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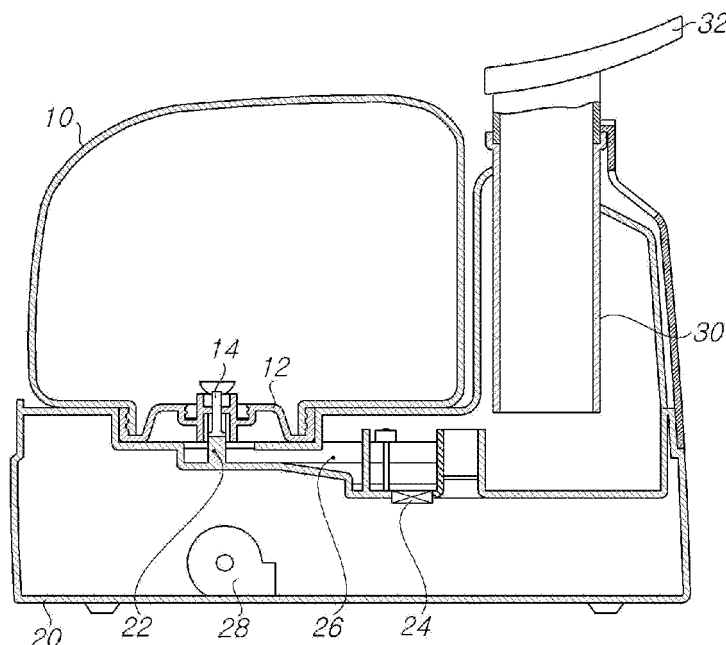
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(54) **Humidifier**

(57) Disclosed is a humidifier integrated with a float to lift a vibrator that atomizes water. The humidifier includes a reservoir used to store water and having an open top surface, a cap for sealing an upper portion of

the reservoir having a discharge port, and a vapor generator coupled with a lower end of the cap to atomize the water. The humidifier facilitates cleaning work for the reservoir and the vibrator, thereby keeping the indoor with clean air while the humidifier is being used.

【FIG. 1】



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a humidifier, more particularly to an ultrasonic humidifier integrated with a float to lift a vibrator that atomizes water.

2. Description of the Related Art

[0002] If a person continuously inhales dry indoor air while living indoors for a long time, the person may suffer from various respiratory diseases caused by continuous inhalation of indoor air. In this regard, a humidifier is used to atomize water and spray the atomized water into the indoor space such that indoor humidity can be maintained at an optimal level.

[0003] When an ultrasonic humidifier, which has been extensively used, generates ultrasonic signals through electric circuits and applies the ultrasonic signals to the vibrator submerged in water, the vibrator vibrates to generate ultrasonic waves. Accordingly, water is atomized into fine particles (vapor) and spattered to the outside due to such a vibration effect.

[0004] FIG. 1 shows the structure of a conventional ultrasonic humidifier.

[0005] Referring to the FIG. 1, the conventional ultrasonic humidifier schematically includes a water tank 10 used to store water, a base 20 to receive various components, such as vibrators and ventilators, and a spray tube 30 and a spray nozzle 32 to guide atomized water to the outside.

[0006] The water tank 10 has a lid 12 used to put water into the water tank 10. The lid 12 is provided therein with a drain port 14. A spring (not shown) is installed in the drain port 14 to lift the drain port 14 of the lid 12 outward at ordinary times. As a result, a space between the drain port 14 and the lid 12 is sealed to prevent the water from flowing out of the water tank 10.

[0007] The base 20 includes a vibrator 24 to atomize water, a circuit part (now shown) electrically connected to the vibrator 24 to apply electric signals and power to the vibrator 24, and a ventilator 28 to generate air flow such that the atomized water is discharged to the outside. The base 20 further includes a protrusion 22 used to push the drain port 14 into the water tank 10 when the water tank 10 is seated on the base 20.

