**Claims**

**[Claim 1]**

A device for managing a fine particle concentration of a target region by supplying charges to the target region, the device comprising:

a container configured to store liquid;

at least one nozzle configured to output the liquid;

a pump configured to supply the liquid from the container to the at least one nozzle;

a power supply configured to supply power to the device; and

a controller configured to supply the charges to the target region through the at least one nozzle by using the power supply,

wherein the controller is configured to, by using the power supply, output charged droplets through the nozzle by applying a voltage equal to or greater than a first reference value to the at least one nozzle, and form space charge in the target region by supplying the charges to the target region through the charged droplets,

wherein the controller is configured to output the charged droplets, charge fine particles in the target region through the charged droplets, and provide electric force in a direction away from the device to the charged fine particles through the formed space charge,

wherein the electric force provided to the fine particles is at least partially provided by electric field formed by charges supplied to the target region, and

wherein the fine particles in the target region are charged with the same polarity as the supplied charges by the supplied charges.

**[Claim 2]**

The device of claim 1,

wherein the controller is configured to, by supplying a charged substance to the target region for more than a predetermined time period, maintain the space charge for more than the predetermined time period such that the charged fine particles are removed by receiving the electric force and moving in a ground direction.

**[Claim 3]**

The device of claim 1,

wherein the controller is configured to supply negative charges to the target region by using the power supply, and the controller is configured to release negatively charged droplets through the at least one nozzle by applying a negative voltage to the at least one nozzle using the power supply.

**[Claim 4]**

The device of claim 1,

wherein the controller is configured to form negative space charge in the target region by supplying charges to the target region through the at least one nozzle using the power supply, and

wherein the electric force provided to the fine particles is at least partially provided by electric field by the negative space charge.

**[Claim 5]**

The device of claim 1,

wherein the controller is configured to provide electric force

including a component directed to a ground to the fine particles in the target region by using the power supply.

**[Claim 6]**

The device of claim 1,

wherein the controller is configured to apply power equal to or greater than the first reference value determined by considering a predetermined effective radius to the at least one nozzle by using the power supply, and

wherein the predetermined effective radius is a distance to a point at which the fine particles concentration decreases to a reference ratio within a reference time period.

**[Claim 7]**

The device of claim 1,

wherein the controller is configured to apply a voltage equal to or greater than the first reference value determined to output a current from 10μA to 10mA through the at least one nozzle to the at least one nozzle by using the power supply.

**[Claim 8]**

The device of claim 1,

wherein the controller is further configured to apply a voltage equal to or less than a second reference value to the at least one nozzle by using the power supply, wherein the second reference value is determined to prevent discharge of a charge from the nozzle.

**[Claim 9]**

A device for managing a fine particle concentration of a target region by supplying charges to the target region, the device comprising:

a container configured to store liquid;

at least one nozzle configured to output the liquid;

a pump configured to supply the liquid from the container to the at least one nozzle;

a power supply configured to supply power to the device; and

a controller configured to supply a charged substance to the target region through the at least one nozzle by using the power supply; and

a particle dispersion unit configured to provide non-electric force to the charged substance near the nozzle,

wherein the controller is configured to, by using the power supply, output charged droplets through the at least one nozzle by applying a voltage equal to or greater than a first reference value to the at least one nozzle, and form space charge in the target region by supplying charges to the target region through the charged droplets,

wherein the controller is configured to provide electric force in a direction away from the device to charged fine particles charged by the charges supplied to the target region through the space charge.

**[Claim 10]**

The device of claim 9,

wherein the particle dispersion unit is configured to provide the non-electric force by spraying an electrically neutral substance to the charged substance.

**[Claim 11]**

The device of claim 9,

wherein the controller is configured to form the space charge in the target region by supplying the charged substance through the at least one nozzle using the power supply.

**[Claim 12]**

The device of claim 11,

wherein the at least one nozzle includes one end from which the charged droplets are released, and

wherein the controller is configured to provide the non-electric force in a direction away from the one end to the charged substance near the one end by using the particle dispersion unit such that a density of the space charge near the one end is at least partially reduced.

**[Claim 13]**

The device of claim 9,

wherein the particle dispersion unit includes at least one air nozzle configured to spraying a gas, and is configured to spray the gas in a direction away from the nozzle to the charged substance.

**[Claim 14]**

A method for managing a concentration of fine particles in a target region by using a device being located at a predetermined distance from a ground and supplying charges to the target region,

wherein the device comprises a container configured to store

liquid, at least one nozzle configured to output the liquid, a pump configured to supply the liquid from the container to the at least one nozzle, a power supply configured to supply power and a controller configured to supply the charges to the target region through the at least one nozzle by using the power supply,

the method comprising:

applying, by the controller, a voltage equal to or greater than a first reference value to the at least one nozzle by using the power supply;

supplying, by the controller, the liquid to the at least one nozzle by using the pump;

outputting, by the controller, charged droplets through the at least one nozzle by using the power supply and the pump, and forming space charge in the target region by supplying the charges to the target region through the charged droplets; and

charging, by the controller, the fine particles in the target region through the charged droplets, and providing, by the controller, electric force at least partially including a component directed away from the device to the fine particles charged with the same polarity as the supplied charges by the charges supplied to the target region through the space charge.

**[Claim 15]**

The method of claim 14,

wherein the providing, by the controller, the electric force to the fine particles includes forming electric field between the ground and the device in the target region by forming the space charge in the target region,and providing the electric force to the fine particles through the formed electric field.

**Claim 16]**

The method of claim 14, wherein the method further comprises:

maintaining, by the controller, by supplying the charged substance to the target region for more than a predetermined time period, the space charge for more than the predetermined time period such that the charged fine particles are removed by receiving the electric force and moving in a ground direction.

**[Claim 17]**

The method of claim 14,

wherein the controller is configured to form negative space charge in the target region by supplying negative charges to the target region through the at least one nozzle using the power supply, and

wherein the electric force provided to the fine particles is at least partially provided by electric field by the negative space charge.

**[Claim 18]**

The method of claim 14,

wherein the device further comprises a particle dispersion unit configured to provide non-electric force to the charged substance, and

wherein the method further comprises providing, by the controller, non-electric force to the charged substance near one end of the nozzle at which the droplets are generated in a direction away from the one end by using the particle dispersion unit.

**[Claim 19]**

The method of claim 18,

wherein the providing the non-electric force further comprises providing the non-electric force by spraying an electrically neutral substance to the charged substance.

**[Claim 20]**

The method of claim 18,

wherein the supplying, by the controller, the charges to the target region comprises forming space charge that forms electric field in the target region by supplying, by the controller, the charges to the target region, and

wherein the providing, by the controller, the non-electric force further comprises providing, by the controller, non-electric force including a component directed away from the one end to the charged substance to reduce a distribution density of the space charge near the one end.