



US 20170314575A1

(19) **United States**

(12) **Patent Application Publication**
OH

(10) **Pub. No.: US 2017/0314575 A1**

(43) **Pub. Date: Nov. 2, 2017**

(54) **FAN MOTOR AND VACUUM CLEANER**
HAVING THE SAME

A47L 9/28 (2006.01)

A47L 9/08 (2006.01)

A47L 9/00 (2006.01)

A47L 5/22 (2006.01)

(71) Applicant: **SAMSUNG ELECTRONICS CO.,**
LTD., Suwon-si (KR)

(72) Inventor: **Hyeon Joon OH,** Hwaseong-si (KR)

(73) Assignee: **SAMSUNG ELECTRONICS CO.,**
LTD., Suwon-si (KR)

(52) **U.S. Cl.**

CPC *F04D 29/542* (2013.01); *A47L 9/2821*

(2013.01); *A47L 9/2842* (2013.01); *A47L 9/00*

(2013.01); *A47L 5/22* (2013.01); *A47L 9/08*

(2013.01)

(21) Appl. No.: **15/584,631**

(22) Filed: **May 2, 2017**

(30) **Foreign Application Priority Data**

May 2, 2016 (KR) 10-2016-0054002

Publication Classification

(51) **Int. Cl.**

F04D 29/54 (2006.01)

A47L 9/28 (2006.01)

(57)

ABSTRACT

Disclosed are a fan motor and a vacuum cleaner which include a blowing fan and a plurality of diffuser blades disposed at a radially outer side of the blowing fan and circumferentially spaced apart from each other. Outer end portions of the plurality of diffuser blades include a spoiler portion formed obliquely to an outward direction with respect to an extending direction of the diffuser blades, so that a flow separation of air flowing across an outer surface of the diffuser blade is reduced. Accordingly, the suction force of the fan motor increases.