[0008] The spray tube 30 has a substantially cylindrical shape, and guides the atomized water to be discharged out by air flow generated by the ventilator 28. The spray nozzle 32 is put into an upper portion of the spray tube 30, and configured to be rotatable in a desired direction. Accordingly, a user can change the direction in which vapor is discharged.

[0009] Hereinafter, the operation of the conventional ultrasonic humidifier will be described. When a user seats

the water tank 10 containing water on the base 20, the drain port 14 installed in the lid 12 is pushed into the water tank 10 by the protrusion 22 installed on the bottom of the base 20. In this case, a space is made between the drain port 14 and the lid 12, so that the water in the water tank 10 flows out to a reservoir part 26 equipped with the vibrator 24. When a user operates the humidifier, the vibrator 24 atomizes the water. Thereafter, the ventilator 28 operates to generate air flow such that vapor is discharged out through the spray tube 30 and the spray nozzle 32.

[0010] However, the conventional technology has the following problems.

[0011] If the conventional ultrasonic humidifier is continuously used, viruses and funguses are propagated in the water collected in the reservoir part 26 to cause pollution in the reservoir part 26. Accordingly, indoor air may be polluted.

[0012] In order to prevent indoor air from being polluted, the water tank 10 and the base 20 must be continuously cleaned. However, the water tank 10 and the base 20 may not be completely cleaned due to structure thereof. In addition, the reservoir part 26 with the vibrator 24 must be continuously cleaned. However, the movement of the whole base 20 is required, and water may permeate into a circuit board of the base 20 improperly insulated to cause the humidifier to be out of order. Accordingly, as a user does not maintain the humidifier at a clean state, the polluted water is mixed with newly introduced water. In this state, indoor air is humidified, so that the indoor air may be more severely polluted.

SUMMARY OF THE INVENTION

[0013] The present invention has been made to solve the above problems occurring in the prior art.

[0014] An object of the present invention is to provide a humidifier capable of adjusting the humidity of indoor air and sanitarily maintaining indoor environment by conveniently cleaning a reservoir used to store water.

[0015] Another object of the present invention is to provide a humidifier capable of fine humidification by supplying only fine particles among vapor particles, which are generated by using an ultrasonic vibrator, to the outside.

[0016] In order to accomplish the above objects, there is provided a humidifier including a reservoir used to store water and having an open top surface, a cap opening or closing an upper portion of the reservoir, and including a discharge port to discharge vapor, which has been generated in the reservoir, to an outside and a vapor generator coupled with a lower end of the cap to atomize the water.

[0017] According to an embodiment, the vapor generator includes a float having a predetermined amount of buoyancy, and a vibrator installed below the float such that the vibrator simultaneously operates with the float.

[0018] According to another embodiment, the vapor

generator includes a guide part installed on a lower end of the cap, and a vibrator installed at a lower portion of the guide part to generate vapor.

[0019] According to still another embodiment, the vapor generator includes a guide part installed on a lower end of the cap, a float vertically guided by the guide part, and a vibrator installed below the float such that the vibrator simultaneously operates with the float.

[0020] The guide part includes a vertical type guidance section to guide guiding the float, and a bottom surface installed on a lower end of the guidance section to restrict a lowest position of the vibrator.

[0021] The humidifier further includes a water level sensor sensing the level of the water to control an on-off operation of the vibrator.

[0022] The cap includes a lower plate having an inlet port, and an upper plate having an outlet port at the position corresponding to the inlet port. The inlet and outlet ports form a discharge port to discharge the vapor generated in the reservoir to the outside.

[0023] The humidifier further includes a fan installed in the cap such that air flow is generated in the reservoir. The air flow generated from the fan forms cyclone flow in the reservoir.

[0024] According to another embodiment, the cap has a handle installed at an upper portion thereof.

