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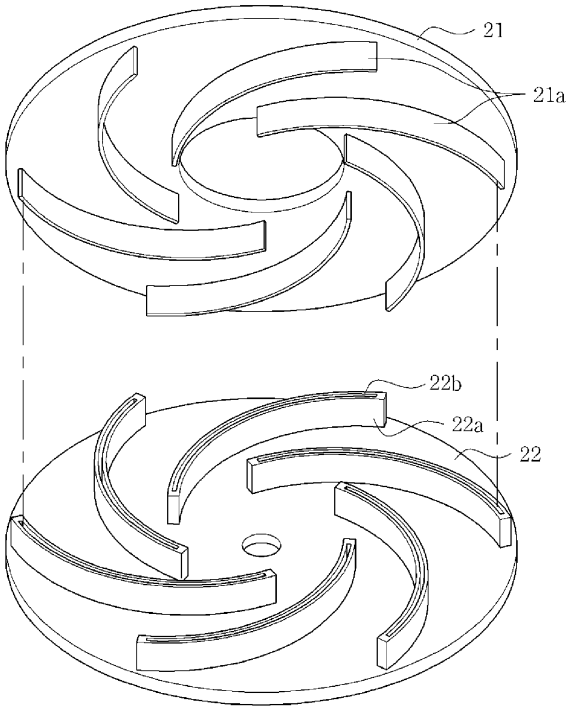
(54) Impeller and vacuum cleaner motor assembly including the same

(57) Disclosed herein is an impeller including: an upper plate formed integrally with upper blades; and a lower plate formed integrally with lower blades each including a coupling groove formed in an inner side thereof so that the upper blades are coupled thereto, the coupling groove corresponding to the upper blade, wherein the upper plate and the lower plate are coupled to each other so that the upper blades are fitting-coupled to the coupling grooves of the lower blades. Each of the upper and lower blades is formed on the upper and lower plates configuring the impeller, and a coupling structure between the upper and lower blades is integrated, thereby making it possible to improve rigidity of the impeller.

FIG.1



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Description

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of Korean Patent Application No. 10-2012-0032415, filed on March 29, 2012, entitled "Impeller and Vacuum Cleaner Motor Assembly having the Same", which is hereby incorporated by reference in its entirety into this application.

BACKGROUND OF THE INVENTION

1. Technical Field

[0002] The present invention relates to an impeller and a vacuum cleaner motor assembly including the same.

2. Description of the Related Art

[0003] Generally, an impeller for an electric blower is used in a state in which it is connected to a motor in order to suck a fluid. More specifically, an upper portion of a fan- motor for a vacuum cleaner is provided with an impeller that is a centrifugal fan for air suction, wherein the impeller is connected to a shaft of a driving motor to thereby rotate.

[0004] However, as disclosed in Korean Patent Laid-Open Publication No. 2004- 0082111 laid- open published in Korean Intellectual Property Office, an impeller according to the prior art includes an upper plate, a lower plate, and a blade; however, the upper plate, the lower plate, and the blade are separately manufactured and then coupled to each other, such that stress due to centrifugal force and aerodynamic force is concentrated on a coupling part at the time of rotation of the impeller. Therefore, the coupling part may be damaged due to the concentration of the stress at the time of high- speed rotation of the impeller.

SUMMARY OF THE INVENTION

[0005] The present invention has been made in an effort to provide an impeller having improved strength at the time of high-speed rotation and improved productivity according to simplification of a manufacturing process, through an integrated coupling structure of upper and lower blades thereof, and a vacuum cleaner motor assembly including the same.

[0006] According to a preferred embodiment of the present invention, there is provided an impeller including: an upper plate formed integrally with upper blades; and a lower plate formed integrally with lower blades each including a coupling groove formed in an inner side thereof so that the upper blades are coupled thereto, the coupling groove corresponding to the upper blade, wherein the upper plate and the lower plate are coupled to each other so that the upper blades are fitting-coupled to the coupling grooves ofthe lower blades.

[0007] The upper blade may be protruded from one surface of the upper plate, and the lower blade may be protruded from one surface of the lower plate so as to face the upper blade and include the coupling groove formed therein so that the upper blade is fitting-coupled thereto.

[0008] The coupling groove may have a thickness and a shape corresponding to those of the upper blade so that the entire upper blade is coupled thereto.

[0009] The upper blade and the lower blade may be coupled to each other to form one integrated blade.

[0010] The upper blade and the lower blade may have a streamlined shape.

[0011] The upper plate formed integrally with the upper blade and the lower plate formed integrally with the lower blade may be made of a plastic material by injection molding.

[0012] The impeller may further include: a first coupling part formed on one end of the upper blade; and a second coupling part formed on one end of the lower blade and coupled to the first coupling part so as to correspond to the first coupling part.

[0013] According to another preferred embodiment ofthe present invention, there is provided a vacuum cleaner motor assembly including: a shaft becoming the rotation center of a motor; a rotor part rotatably coupled to the shaft; a first stopper coupled to an upper portion of the rotor part in an axial direction; a first bearing part coupled to an upper portion of the first stopper in the axial direction; a second stopper coupled to a lower portion of the rotor part in the axial direction; a second bearing part coupled to a lower portion of the second stopper in the axial direction; a front part formed at an upper portion of the first bearing part in the axial direction and supporting the first bearing part; a diffuser part coupled to an upper portion of the front part in the axial direction; and an impeller coupled to an upper portion of the diffuser part in the axial direction and coupled to the shaft to thereby rotate, wherein the impeller includes: an upper plate formed integrally with upper blades; and a lower plate formed integrally with lower blades each including a coupling groove formed in an inner side thereof so that the upper blades are coupled thereto, the coupling groove corresponding to the upper blade, and the upper plate and the bwer plate being coupled to each other so that the upper blades are fitting-coupled to the coupling grooves of the lower blades.