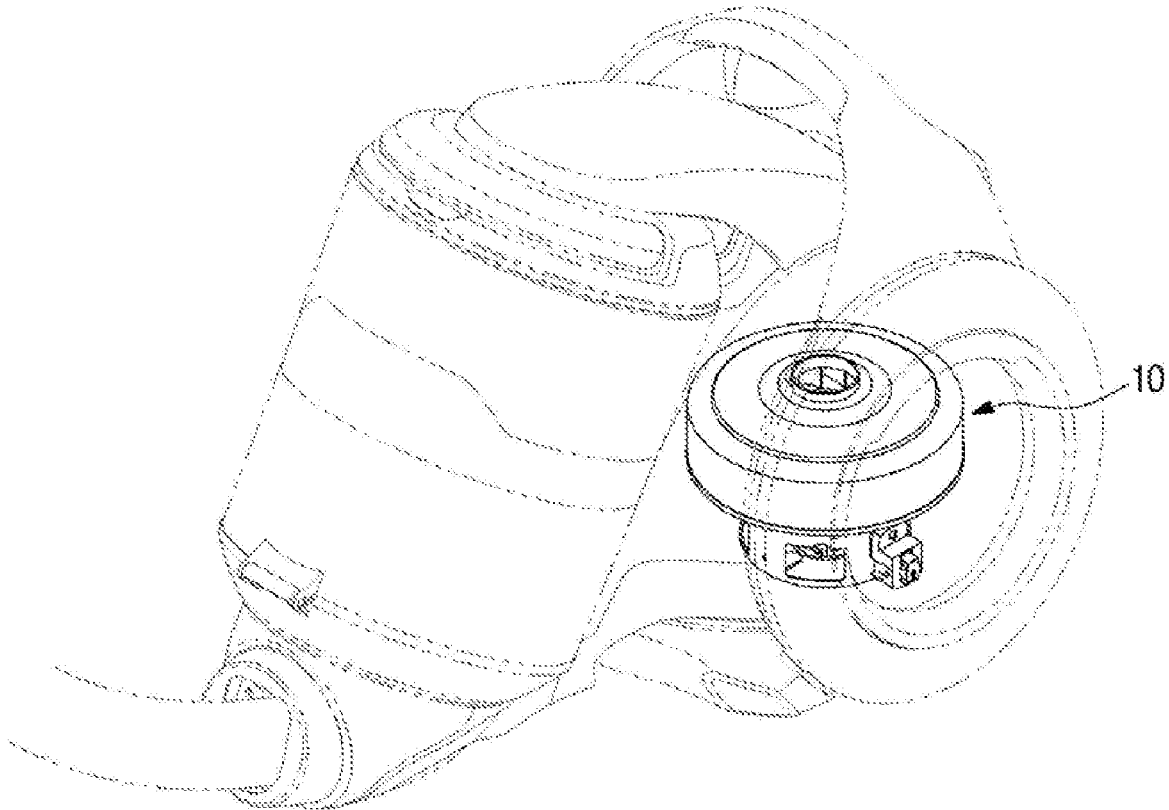


FIG. 1

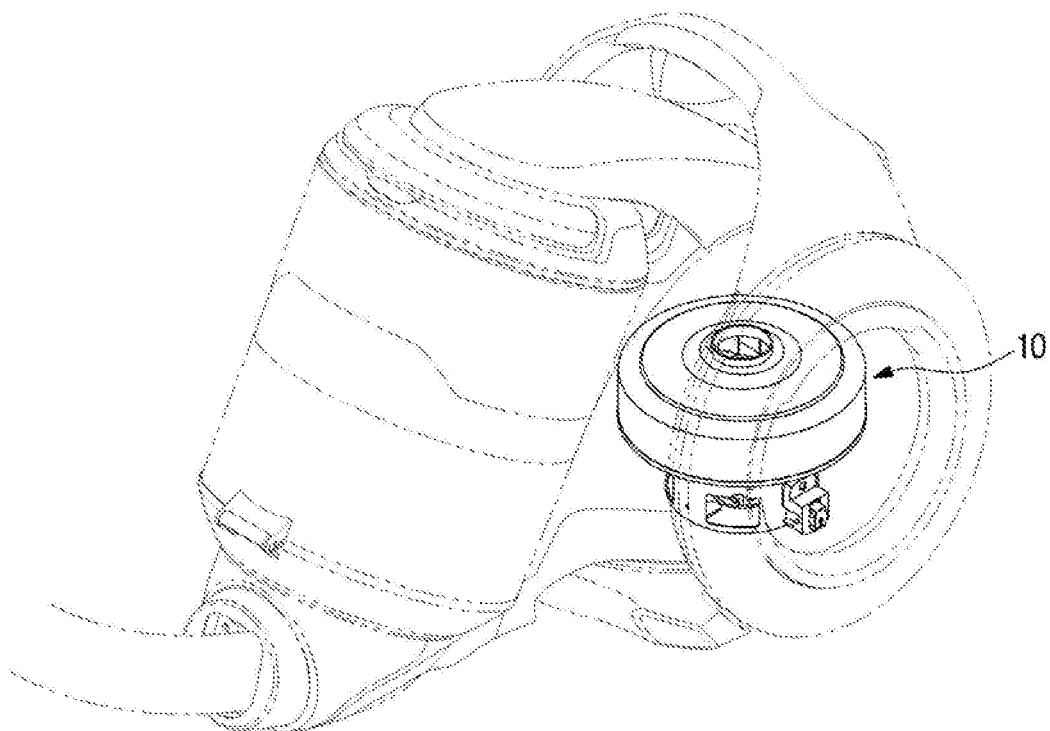


FIG. 2

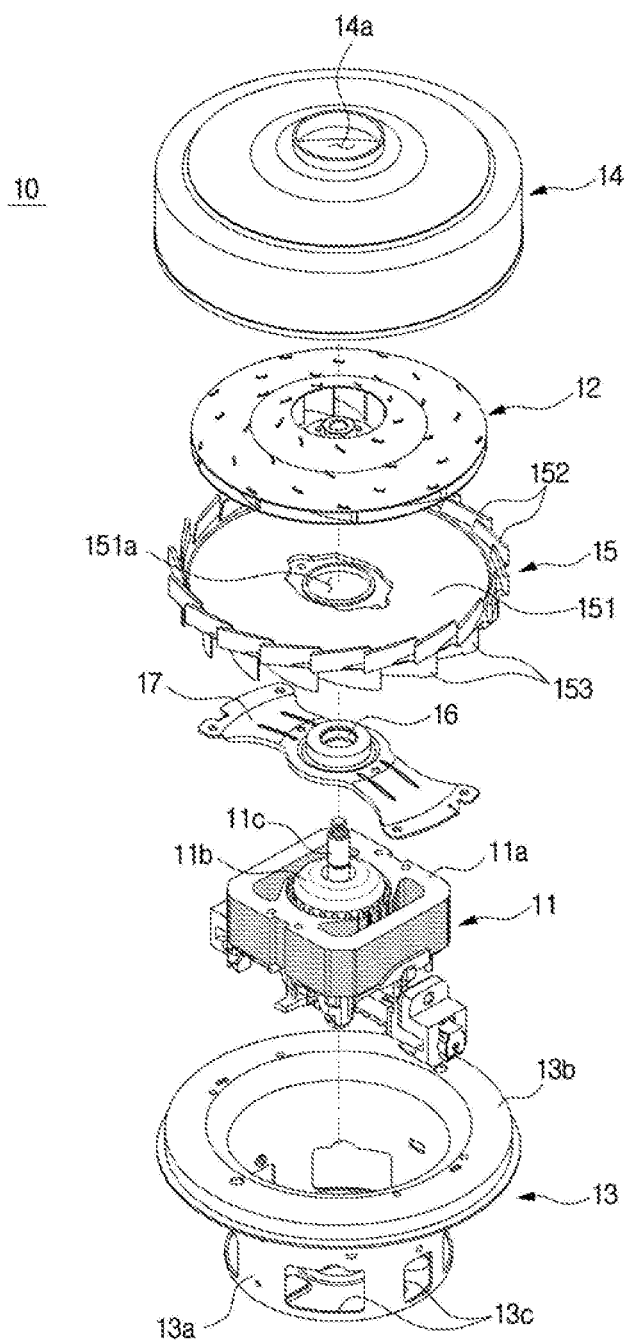


FIG. 3

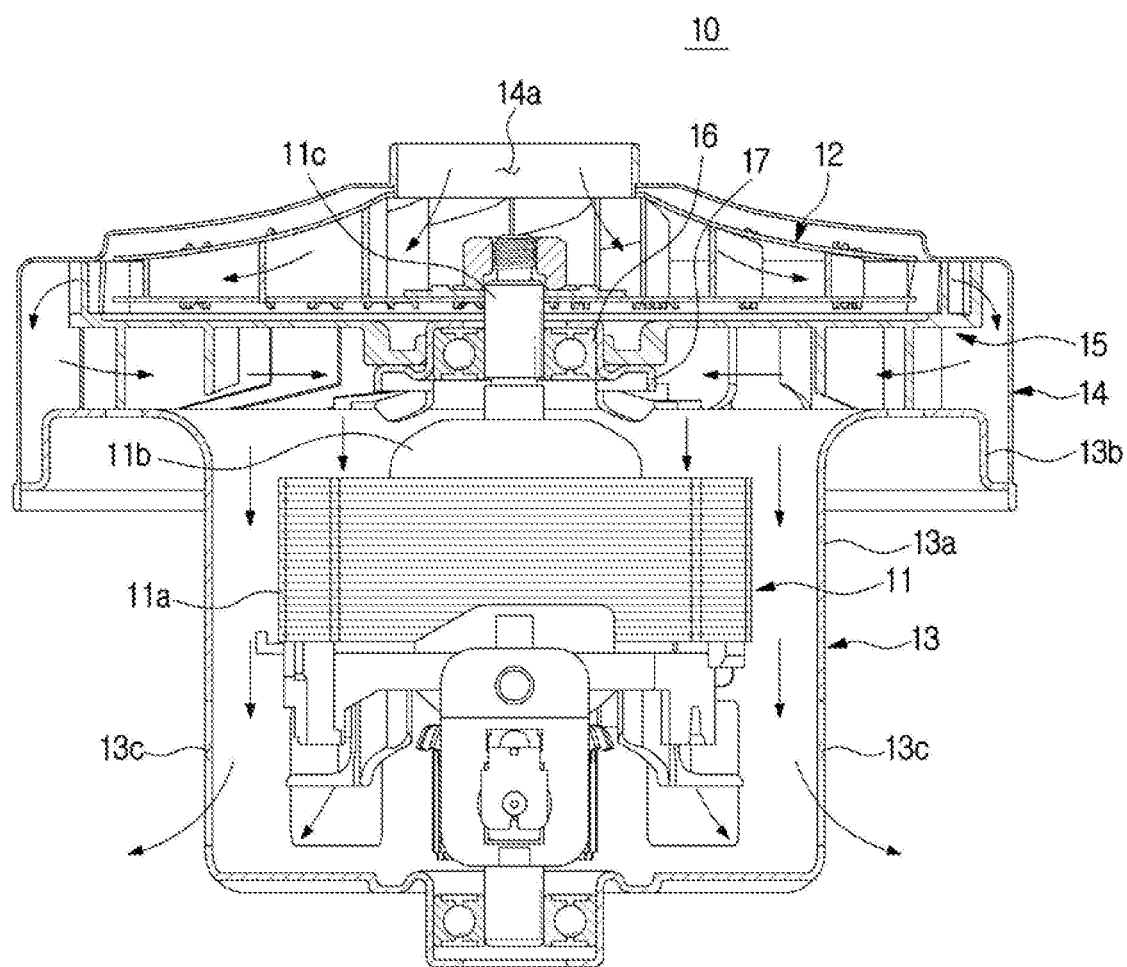


