ABSTRACT

A humidifier including a spray unit configured to apply electric charge to water, and to spray water having electric charge applied thereto, an evaporation unit formed with a duct in which evaporation of the electrically-charged water being sprayed is taken place, and configured to guide a vapour and a foreign substance, which are separated from each other through the evaporation, to an outside, and a dust collection unit configured to collect the foreign substance at an inside the duct by forming an electric field, the humidifier capable of performing a large-capacity humidification by the generation of the electrically charged droplets, and capable of removing the foreign substance included in the droplets by using the electrical force, thereby enhancing the cleanliness of the humidification, and by using an electric field, accelerating the evaporation so that the size of the duct is minimized, and thus manufacturing the humidifier in a compact size.

CLAIMS

We Claim:

1. A humidifier, comprising:
a spray unit configured to electrically charge water and to spray the electrically-charged water in the form of droplets; and
a duct in which the electrically-charged droplets are arranged to be evaporated, the duct being configured to guide the water vapour and foreign substances included in the electrically-charged water to an outlet.

2. The humidifier of claim 1, further comprising:
a dust collection unit configured to collect the foreign substances in the duct using an electric field, wherein the dust collection unit may comprise a filter at which the electric field is formed, or may comprise a cyclone at which the electric field is formed.

3. The humidifier of claim 2, wherein:
the duct is configured to guide non-evaporated ones of the electrically-charged droplets to the outlet, and the dust collection unit is configured to collect the n0n-evaporated electrically-charged droplets.

4. The humidifier of claim 2 or 3, further comprising:
a blower unit configured to introduce outside air into the duct to move the electrically-charged droplets.

5. The humidifier of claim 4, further comprising:
an input unit configured to input a cleaning mode; and
a control unit which, in response to the cleaning mode being input, is configured to control an output of the blower unit so that the evaporation of the electrically-charged droplets is decreased.

6. The humidifier of any one of claims 2 to 5, further comprising:
a water storage chamber configured to store water and to supply the stored water to the spray unit; and
a first pipe connected in between the water storage chamber and the spray unit, and configured to guide the water from the water storage chamber to the spray unit, wherein the first pipe may include a plurality of branch pipes and the spray unit may include a plurality of spray assemblies connected to the first pipe, and/or wherein the number of branch pipes corresponds to the number of spray assemblies and/or further comprising:
a valve disposed at the first pipe and configured to adjust an opening degree of the first pipe so that a flow rate of water being supplied from the water storage chamber to the spray unit is adjustable.

7. The humidifier of claim 6, further comprising:
an input unit configured to input a humidification mode and an amount of spraying; and a control unit which, in response to the humidification mode and the amount of the spraying being input, is configured to control the opening degree of the valve based on the input amount of the spraying.

8. The humidifier of any one of claims 3 to 7, further comprising:
a tray configured to store the non-evaporated electrically-charged droplets.

9. The humidifier of any one of claims 6 to 8, further comprising:
a second pipe connected in between the water storage chamber and the duct;
a pump disposed at the second pipe and configured to pump the water out of the duct to supply the water to the water storage chamber; and a filter disposed at the second pipe and configured to filter the water to supply the filtered water to the pump.

10. The humidifier of any one of claims 2 to 9, wherein the spray unit comprises:
a body comprising an accommodation unit to accommodate water, and a plurality of insertion holes;
a plurality of nozzles respectively inserted into the plurality of insertion holes, each configured to spray the water out of the accommodation unit;
a first conductive member configured to electrically charge the water; and a second conductive member spaced apart from the body, provided with a plurality of nozzle holes each formed at a corresponding position to each of the plurality of nozzles, and to which an electric charge having a different polarity from a polarity of the first conductive member is applied, wherein the plurality of nozzles may be separated from the plurality of insertion holes, and/or wherein the plurality of nozzles may be disposed on an array member.

11. The humidifier of claim 10, further comprising:
a first voltage generating unit configured to apply voltage to the first conductive member and the second conductive member.

12. The humidifier of any one of claims 2 to 11, wherein:
the dust collection unit comprises:
a first dust collection member to which an electric charge having a different polarity from a polarity of the electrically-charged water is applied; and
a second dust collection member to which an electric charge having a different polarity from a polarity of the first dust collection member is being applied, wherein:
the first dust collection member may be positioned in close contact with the duct, and the second collection member may be positioned inside the first collection member and wherein the second dust collection member may comprise a wire.

13. The humidifier of claim 12 when dependendent on claim 11, further comprising:
a second voltage generating unit configured to apply voltage to the first dust collection member and the second dust collection member so that an electric field is formed in between the first dust collection member and the second dust collection member.

14. The humidifier of any one of claims 2 to 13, wherein the length of the duct is dependent on the size of the droplets and the evaporation time of the droplets.

15. The humidifier of any one of claims 2 to 5, wherein the spray unit comprises:
a spray chamber configured to store water;
a first conductive member provided inside the spray chamber, and configured to apply an electric charge to the water;
a piston disposed inside the spray chamber to pressurize water; and

a nozzle configured to spray the water pressurized by the piston as electrically-charged droplets.

16. The humidifier of any one of claims 2 to 15, further comprising:
a first conductive member configured to electrically charge water of the spray unit;
a second conductive member to which an electric charge having a different polarity from a polarity of the first conductive member is being applied, and which is configured to eject the electrically-charged water to an outside by forming an electric field in between the first conductive member and the second conductive member; and
a third conductive member positioned on the duct, and to which an electric charge having a different polarity from a polarity of the first conductive member is applied, the third conductive member configured to move the electrically-charged droplets by forming an electric field in between the first conductive member and the third conductive member, wherein the third conductive member may be vertically or horizontally installed inside the duct.

17. The humidifier of claim 16, further comprising:
a first voltage generating unit configured to apply a high voltage to the first conductive member, the second conductive member, and the third conductive member, wherein the first voltage generating unit is configured to apply a voltage larger than a voltage of the second conductive member to the third conductive member.

18. The humidifier of any one of the preceding claims, comprising:
a vibration unit configured to spray the electrically-charged water in the form of electrically-charged droplets by generating an ultrasonic wave.

Gupta

Date: September 12, 2014
Place: Noida

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Agent for the Applicant

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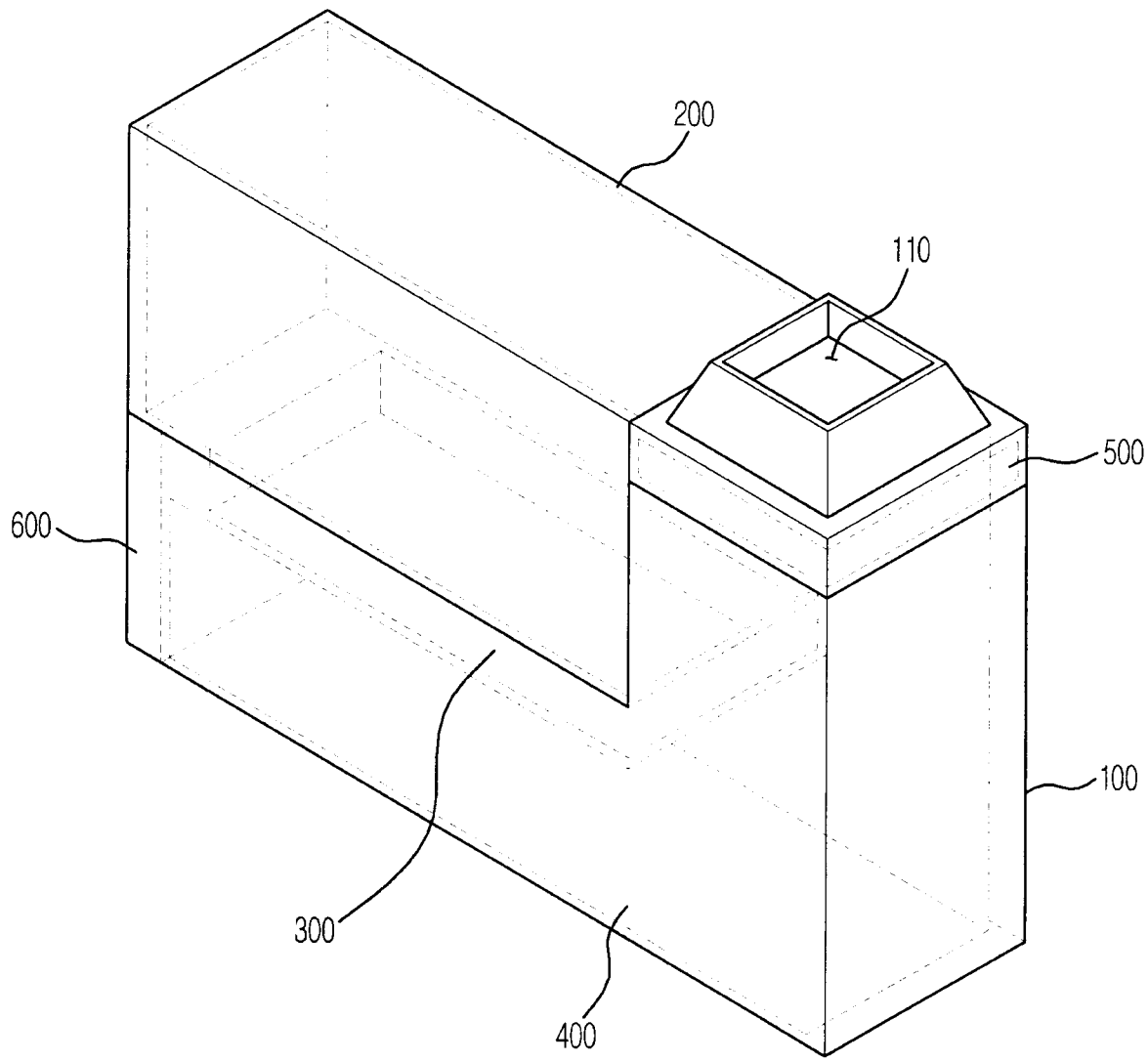
FIG. 1



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Name of the Applicant: SAMSUNG ELECTRONICS CO., LTD. Total Sheets: 27