[0025] According to still another embodiment, the guidance section has a cylindrical shape with slits formed in a longitudinal direction, the bottom surface is formed inside the guidance section, the float has a ring shape, the vibrator is integrated with the float below a center portion of the float, the guidance section is put into a space between the float and the vibrator to guide upward and downward movement depending on a level of the water, and the bottom surface restricts the lowest position of the vibrator.

[0026] As described above, according to the ultrasonic humidifier of the present invention, since the vapor generator is installed below the cap, only the reservoir of which the entire top surface is open can be actually separated by separating the cap from the reservoir. Accordingly, the inside of the reservoir can be completely cleaned.

[0027] According to the present invention, the air flow generated from the fan can form cyclone flow in the reservoir. If the cyclone flow is formed in the reservoir, relatively large and heavy particles sink downward due to self-weight and only relatively fine particles are supplied to the outside through the outlet. As a result, fine humidification can be actually achieved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028]

FIG. 1 is a sectional view showing the structure of a conventional ultrasonic humidifier;

FIG. 2 is a perspective view showing the entire outer

appearance of the ultrasonic humidifier according to one embodiment of the present invention;

FIG. 3 is a sectional view schematically showing the internal structure of the ultrasonic humidifier according to the embodiment of the present invention; and FIG. 4 is an exploded perspective view of the humidifier according to the present invention.

DESCRIPTION OF THE EMBODIMENTS

[0029] Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0030] FIG. 2 is a perspective view showing the entire outer appearance of a humidifier according to an embodiment of the present invention, FIG. 3 is a sectional view schematically showing the internal structure of the humidifier according to the embodiment of the present invention, and FIG. 4 is an exploded perspective view of the humidifier according to the present invention.

[0031] As shown in FIGS 2 to 4, the humidifier of the present invention includes a reservoir 200 used to store water and having an open top surface, a cap 300 for opening and closing an upper portion of the reservoir 200, and having an outlet port to discharge vapor, and a vapor generator 100 coupled with a lower end of the cap 300 to atomize water.

[0032] The reservoir 200 has a substantially cylindrical shape and has the open top surface. Since the entire top surface of the reservoir 200 is open, the inside of the reservoir is very easy to be cleaned actually. The top surface of the reservoir 200 is open and closed by the cap 300. In other words, the cap 300 is separated from the reservoir 200, so that water can be supplied into the reservoir 200 or the inside of the reservoir 200 can be cleaned.

[0033] The vapor generator 100 according to the present invention is installed at a lower portion of the cap 300. Therefore, when the cap 300 is separated from the reservoir 200, the vapor generator 100 is separated from the reservoir 200 together with the cap 300, as shown in FIG. 4.

[0034] The vapor generator 100 includes a vibrator 110 to generate ultrasonic waves to atomize the water, a water level sensor 130 to sense the level of water such that operations of the humidifier may be stopped, and a float 150 having a predetermined amount of buoyancy to hold the vibrator 110 under water having a predetermined depth.

[0035] The float 150 has a substantially ring shape. The vibrator 110 is coupled with the float 150 at the center of the float. For example, the vibrator 110 may be coupled with a connection arm 152 formed inside the float 150, so that the float 150 can be coupled with the vibrator 150 to simultaneously operate with the vibrator 150. In this case, the vibrator 110 is lower than the float 150 by a predetermined height. In other words, if the float 150 floats on the surface of the water, the vibrator 110 must

be submerged under water having a preset depth. The water level sensor 130 is installed on a top surface of the vibrator 110.

[0036] The vibrator 110 and the float 150 are vertically guided by a guide part 170 mounted on a bottom surface of the cap 300. The guide part 170 has the shape of a substantially cylinder having a thin thickness, and includes a guidance section 172 defined as longitudinal slits at the central portion of the guide part 170 and a bottom surface 174 formed at a lower end portion of the guidance section 172 of the guide part 170.