FIG. 4

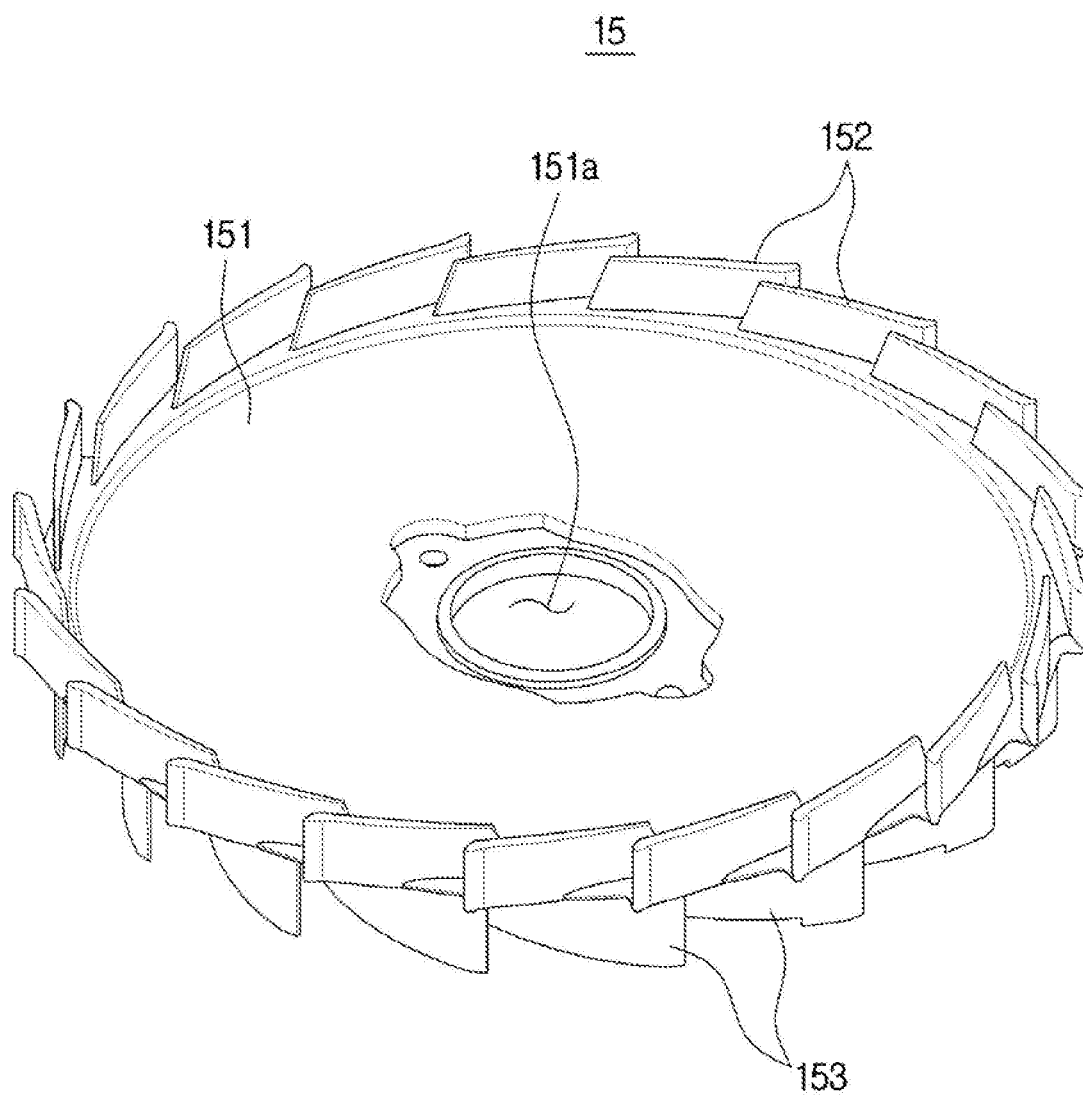


FIG. 5

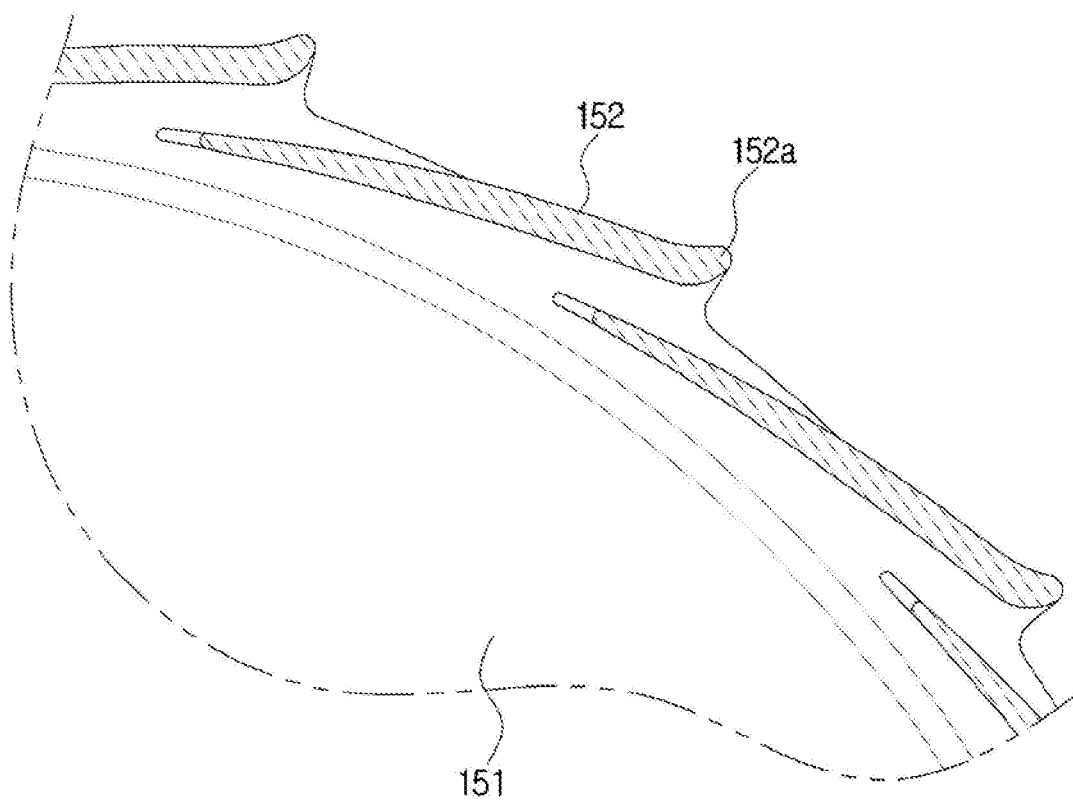
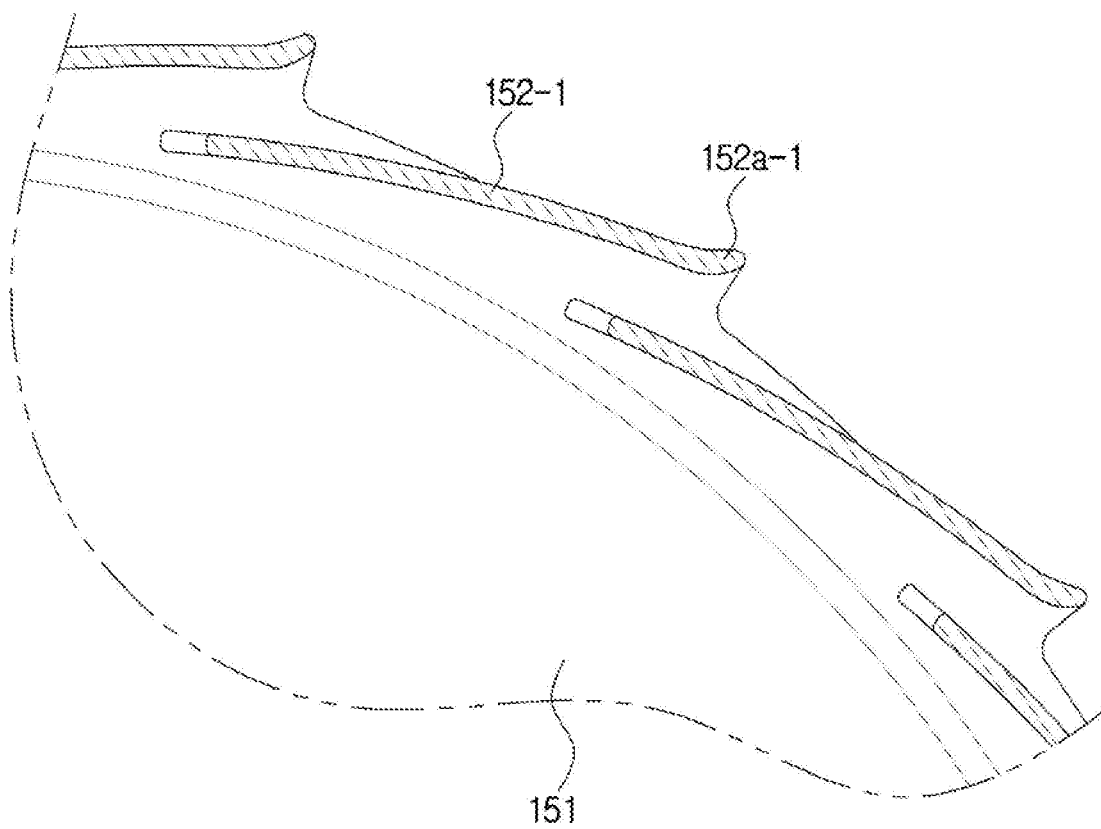


FIG. 6



FAN MOTOR AND VACUUM CLEANER HAVING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Korean Patent Application No. 10-2016-0054002, filed on May 2, 2016, in the Korean Intellectual Property Office, the disclosures of which is incorporated herein by reference.

BACKGROUND

1. Field

[0002] Embodiments of the disclosure relate to a fan motor that generates suction force and a vacuum cleaner having the fan motor.