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FIG. 2

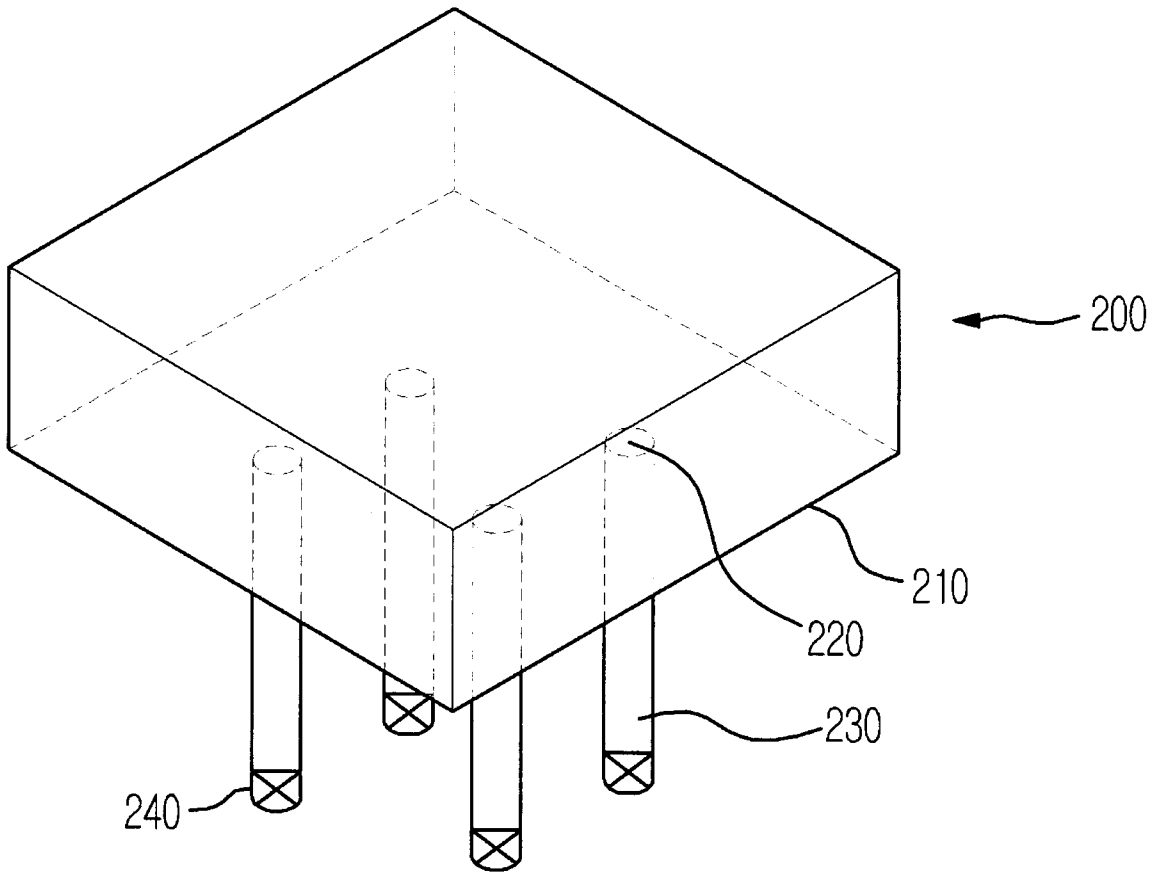

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FIG. 3

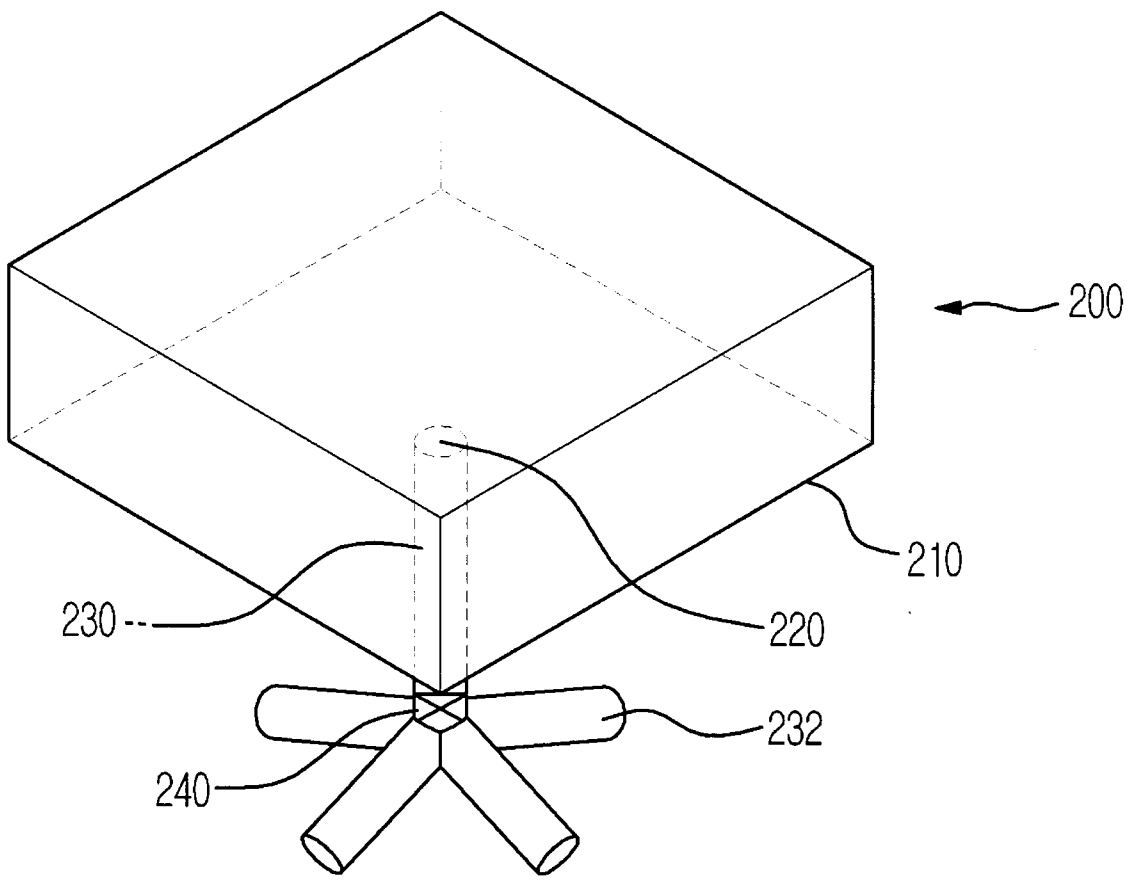

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FIG. 4

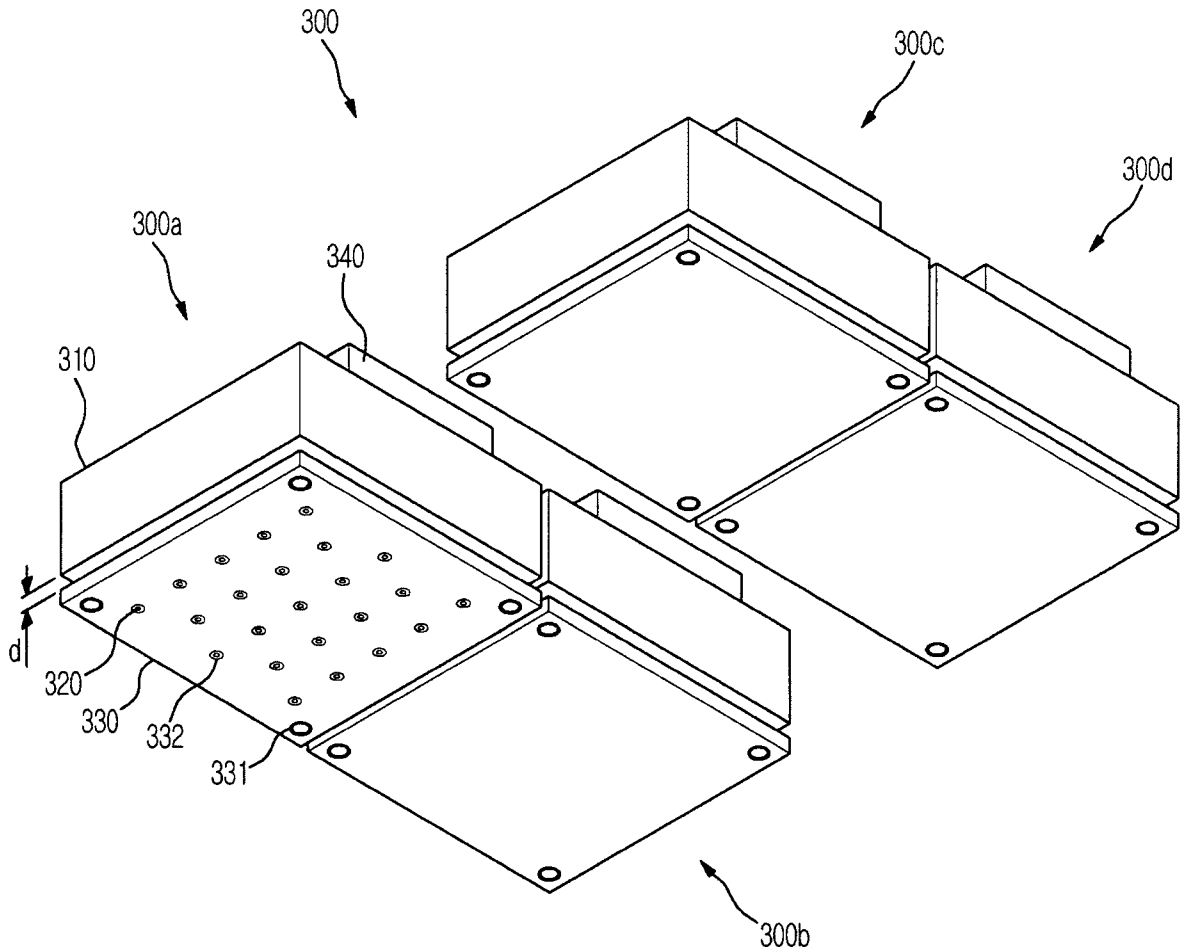

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FIG. 5

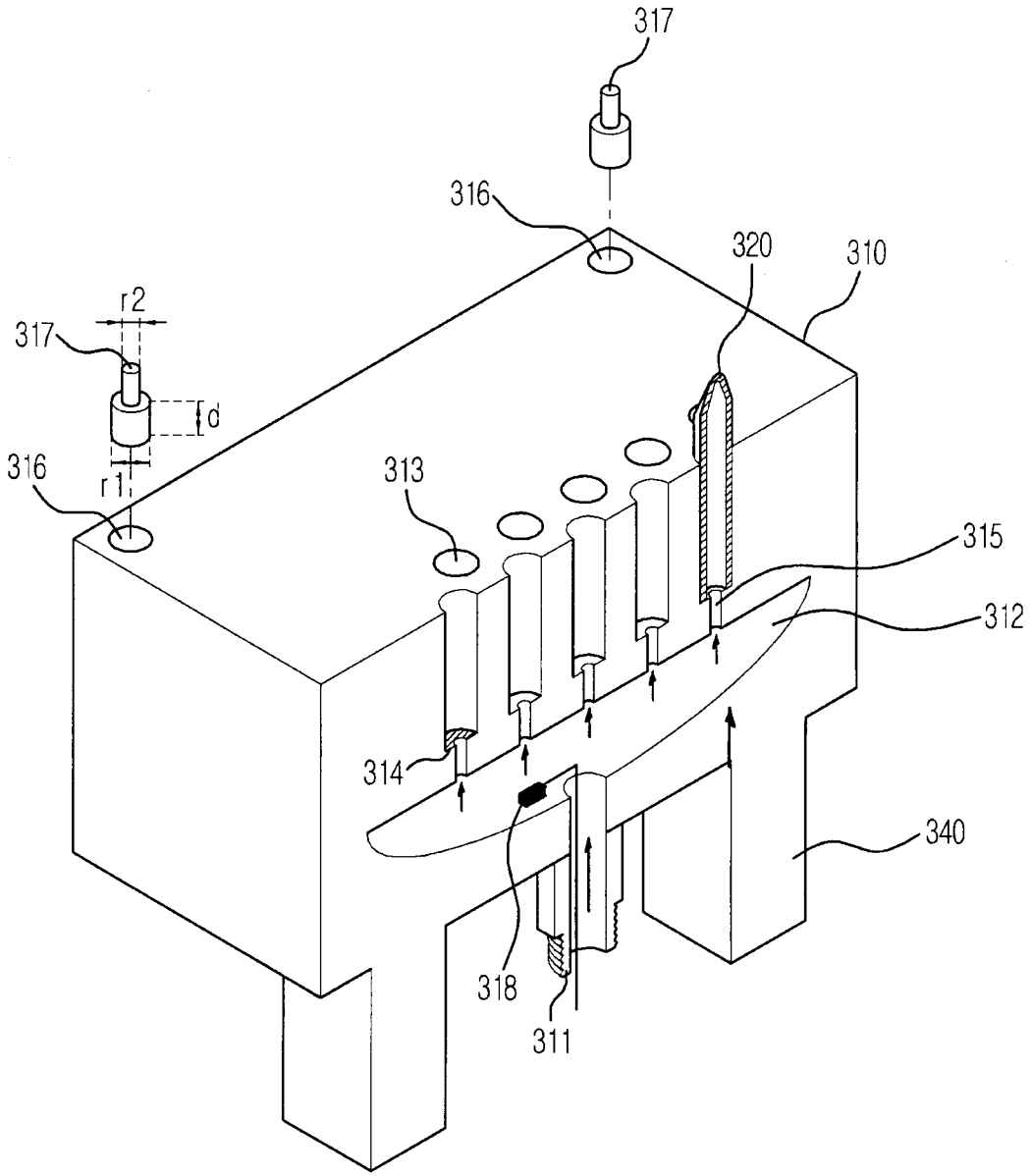

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FIG. 6

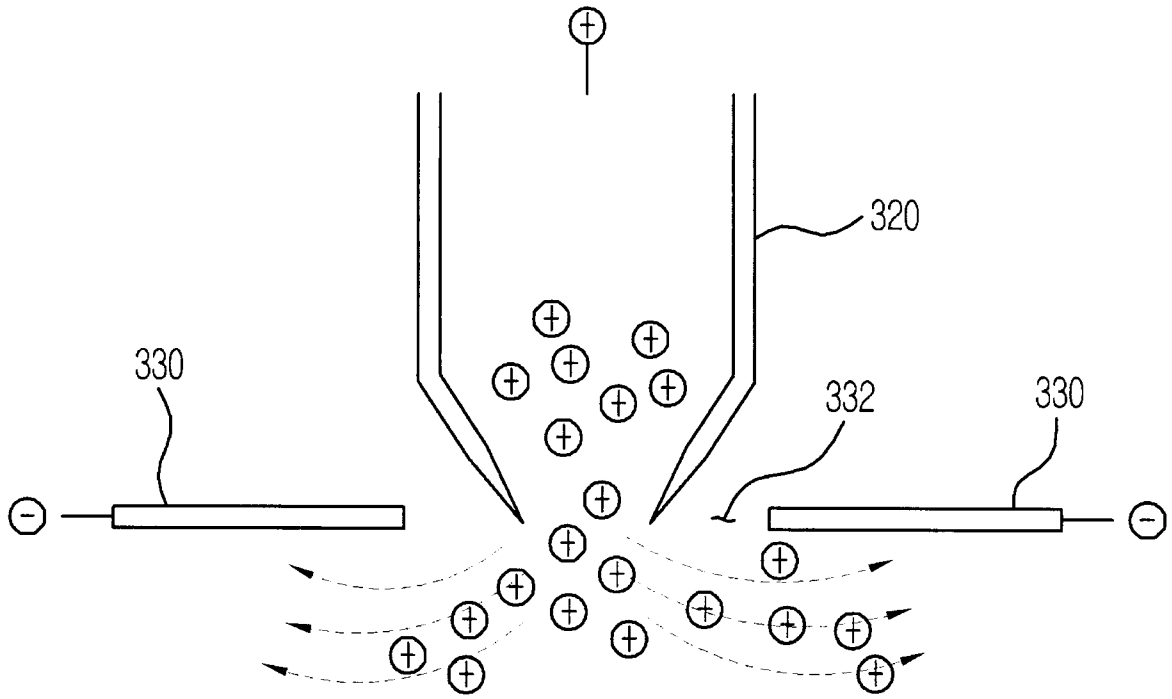

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FIG. 7

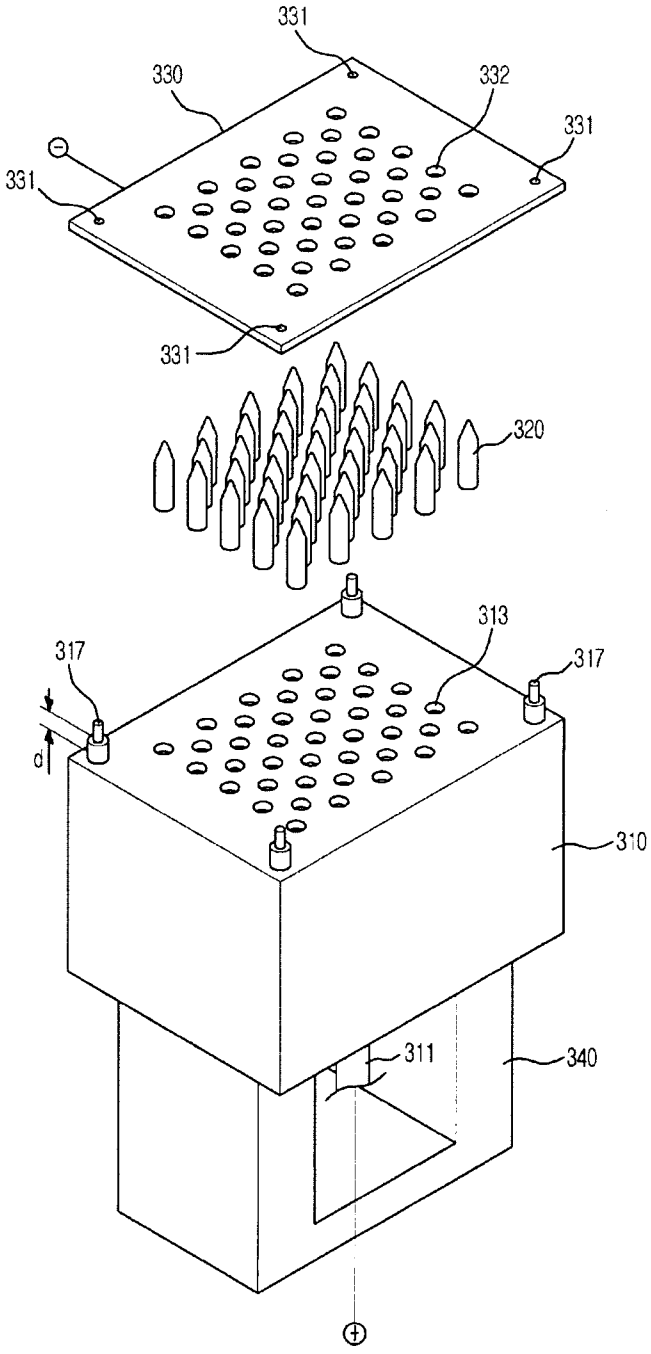