[0014] The vacuum cleaner motor assembly may further include a housing enclosing an outer side ofthe rotor part and including the first and second bearing parts; and a cover member coupled to an upper portion ofthe housing in the axial direction.

[0015] The upper blade may be protruded from one surface of the upper plate, and the lower blade may be protruded from one surface of the lower plate so as to face the upper blade and includes the coupling groove formed therein so that the upper blade is fitting-coupled thereto.

[0016] The coupling groove may have a thickness and a shape corresponding to those of the upper blade so that the entire upper blade is coupled thereto.

[0017] The upper blade and the lower blade may be coupled to each other to form one integrated blade.

[0018] The upper blade and the lower blade may have a streamlined shape.

[0019] The upper plate formed integrally with the upper blade and the lower plate formed integrally with the lower blade may be made of a plastic material by injection molding.

[0020] The impeller may further include: a first coupling part formed on one end of the upper blade; and a second coupling part formed on one end of the lower blade and coupled to the first coupling part so as to correspond to the first coupling part.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The above and other objects, features and advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is an exploded perspective view of an impeller according to a preferred embodiment ofthe present invention;

FIG. 2 is an assembled perspective view of the impeller according to the preferred embodiment ofthe present invention;

FIG. 3 is a plan view of an impeller according to another preferred embodiment of the present invention;

FIGS. 4A to 4F are assembled plan views of various examples of upper and lower blades of FIG. 3;

FIG. 5 is a cross-sectional view of a vacuum cleaner motor module including the impeller according to the preferred embodiment ofthe present invention; and

FIG. 6 is a schematic cross-sectional view of a rotor part and a stator part according to the preferred embodiment ofthe present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] The objects, features and advantages of the present invention will be more clearly understood from the following detailed description of the preferred embodiments taken in conjunction with the accompanying drawings. Throughout the accompanying drawings, the same reference numerals are used to designate the same or similar components, and redundant descriptions thereof are omitted. Further, in the following description, the terms "first", "second", "one side", "the other side" and the like are used to differentiate a certain component from other components, but the configuration of such components should not be construed to be limited by the terms. Further, in the description of the present invention, when it is determined that the detailed description of the related art would obscure the gist of the present invention, the description thereof will be omitted.

[0023] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the attached drawings.

[0024] FIG. 1 is an exploded perspective view of an impeller according to a preferred embodiment of the present invention; FIG. 2 is an assembled perspective view of the impeller according to the preferred embodiment of the present invention; FIG. 3 is a plan view of an impeller according to another preferred embodiment of the present invention; and FIGS. 4A to 4F are assembled plan views of various examples of upper and lower blades of FIG. 3.

[0025] The impeller 20 according to the preferred embodiment of the present invention may be configured to include an upper plate 21 formed integrally with upper blades 21a; and a lower plate 22 formed integrally with lower blades 22 each including a coupling groove 22b formed in an inner side thereof so that the upper blades 21a are coupled thereto, the coupling groove 22b corresponding to the upper blade 21a, wherein the upper plate 21 and the lower plate 22 may be coupled to each other so that the upper blades 21a are fitting-coupled to the coupling grooves 22b ofthe lower blades 22a.

[0026] According to the preferred embodiment of the present invention, the upper blade 21a and the lower blade 22a may have an independent shape forming each blade of the impeller 20. Alternatively, the upper blade 21a and the lower blade 22a having a partial shape of the entire blade may be coupled to each other to thereby have one complete blade shape of the impeller 20.

[0027] The upper plate 21 is coupled and formed integrally with the upper blade 21a. The upper plate 21 formed integrally with the upper blade 21a may be made of a plastic material by an injection molding method. However, a material and a formation method of the upper plate 21 are not necessarily limited thereto. The upper blade 21a formed on the upper plate 21 may be formed to have the entire shape of the blade for sucking air through rotation of the impeller 20 or be formed to have a partial shape of the entire blade and be then coupled to a lower blade 22a to be described below to thereby have a complete shape of the blade of the impeller 20.

[0028] The lower plate 22 is coupled and formed integrally with the lower blade 22a. The lower blade 22a may also be manufactured integrally with the lower plate 22 using a plastic material by injection molding, similar to the upper blade 21a. The lower blade 22a may be formed to face the upper blade 21a and have the coupling groove 22b formed therein so that the upper blade 21a may be coupled thereto. In detail, as shown in FIGS. 1 and 2, the coupling groove 22b formed in the lower blade 22a may have a thickness and a shape corresponding to those of the upper blade 21a so that the upper blade 21a may be fitting-coupled thereto. As a result, as shown in FIG. 1, the impeller 20 may be manufactured by coupling the upper plate 21 and the bwer plate 22 to each other so that the upper blade 21a and the lower blade 22a face

each other.

[0029] The upper blade 21a may be protruded from one surface of the upper plate 21, and the lower blade 22a may be protruded from one surface of the lower plate 22 so as to face the upper blade 21 a. In this configuration, the lower plate 22a may include the coupling groove 22b formed in an inner side thereof so that the upper blade 21a may be fitting-coupled thereto, wherein the coupling groove 22b coincides with the upper blade 21a.

[0030] The upper blade 21a and the blade plate 22a may be formed to have a streamlined shape as shown in FIGS. 4A to 4F, unlike the shape shown in FIGS. 1 and 2. This shape is to reduce resistance of air according to rotation against an increase in a thickness of the blade that may be incurred due to coupling the upper blade 21a and the lower blade 22a to each other so as to correspond to each other. The upper blade 21a and the lower blade 22a may be coupled to each other by forming the coupling groove 22b corresponding to the upper blade 21a in the inner side of the lower blade 22a. However, the upper blade 21a and the lower blade 22a may also be coupled to each other by forming coupling parts on each of the upper blade 21a and the lower blade 22a.