[0037] The guidance section 172 is fitted into a space between the float 150 and the vibrator 110, thereby guiding the vibrator 110 and the float 150 to vertically move depending on a varying water level in the reservoir 200. When the water in the reservoir 200 is reduced to a predetermined amount, the vapor generator 100 is seated on the bottom surface 174 of the guide part 170. That is, the lowest position of the vibrator 110 is restricted by the bottom surface 174. An upper end of the guidance section 172 is coupled with the lower end of the cap 300 that will be described below. Accordingly, when a handle 350 of the cap 300 is lifted, the cap 300, the guide part 170 and the vapor generator 100 are lifted together with the handle 350.

[0038] According to the embodiment, the vibrator 110 is located inside the guidance section 172, and the float 150 connected to the vibrator 110 is located outside the guidance section 172. Thus, when the cap 300 is lifted, the vibrator 110 and the float 150 can be removable from the reservoir 200 together with the guide part 170 attached to the lower end of the cap 300.

[0039] The water level sensor 130 is located lower than the float 150 by a predetermined height. Accordingly, when a small amount of water is left inside the reservoir 200 in the extent that the float 150 cannot float the vibrator 110, the water level sensor 130 is exposed to air to sense the shortage of water and allow the circuit part to generate an electric signal that stops the operation of the vibrator 110.

[0040] The upper portion of the reservoir 200 is open and closed by the cap 300. The cap 300 includes a lower plate 310 having an inlet port 320 and an upper plate 330 having an outlet port 340 and the handle 350. The inlet port 320 is upward recessed such that vapor can be spouted out. The outlet port 340 of the upper plate 330 is downward recessed at the position corresponding to that of the inlet port 320 of the lower plate 310.

[0041] If the upper plate 330 is coupled with the lower plate 310, the inlet port 320 communicates with the outlet port 340 to form a discharge port A that discharges vapor generated in the reservoir 200.

[0042] A fan 360 is installed inside the cap 300. The fan 360 is configured to generate air flow into the reservoir 200. In other words, holes are formed in the lower plate 310 on which the fan 360 are mounted, so that the air flow generated by the fan 360 is supplied into the reservoir 200 through the hole. In addition, a circuit board 370

may be installed inside the cap 300 to control the operating state of the fan 360 or the vibrator 110.

[0043] Accordingly, if the user operates the humidifier, air flow is generated by the fan 360 installed inside the cap 300, and then supplied into the reservoir 200 through holes (not shown) formed in a bottom surface of the lower plate 310 on which the fan 360 is mounted. The air flow allows the vapor generated by the vibrator 110 to be spout out through the discharge port A formed by the inlet port 320 and the outlet port 340. That is, the inlet port 320 and the outlet port 340 cooperate with each other to guide the vapor to be discharged out.

[0044] Hereinafter, the air flow supplied into the reservoir 200 by the fan 360 will be described. The air flow generated by the fan 360 preferably makes cyclone flow in the reservoir 200. When the cyclone flow is generated in the reservoir 200, relatively light particles (i.e., the finest particles) among vapor particles go out through the discharge port A. In contrast, actually heavier particles sink downward due to self-weight. Therefore, only fine particles go out through the discharge port A by the cyclone flow which is generated in the reservoir 200 by the fan 360, so that fine humidification can be practically expected.

[0045] To allow the air flow generated by the fan 360 to form cyclone flow in the reservoir 200, the position of the fan 360 may be adjusted to be inclined in the circumferential direction of the reservoir 200, or a separate guide unit may be installed on the lower plate 310 such that the air flow generated by the fan 360 flows in the circumferential direction in the reservoir 200.

[0046] The handle 350 is installed on the upper plate 330. The handle 350 extends while crossing over a top surface of the upper plate 330. A space is formed between the central portion of the handle 350 and the central portion of the upper plate 330 to allow the user to put a portion of his or her hand into the space to lift the cap 300 easily.

