US 20090290973A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2009/0290973 A1

(43) Pub. Date: Nov. 26, 2009

Wang et al.

(54) **TOWER FAN**

(76) Inventors: **Chi-Hsiang Wang**, Taipei (TW); **Yung Ming Tai**, Tao-Yaun City (TW); **Meng-Yun Lee**, Taipei (TW)

Correspondence Address:
FRANCIS EDWARD MARINO
394 MEREDITH NECK ROAD
MEREDITH, NH 03253 (US)

(21) Appl. No.: **12/126,949**

(22) Filed: **May 26, 2008**

Publication Classification

(51) **Int. Cl.**
F04D 5/00 (2006.01)

(52) **U.S. Cl.** **415/53.1**

(57) **ABSTRACT**

An air blowing apparatus is disclosed having an elongate housing with an elongate scroll defining an airflow passage. An elongate blower is surrounded by the scroll and adapted when energized to move air through the airflow passage. The airflow passage is partially helically-shaped to cause the moved air to be distributed into the surrounding environment in a partially helical pattern.

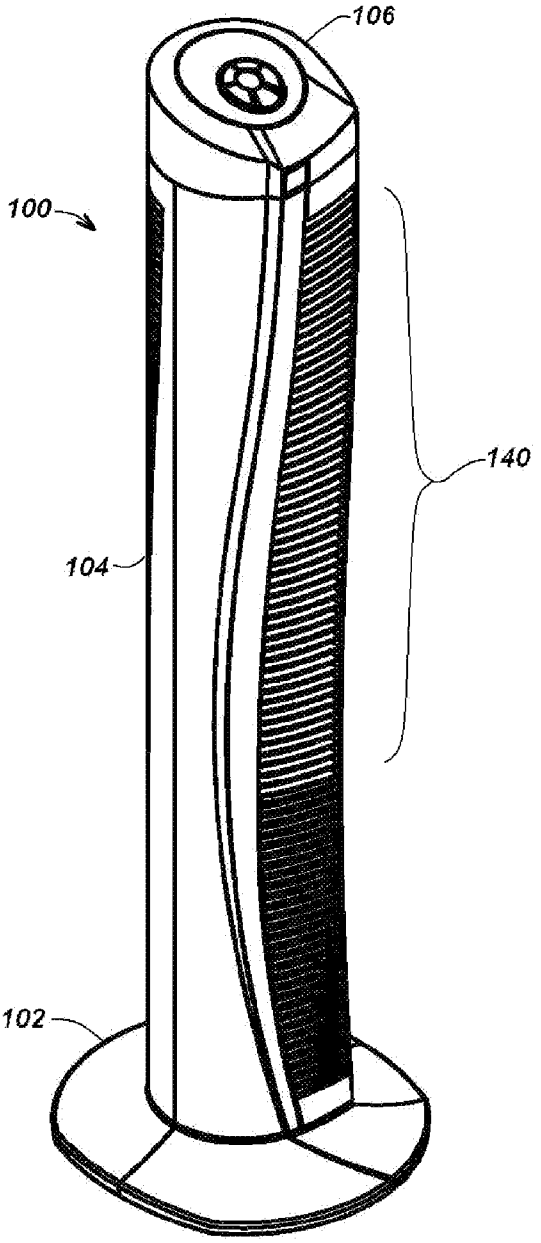


FIG 1

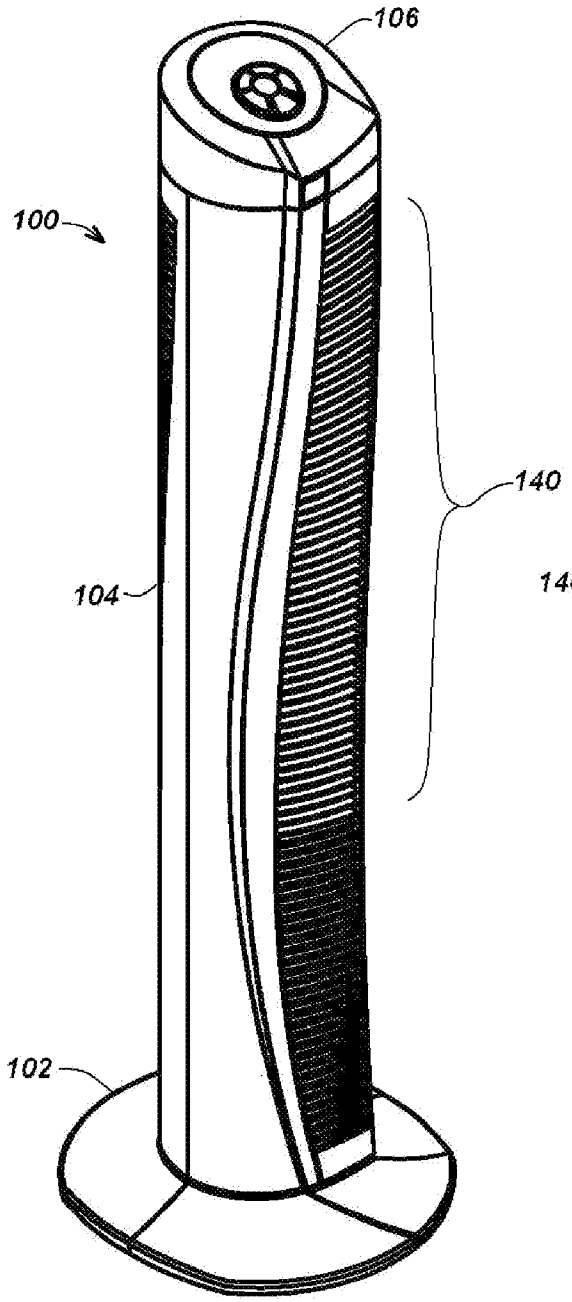


FIG 2

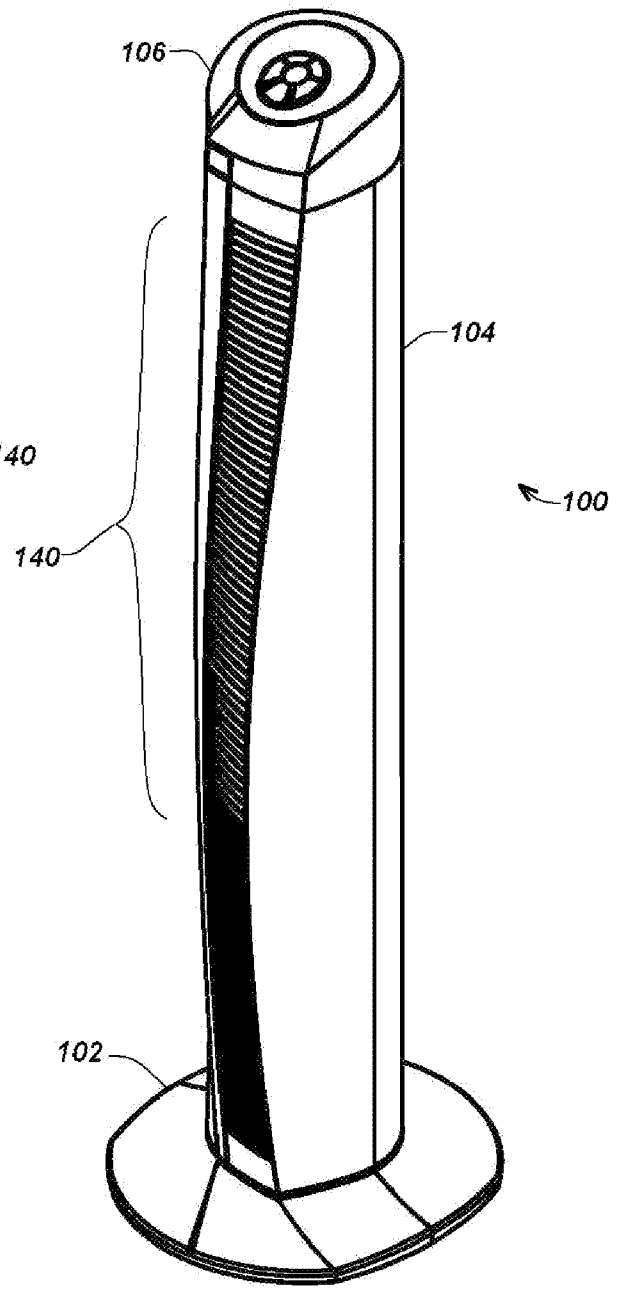
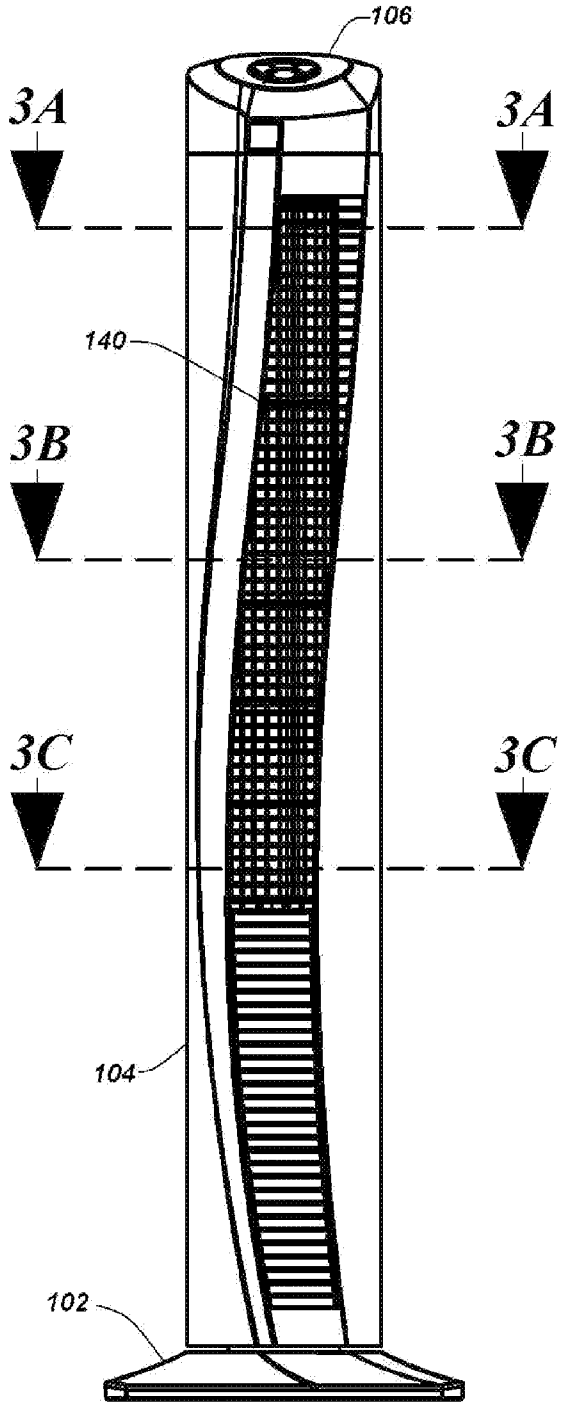