2. Description of the Related Art

[0003] In general, a vacuum cleaner is a device for performing cleaning using a fan motor that generates suction force by sucking foreign substances such as dust together with air by the suction force, and then separating the foreign substances from the air.

[0004] The fan motor includes a motor to generate rotational force, a blowing fan rotated by the motor to generate suction force, and a guide member to guide air discharged from the blowing fan.

[0005] The guide member includes a plurality of diffuser blades disposed on a radially outer side of the blowing fan and spaced apart from each other in a circumferential direction. The diffuser blades allow the air discharged from the blowing fan to the outside at high velocity.

SUMMARY

[0006] The present disclosure provides a fan motor and a vacuum cleaner capable of increasing suction force by increasing flow velocity of air passing between diffuser blades.

[0007] The present disclosure also provides a fan motor and a vacuum cleaner capable of maintaining suction force of the fan motor while reducing the size of a guide member and the length of diffuser blades.

[0008] In accordance with one aspect of the present disclosure, a fan motor and a vacuum cleaner may include a blowing fan, and a plurality of diffuser blades provided on a radially outer side of the blowing fan and spaced apart from each other in a circumferential direction, wherein each of the plurality of diffuser blades includes a spoiler portion provided at an outer end of the diffuser blade and extending obliquely to an outward direction with respect to an extending direction of the diffuser blades.

[0009] The plurality of diffuser blades may each extend obliquely with respect to the circumferential direction.

[0010] The spoiler portion may be formed such that the outer surface of the spoiler portion is at an angle between about 5 and about 20 degrees with respect to the extending direction of the diffuser blade.

[0011] The spoiler portion may be of a third of the length of the diffuser blade.

[0012] The diffuser blade may have a thickness such that an inner end portion of the diffuser blade is thicker than an outer end portion of the diffuser blade.

[0013] The diffuser blade may have a gradually increasing thickness from the inner end portion to the outer end portion.

[0014] The fan motor and the vacuum cleaner may further include a motor housing configured to accommodate the motor, a fan housing configured to accommodate the blowing fan and coupled to the motor housing, and a guide member configured to guide air discharged from the blowing fan, wherein the guide member includes a partition wall having a circular plate shape, and the plurality of diffuser blades are provided at an outermost edge of one side of the partition wall.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] These and/or other aspects of the disclosure will become apparent and more readily appreciated from the following description of the exemplary embodiments, taken in conjunction with the accompanying drawings, in which:

[0016] FIG. 1 is a perspective view illustrating a fan motor included in a vacuum cleaner according to an embodiment of the present disclosure;

[0017] FIG. 2 is an exploded perspective view illustrating a fan motor included in a vacuum cleaner according to the embodiment of the present disclosure;

[0018] FIG. 3 is a cross-sectional view of a fan motor included in a vacuum cleaner according to the embodiment of the present disclosure;

[0019] FIG. 4 is a perspective view illustrating a guide member included in a vacuum cleaner according to the embodiment of the present disclosure;

[0020] FIG. 5 is a cross-sectional view of diffuser blades applied to the vacuum cleaner according to the embodiment of the present disclosure; and

[0021] FIG. 6 is a cross-sectional view of diffuser blades applied to a vacuum cleaner according to another embodiment of the disclosure.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0022] A vacuum cleaner in accordance with an embodiment of the present disclosure will now be described in detail with reference to the accompanying drawings.

[0023] Referring to FIG. 1, a vacuum cleaner includes a fan motor 10 inside. The vacuum cleaner sucks foreign materials on a floor together with air by suction force generated by the fan motor 10, thereby cleaning the floor.

[0024] Referring to FIGS. 2 and 3, the fan motor 10 includes a motor 11 to generate rotational force, and a blowing fan 12 to be rotated by the motor 11.

[0025] The motor 11 includes a stator 11a fixed to a motor housing 13, which will be described later, a rotator 11b rotatably installed in the stator 11a and rotated by interaction with the stator 11a, and a rotating shaft 11c installed at the center of the rotor 11b and connected to the blowing fan 12 to rotate the blowing fan 12 together with the rotor 11b.

[0026] The blowing fan 12 has a centrifugal fan that sucks air in an axial direction thereof and discharges the air to an outside in a radial direction thereof.

[0027] The fan motor 10 includes a motor housing 13 to accommodate the motor 11, a fan housing 14 coupled to the motor housing 13 and accommodating the blowing fan 12, a bearing 16 to rotatably support the rotating shaft 11c, and a fixing bracket 17 to fix the bearing 16 to the fan housing 14.

[0028] The motor housing 13 is formed in a hollow cylindrical shape and includes a motor accommodating portion 13a to form a space for accommodating the motor 11 therein and a flange portion 13b that extends radially and outwardly from one end of the motor accommodating portion 13a to form a space to accommodate the air blowing fan 12 together with the fan housing 14.