[0031] In detail, the impeller 20 may include a first coupling part 21a formed on one end of the upper blade 21a and a second coupling part 22c coupled to the first coupling part 21b so as to correspond to the first coupling part 21b and formed on one end of the lower blade 22a. Various coupling examples between the upper blade 21a and the lower blade 22a will be described based on various examples shown in FIGS. 4A to 4F.

[0032] First, as shown in FIG. 4A, the blade of the impeller 20 may be formed by coupling the upper blade 21a and the lower blade 22a having the coupling groove 22b formed so as to correspond to the upper blade 21a described above to each other.

[0033] In addition, as shown in FIG. 4B, the first coupling part 21b may be formed in one end of the upper blade 21a configuring a portion of the blade of the impeller 20, and the second coupling part 22c that may be coupled to the first coupling part 21b may be formed on the lower blade 22a. One blade configuring the impeller 20 maybe formed by coupling the first coupling part 21b of the upper blade 21a and the second coupling part 22c of the lower blade 22a to each other.

[0034] Further, as shown in FIG. 4C, the first coupling part 21b may be formed in a protrusion shape on one end of the upper blade 21a, and the second coupling part 22c may be formed as a coupling groove corresponding to the protrusion part in the lower blade 22a.

[0035] As shown in FIG. 4D, a plurality of first coupling parts 21b having a protrusion shape may be formed on the upper blade 21a or the upper blade 21a itself may be formed in a shape in which it has a plurality of protrusions, and the second coupling parts 22c having a groove shape so that they may be coupled to the first coupling parts 21b may be formed in the lower blade 22a. FIGS. 4E and 4F also show examples of a corresponding relationship between the first coupling part 21b and the second coupling part 22c. As described above, since the first and second coupling parts 21b and 22c may be formed by various methods, the first and second coupling parts 21b and 22c may be changed in design so that the upper and lower blades 21a and 22a may be coupled to each other, wherein the first coupling part 21b is formed integrally with the upper plate 21 and the second coupling part 22c is formed integrally with the lower plate 22. An object of the present invention is to design the blade of the impeller 20 so as to have large durability against stress concentration due to high speed rotation thereof by coupling these upper and lower plates 21 and 22 to each other.

[0036] FIG. 5 is a cross-sectional view of a vacuum cleaner motor assembly including the impeller according to the preferred embodiment of the present invention.

[0037] The vacuum cleaner motor assembly including the impeller according to the preferred embodiment of the present invention is configured to include a shaft 10 becoming the rotation center of a motor, a rotor part 11 rotatably coupled to the shaft 10, a first stopper 13 coupled to an upper portion of the rotor part 11 in an axial direction, a first bearing part 40 coupled to an upper portion of the first stopper 13 in the axial direction, a second stopper 14 coupled to a lower portion of the rotor part 11 in the axial direction, a second bearing part 50 coupled to a lower portion of the second stopper 14 in the axial direction, a front part 70 formed at an upper portion of the first bearing part 40 in the axial direction and supporting the first bearing part 40, a diffuser part 30 coupled to an upper portion of the front part 70 in the axial direction, and an impeller 20 coupled to an upper portion of the diffuser part 30 in the axial direction and coupled to the shaft 10 to thereby rotate, wherein the impeller 20 includes an upper plate 21 formed integrally with upper blades 21a; and a lower plate 22 formed integrally with lower blades 22a each including a coupling groove 22b formed in an inner side thereof so that the upper blades 21a are coupled thereto, the coupling groove 22b corresponding to the upper blade 21a, and the upper plate 21 and the lower plate 22 being coupled to each other so that the upper blades 21a are fitting-coupled to the coupling grooves 22b of the lower blades 22a.

[0038] Since configurations ofthe upper and lower plates 21 and 22 forming the impeller 20, the upper blade 21a coupled integrally with the upper plate 21, and the lower blade 22a coupled integrally with the lower plate 22, and examples thereof are overlapped with contents described above, a detailed description thereof will be omitted. Hereinafter, components of the vacuum cleaner motor assembly including the impeller 20 according to the preferred embodiment of the present invention and an operation relationship therebetween will be described.

[0039] The shaft 10 becomes the rotation center of the motor and is formed to be extended in the axial direction. Particularly, the axial direction in the present invention, which is based on a direction in which the shaft 10 is formed, refers to directions toward an upper or lower por-

tion based on the shaft 10 shown in FIG. 5. A rotor part 11 to be described below is coupled to the shaft 10 becoming the rotation center ofthe motor.

[0040] As shown in FIG. 6, the rotor part 11 may be configured to include an annular rotor core 11a and a plurality of rotor poles 11b protruded outwardly from the rotor core 11a. The rotor core 11a has a hollow hole formed at a central portion thereof, and the shaft 10 is fixedly coupled to the hollow hole to transfer rotation ofthe rotor part 11 to the outside. The plurality of rotor poles 11b may be formed to be protruded outwardly along an outer peripheral surface of the rotor core 11a and be formed to correspond to stator salient poles 12b to be described below.

[0041] A stator part 12 is configured to include a stator yoke 12a and stator salient poles 12b, as shown in FIG. 6. The stator yoke 12a may include a hollow hole formed therein so as to receive the rotor part 11 therein, and a plurality of stator salient poles 12b may be formed to be protruded from an inner side of the stator yoke 12a and correspond to the rotor poles 11b ofthe rotor part 11. Current is applied to the stator salient poles 12b of the stator yoke 12a to form a magnetic flux path through the stator salient poles 12b and the rotor poles 11b of the rotor part 11 facing the stator salient poles 12b, such that the rotor part 11 rotates.

[0042] The first bearing part 40 is a component rotating the rotor part 11 while supporting weight in the axial direction in the shaft 10 including the rotating rotor part 11 and a bad applied to the shaft 10. The first bearing part 40 is coupled to the upper portion of the first stopper 13 in the axial direction and is positioned in a housing 60 of the motor to be described below. A front part 70 to be described below supports the first bearing part 40 from an upper portion of the first bearing part 40 in the axial direction toward a lower portion thereof in the axial direction and is fixedly couple d to the first bearing part 40.