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FIG. 8

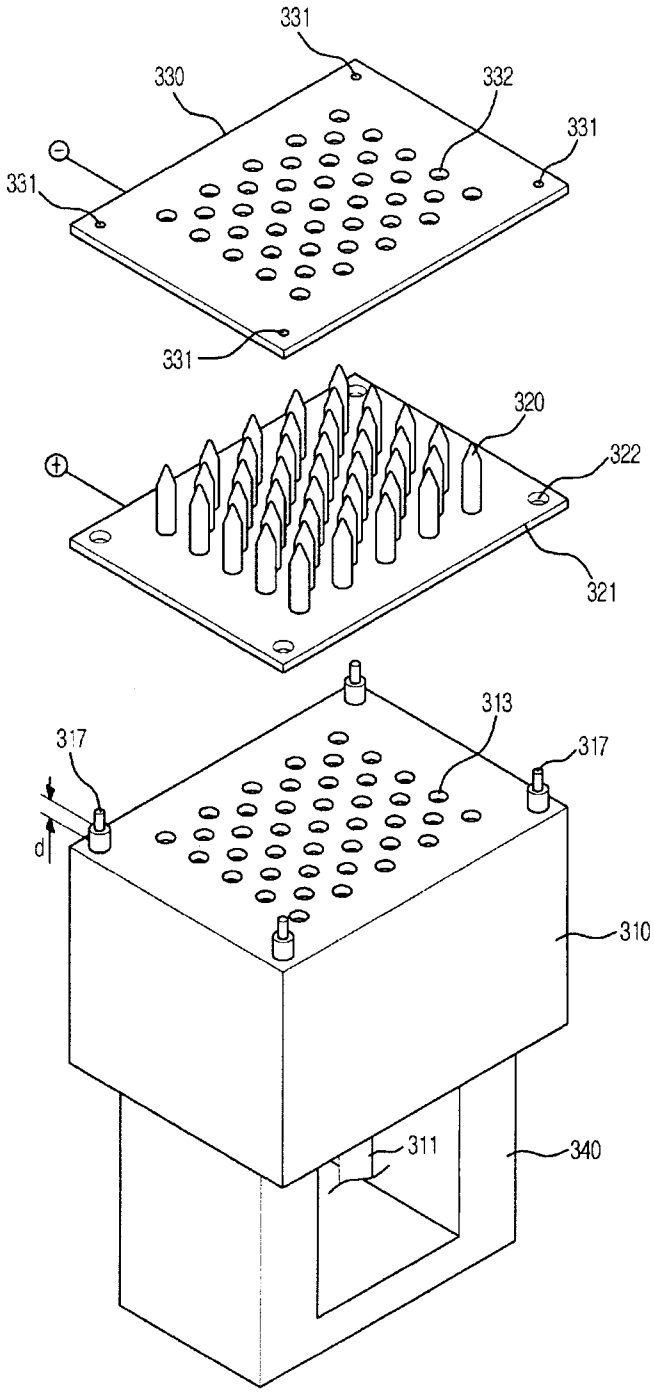

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FIG. 9

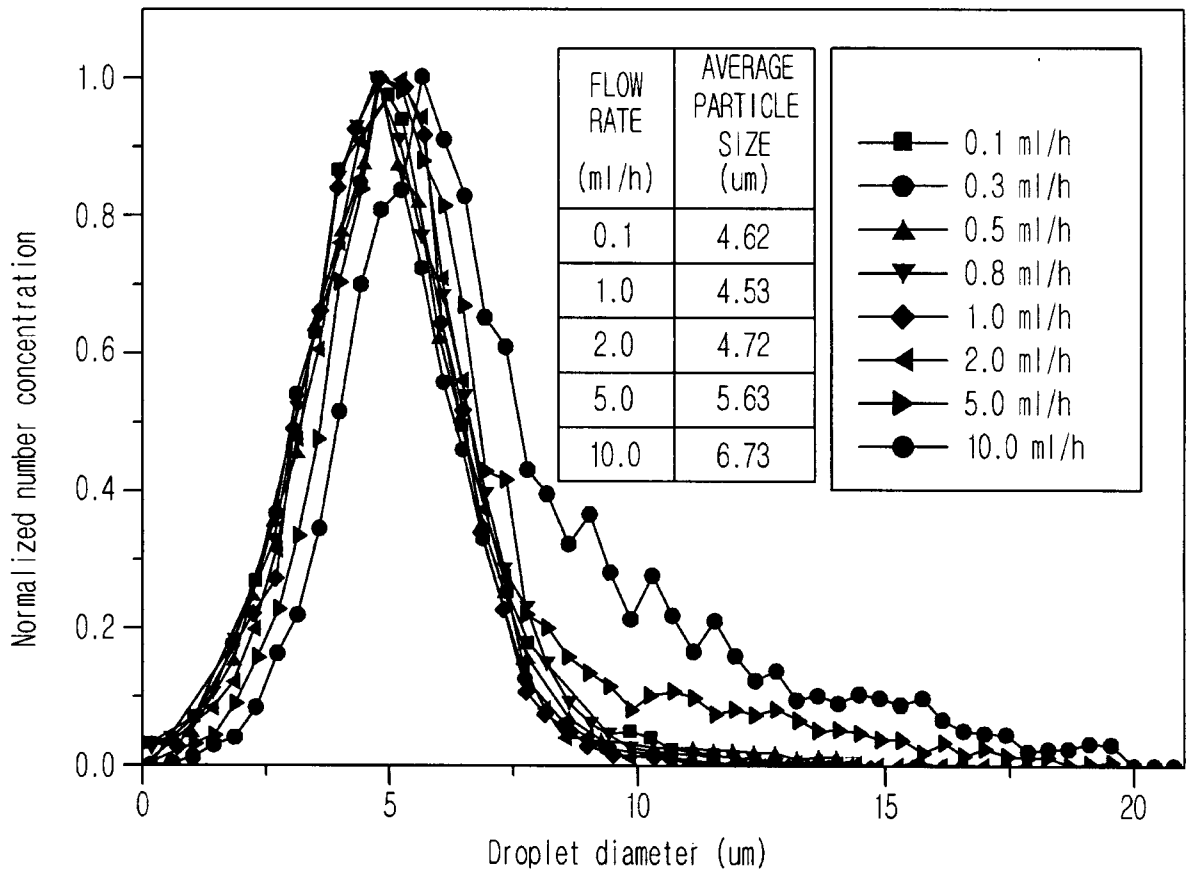

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FIG. 10

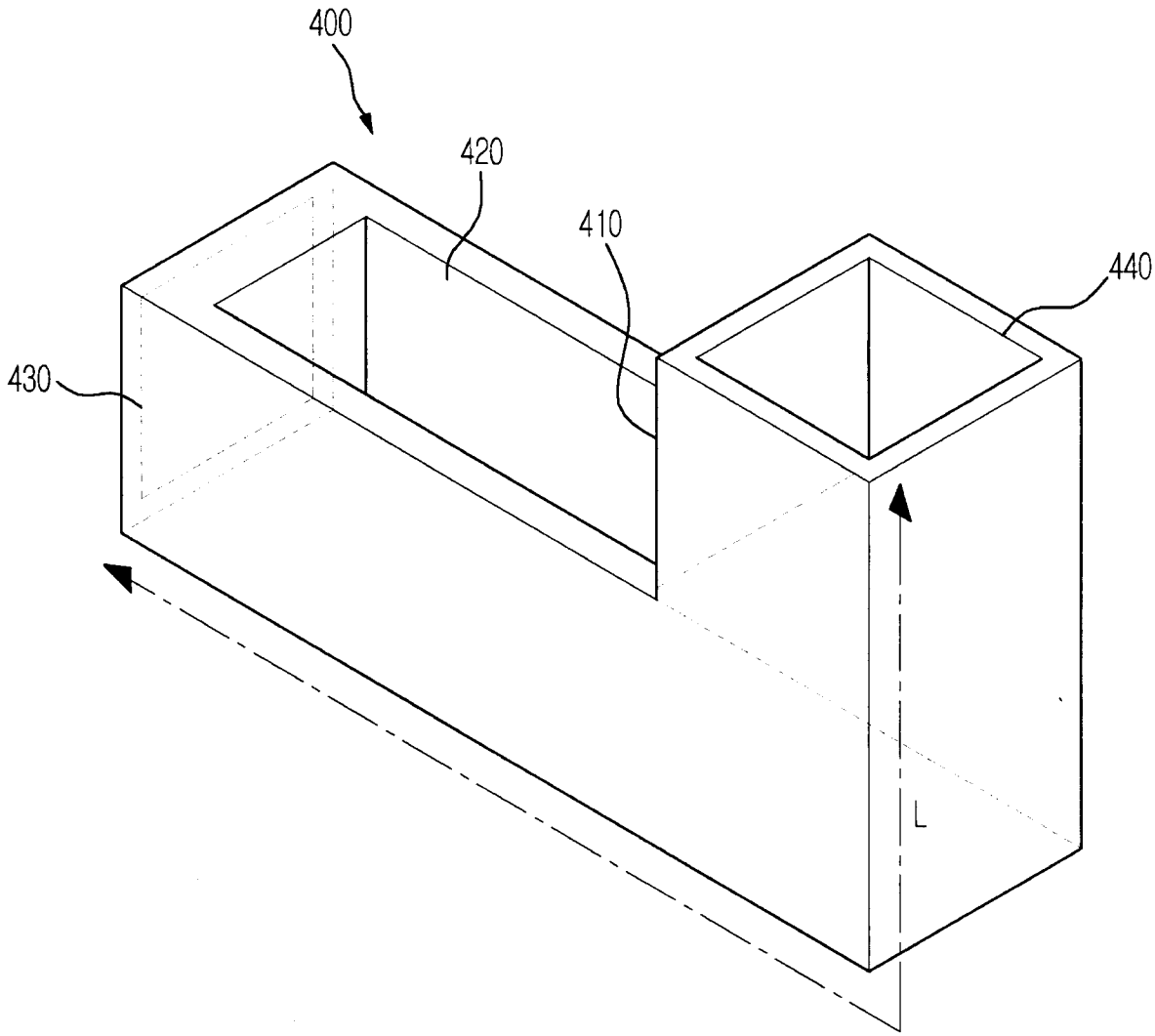

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FIG. 11

Droplet Diameter (um)	Droplet Lifetime(s)						
	RHn = 50%	RHn = 75%	RHn = 80%	RHn = 85%	RHn = 90%	RHn = 95%	RHn = 99%
5.0	0.044	0.094	0.118	0.16	0.24	0.4932	2.5
8	0.11	0.24	0.3	0.41	0.62	1.26	6.37