FIG 3



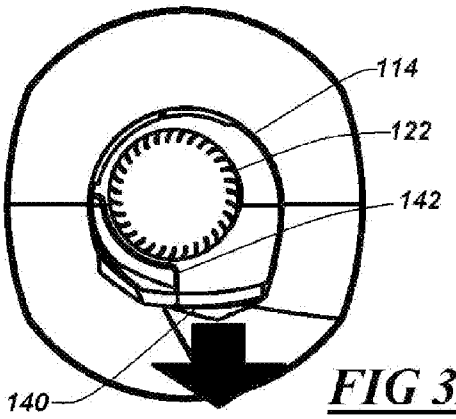


FIG 3A

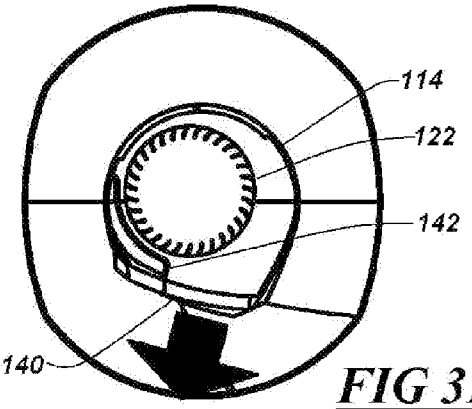


FIG 3B

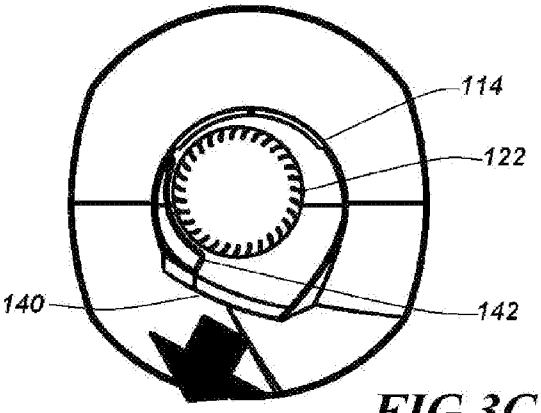


FIG 3C

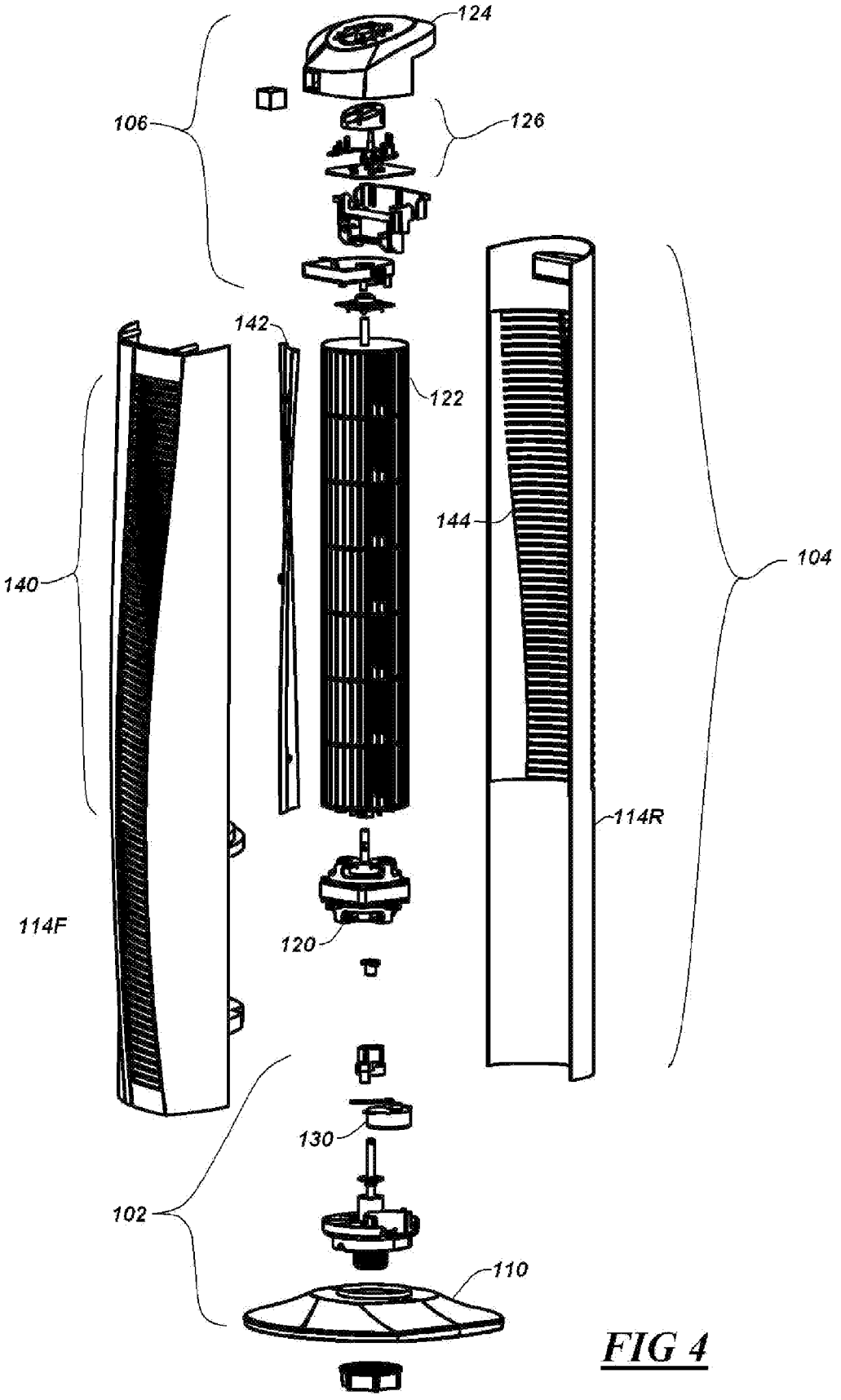