[0043] Each ofthe first and second stoppers 13 and 14 is coupled to the upper and lower portions ofthe rotor part 11 in the axial direction to serve to support the rotor part 11. The stoppers 13 and 14 are coupled to the shaft 10 while supporting the rotor part 11, thereby rotating together with the rotor part 11. The stoppers 13 and 14 may support the rotor part 11 in the axial direction and may be made of a resin such as a plastic, or the like, to thereby be formed as a balanc ing member capable of adjusting rotation balancing at the time of rotation of the motor. As a balancing method, a method of cutting a portion of a balancing member in order to maintain balancing at the time ofthe rotation ofthe motor or a method of coup ling a separate weight member to a balancing member may be used. In addition to the above-mentioned methods, various methods for rotation balancing of the motor may be selected and used by those skilled in the art. In addition, the stoppers 13 and 14 may be formed by processing a plastic, or the like, or be formed integrally with the rotor part 11 by injection.

[0044] The second bearing part 50 is coupled to the lower portion of the second stopper 14 in the axial direction. The second bearing part 50 is also coupled to the second stopper 14 so as to be disposed in the housing 60 of the motor together with the first bearing part 40. Since other operations and effects ofthe second bearing parts are the same as those of the first bearing part 40, a detailed description thereof will be omitted.

[0045] In addition, the vacuum cleaner motor assembly according to the preferred embodiment of the present invention may further include the front part 70 formed at the upper portion of the first bearing part 40 in the axial direction and supporting the first bearing part 40, the diffuser part 30 coupled to the upper portion of the front part 70 in the axial direction, and the impeller 20 coupled to the upper portion of the diffuser part 30 in the axial direction and coupled to the shaft 10.

[0046] The front part 70 may be formed of a separate member coupled to the housing 60 so as to be coupled to the upper portion of the first bearing part 40 in the axial direction to thereby support the first bearing part 40 as described above. The front part 70 may be coupled to the first bearing part 40 at a central portion thereof to support the first bearing part 40, as shown in FIG. 5. However, a shape ofthe front part 70 is not limited thereto. That is, various structures of the front part 71 capable of supporting the first bearing part 40 may be selected and used by those skilled in the art.

[0047] The diffuser part 30 is coupled to the upper portion of the front part 70 in the axial direction. Pressure of air sucked by an impeller 20 to be described below is increased by diffusers 31 of the diffuser part 30, the air having the increase pressure as described above is supplied toward return channels 32 disposed under the diffusers 31 through space parts between an inner peripheral surface of a cover member 80 and an outer peripheral surface of the diffuser part 30, and the air supplied as described above is guided to a central portion by the return channels 32 to thereby be blown toward the motor, such that the air is discharged while cooling the motor.

[0048] The impeller 20 is coupled to the upper portion of the diffuser part 30 in the axial direction and is coupled to the shaft 10. The impeller 20 is coupled to the shaft 10 to rotate together with the shaft 10 at the time of the rotation of the motor, thereby sucking external air. Particularly, the impeller 20 rotates in order to introduce the air from the outside at the time of an operation of the cleaner. The impeller 20 may be manufactured so as to have a direction and a shape of a blade formed at an inner side in order to introduce the external air. Since a detailed structure and example of the impeller 20 have been described above, a detailed description thereof will be omitted.

[0049] In addition, the vacuum cleaner motor assembly according to the embodiment of the present invention further includes the housing 60 enclosing an outer side of the rotor part 11 and including the first and second bearing parts 40 and 50 and the cover member 80 coupled to an upper portion of the housing 60 in the axial

direction.

[0050] The housing 60 is formed to be spaced apart from the rotor part 11, the first and second stoppers 13 and 14, and the first and second bearing parts 40 and 50 so as to encbse them. The housing 60 protects internal components such as the rotor part 11, the stator part, and the like and prevents other foreign materials from being introduced thereinto, thereby improving operational reliability of the motor. The housing 60 may further include a step part 61 formed on an outer peripheral surface of an upper portion thereof so that a cover member 80 to be described below is coupled thereto. The step part 61 is formed to be protruded from the outer peripheral surface of the housing 60, thereby making it possible to improve precision of a coupling height at the time of assembly of the cover member 80. Therefore, the precision of the assembling height of the cover member 80 is improved through the step part 61 formed on the outer peripheral surface of the housing 60, thereby making it possible to improve the efficiency of the vacuum cleaner motor assembly.

[0051] The cover member 80 is coupled to the upper portion of the housing 60 in the axial direction, as shown in FIG. 5. As described above, the assembling height of the coupled cover member 80 of the impeller 20 is an important factor. The cover member 80 adjusts a coupling height of the upper portion of the impeller 20, simultaneously with serving to cover the upper portion of the housing 60, thereby making it possible to improve the efficiency of the motor. To this end, the step part 61 is formed on the outer peripheral surface of the housing 60. Since other detailed descriptions are overlapped with those of the preferred embodiment of the present invention, they will be omitted.

[0052] As set forth above, according to the preferred embodiments ofthe present invention, each of the upper and lower blades is formed on the upper and lower plates configuring the impeller, and a coupling structure between the upper and lower blades is integrated, thereby making it possible to improve rigidity of the impeller.

[0053] In addition, the upper blade coupled integrally with the upper plate and the lower blade coupled integrally with the lower plate are coupled to each other to form the impeller, such that a stress concentration phenomenon is prevented, thereby making it possible to improve operational reliability and operation performance of the impeller.

[0054] Further, a lead time of manufacturing of the impeller and the vacuum cleaner motor assembly including the same is reduced through a simple coupling structure between the upper and lower blades, thereby making it possible to improve productivity.

[0055] Further, the integrated blade is formed in a streamlined shape in order to reduce resistance force generated due to a thickness of the blade according to an integrated structure in which the upper and lower blades are coupled to each other, thereby making it possible to reduce air resistance at the time of rotation.