[0047] Locking protrusions 210 stick out from the upper ends of both insides of the reservoir 200. Locking slits 380 are formed at lower ends of both side surfaces of the lower plate 310 such that the locking protrusions 210 are inserted into the locking SLITS 380. Each of the locking slits 380 includes an insertion groove 382 that is longitudinally formed, and a locking groove 385 extending to the right from an upper end of the insertion groove 382 perpendicularly to the insertion groove 382. The locking protrusions 210 of the reservoir 200 must be put into the insertion groove 382 in the lower plate 320 when the reservoir 200 is closed by using the cap 300. Then, if the cap 300 is rotated in the extension direction of the locking groove 384, the cap 300 and the reservoir 200 are locked. In this state, if the locked cap 300 is lifted, the reservoir 200 is lifted together with the cap 300.

[0048] To unlock the cap 300 in a state in which the cap 300 and the reservoir 200 has been locked, the above procedure is performed in reverse. That is, if the cap 300 is rotated in a direction opposite to the extension direction

of the locking groove 384, moved to the position where the insertion groove 382 is formed, and then lifted the cap 300, the cap 300 is unlocked.

[0049] The vibrator 110 to generate the vapor is electrically connected to the circuit part 370. For example, the vibrator 110 may be connected to the circuit part 370 through wires. In this case, the wires must have sufficient waterproof capability, and connection portions between the wires and the vibrator 110 must be completely waterproofed, for example, through silicon coating.

[0050] Hereinafter, the operation of the humidifier according to an exemplary embodiment of the present invention will be described in detail. First, an operation procedure of the humidifier according to the present invention will be described.

[0051] A predetermined amount of water is stored in the reservoir 200. If the user pushes an operation button of the humidifier, an electric signal generated from the circuit part 370 is transferred to the vibrator 110. Accordingly, if the vibrator 110 vibrates to generate ultrasonic waves, the water is atomized and scattered out. In addition, the fan 360 installed in the cap 300 operates and generates air flow in the reservoir 200. In this case, the atomized water (vapor) passes through the inlet port 320 of the lower plate 310, and spouts out through the outlet port 340 of the upper plate 330, by the air flow generated from the fan 360.

[0052] As described above, when the air flow generated by the fan 360 forms cyclone flow inside the reservoir 200, larger and heavier particles among vapor particles generated by the vibrator sink downward due to self-weight during circling, and smaller and finer particles are supplied to the outside through the discharge port A.

[0053] If the level of the water in the reservoir 200 is gradually lowered due to the operation of the vibrator 110, the float 150 and the vibrator 110 descend downward along the guidance section 172 of the guide part 170. If the water in the reservoir 200 is left less than a predetermined amount, the vibrator 110 is seated on the bottom surface 174 of the guide part 170. If the level of the water becomes more lowered due to the continuous operation of the humidifier, the water level sensor 130 senses the level of the water to transmit the sensing result to the circuit part 370. Upon receiving the signal, the circuit part 370 transmits an electric signal that stops the operation of the vibrator 110 to the vibrator 110. Accordingly, the operation of the vibrator 110 is stopped.

[0054] Next, a procedure of cleaning the humidifier according to the present invention will be described in detail.

[0055] When all the water stored in the reservoir 200 is used up or a user intends to clean the humidifier, the handle 350 formed on the upper plate 330 is rotated in a direction opposite to the extension direction of the locking groove 384 and lifted along the insertion groove 382. In this case, the cap 300, the guide part 170 fitted into the lower plate 310, and the vapor generator 100 placed on the bottom surface 174 of the guide part 170 are lifted together. At this time, the guide part 170 fitted into the

lower plate 310 may be separated from the lower plate 310. As a result, the reservoir 200 and the guide part 170, from which the above components have been separated, may be easily cleaned. Also, the vapor generator 100 may be separated from the above components and easily cleaned. Accordingly, a user can easily clean the reservoir 200 and the vapor generator 100 to cleanly maintain the components. As a result, the user can keep indoor air with clean through the humidifier.