FIG 4

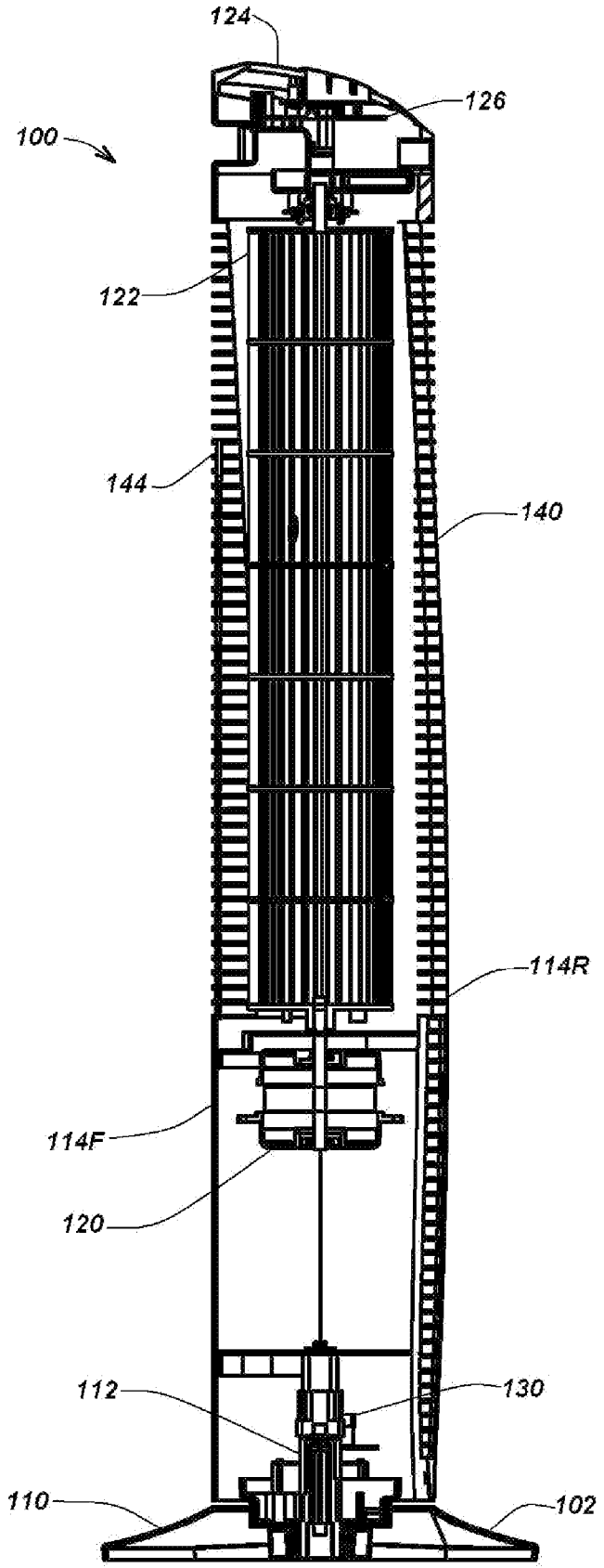


FIG 5

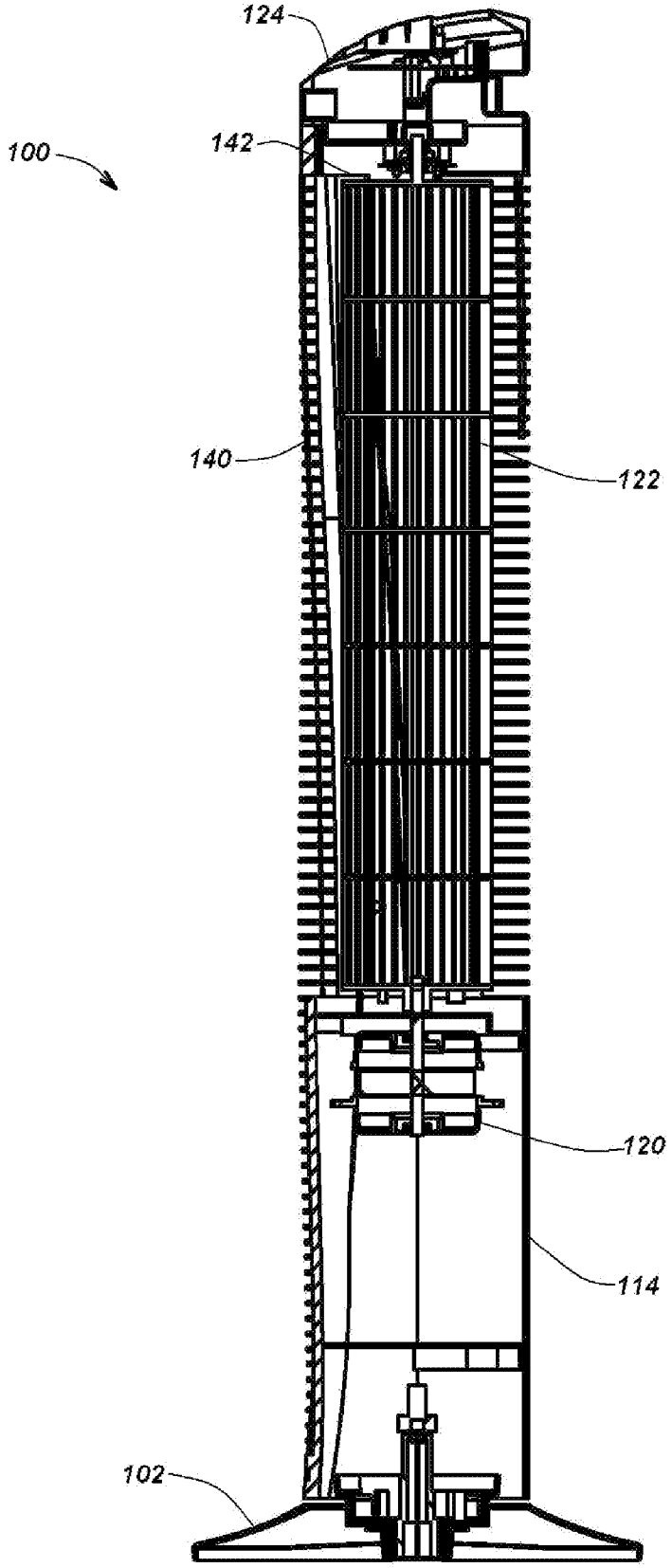


FIG 6

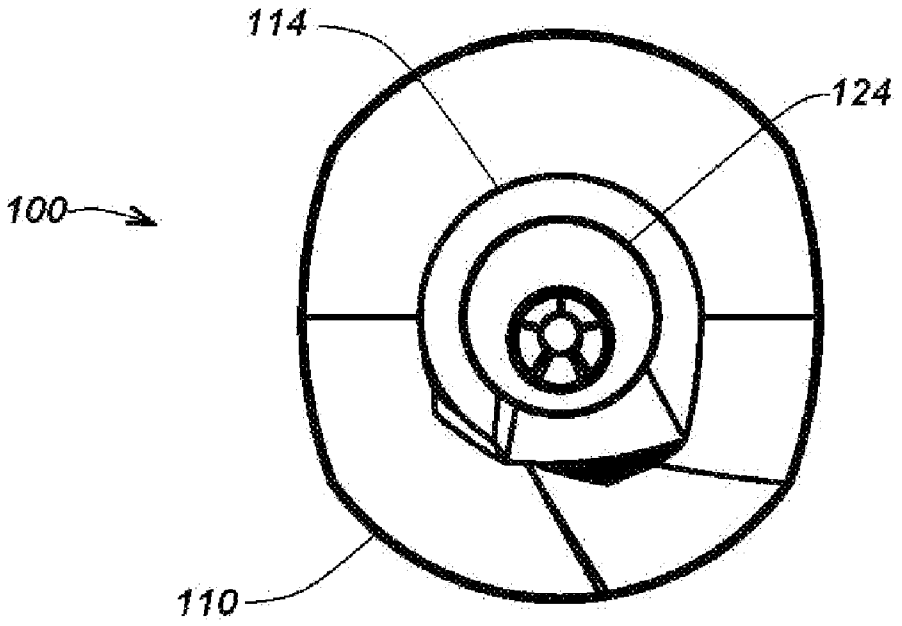


FIG 7

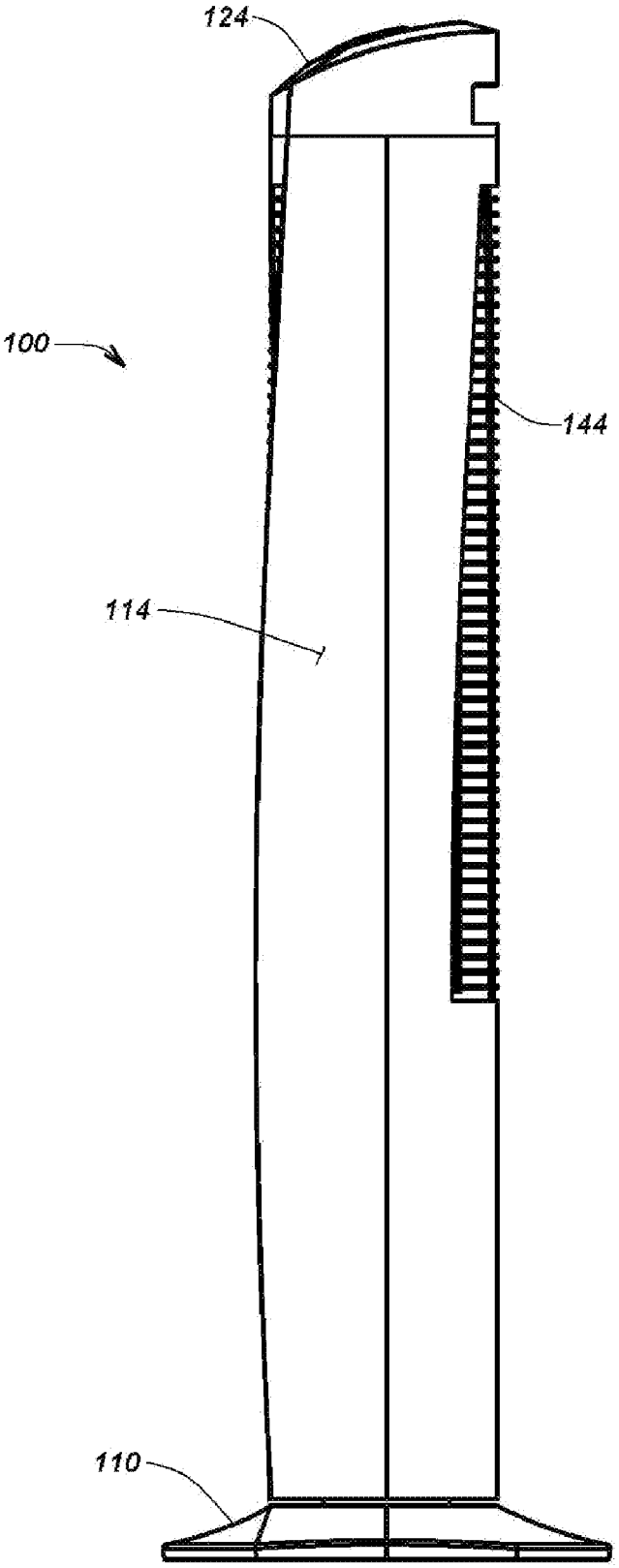