[0056] Furthermore, the upper and lower blades are coupled to each other so as to be integrated with each other, thereby making it possible to remove a separate coating process and manufacture the impeller made of the plastic material through the injection molding. Therefore, a manufacturing process is simplified, and a material cost is reduced, thereby making it possible to improve the productivity.

[0057] Although the embodiments of the present invention have been disclosed for illustrative purposes, it will be appreciated that the present invention is not limited thereto, and those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention.

[0058] Accordingly, any and all modifications, variations or equivalent arrangements should be considered to be within the scope of the invention, and the detailed scope of the invention will be disclosed by the accompanying claims.

Claims

1. An impeller comprising:

an upper plate formed integrally with upper blades; and

a lower plate formed integrally with lower blades each including a coupling groove formed in an inner side thereof so that the upper blades are coupled thereto, the coupling groove corresponding to the upper blade,

wherein the upper plate and the lower plate are coupled to each other so that the upper blades are fitting-coupled to the coupling grooves ofthe lower blades.

2. The impeller as set forth in claim 1, wherein the upper blade is protruded from one surface ofthe upper plate, and the lower blade is protruded from one surface of the lower plate so as to face the upper blade and includes the coupling groove formed therein so that the upper blade is fitting-coupled thereto.

3. The impeller as set forth in claim 1, wherein the coupling groove has a thickness and a shape corresponding to those ofthe upper blade so that the entire upper blade is coupled thereto.

4. The impeller as set forth in claim 1, wherein the upper blade and the lower blade are coupled to each other to form one integrated blade.

5. The impeller as set forth in claim 1, wherein the upper blade and the lower blade have a streamlined shape.

6. The impeller as set forth in claim 1, wherein the upper

plate formed integrally with the upper blade and the lower plate formed integrally with the lower blade are made of a plastic material by injection molding.

7. The impeller as set forth in claim 1, further comprising:

a first coupling part formed on one end of the upper blade; and
a second coupling part formed on one end of the lower blade and coupled to the first coupling part so as to correspond to the first coupling part.

8. A vacuum cleaner motor assembly comprising:

a shaft becoming the rotation center of a motor;
a rotor part rotatably coupled to the shaft;
a first stopper coupled to an upper portion of the rotor part in an axial direction;
a first bearing part coupled to an upper portion ofthe first stopper in the axial direction;
a second stopper coupled to a lower portion of the rotor part in the axial direction;
a second bearing part coupled to a lower portion of the second stopper in the axial direction;
a front part formed at an upper portion of the first bearing part in the axial direction and supporting the first bearing part;
a diffuser part coupled to an upper portion of the front part in the axial direction; and
an impeller coupled to an upper portion of the diffuser part in the axial direction and coupled to the shaft to thereby rotate,

wherein the impeller includes:

an upper plate formed integrally with upper blades; and
a lower plate formed integrally with lower blades each including a coupling groove formed in an inner side thereof so that the upper blades are coupled thereto, the coupling groove corresponding to the upper blade, and the upper plate and the bwer plate being coupled to each other so that the upper blades are fitting-coupled to the coupling grooves of the lower blades.

9. The vacuum cleaner motor assembly as set forth in claim 8, further comprising a housing enclosing an outer side of the rotor part and including the first and second bearing parts; and
a cover member coupled to an upper portion ofthe housing in the axial direction.

10. The vacuum cleaner motor assembly as set forth in claim 8, wherein the upper blade is protruded from one surface of the upper plate, and the lower blade is protruded from one surface of the lower plate so as to face the upper blade and includes the coupling groove formed therein so that the upper blade is fitting-coupled thereto.

11. The vacuum cleaner motor assembly as set forth in claim 8, wherein the coupling groove has a thickness and a shape corresponding to those of the upper blade so that the entire upper blade is coupled thereto.

12. The vacuum cleaner motor assembly as set forth in claim 8, wherein the upper blade and the lower blade are coupled to each other to form one integrated blade.

13. The vacuum cleaner motor assembly as set forth in claim 8, wherein the upper blade and the lower blade have a streamlined shape.

14. The vacuum cleaner motor assembly as set forth in claim 8, wherein the upper plate formed integrally with the upper blade and the lower plate formed integrally with the lower blade are made of a plastic material by injection molding.

15. The vacuum cleaner motor assembly as set forth in claim 8, wherein the impeller further includes:

a first coupling part formed on one end of the upper blade; and
a second coupling part formed on one end of the lower blade and coupled to the first coupling part so as to correspond to the first coupling part.