[0056] Although the exemplary embodiments of the present invention have been described, it is understood that the present invention should not be limited to these exemplary embodiments but various changes and modifications can be made by ordinary skilled in the art within the spirit and scope of the present invention as hereinafter claimed

Claims

1. A humidifier comprising:

- a reservoir used to store water and having an open top surface;
- a cap opening or closing an upper portion of the reservoir, and including a discharge port to discharge vapor, which has been generated in the reservoir, to an outside; and
- a vapor generating means coupled with a lower end of the cap to atomize the water.

2. The humidifier of claim 1, wherein the vapor generator comprises a float having a predetermined amount of buoyancy, and a vibrator installed below the float such that the vibrator simultaneously moves up and down with the float.

3. The humidifier of claim 1, wherein the vapor generator comprises a guide part installed on a lower end of the cap, and a vibrator installed at a lower portion of the guide part to generate vapor.

4. The humidifier of claim 2, wherein a guide part is installed on a lower end of the cap and the float is vertically guided by the guide part.

5. The humidifier of claim 4, wherein a bottom surface installed on a lower end of the guidance section to restrict a lowest position of the vibrator.

6. The humidifier of one of claims 1 to 5, wherein the vapor generator further comprises a water level sensor sensing the level of the water to control an on-off operation of the vibrator.

7. The humidifier of one of claims 1 to 6, wherein the cap comprises a lower plate having an inlet port, and an upper plate having an outlet port at the position

corresponding to the inlet port.

8. The humidifier of one of claims 1 to 7, further comprising a fan installed in the cap such that air flow is generated in the reservoir. 5
9. The humidifier of claim 8, wherein the fan allows the air flow to form cyclone flow in the reservoir.
10. The humidifier of claim 8, further comprising a guide unit guiding the air flow to be inclined in a circumferential direction such that the air flow forms the cyclone flow in the reservoir. 10
11. The humidifier of one of the previous claims, wherein the cap has a handle installed at an upper portion thereof. 15
12. The humidifier of one of the claims 5 to 11, wherein the guidance section has a cylindrical shape with slits formed in a longitudinal direction, the bottom surface is formed inside the guidance section, the float has a ring shape, the vibrator is integrated with the float below a center portion of the float, the guidance section is fitted into a space between the float and the vibrator to guide upward and downward movement depending on a level of the water. 20 25