FIG 8

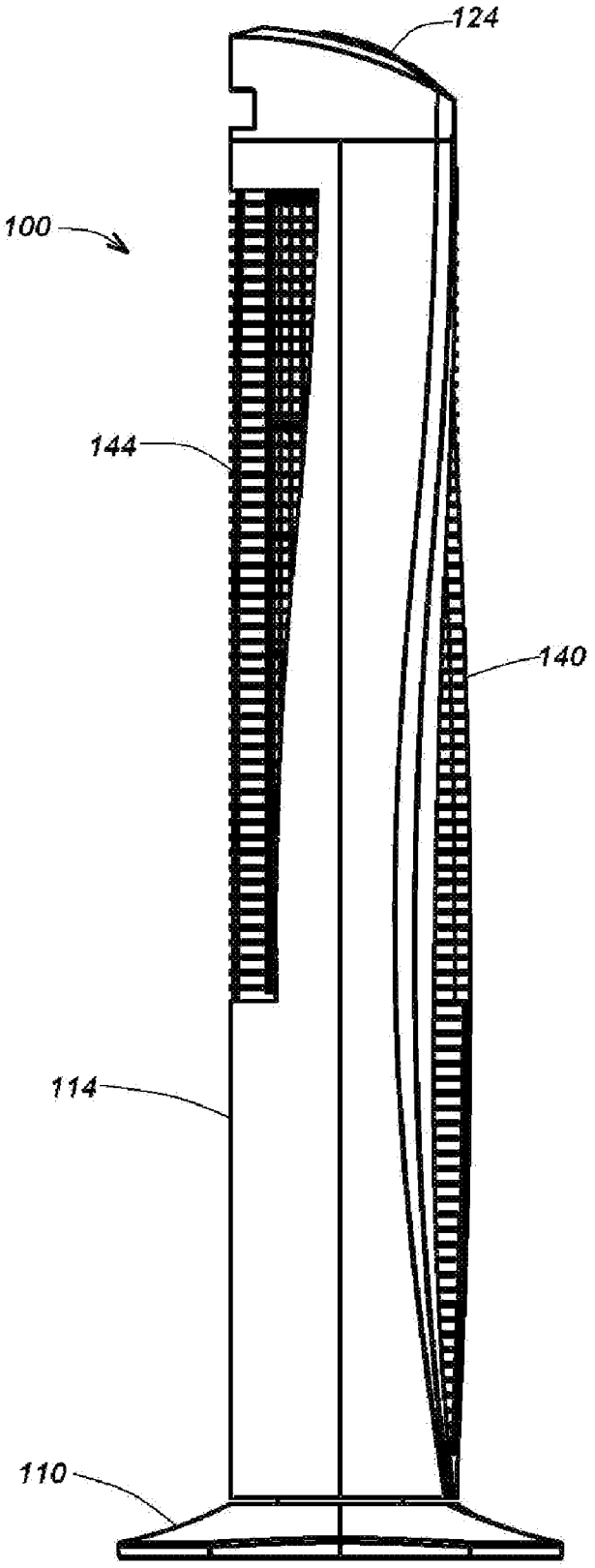


FIG 9

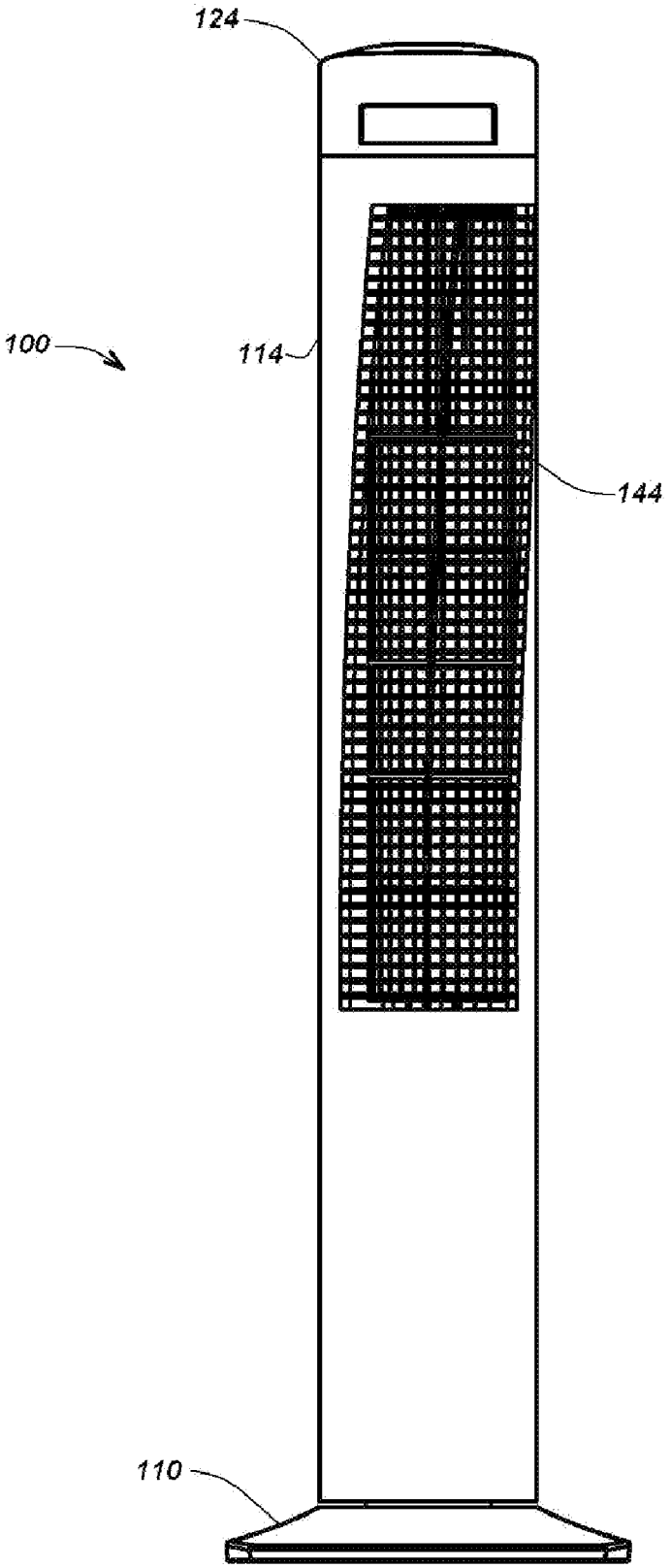


FIG 10

FIG 11

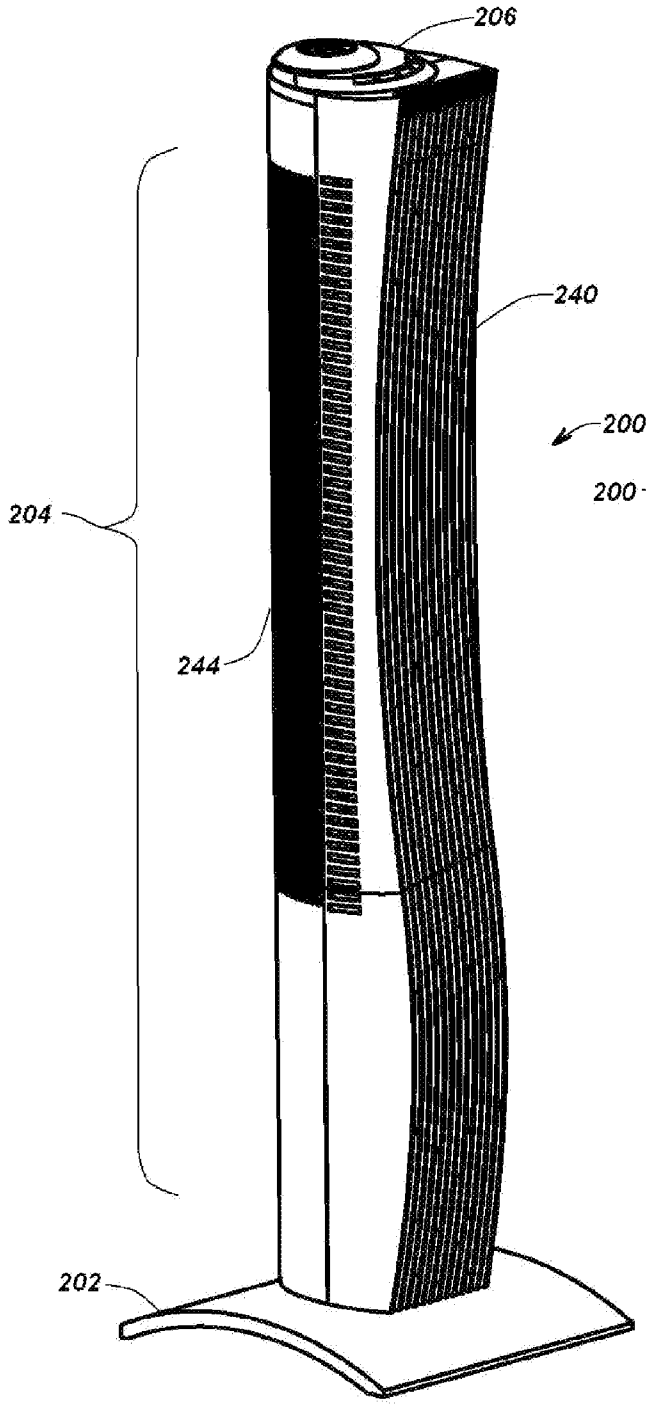
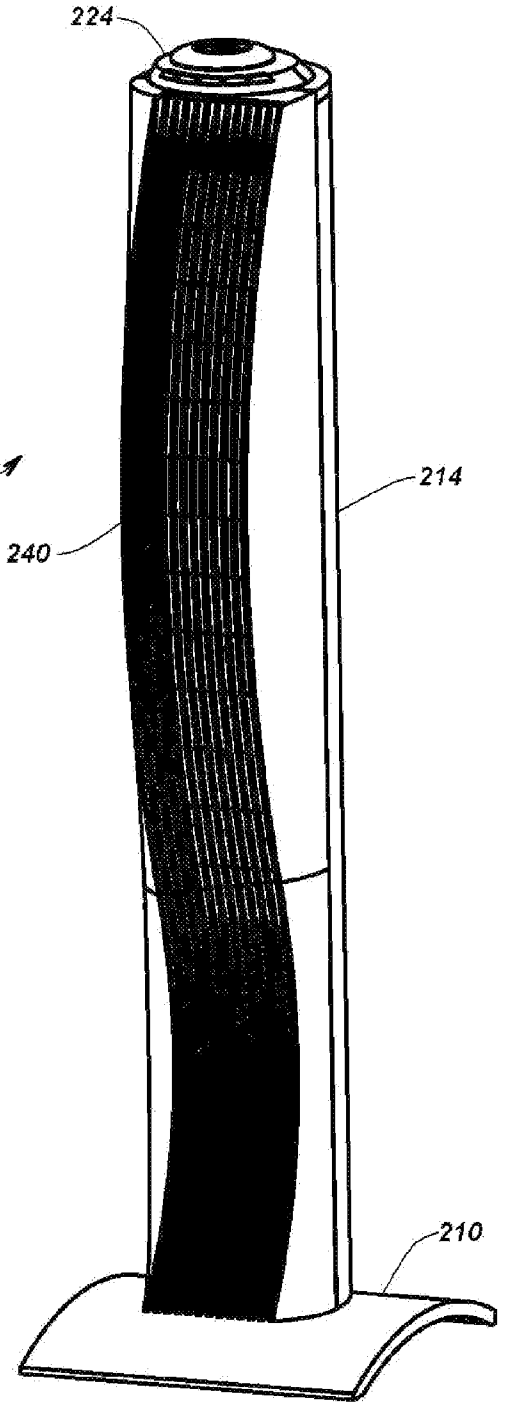