FIG.1

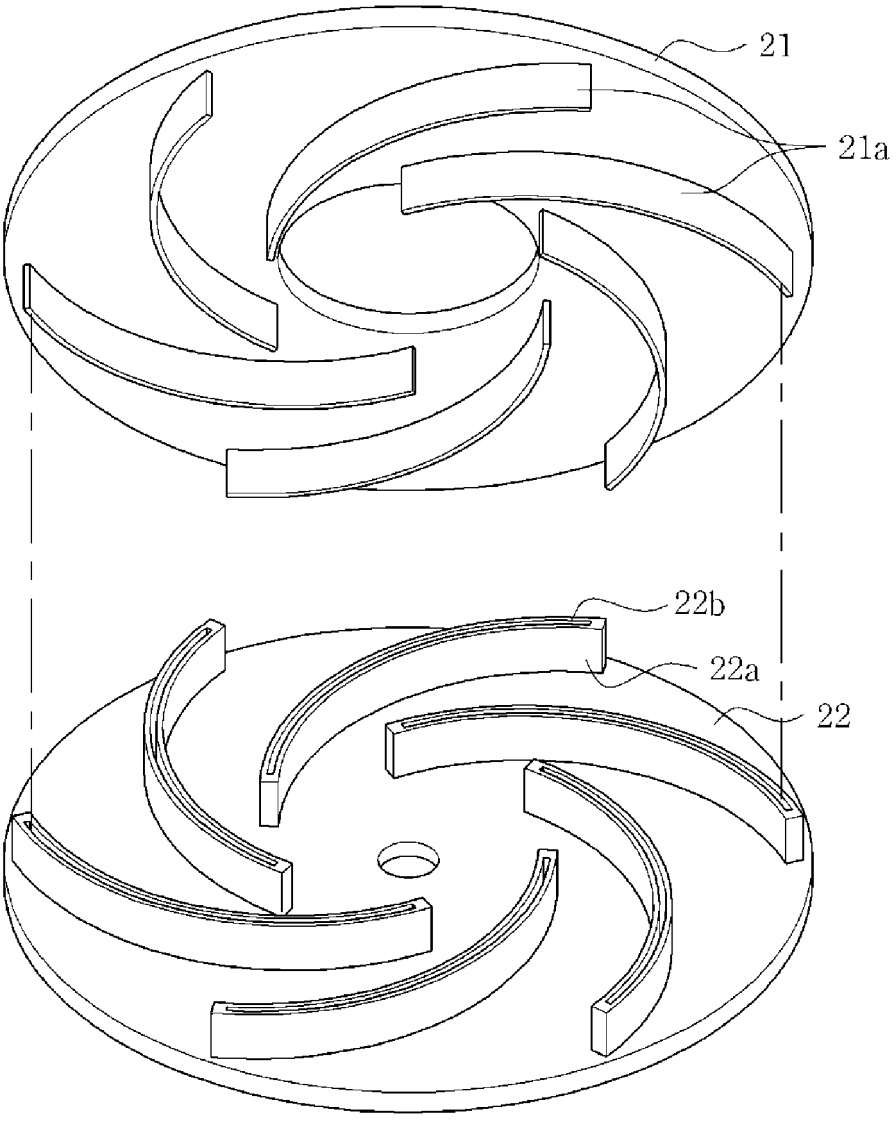


FIG.2

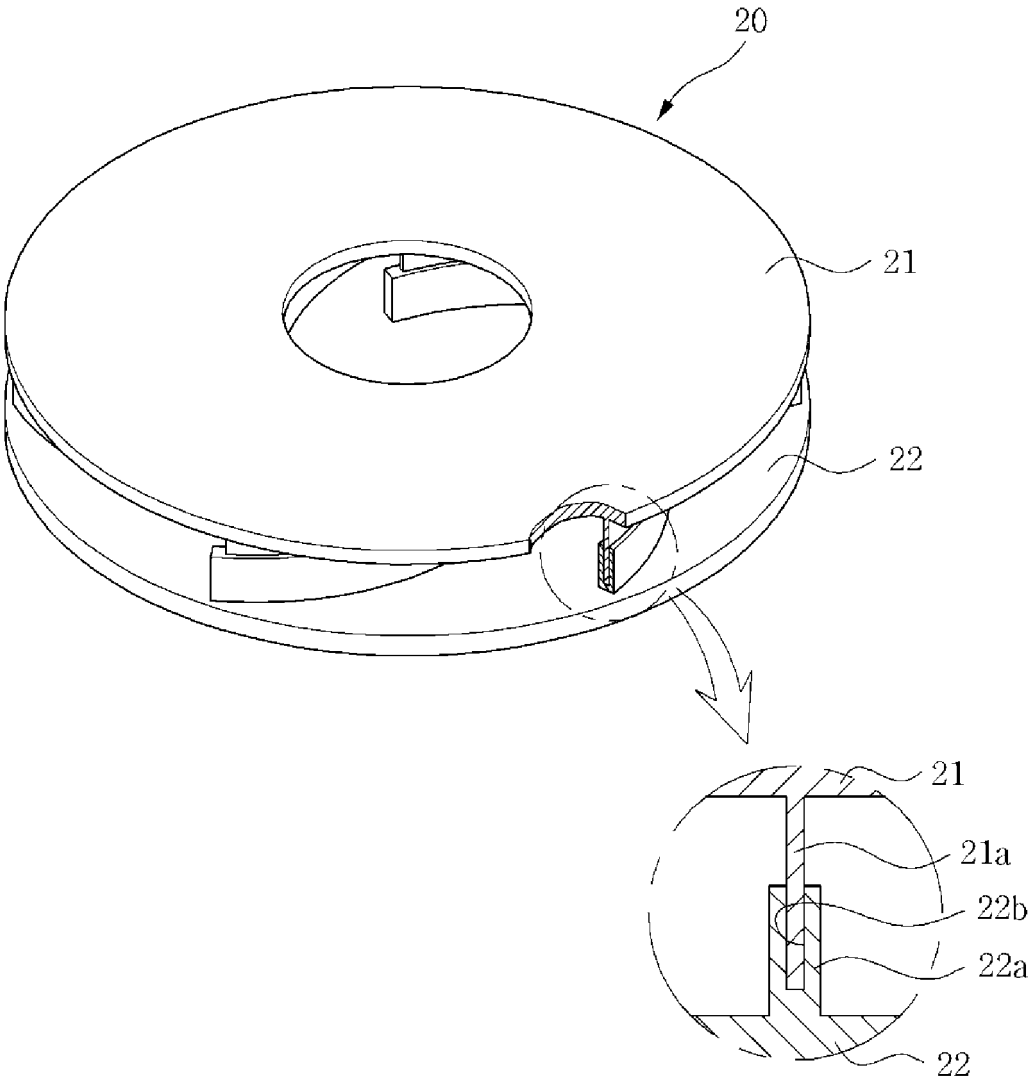


FIG.3

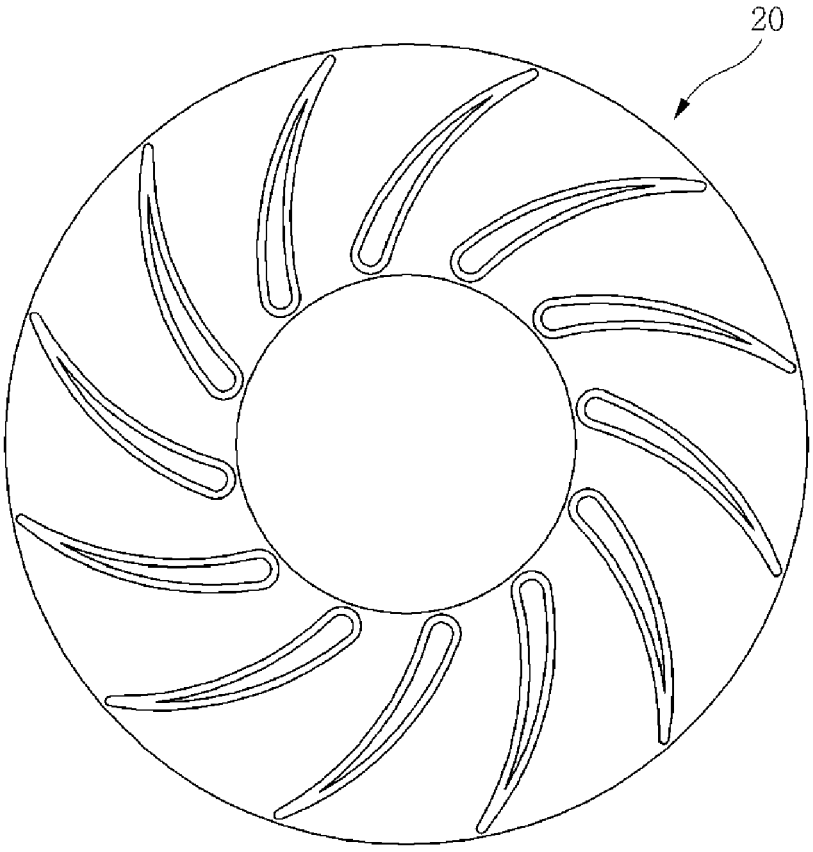


FIG.4A

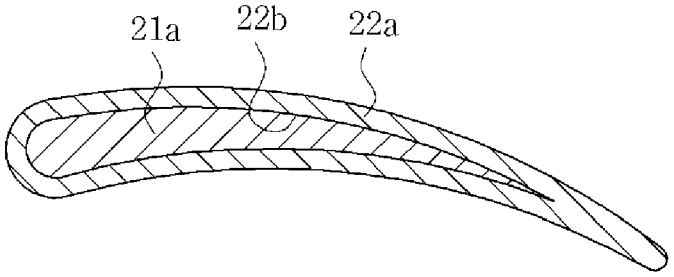


FIG.4B

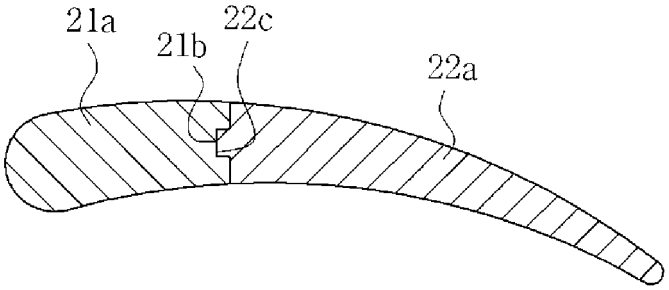