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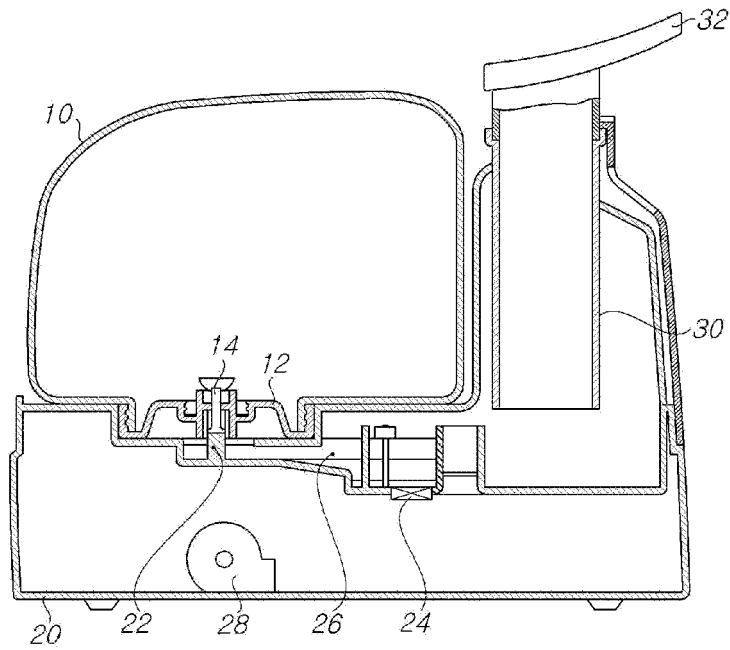
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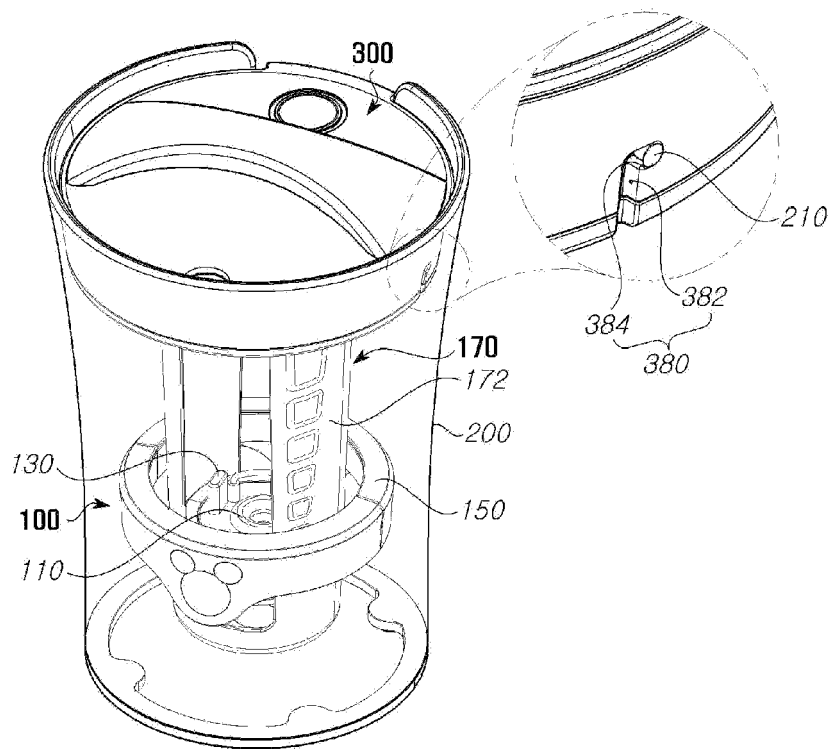
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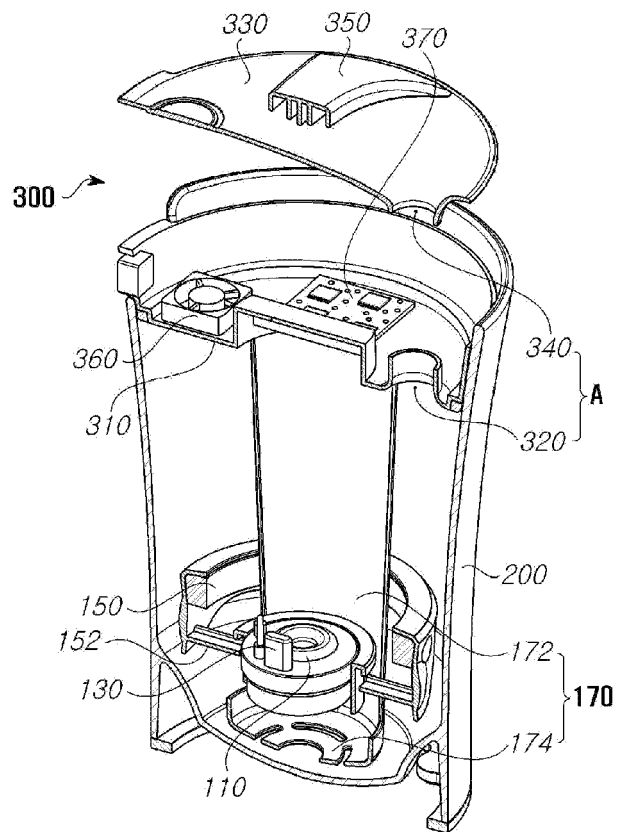
【FIG. 1】



【FIG. 2】



【FIG. 3】



【FIG. 4】

