glass, snow dust). Powders screened through a sieve are also charged.

Triboelectrical effect in solid bodies is caused by transfer of charge from one body to another. Triboelectrical effect in metals and semiconductors is caused by movement of electrons from a substance with lower work function (F) value to a substance with higher work function (F) value. During contact between a metal and a dielectric material, triboelectrical effect is caused by movement of electrons from the metal to the dielectric material. During friction of two dielectric materials, triboelectrical effect is caused by diffusion of electrons and ions.

Inner surface of the cylinder (2) is charged (e.g., positively) due to friction of a flow (8) of air containing substance particles (14) against the inner surface of the cylinder (2). After that, the air flow with (negatively) charged substance particles (14) forms a flow (9). The substance particles (14), during contact with the lower screen (5), transfer their charge to the lower screen (5) and the electrode (3) connected thereto. Further, the discharged substance particles (14) are dragged upwards along with a flow (10) by the intake axial fan (7). When voltage on the electrode (3) reaches a burst voltage value for a gap towards the current collector (4) and the (negative) charge induced on surface of the electrode (3) is transferred to the current collector (4) and used by a consumer in the load (12). After contacting the lower screen (5), the electrode (3) and the grounded upper screen (6), substance particles (14) lose their charge and, after repelling from the upper screen (6), they form a flow (11) of uncharged substance particles (14), which evolves into the flow (8). Further substance particles (14) are (negatively) charged again due to friction thereof against the inner surface of the cylinder (2). Cycle of rising voltage of the electrode (3) up to the burst value for the gap towards the current collector (4) is repeated. The cylinder (2) is charged up to a voltage so as draining current of the cylinder (2) material compensates charging current generated due to friction of the flow (8) of substance particles (14) against surface of the cylinder (2).

Thus, the technical effect of providing an electrostatic frictional pulse generator having innovative configuration is attained.

CLAIMS

1. An electrostatic frictional pulse generator comprising:
a hollow cylinder filled with air containing substance particles; and
a means for providing flow of the substance particles along surface of the cylinder,
wherein material of the cylinder and material of the particles are selected so as to provide induction of opposite electric charges on the cylinder surface and on the substance particles due to friction of the substance particle flow against the cylinder surface, wherein an electrode and a current collector connected to a load are spaced with a gap and located along axis of the cylinder, and wherein the means for providing flow of substance particles includes screens located in upper and lower portions of the cylinder and configured to repel flows of substance particles, and an axial fan located under the upper screen, which intakes air and has blades of less diameter than inner diameter of the cylinder.
2. The electrostatic frictional pulse generator of claim 1, wherein the hollow cylinder includes a device for inputting the substance particles or air with substance particles into the inner cavity.
3. The electrostatic frictional pulse generator of claim 1, wherein the hollow cylinder has round and straight shape.
4. The electrostatic frictional pulse generator of claim 1, wherein the hollow cylinder is made of a dielectric material.
5. The electrostatic frictional pulse generator of claim 1, wherein the electrode is provided in form of a metal rod.
6. The electrostatic frictional pulse generator of claim 4, wherein the electrode has a sharpened or rounded tip directed to the current collector.
7. The electrostatic frictional pulse generator of claim 1, wherein the current collector is provided in form of a metal rod having a sharpened or rounded tip directed to the electrode.
8. The electrostatic frictional pulse generator of claim 1, wherein the cylinder has a grounded outer metal shell.
9. The electrostatic frictional pulse generator of claim 1, wherein the means for providing flow of substance particles along the cylinder surface provides the flow along inner surface of the cylinder.
10. The electrostatic frictional pulse generator of claim 9, wherein the means for providing the flow of substance particles along inner surface of the cylinder is configured to simultaneously provide flow of substance particles in backward direction along the electrode after passing along inner surface of the cylinder.

11. The electrostatic frictional pulse generator of claim 1, wherein the hollow cylinder is positioned vertically.

12. The electrostatic frictional pulse generator of claim 1, wherein the upper screen is made solid.

13. The electrostatic frictional pulse generator of claim 12, wherein the upper screen is provided in form of a semi-sphere.

14. The electrostatic frictional pulse generator of claim 13, wherein the upper screen is made of metal and grounded.

15. The electrostatic frictional pulse generator of claim 1, wherein the lower screen is made solid.

16. The electrostatic frictional pulse generator of claim 1, wherein the lower screen is provided in form of a metal grill that is connected to the electrode and isolated from the cylinder inner surface.

17. The electrostatic frictional pulse generator of claim 16, wherein the grill is made of metal strips, which are directed radially, connected to the electrode and attached to the cylinder via an isolating member.

18. The electrostatic frictional pulse generator of claim 17, wherein plane of the metal strips is angularly oriented relative to surface of the grill.

19. The electrostatic frictional pulse generator of any of claims 16–17, wherein the grill is provided in form of a cone.