FIG 12



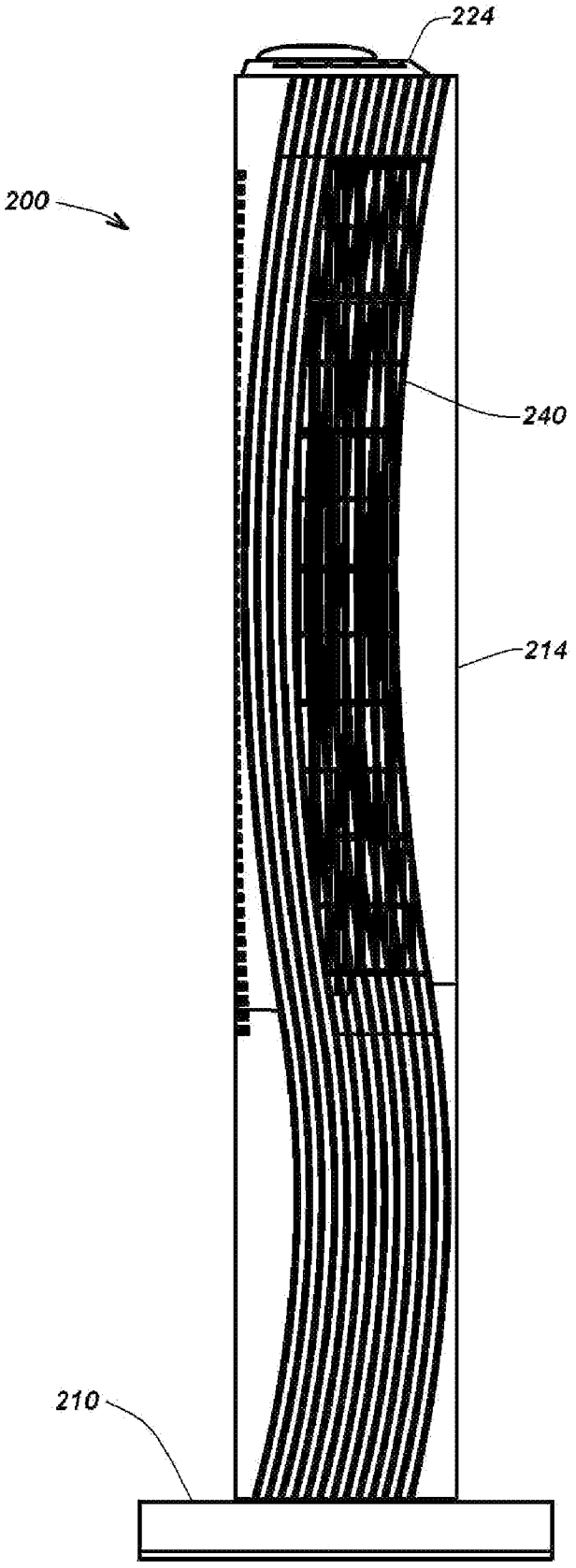


FIG 13

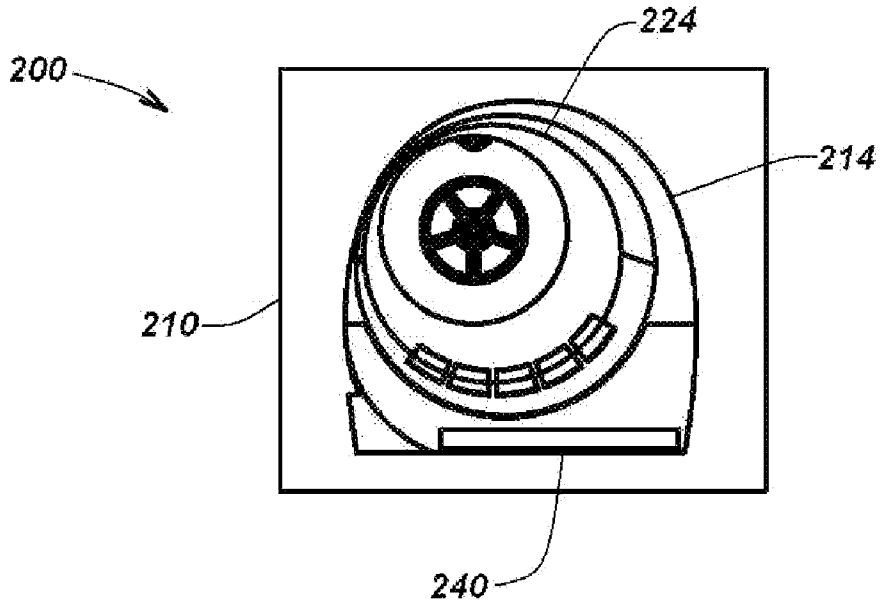


FIG 14

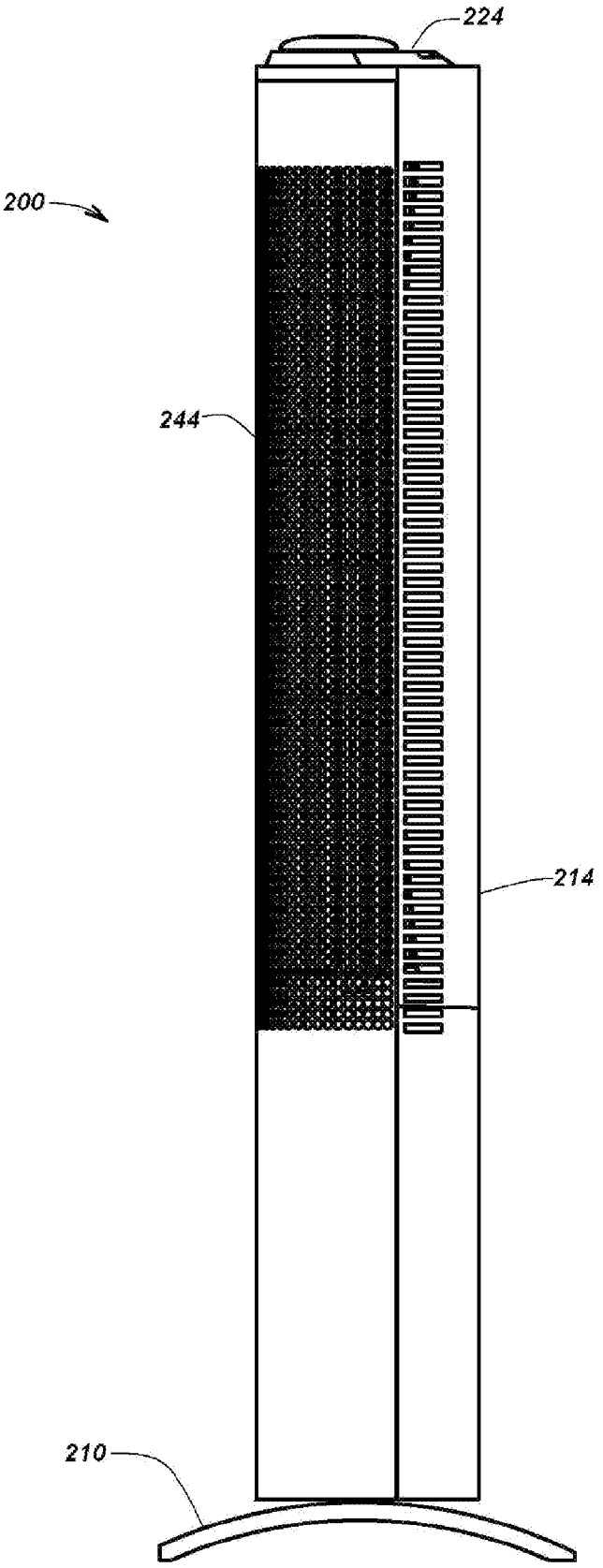


FIG 15

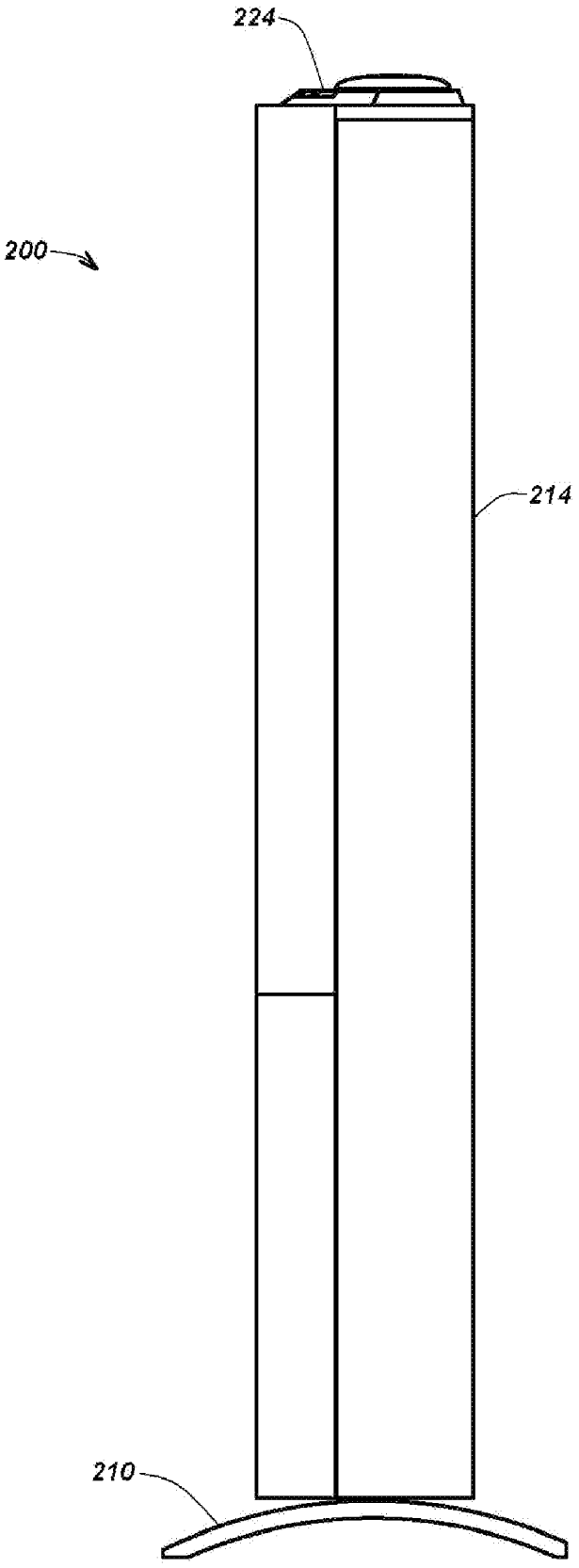


FIG 16

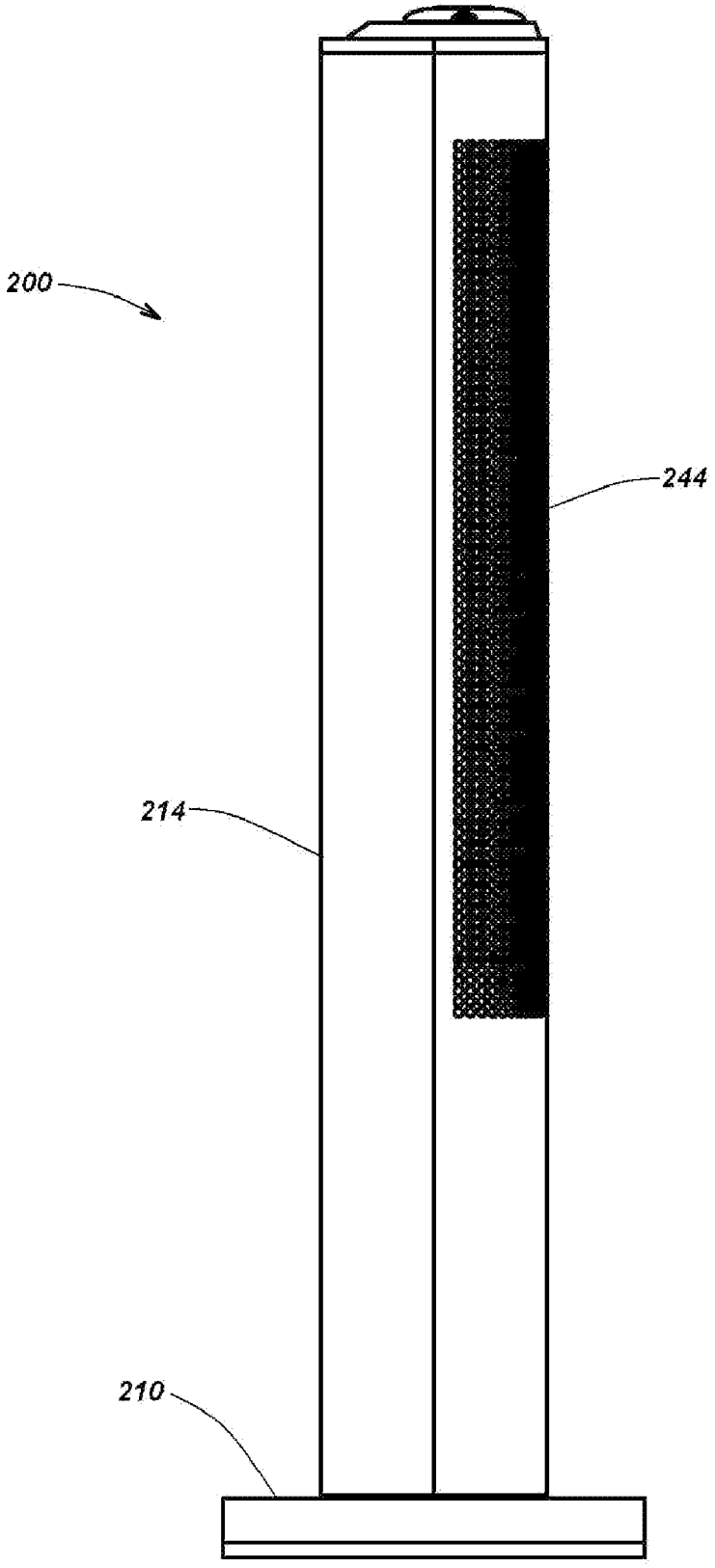
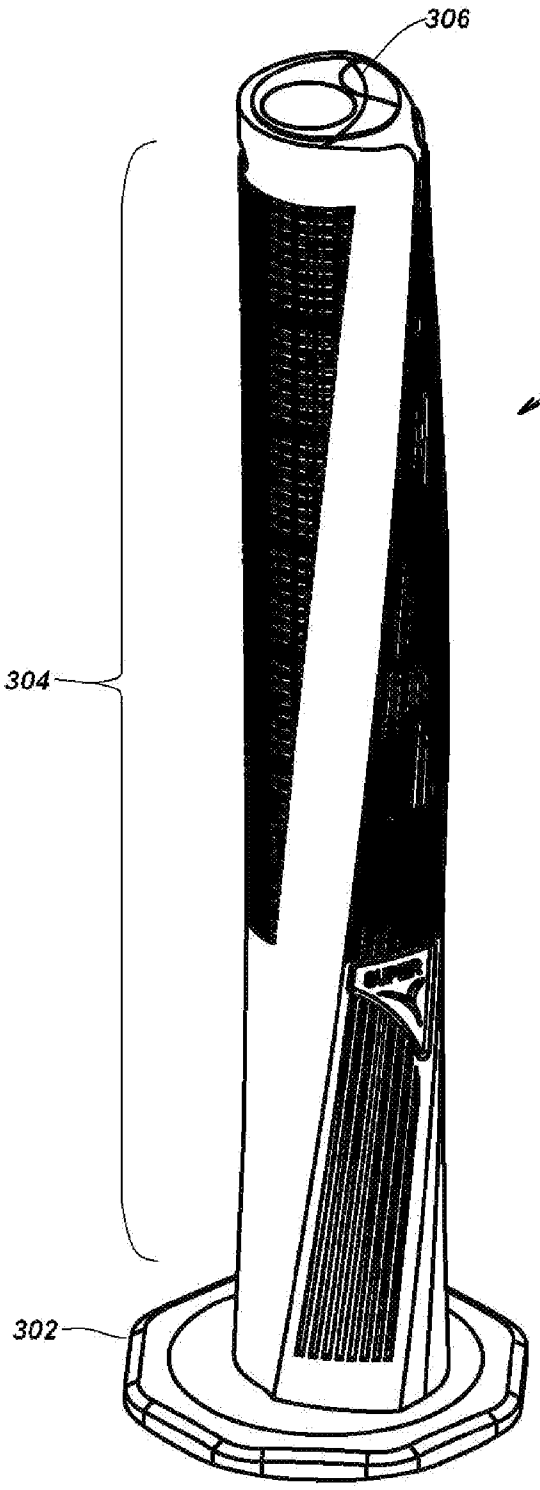