10.0	0.17	0.37	0.474	0.63	0.973	1.972	10
15.0	0.39	0.84	1.06	1.44	2.19	4.43	22
20.0	0.7	1.5	1.89	2.56	3.89	7.89	40

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FIG. 12

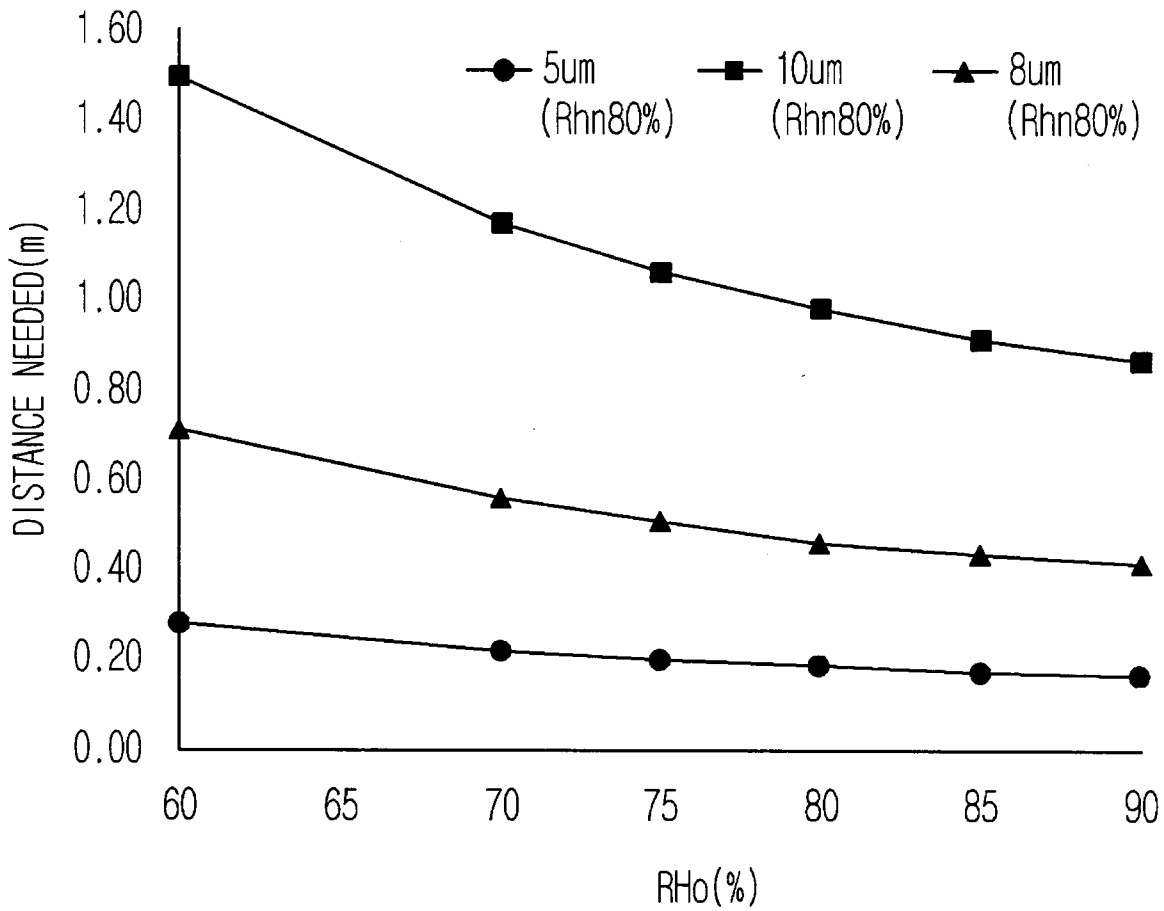

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FIG. 13

Rho (%)	AMOUNT OF AIR (CMM)	EVAPORATION DISTANCE (m)		
		Droplet size 5um	Droplet size 8um	Droplet size 10um
60	2.84	0.28	0.71	1.49
70	2.23	0.22	0.56	1.17
75	2.02	0.20	0.51	1.06
80	1.90	0.19	0.46	0.98
85	1.74	0.17	0.43	0.91

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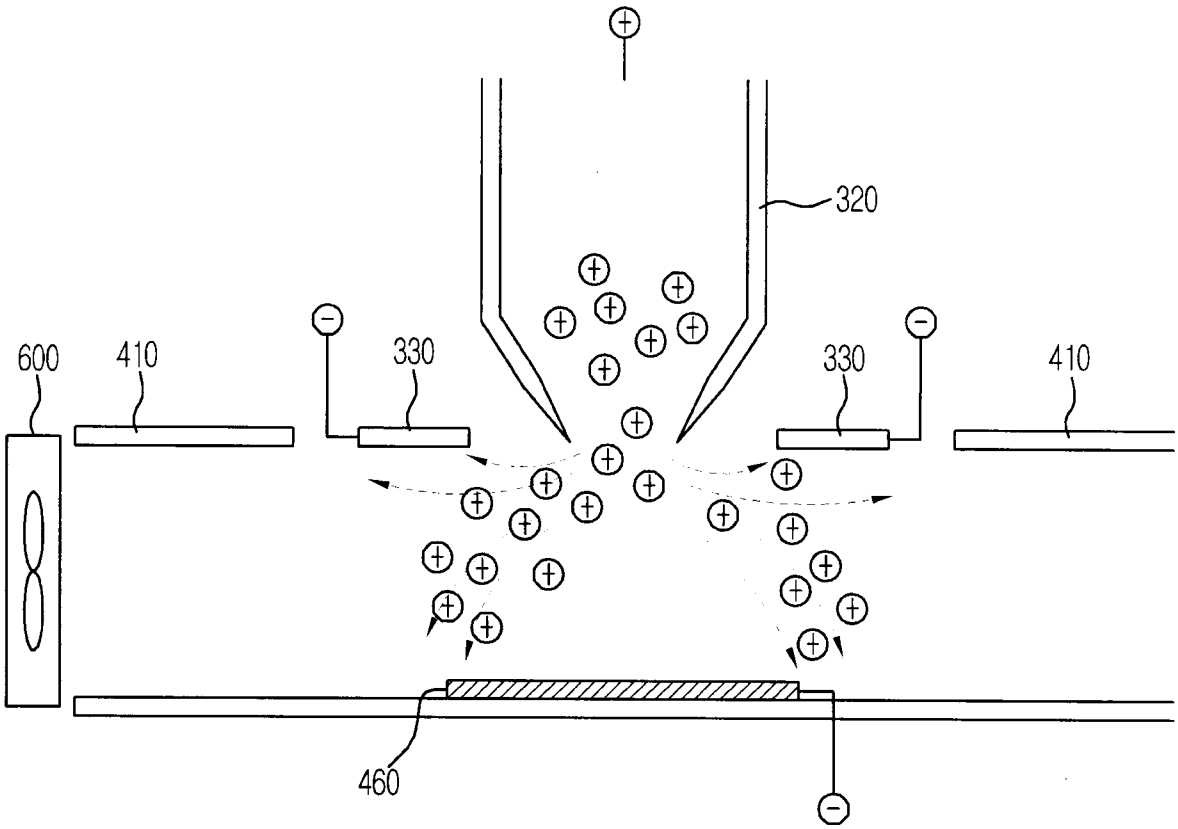
FIG. 14