FIG.4C

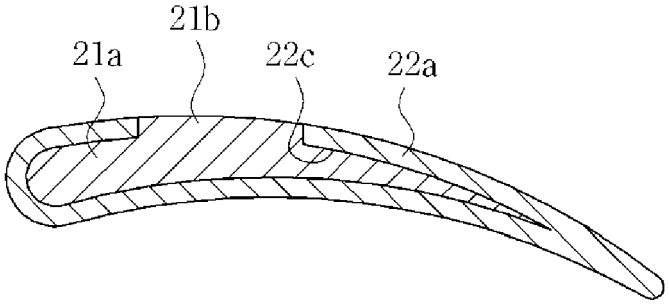


FIG.4D

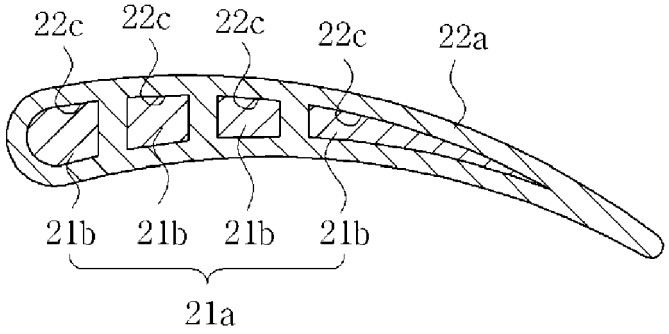


FIG. 4E

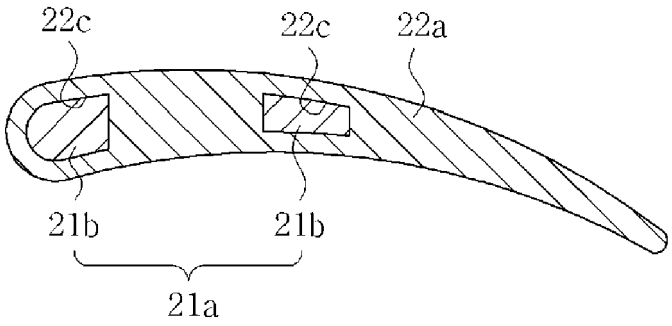


FIG. 4F

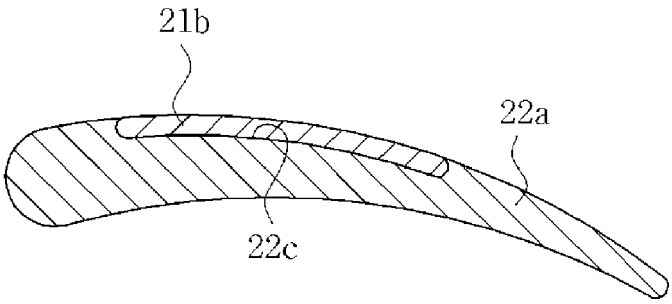


FIG.5

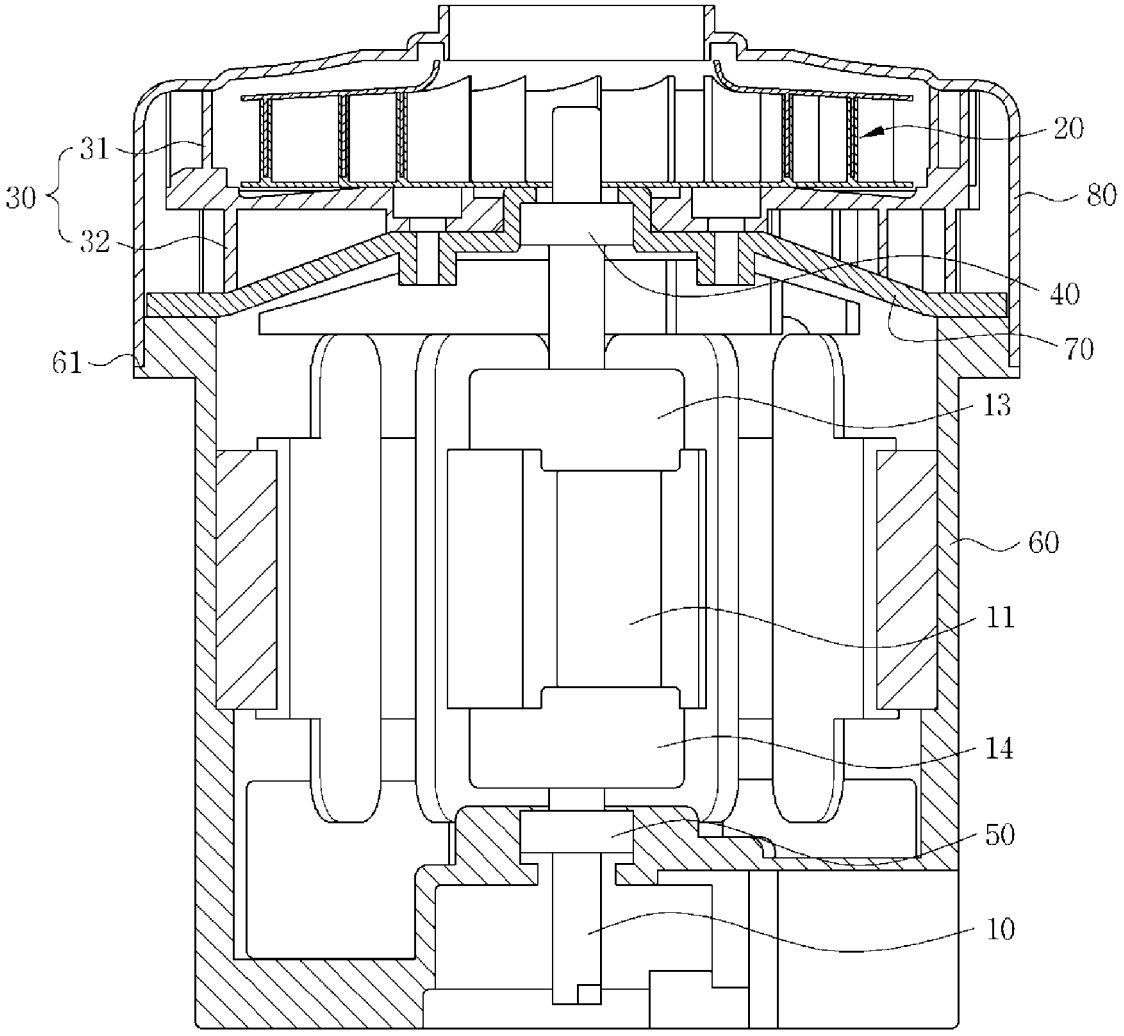