FIG 17

FIG 18



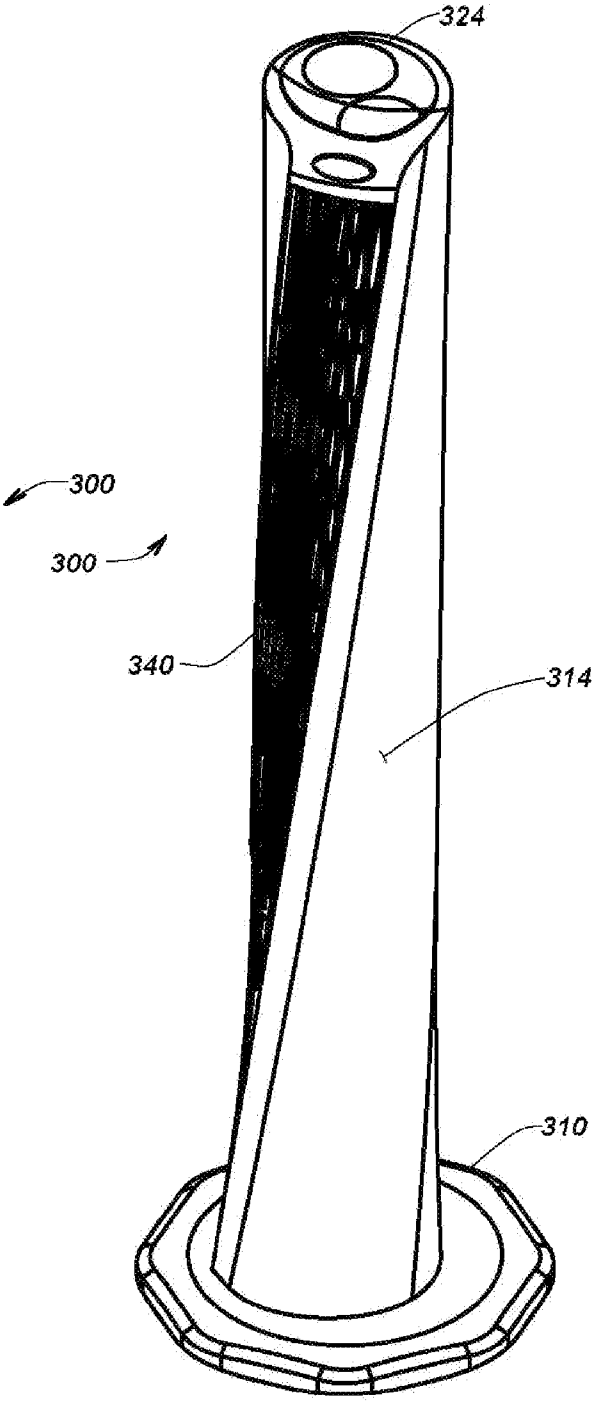


FIG 19

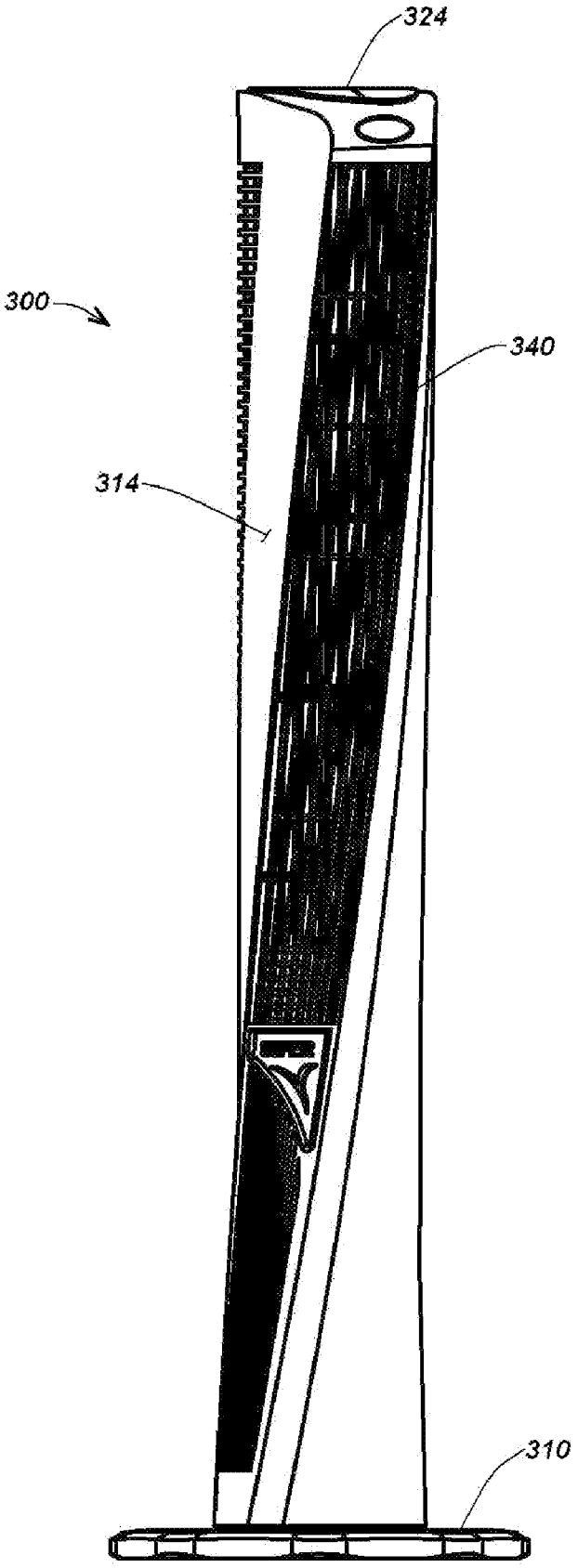


FIG 20

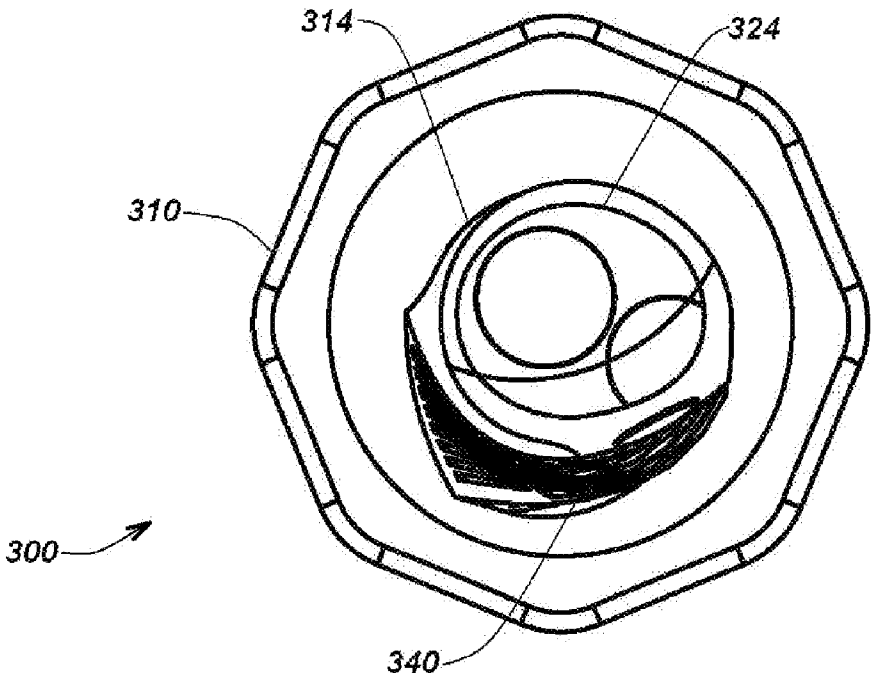


FIG 21

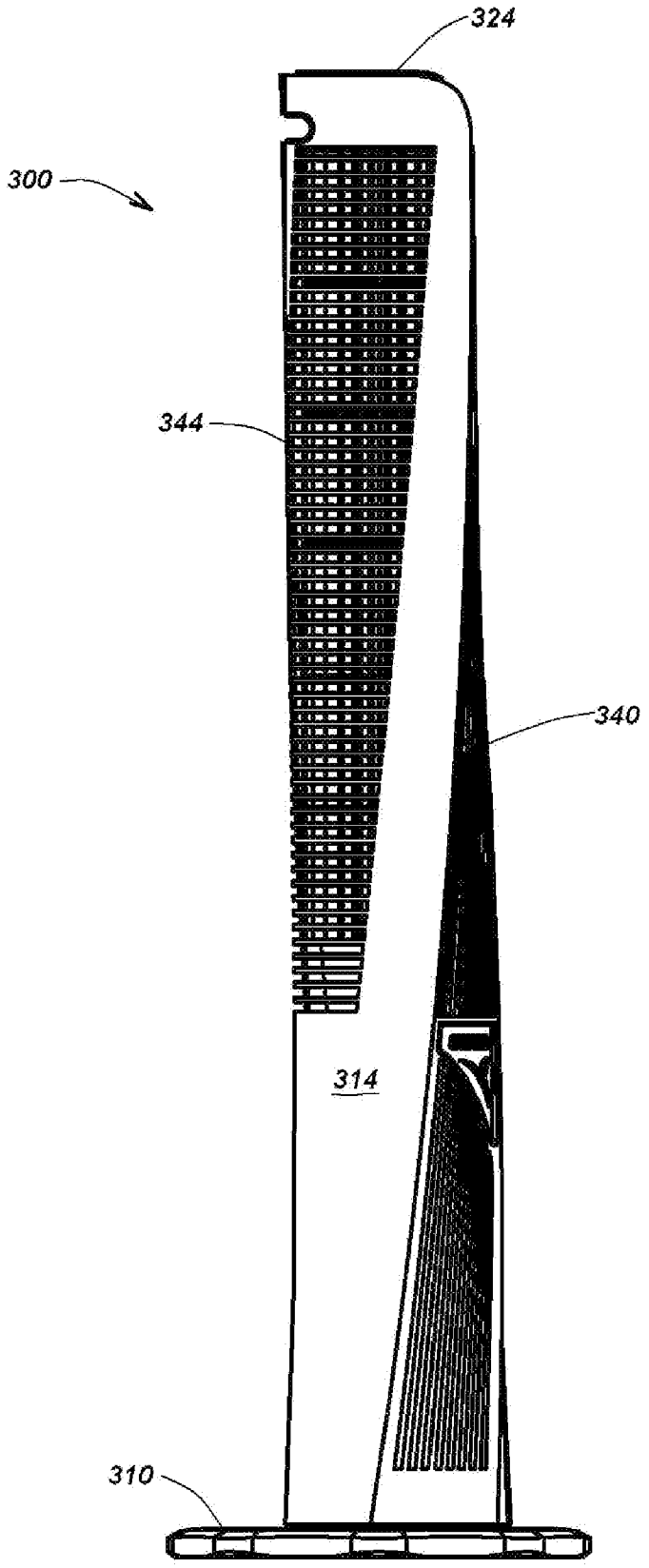


FIG 22

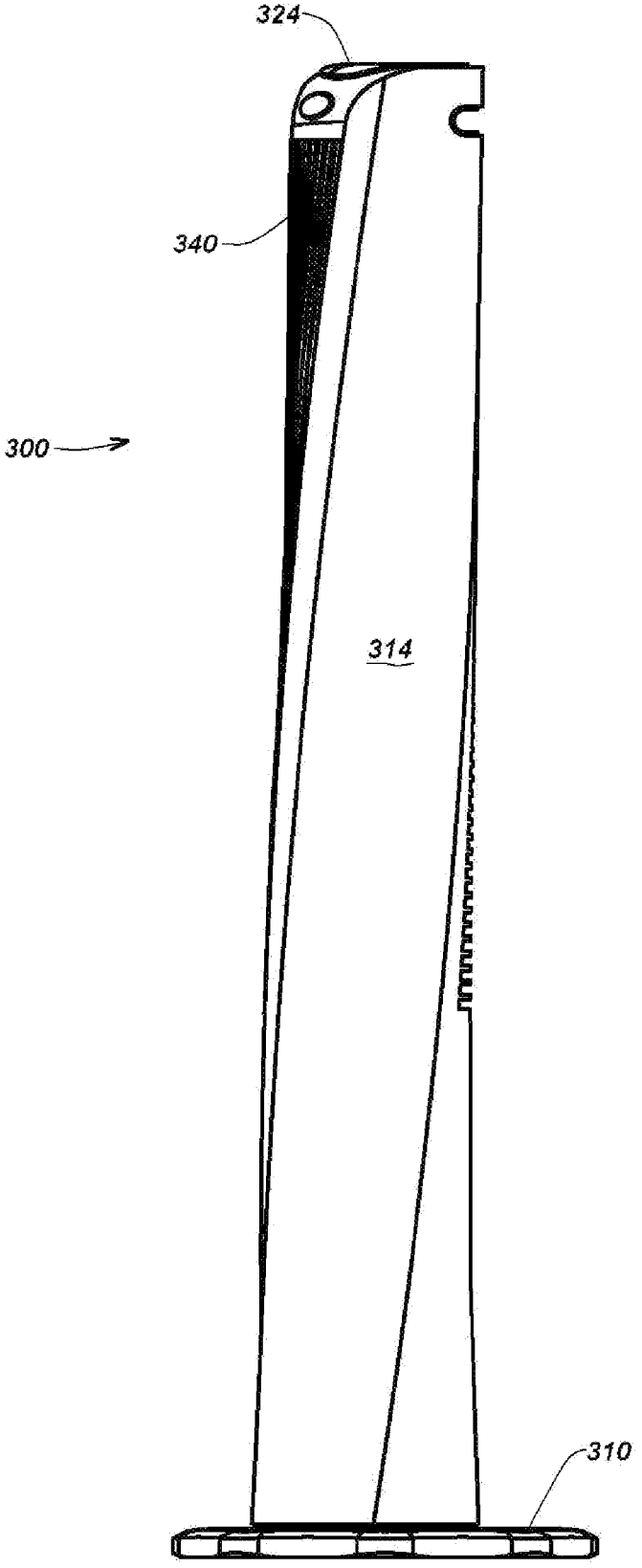


FIG 23

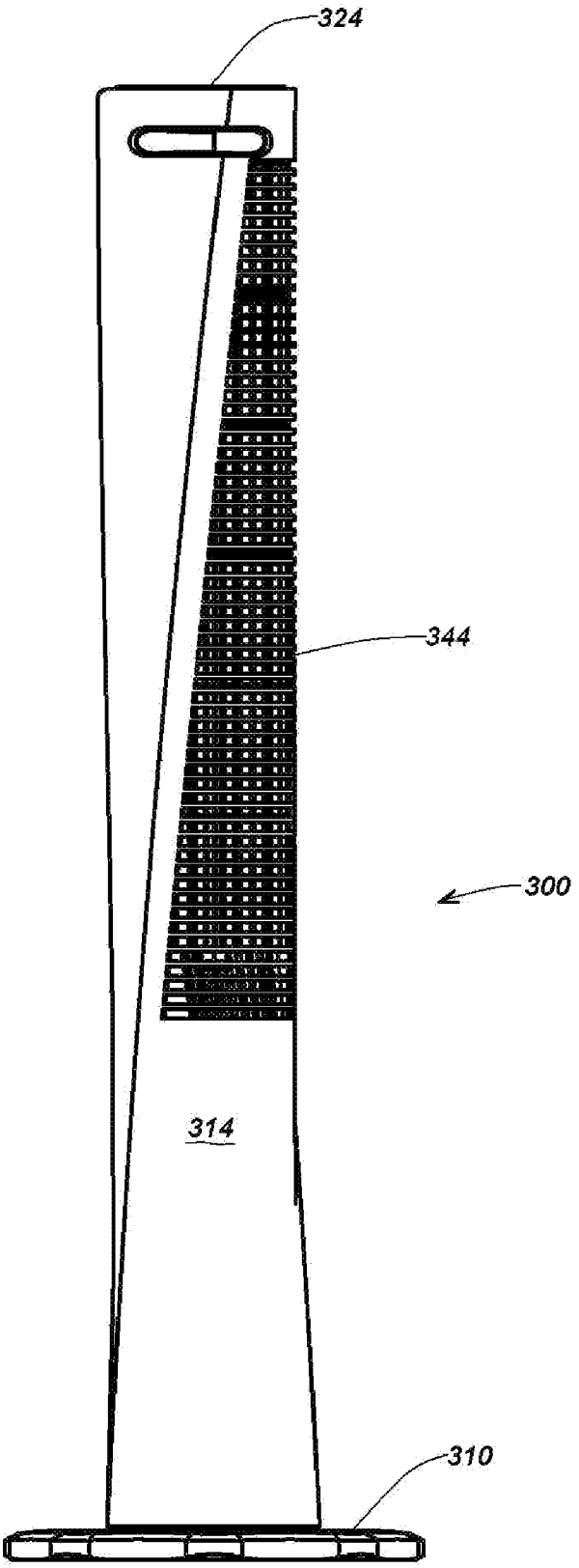


FIG 24

TOWER FAN

FIELD OF THE INVENTION

[0001] This invention relates to household fans and blowers, and more specifically, to tower fans having upright centrifugal blower wheels and scrolls for directing a cooling breeze into the surrounding environment.

BACKGROUND OF THE INVENTION

[0002] There is an ever-increasing need to provide cooling or ventilating air flow at home and in the work place. Existing air blower apparatuses typically prevail in two main types; axial fans and centrifugal blowers. Axial fans have an electric motor typically oriented such that its rotational axis is aligned with the direction of air movement. A fan blade affixed to the motor's rotor rotates about the axis and causes air to be pushed forwardly from the fan in the direction along the axis. Centrifugal blowers have an electric motor typically oriented such that its rotational axis is perpendicular to the direction of air movement. A blower wheel affixed to the motor's rotor rotates about the axis and causes air to be pushed forwardly from the fan in a direction perpendicular to the axis.

[0003] A desirable function of many fans and blowers is an oscillatory redirection of the airflow in a sweeping pattern. When embodied in an axial fan, such an oscillation is typically caused by an elaborate and expensive oscillation gearing system that converts rotational energy from the motor's rotor and causes the orientation of the motor and its rotor to sweep back and forth relative to the environment. Not only are such gearing systems expensive to manufacture, but the multitude of moving parts renders them somewhat short-lived and their parasitic use of the motor's rotational energy reduces the desired airflow from the fan.

[0004] Oscillation is also caused in some centrifugal blowers and some axial fans by the use of an additional and smaller oscillation motor. In the case of upright "tower" type blowers, commonly referred to as "tower fans", such oscillation motors typically cause a sweeping motion to the entire elongate upright fan housing, thereby causing the exhaust of the fan to move back and forth in an equivalent sweeping motion. Because of the structural limitations of such tower fans, in order to obtain an oscillation of sufficient breadth and smoothness, the auxiliary oscillation motors must be somewhat expensive, noisy, and powerful, using relatively high amounts of costly electrical energy that could otherwise be fed to the fan motor to increase airflow.

[0005] There exists the need for an efficient air blowing apparatus which overcomes the above problems of fans and blowers by providing means for causing a sweeping airflow from an air blowing apparatus that requires no auxiliary gearing systems, no auxiliary motors, no additional moving parts, and no additional energy input, and which does not provide sweeping airflow at the cost of reduced air moving performance.

[0006] Alternatively, there exists the need for an oscillating air blowing apparatus with means for enhancing the sweeping effects of its airflow with no additional gearing systems, motors, moving parts, or energy input.

[0007] Other needs and objects will become apparent upon a reading of the following disclosure in combination with the appended drawings.

SUMMARY OF THE INVENTION

[0008] The present invention is preferably embodied as an air blowing apparatus having an elongate housing with an elongate scroll defining an airflow passage. As embodied, an elongate blower is surrounded by the scroll and adapted when energized to move air through the airflow passage. The airflow passage is preferably partially helically-shaped to cause the moved air to be distributed into the surrounding environment in a partially helical pattern.