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Name of the Applicant: SAMSUNG ELECTRONICS CO., LTD. **Total Sheets: 27**

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FIG. 15

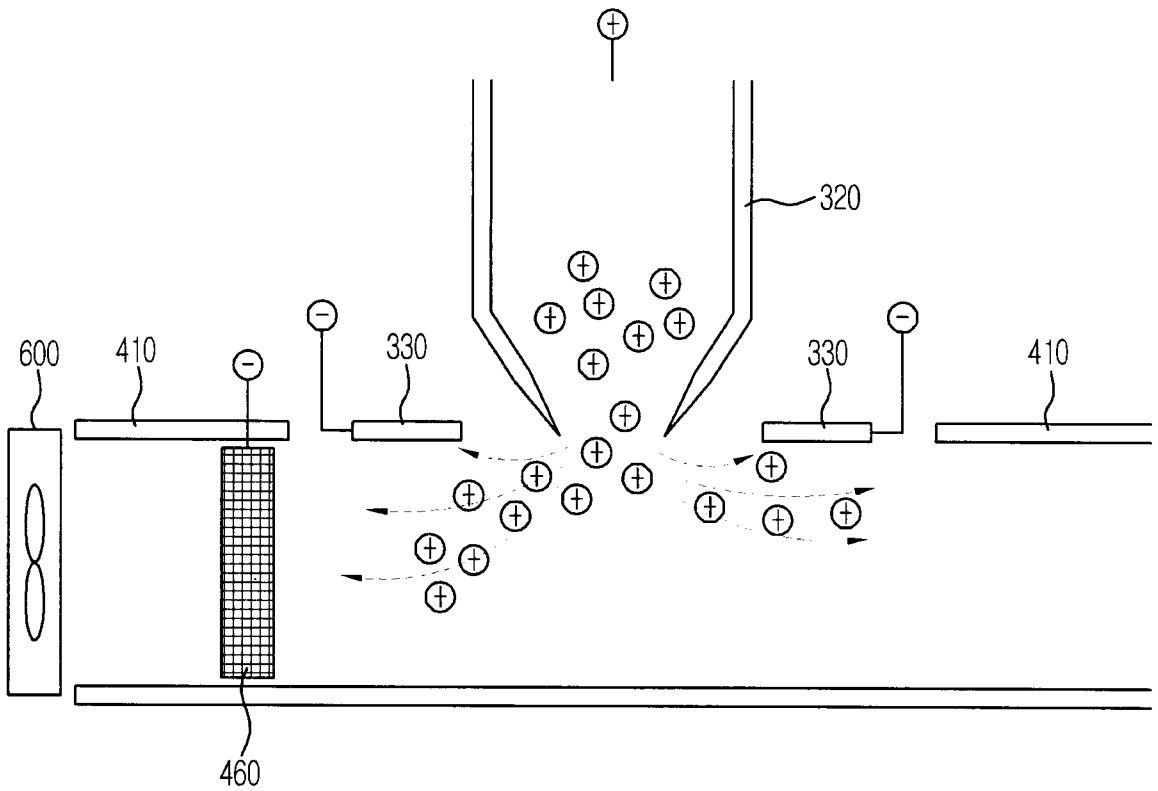

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FIG. 16

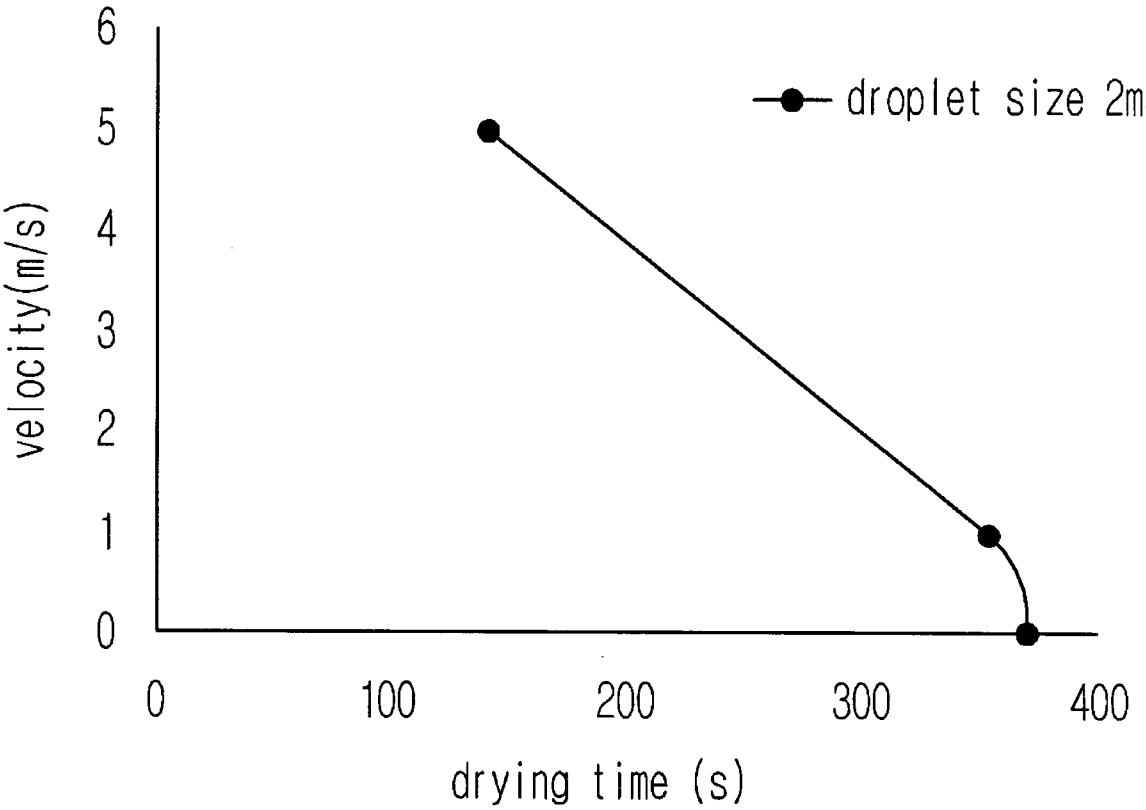

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FIG. 17

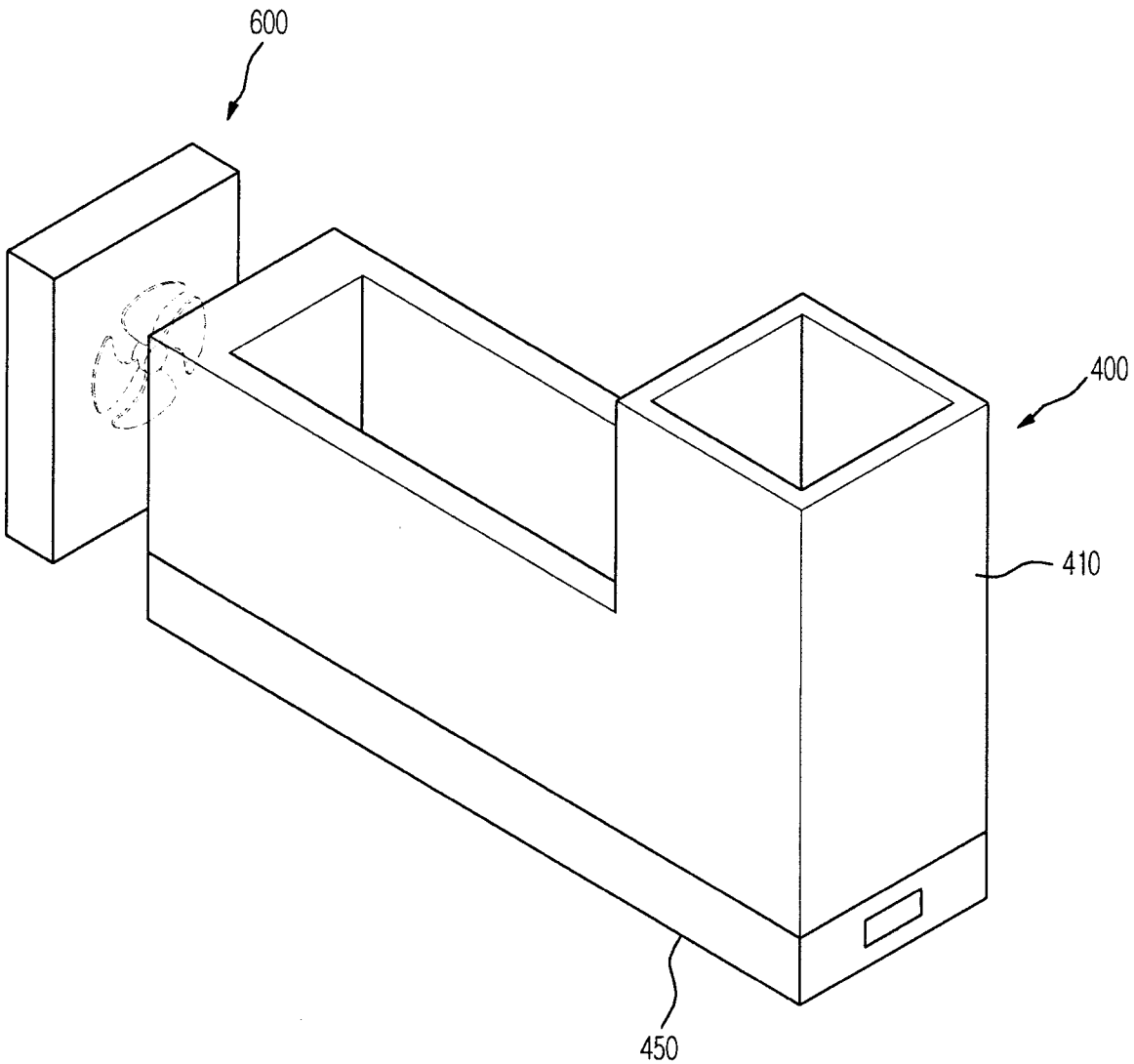

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FIG. 18

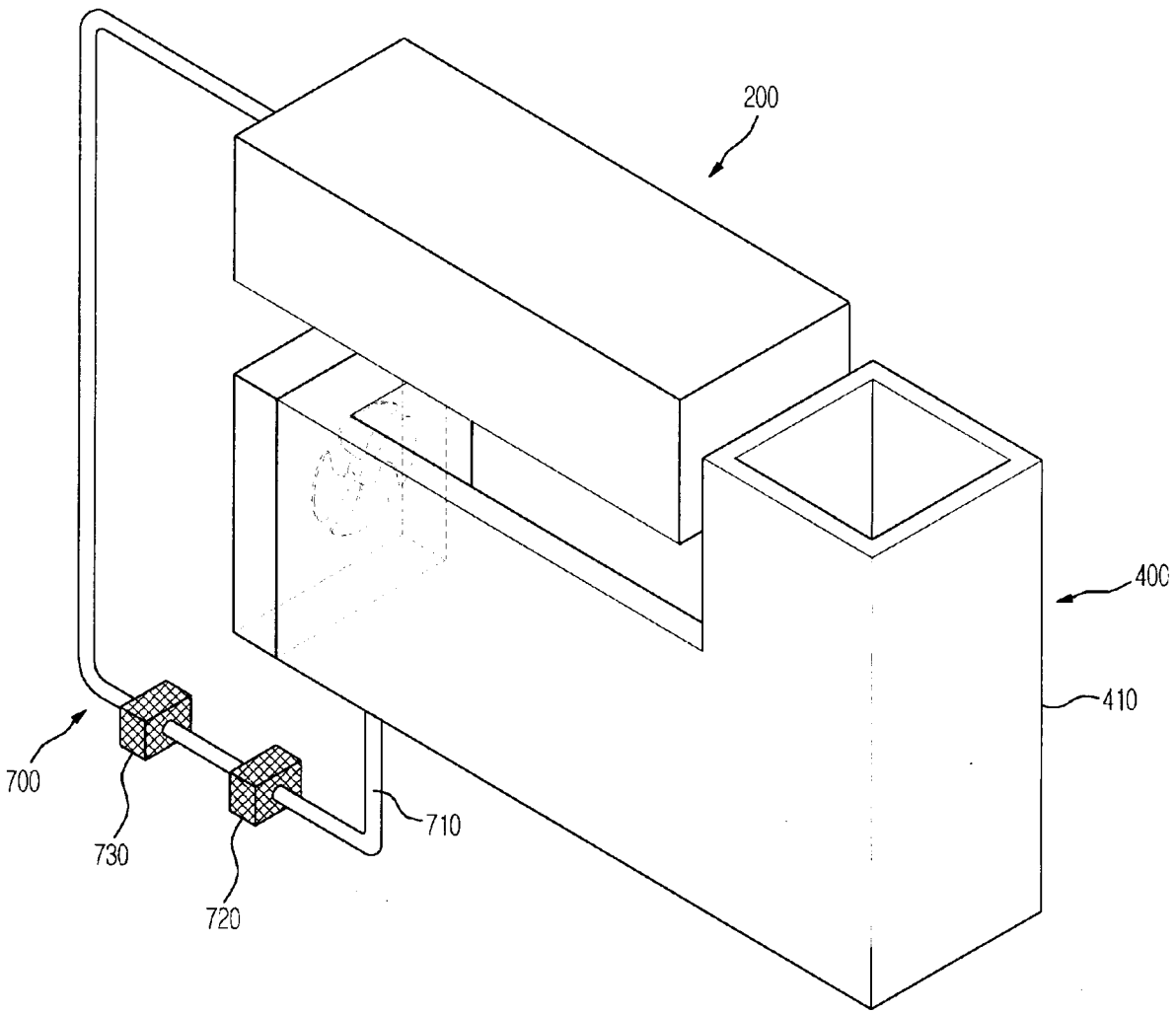

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FIG. 19

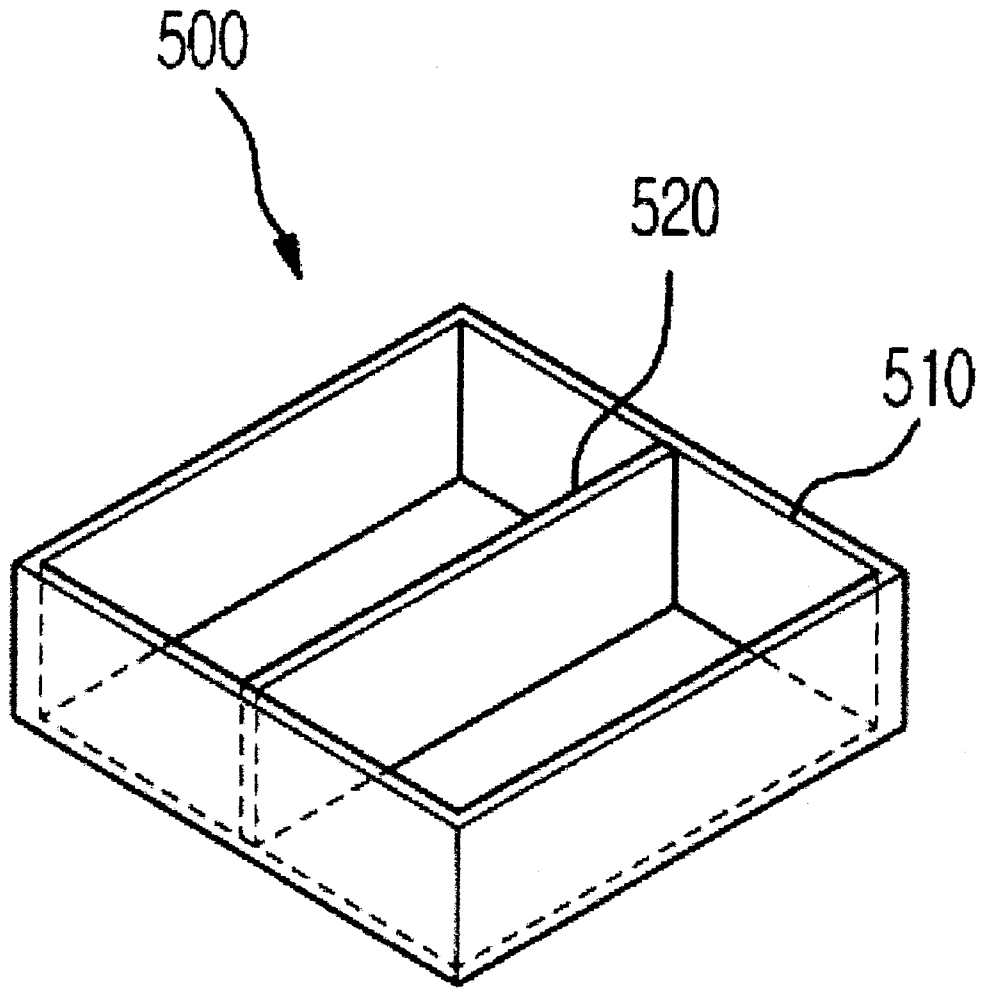

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FIG. 20

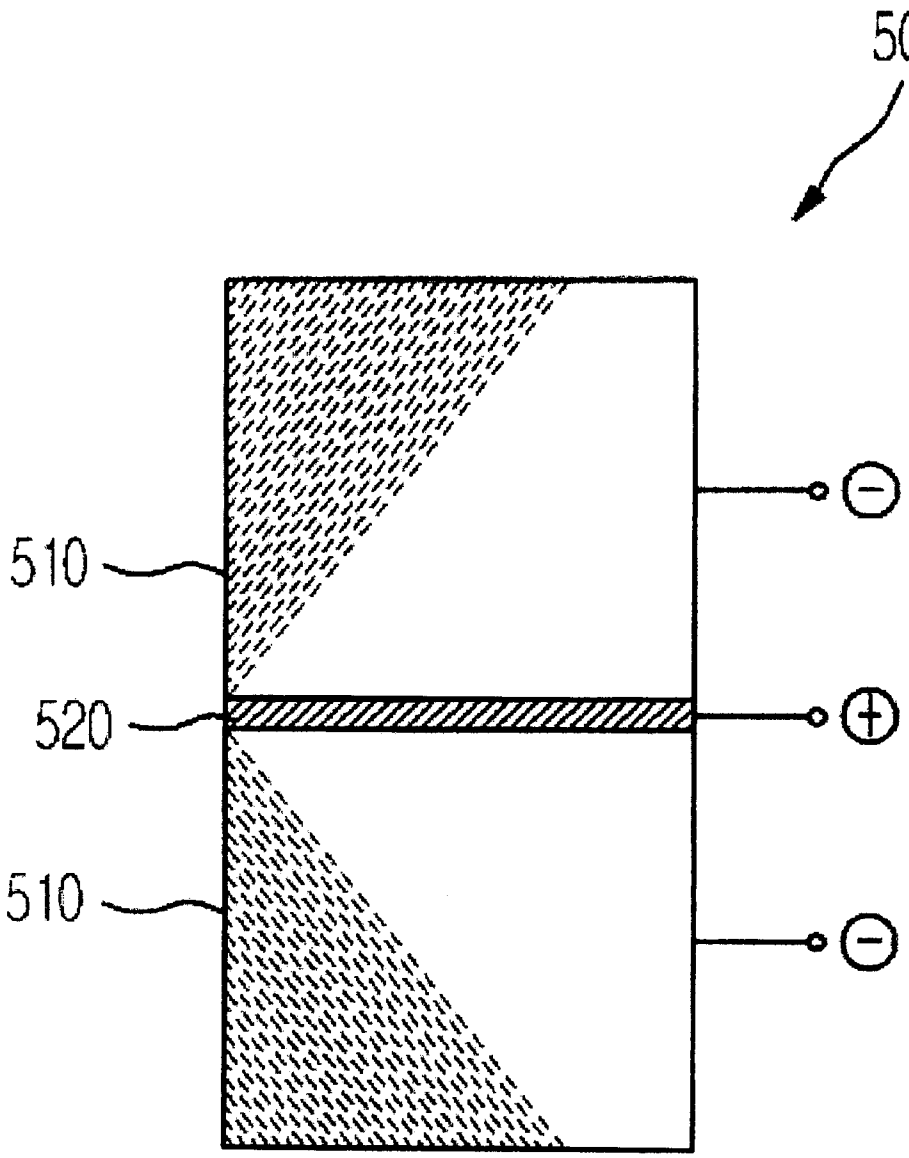

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FIG. 21

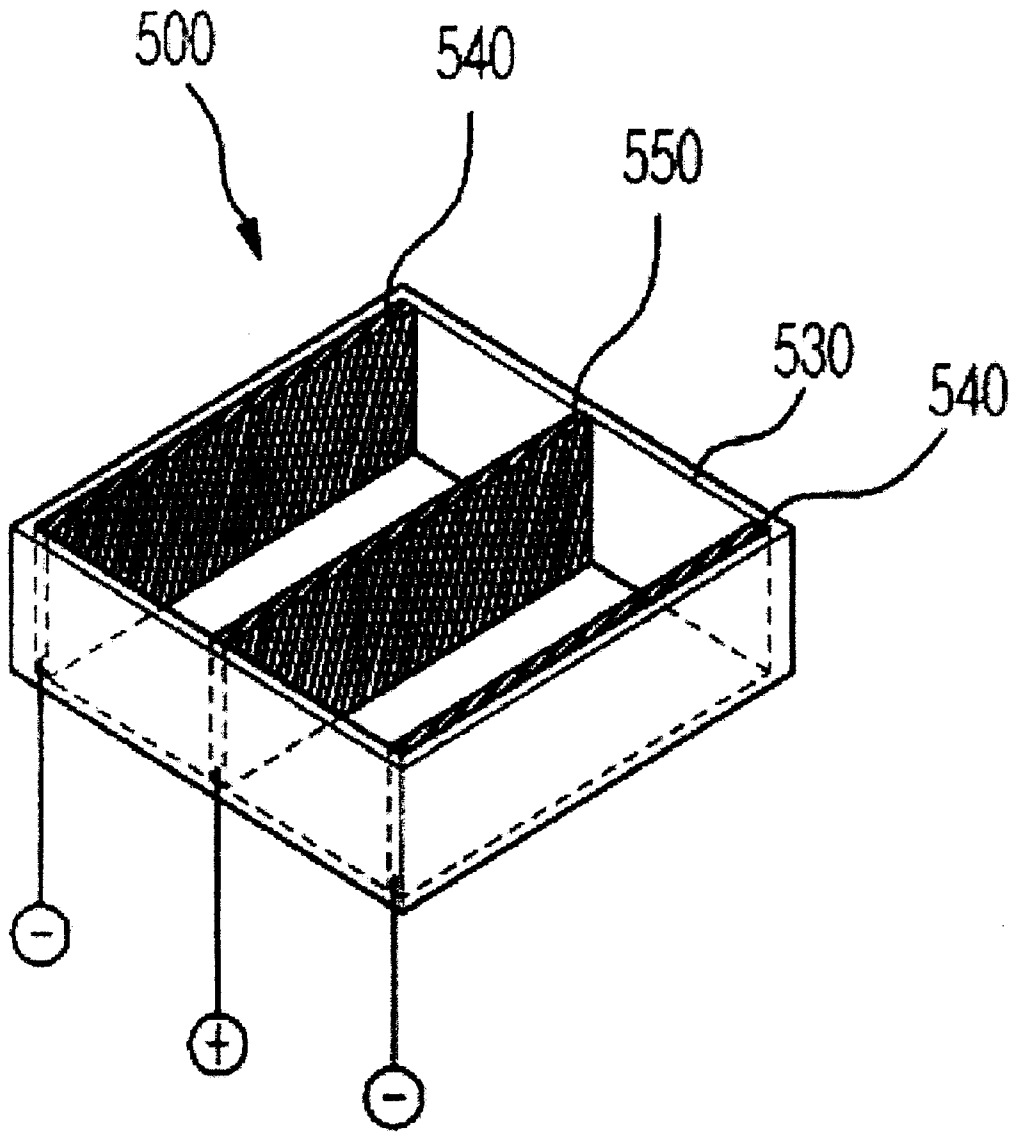

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FIG. 22

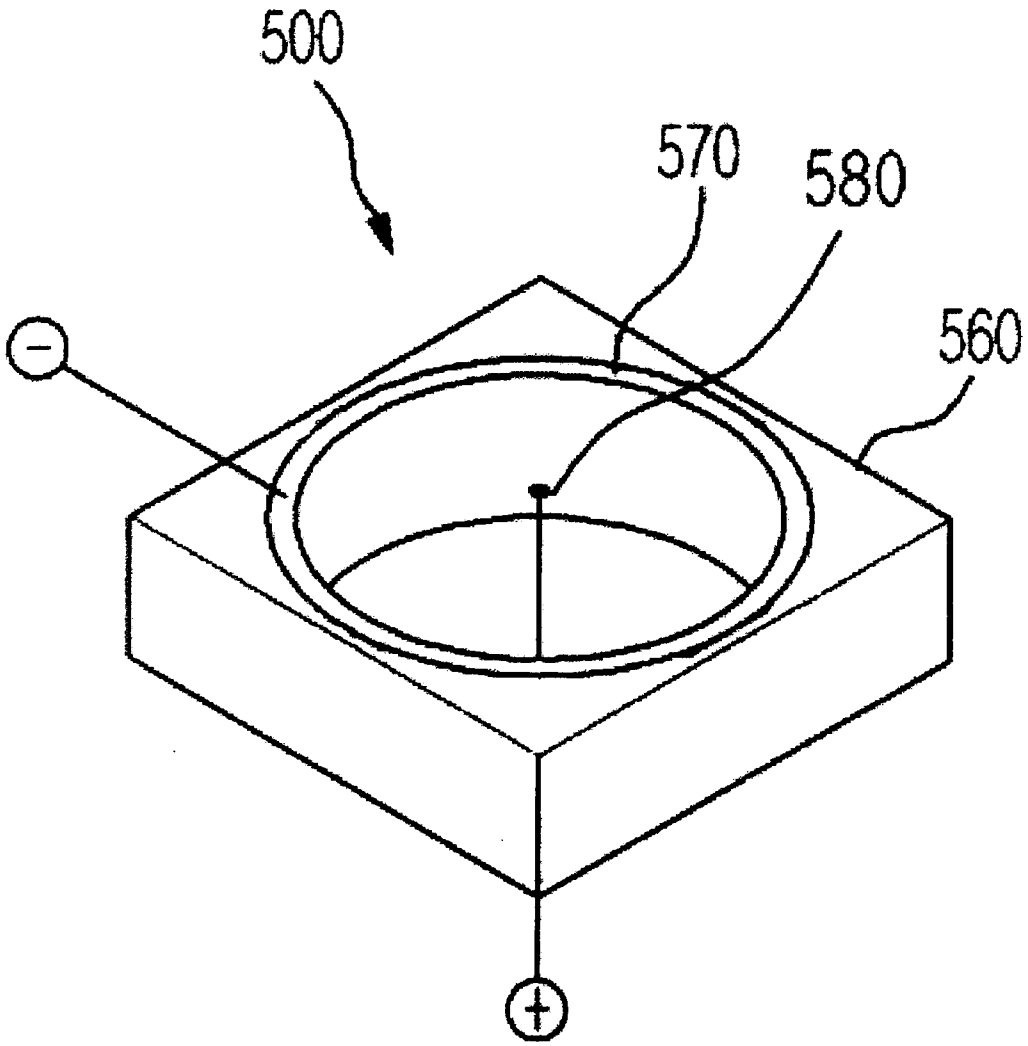

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FIG. 23