[0029] The motor housing portion 13a is provided with a discharge port 13c through which the air having passed through the motor 11 is discharged to an outside of the fan motor 10. The discharge ports 13c are spaced apart from each other in a circumferential direction of the motor housing portion 13a.

[0030] The fan housing 14 accommodates the blowing fan 12 and the guide member 15 for spreading the air discharged from the blowing fan 12 and guiding it to the motor 11.

[0031] The fan housing 14 is formed in a cylindrical shape with one side closed and the other side opened, and an inside of the fan housing 14 forms a space to accommodate the blowing fan 12 and the guide member 15.

[0032] The opened side of the fan housing 14 is closed by the flange portion 13b of the motor housing 13 as the fan housing 14 is coupled with the motor housing 13. A center portion of the closed side of the fan housing (14) is provided with a suction port (14a) through which air may be sucked into the fan housing 14.

[0033] Referring to FIG. 4, the guide member 15 includes a partition wall 151 formed in a circular plate shape, a plurality of diffuser blades 152 provided at an outermost edge of one side of the partition wall 151 and spaced apart from each other in a circumferential direction, and a plurality of guide blades 153 provided on the other side of the partition wall 151 and spaced apart from each other in the circumferential direction of the partition wall 151. The partition wall 151 partitions the space in which the motor accommodation portion 13a and the air blowing fan 12 are accommodated. The partition wall 151 has a through hole 151a at a center thereof through which the rotation axis 11c passes

[0034] The diffuser blades 152 guide the air discharged from the blowing fan 12 to be radially and outwardly discharged at high velocity, thereby increasing the suction force of the fan motor 10.

[0035] The diffuser blades 152 extend obliquely with respect to the circumferential direction of the partition wall 151 and curvedly extend in the form of an arch to smoothly guide the air discharged between the diffuser blades 152 across the inner circumferential face of the fan housing 14.

[0036] The blowing fan 12 is disposed inside of the diffuser blades 152. Specifically, the diffuser blades 152 are disposed on the outer side of the radial direction of the blowing fan 12 and spaced apart from each other in a circumferential direction of the partition wall 151, so that the air radially discharged to the outer direction from the blowing fan 12 is guided by the diffuser blades 152.

[0037] Referring to FIG. 5 the diffuser blades 152 gradually increases in thickness from an inner end portion of the diffuser blade to an outer end portion of the diffuser blade to form the shape of substantial wedges. Therefore, the air discharged from the blowing fan 12 flows more smoothly into the space between the diffuser blades 152, making the air rapidly pass between the diffuser blades 152.

[0038] The guide blades 153 guide the discharged air that has passed between the diffuser blades 152 back to the inner side of the radial direction of the air blowing fan 12 to make the air pass the motor 11.

[0039] Therefore, when the blowing fan 12 is rotated by the motor 11, air is guided by the suction force generated from the blowing fan 12 into the blowing fan 12 through the suction port 14a and then to the outer side of the radial direction of the blowing fan 12 in. The air discharged from the blowing fan 12 is guided by the diffuser blades 152 and discharged through spaces between the diffuser blades 152.

[0040] The air moves along the inner circumferential face of the fan housing 14 and is guided by the guide blades 153 to move to the inner side of the radial direction through the spaces between the guide blades 153. The air is subsequently transferred to the inside of the motor housing 13, cools the motor 11 disposed in the motor housing 13 while passing the inside of the motor housing 13, and is discharged from the fan motor 10 through the discharge port 13c.

[0041] As for this vacuum cleaner, the suction force of the fan motor 10 is determined not only by the rotational velocity of the blowing fan 12 but also by the flow velocity of the air discharged from the blowing fan 12. That is, the suction force of the fan motor 10 may increase by making the air rapidly discharged from the blowing fan 12.

[0042] For this purpose, a spoiler portion 152a is provided in an outer end portion of the diffuser blade 152, and the spoiler portion is formed to be oblique outwardly with respect to an extending direction of the diffuser blade 152. The spoiler portion 152a is formed at an angle of 5 degrees or more and 20 degrees or less with respect to the extending direction of the diffuser blade 152 and has a length, which is a third or less of the length of the diffuser blade 152.

[0043] This spoiler portion 152a is to reduce flow separation of the air guided by the outer circumferential face of the diffuser blade 152.

[0044] As described above, since the diffuser blade 152 is formed in the form of an arch, the flow separation may inevitably occur at the outer end portion of the diffuser blade 152 while the air is moving along the outer circumferential surface of the diffuser blade 152. The flow separation acts as a factor to reduce flow velocity of the air passing between the diffuser blades 152.