[0009] According to one aspect of the invention in its preferred mode, the air blowing apparatus has an elongate housing with an elongate scroll defining an airflow passage, and an elongate blower surrounded by the scroll and adapted when energized to aerodynamically engage and move air through the airflow passage.

[0010] According to another aspect of the inventions, the airflow passage is partially helically-shaped to cause the moved air to be distributed into the surrounding environment in a partially helical pattern.

[0011] According to another respect of the invention, the helical pattern of the distributed air gives a perceived effect that imitates the swept airflow of an oscillating fan or blower.

[0012] According to another aspect of the invention, this advantageous airflow distribution is achieved without additional or auxiliary components.

[0013] According to another aspect of the invention, this advantageous airflow distribution is achieved without additional noise or power consumption.

[0014] Additional aspects of the invention can be appreciated upon perusal of the following detailed description of an exemplary air blower according to the invention along with the accompanying drawings. The components in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the invention. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG. **1** is a left perspective view of a portable air blower in accordance with a first exemplary embodiment of the invention;

[0016] FIG. **2** is a right perspective view of the portable air blower of FIG. **1**;

[0017] FIG. **3** is a front view of the air blower of FIG. **1**;

[0018] FIG. **3**A is a partial cross-sectional view of the air blower of FIG. **1** taken at Line **3**A-**3**A of FIG. **3**;

[0019] FIG. **3**B is a partial cross-sectional view of the air blower of FIG. **1** taken at Line **3**B-**3**B of FIG. **3**;

[0020] FIG. **3**C is a partial cross-sectional view of the air blower of FIG. **1** taken at Line **3**C-**3**C of FIG. **3**;

[0021] FIG. **4** is an exploded perspective view of the air blower of FIG. **1**;

[0022] FIG. **5** is a left side cross-sectional view of the air blower of FIG. **1**;

[0023] FIG. **6** is a right side cross-sectional view of the air blower of FIG. **1**;

[0024] FIG. **7** is a top view of the air blower of FIG. **1**;

[0025] FIG. **8** is a right side view of the air blower of FIG. **1**;

[0026] FIG. **9** is a left side view of the air blower of FIG. **1**;

[0027] FIG. **10** is a rear view of the air blower of FIG. **1**;

[0028] FIG. **11** is a left perspective view of a portable air blower in accordance with a second exemplary embodiment of the invention;

[0029] FIG. **12** is a right perspective view of the portable air blower of FIG. **11**;

[0030] FIG. **13** is a front view of the air blower of FIG. **11**;

[0031] FIG. **14** is a top view of the air blower of FIG. **11**;
[0032] FIG. **15** is a left side view of the air blower of FIG. **11**;
[0033] FIG. **16** is a right side view of the air blower of FIG. **11**;
[0034] FIG. **17** is a rear view of the air blower of FIG. **11**;
[0035] FIG. **18** is a left perspective view of a portable air blower in accordance with a third exemplary embodiment of the invention;
[0036] FIG. **19** is a right perspective view of the portable air blower of FIG. **18**;
[0037] FIG. **20** is a front view of the air blower of FIG. **18**;
[0038] FIG. **21** is a top view of the air blower of FIG. **18**;
[0039] FIG. **22** is a left side view of the air blower of FIG. **18**;
[0040] FIG. **23** is a right side view of the air blower of FIG. **18**; and
[0041] FIG. **24** is a rear view of the air blower of FIG. **18**.