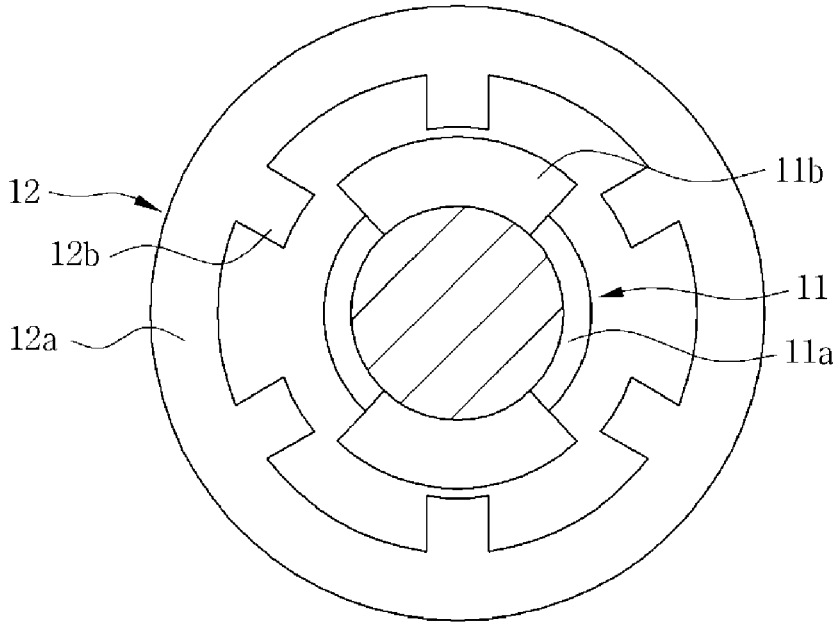


FIG. 6



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Patent documents cited in the description

- KR 1020120032415 **[0001]**
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