[0045] As in the present disclosure, with the spoiler portions 152a formed on the outer end portions of the diffuser blades 152, the flow separation that might occur at the outer end portions of an outer circumferential surface of the diffuser blades 152 may be reduced. The air flowing across the outer circumferential faces of the diffuser blades 152 may be rapidly discharged through the spaces between the diffuser blades 152.

[0046] In addition, the spoiler portion 152a is configured for an airflow of the air guided by one of the diffuser blades 152 to be separated from the other airflow of air guided by a neighboring diffuser blade 152. This may reduce interferences between the airflows guided by the diffuser blades 152, thereby discharging the air more smoothly.

[0047] As described above, the spoiler portion 152a provided in the diffuser blade 152 is configured to reduce the flow separation of the air discharged across the outer circumferential face of the diffuser blades 152 and reduce interferences between the airflows guided by the diffuser blades 152. As a result, the flow velocity of air discharged

between the diffuser blades **152** increases, and the suction force of the fan motor **10** increases.

[0048] In general, the suction force of the fan motor **10** increases in proportion to the size of the guide member **15** and the length of the diffuser blade **152**. Therefore, by forming the spoiler portion **152a** at the outer end portion of the diffuser blades **152**, it is possible to reduce the size of the guide member **15** and the length of the diffuser blade **152** while allowing the fan motor **10** to generate the same suction force. That is, by forming the spoiler portion **152a**, the guide member **15** and the diffuser blade **152** may be formed to be smaller.

[0049] In this embodiment, the thickness of the diffuser blade **152** gradually increases from the inner end portion to the outer end portion, without being limited thereto.

[0050] It is also possible to partially form the wedge shape in some section of the diffuser blade **152** by having the inner end portion of the diffuser blade formed to be thicker than the outer end

[0051] That is, some section of the diffuser blade **152** is formed to have the wedge shape, while the remaining section is formed to have a constant thickness.

[0052] In this embodiment, the thickness of the diffuser blade **152** gradually increases from the inner end portion to the outer end portion, making the air discharged more smoothly. However, the thickness of the diffuser blade **152** is not limited thereto. As shown in FIG. 6, even if the diffuser blade **152-1** is formed to have a constant thickness as the whole, a spoiler portion **152a-1** may be formed on an outer end portion of the diffuser blade **152-1** to reduce the flow separation.

[0053] As described above, a fan motor and a vacuum cleaner according to the present disclosure reduce flow separation by a spoiler portion provided at an outer end portion of diffuser blades so that flow velocity of the discharged air guided by the diffuser blades increases, and accordingly, suction force of the fan motor increases.

[0054] The fan motor and the vacuum cleaner according to the present disclosure may maintain the suction force of the fan motor at a predetermined level or higher using the spoiler portion while reducing the size of a guide member and the length of the diffuser blades.

[0055] The present disclosure is not limited to the embodiments described above, and it should be clear to those skilled in the art that various changes and modifications thereto are possible without departing from the spirit and scope of the present disclosure. Therefore, the changes and modifications fall within the scope of the appended claims of the present disclosure.

1. A fan motor comprises:

a blowing fan, and

a plurality of diffuser blades provided on a radially outer side of the blowing fan and spaced apart from each other in a circumferential direction,

wherein each of the plurality of diffuser blades includes a spoiler portion provided at an outer end of the diffuser blade and extending obliquely to an outward direction with respect to an extending direction of the diffuser blades.

2. The fan motor according to claim 1, wherein the plurality of diffuser blades each extend obliquely with respect to the circumferential direction.

3. The fan motor according to claim 1, wherein the spoiler portion is formed such that outer surface of the spoiler portion is at an angle between about 5 and about 20 degrees with respect to the extending direction of the diffuser blade.

4. The fan motor according to claim 1, wherein the spoiler portion has a length, which is a third of the length of the diffuser blade.

5. The fan motor according to claim 1, wherein the diffuser blade has a thickness such that an inner end portion of the diffuser blade thicker than an outer end portion of the diffuser blade.

6. The fan motor according to claim 5, wherein the diffuser blade has a gradually increasing thickness from the inner end portion to the outer end portion.

7. The fan motor according to claim 1, further comprises: a motor housing configured to accommodate the motor; a fan housing configured to accommodate the blowing fan and coupled to the motor housing, and a guide member configured to guide air discharged from the blowing fan,

wherein the guide member includes a partition wall having a circular plate shape, and the plurality of diffuser blades are provided at an outermost edge of one side of the partition wall.

8. A vacuum cleaner comprising the fan motor according to claim 1.

9. A vacuum cleaner comprising the fan motor according to claim 2.

10. A vacuum cleaner comprising the fan motor according to claim 3.

11. A vacuum cleaner comprising the fan motor according to claim 4.

12. A vacuum cleaner comprising the fan motor according to claim 5.

13. A vacuum cleaner comprising the fan motor according to claim 6.

14. A vacuum cleaner comprising the fan motor according to claim 7.

* * * * *