DETAILED DESCRIPTION OF THE INVENTION

[0042] FIGS. **1-10** illustrate a first exemplary embodiment of a tower fan **100** according to the present invention. The tower fan has a base portion **102**, a blower portion **104** and a control portion **106**. The base portion has a stationary base plate **110** for resting on a support surface such as a floor or tabletop, and a motorized oscillation mechanism **112**.
[0043] The blower portion includes an elongate upright housing **114** made of front housing **114**F and rear housing **114**R, which are affixed together to encapsulate an electric blower motor **120** and an elongate upright blower wheel **122**. The assembled housing is supported on the base plate of the base portion and pivotable there-about in a back-and-forth direction. The assembled housing is pivotably linked to the base plate through the oscillation mechanism.
[0044] The control portion is rigidly affixed atop the housing **114** and includes control housing **124** and control electronics **126** for controlling the various operations of the fan.
[0045] In operation, the user turns on the power to motor **120** by activating a power switch on the control housing, and selects a speed of operation, which is proportional to the selected speed of the motor. Blower wheel **122** rotates to cause an airflow in a typical centrifugal blower manner, as will be discussed.
[0046] The user may also choose between stationary or oscillating operation. During oscillating operation, oscillation motor **130** of the oscillation mechanism is energized and causes housing **114** to sweep back and forth in an oscillatory motion relative to the stationary base plate, via linkage of the mechanism.
[0047] Such a tower fan as so far described could alternatively be constructed in accordance with prior art oscillating tower fans, such as those described in U.S. Pat. Nos. 6,953,322, 7,118,323, or 7,217,098, the specifications of which are incorporated herein by reference.
[0048] Among the novelties of the present invention is the sweeping effect of the exhausted airflow relative to the housing that is derived from the helical shape of the housing's exhaust vent **140** and its cooperation with the helically-twisted exhaust guide **142**. In oscillating embodiments, this helical shaped vent and twisted guide are found to enhance the broadcasting benefits of the oscillating the airflow, and in non-oscillating embodiments, or in oscillating embodiments during non-oscillating mode, this helical shaped vent and twisted guide are found to provide a unique and comforting cooling experience not fully provided by oscillation, and without the aforementioned drawbacks of oscillation.
[0049] As seen best in FIG. **3** and FIGS. **3**A to **3**B, housing **114** and guide **142** form a scroll shape so that clockwise (when viewed from above as in FIGS. **3**A-**3**C) rotation of blower wheel causes air to be pulled into housing **114** through intake vent **144**, to be moved through the housing, and to be forced out of the housing through exhaust vent **140**. The shape of the exhaust vent and guide form a right-handed helix that is first impinged by the moved air near to the top of the housing, where it is guided directly forwardly from the fan, as seen in FIG. **3**A, which is taken at upper section line **3**A-**3**A of FIG. **3**. Air moved further vertically down the blower impinges the vent and guide at a later clock-wise point, causing that moved air to be guided in a more positive angular direction, as seen in FIG. **3**B, which is taken at mid section line **3**B-**3**B of FIG. **3**. Air moved even further vertically down the blower impinges the vent and guide at an even later clock-wise point, causing that moved air to be guided in an even more positive angular direction, as seen in FIG. **3**C, which is taken at lower section line **3**C-**3**C of FIG. **3**.
[0050] While the helical pitch of vent **140** and guide **142** may seem slight, the results on the exhausted airflow are found to be surprisingly significant. Due to the combined effects of airflow turbulence and the helical shape of the airflow as it exits the vent, the slight angular initial spread of airflow is increased dramatically as it travels downstream form the fan. Additionally, the exiting air experiences a compounding of the turbulence as it exits further down the vent compared to the air impinging on the guide and vent higher and earlier in the blower's rotation, so that the exiting air is more focused and faster towards the top of the fan and more spread out towards the floor. The resulting breeze along the floor is more subtle towards the user's feet, where less cooling is generally desired, and more powerful towards the user's upper body, where more cooling is generally desired. As can be appreciated, this rather complicated effect would be difficult to achieve by even a much more complicated array of air blowing apparatuses.
[0051] And while the forgoing embodiment practices a clockwise blower rotation coupled with a right-handed helical exhaust vent, an opposite arrangement is found to provide a differently unique airflow. When the same blower rotation is coupled to a left-handed helical vent and guide (or else, when a counter-clockwise blower rotation is coupled with the same right-handed helical vent and guide), the exhausted airflow is found to be more focused and faster towards floor and more spread out towards the top of the apparatus. Such an arrangement may be particularly beneficial in such devices as a heating fan, where the stronger heated airflow towards one's feet and a more subtle heated airflow towards one's face are more desirable.
[0052] FIGS. **11** through **17** illustrate a second exemplary embodiment of a tower fan **200** according to the present invention. This tower fan has a base portion **202** including stationary base plate **210**, a blower portion **204** including housing **214**, and a control portion **206** including control housing **224**. The housing includes intake vent **244**, helical exhaust vent **240**, and (not visible) an equivalent internal blower and guide arrangement to the first embodiment.
[0053] FIGS. **18** through **24** illustrate a third exemplary embodiment of a tower fan **300** according to the present invention, differing substantially from the first and second embodiments only in ornamental design. This tower fan has a

base portion **302** including stationary base plate **310**, a blower portion **304** including housing **314**, and a control portion **306** including control housing **324**. The housing includes intake vent **344**, helical exhaust vent **340**, and (not visible) an equivalent internal blower and guide arrangement to the first embodiment

[0054] In summary, the present invention may be embodied as an air blowing apparatus having a housing defining an airflow passage, and a blower retained by the housing and adapted when energized to aerodynamically engage and move air through the airflow passage, where the airflow passage is partially helically-shaped to cause the moved air to be distributed into the surrounding environment in a partially helical pattern. The housing may define a vertical axis, and the blower may rotate when energized about the vertical axis, and the partially helically-shaped airflow passage may partially surround the blower and vertical axis.

[0055] The housing may have a height to width ratio exceeding two-to-one. The helically-shaped airflow passage may be initially aerodynamically engaged approximate an upper end by the moved air. For instance, the blower may rotate in a direction clockwise in top view, and the airflow passage may be right-hand helically shaped.

[0056] Or, the helically-shaped airflow passage may be initially aerodynamically engaged approximate a lower end by the moved air. For instance, the blower may rotate in a direction clockwise in top view, and the airflow passage may be left-hand helically shaped.

[0057] The invention may more specifically be embodied as an air blowing apparatus having an elongate housing having an elongate scroll defining an airflow passage, and an elongate blower surrounded by the scroll and adapted when energized to aerodynamically engage and move air through the airflow passage, where the airflow passage is partially helically-shaped to cause the moved air to be distributed into the surrounding environment in a partially helical pattern. The housing may define a vertical axis, and the blower may rotate when energized about the vertical axis, and the partially helically-shaped airflow passage may partially surround the blower and vertical axis.

[0058] The invention may also be embodied in a method of blowing air with an air blowing apparatus having an elongate housing defining a partially helically-shaped airflow passage, and an elongate blower retained by the housing and adapted when energized to move air through the airflow passage. The method may include energizing the blower to move the air, shaping the moved air with the partially helically-shaped airflow passage, and distributing the moved air into the surrounding environment in a partially helical pattern. The method may further include initially aerodynamically engaging the moved air with the partially helically-shaped airflow passage approximate an upper end thereof. Or the method may alternatively further include initially aerodynamically engaging the moved air with the partially helically-shaped airflow passage approximate a lower end thereof.

[0059] From the foregoing, it will be clear that the present invention has been shown and described with reference to a preferred embodiment that merely exemplifies the broader invention revealed herein. Certainly, those skilled in the art can conceive of alternative embodiments. For instance, those with the major features of the invention in mind could craft embodiments that incorporate one or more major features while not incorporating all aspects of the foregoing exemplary embodiment.

[0060] Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is to be understood, therefore, that the invention can be practiced otherwise than as specifically described. With this in mind, the claims that follow will define the scope of protection to be afforded the invention, and those claims shall be deemed to include equivalent constructions insofar as they do not depart from the spirit and scope of the present invention. Certain of these claims may express certain elements as a means for performing a specific function, at times without the recital of structure or material. As the law demands, any such claims shall be construed to cover not only the corresponding structure and material expressly described in the specification but also equivalents thereof.

We claim:

1. An air blowing apparatus comprising:
a housing defining an airflow passage;
a blower retained by the housing and adapted when energized to aerodynamically engage and move air through the airflow passage; wherein
said airflow passage is partially helically-shaped to cause the moved air to be distributed into the surrounding environment in a partially helical pattern.

2. The air blowing apparatus of claim **1** wherein:
said housing defines a vertical axis;
said blower rotates when energized about said vertical axis; and
said partially helically-shaped airflow passage partially surrounds said blower and vertical axis.

3. The air blowing apparatus of claim **2** wherein said housing has a height to width ratio exceeding two-to-one.

4. The air blowing apparatus of claim **3** wherein said helically-shaped airflow passage is initially aerodynamically engaged approximate an upper end thereof by said moved air.

5. The air blowing apparatus of claim **4** wherein said blower rotates in a direction clockwise in top view, and wherein said airflow passage is right-hand helically shaped.

6. The air blowing apparatus of claim **3** wherein said helically-shaped airflow passage is initially aerodynamically engaged approximate a lower end thereof by said moved air.

7. The air blowing apparatus of claim **6** wherein said blower rotates in a direction clockwise in top view, and wherein said airflow passage is left-hand helically shaped.

8. The air blowing apparatus of claim **1** wherein said helically-shaped airflow passage is initially aerodynamically engaged approximate an upper end thereof by said moved air.

9. The air blowing apparatus of claim **8** wherein said blower rotates in a direction clockwise in top view, and wherein said airflow passage is right-hand helically shaped.

10. The air blowing apparatus of claim **1** wherein said helically-shaped airflow passage is initially aerodynamically engaged approximate a lower end thereof by said moved air.

11. The air blowing apparatus of claim **10** wherein said blower rotates in a direction clockwise in top view, and wherein said airflow passage is left-hand helically shaped.

12. An air blowing apparatus comprising:
an elongate housing comprising an elongate scroll defining an airflow passage;
an elongate blower surrounded by said scroll and adapted when energized to aerodynamically engage and move air through the airflow passage; wherein
said airflow passage is partially helically-shaped to cause the moved air to be distributed into the surrounding environment in a partially helical pattern.

13. The air blowing apparatus of claim **12** wherein:

said housing defines a vertical axis;

said blower rotates when energized about said vertical axis; and

said partially helically-shaped airflow passage partially surrounds said blower and vertical axis.

14. The air blowing apparatus of claim **13** wherein said housing has a height to width ratio exceeding two-to-one.

15. The air blowing apparatus of claim **14** wherein said helically-shaped airflow passage is initially aerodynamically engaged approximate an upper end thereof by said moved air.

16. The air blowing apparatus of claim **15** wherein said blower rotates in a direction clockwise in top view, and wherein said airflow passage is right-hand helically shaped.

17. The air blowing apparatus of claim **14** wherein said helically-shaped airflow passage is initially aerodynamically engaged approximate a lower end thereof by said moved air.

18. The air blowing apparatus of claim **17** wherein said blower rotates in a direction clockwise in top view, and wherein said airflow passage is left-hand helically shaped.

19. The air blowing apparatus of claim **12** wherein said helically-shaped airflow passage is initially aerodynamically engaged approximate an upper end thereof by said moved air.

20. The air blowing apparatus of claim **19** wherein said blower rotates in a direction clockwise in top view, and wherein said airflow passage is right-hand helically shaped.

21. The air blowing apparatus of claim **12** wherein said helically-shaped airflow passage is initially aerodynamically engaged approximate a lower end thereof by said moved air.

22. The air blowing apparatus of claim **21** wherein said blower rotates in a direction clockwise in top view, and wherein said airflow passage is left-hand helically shaped.

23. A method of blowing air with an air blowing apparatus;

wherein the air blowing apparatus comprises:

an elongate housing defining a partially helically-shaped airflow passage;

an elongate blower retained by the housing and adapted when energized to move air through the airflow passage;

and wherein the method comprises;

energizing said blower to move the air;

shaping the moved air with the partially helically-shaped airflow passage; and

distributing the moved air into the surrounding environment in a partially helical pattern.

24. The method of claim **23** further comprising initially aerodynamically engaging the moved air with the partially helically-shaped airflow passage approximate an upper end thereof.

25. The method of claim **23** further comprising initially aerodynamically engaging the moved air with the partially helically-shaped airflow passage approximate a lower end thereof.

* * * * *