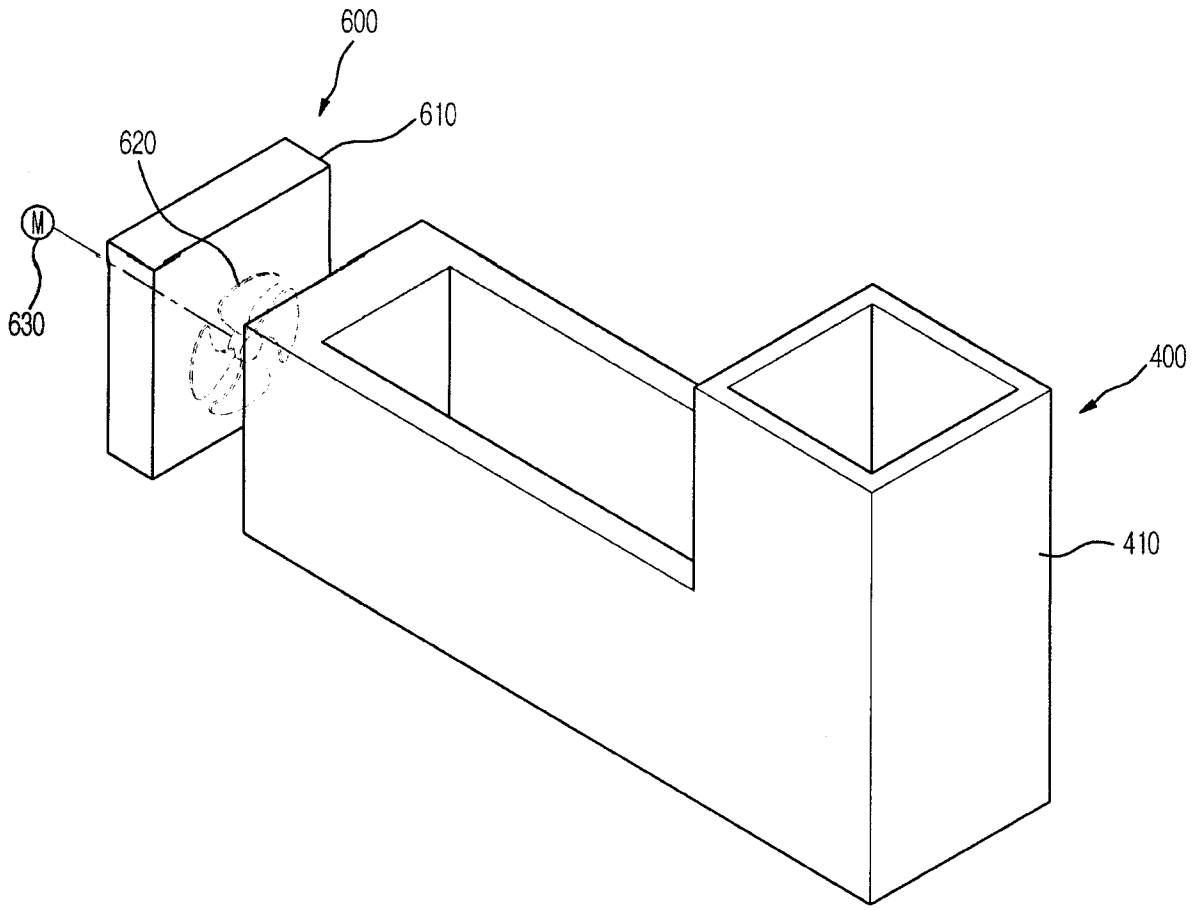

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FIG. 24

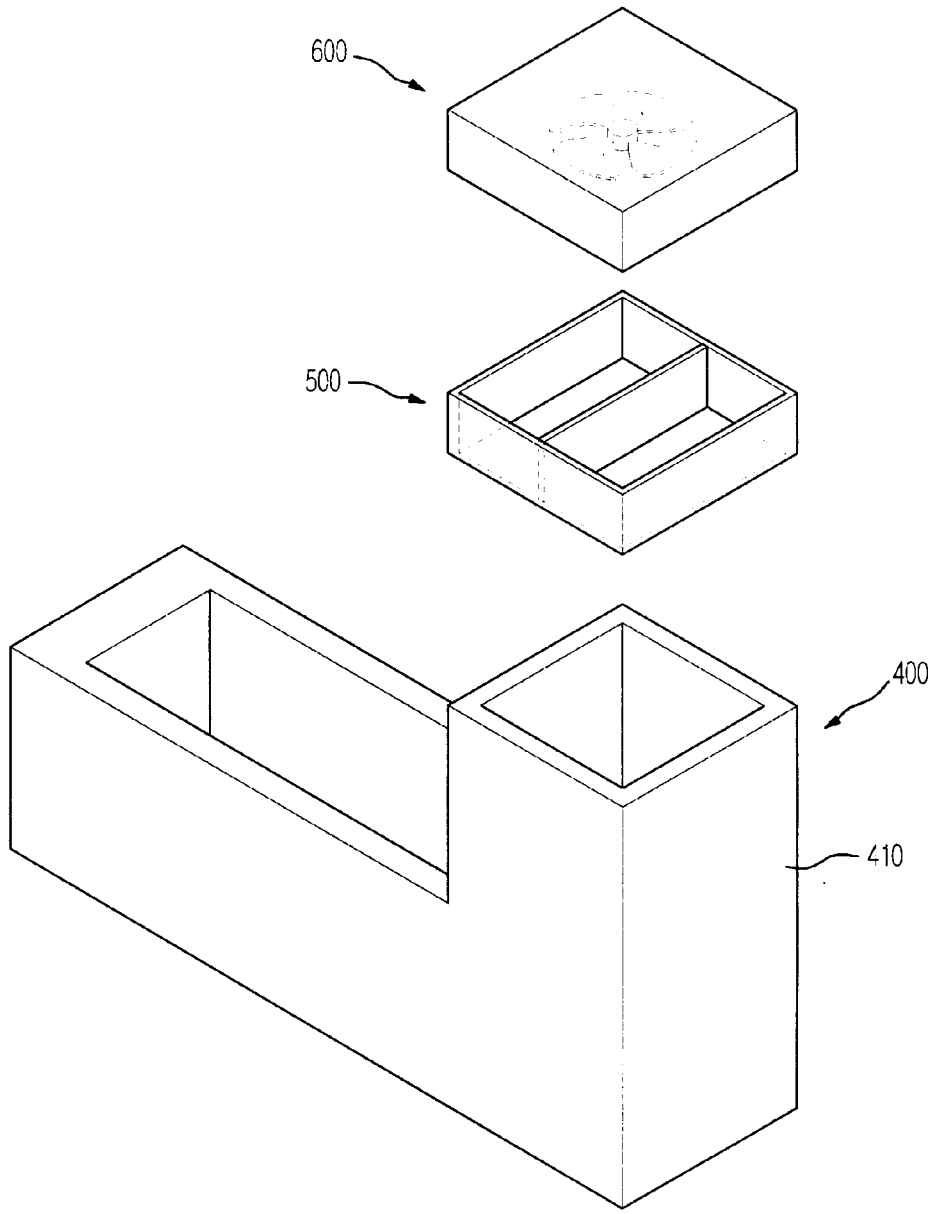

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FIG. 25

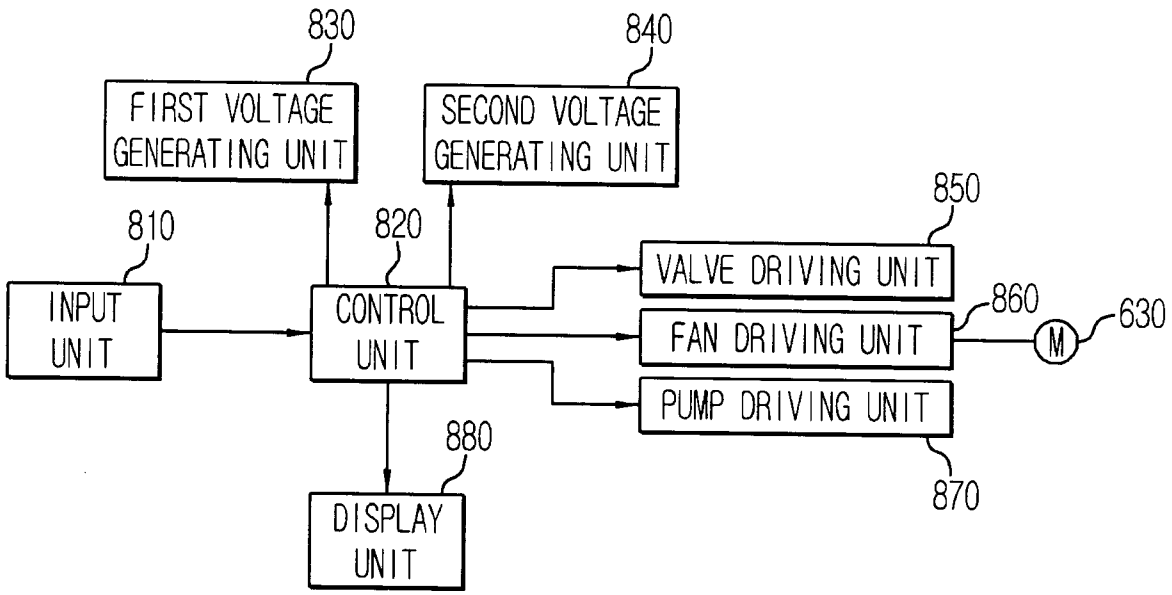

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FIG. 26

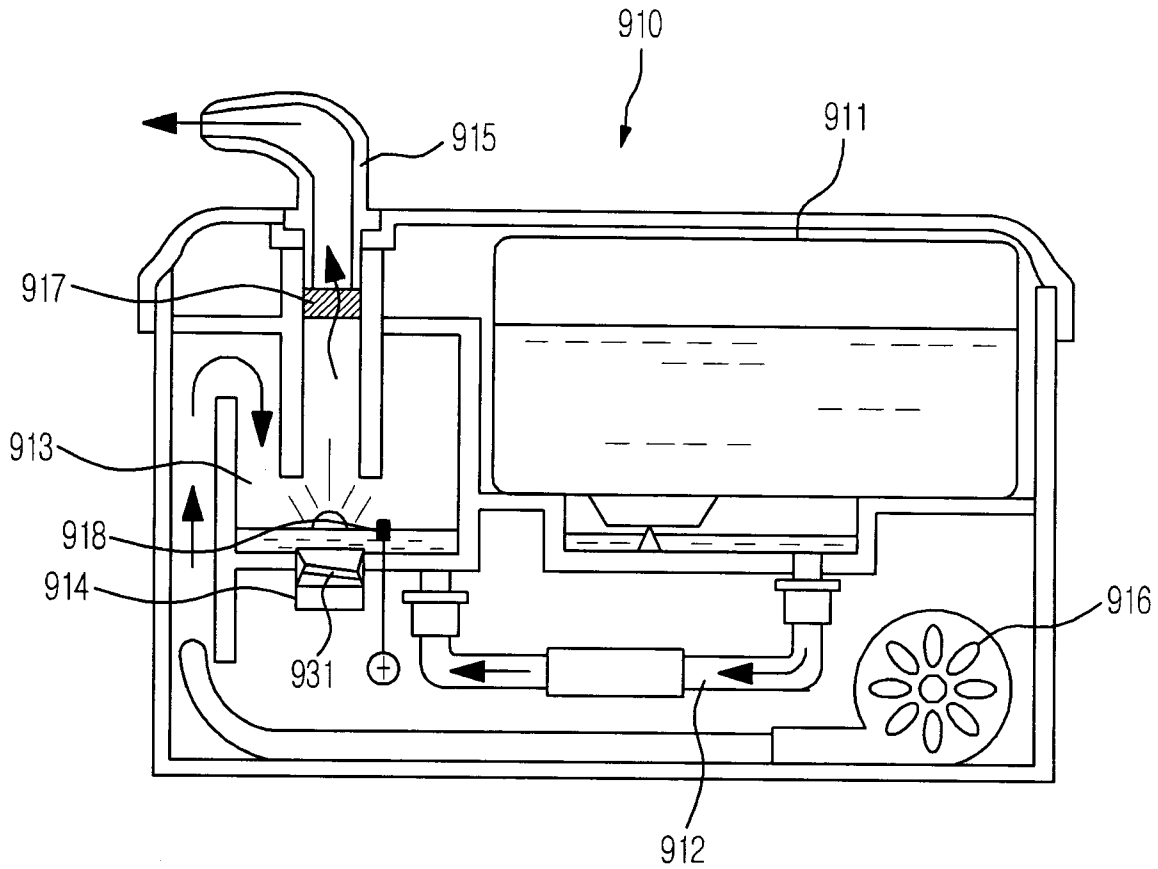

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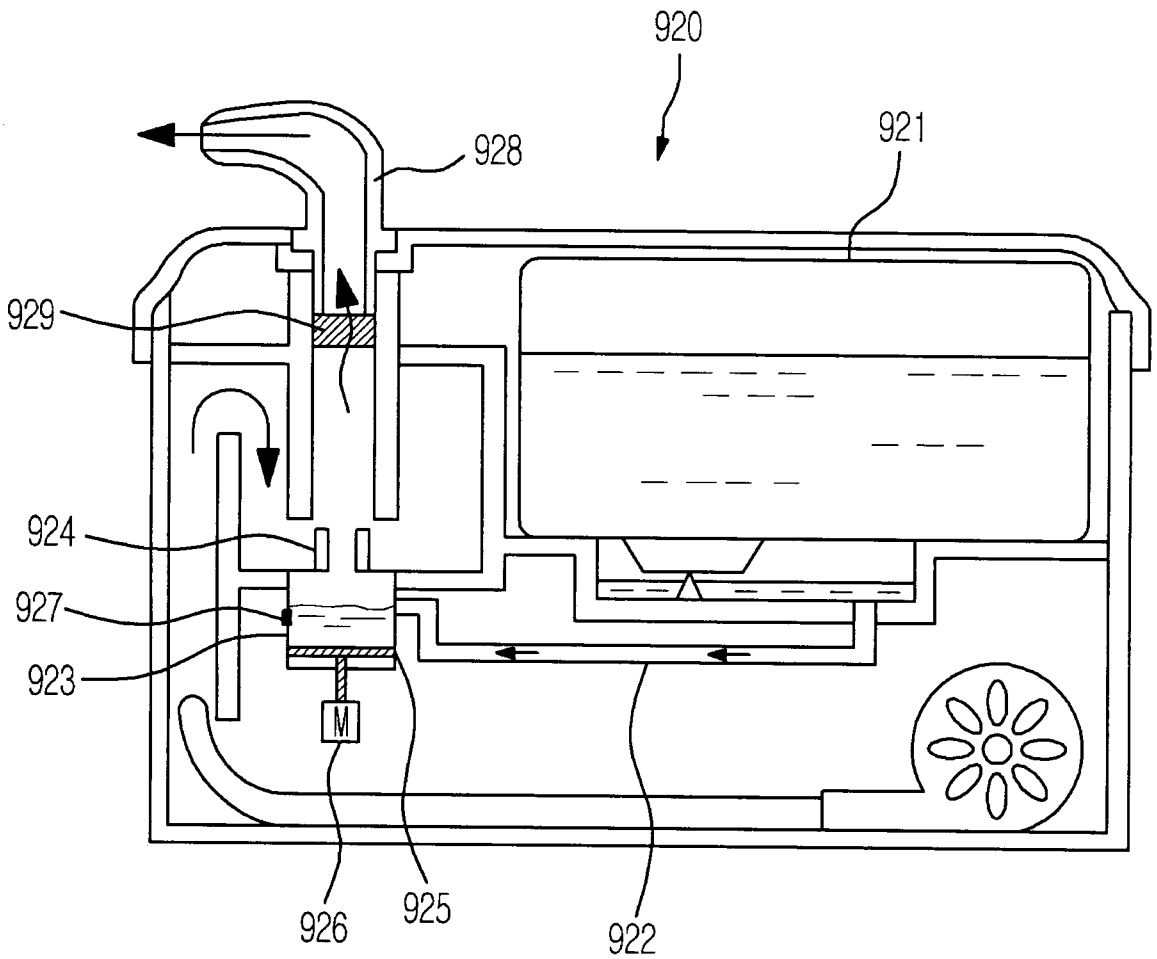
FIG. 27



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DESCRIPTION

Technical Field

The present disclosure relates to a humidifier configured to spray clean water.

Background Art

A humidifier is an apparatus configured to increase or maintain humidity of air in an indoor space, i.e. indoors, and sprays water in a state of droplets or ejects water to an outside in a form of vapour.

The types of the humidifier may include a heating-type humidifier, an ultrasonic-type humidifier, a combination-type humidifier having combined with the heating-type humidifier and the ultrasonic-type humidifier, a centrifugal atomization-type humidifier configured to release the small particles of water after having the water centrifugally floated and collided at a screen, or a filter vapourization-type humidifier configured to generate moisture by evaporating water after having the water passing through a wet filter.

Disclosure

Technical Problem

From the above, the ultrasonic-type humidifier is configured to electrically change water into a state of microscopic droplets by using the vibration of an ultrasonic vibrator, and spray the microscopic droplets into a space by using the blowing blower force of a fan.

The humidifier configured to spray droplets as such is capable of adjusting the amount of the droplets being generated while the power consumption thereof is relatively small, but bacteria may spread in remaining water and thus the bacteria may be sprayed along with the droplets to be propagated into air at an indoor space, while the minerals in the water may also be sprayed in a form of powder to bring pollution at an indoor space.

In recent years, as to sterilize humidifiers, chemical sterilization products are developed, but as the controversy over the hazardous substance contained in the chemical sterilization products is intensified, caution is needed to be applied by a user with respect to using the chemical sterilization products.

The filter vapourization-type humidifier is configured to humidify an indoor space by use of the moisture being naturally evaporated in the process of passing air through a wet disc or a wet filter. In the case as such, since no droplets is generated, the clean humidification may be possible, but because of the principle of such, the amount of humidification per unit area is small, and thus is less suitable for large-capacity humidification, and noise may also be generated by the driving of a fan configured to create an air flow at high air flow rate.

Technical Solution

Therefore, it is an aspect of the present disclosure to provide a humidifier configured to spray electrically-charged droplets.