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(54) **FAN DEVICE**

LÜFTERVORRICHTUNG

DISPOSITIF DE VENTILATION

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Description

[0001] The disclosure relates to a fan device, and more particularly to a fan device having a casing body and a porous plate to define a noise-reduction room.

[0002] When a general fan is in operation, fan blades of the fan are prone to irregular vibration due to air turbulence at end portions of the fan blades, and an undesired noise is generated accordingly. For reducing the undesired noise, different auxiliary noise-reduction devices have been developed to be used with the fan, as disclosed for example in GB2284448 A.

[0003] Referring to FIG. 1, a conventional noise-reduction fan assembly includes a fan 10 and a noise-reduction device 1 mounted to the fan 10. The noise-reduction device 1 includes a casing 11 connected to the fan 10, a plurality of drivenable fan blades 12, a surrounding plate 13, and a sound-absorbing member 14. The casing 11 defines an inner space 110. The drivenable fan blades 12 are made of a sound-absorbing material and disposed in the inner space 110. The surrounding plate 13 is disposed in the inner space 110 and divides the inner space 110 into a central room 132 for receiving the drivenable fan blades 12 and a sound-absorbing room 130 surrounding the central room 132. The sound-absorbing member 14 is filled in the sound-absorbing room 130. The surrounding plate 13 has a plurality of through holes 131 to spatially communicate the central room 132 with the sound-absorbing room 130. Airflow generated by the fan 10 will drive rotation of the drivenable fan blades 12 and then the airflow will be guided into the central room 132. The airflow is also guided from the central room 132 into the sound-absorbing room 130 through the through holes 131 of the surrounding plate 13. The noise generated by the fan 10 can be partially absorbed by the drivenable fan blades 12 and partially absorbed by the noise-absorbing member 14 filled in the sound-absorbing room 130.

[0004] However, the aforementioned conventional noise-reduction fan assembly requires installation of the drivenable fan blades 12, and the drivenable fan blades 12 are required to be adjusted based on a few parameters of the fan 10, such as rotational performance and an integral structural configuration. Hence, the design and manufacturing of the conventional noise-reduction device 1 is relatively complicated.

[0005] Referring to FIG. 2, another conventional noise-reduction fan assembly includes a fan 20 and a noise-reduction device 2 connected to the fan 20. The noise-reduction device 2 includes a resonator 21 and a status indication unit 220. The fan 20 is exemplified to be a heat-dissipating fan for dissipating heat of an electronic apparatus, such as a central processing unit 22. The status indication unit 220 is connected between the resonator 21 and the central processing unit 22, and is capable of indicating an operational status of the central processing unit 22. The resonator 21 includes a casing 211 that defines an inner chamber 210 in spatial communication with the fan 20, a clapboard 212, an elastic component 213, and two thermoelectric components 214 capable of detecting noise through noise-responsive deformation.

[0006] The clapboard 212 is disposed in the inner chamber 210, and divides the inner chamber 210 into a space 201 in spatial communication with the fan 20 and a resonance room 200. The elastic component 213 is received in the resonance room 200 and is connected to the clapboard 212 and the casing 211 so that the clapboard 212 is movable relative to the casing 211.

[0007] The two thermoelectric components 214 are disposed in the resonance room 200 and located respectively on two symmetrical sides of the clapboard 212. The thermoelectric component 214 is in signal communication with the status indication unit 220 and is deformable accordingly. Deformation of the thermoelectric components 214 will move the clapboard 212 to adjust a resonance volume of the resonance room 200 so as to eliminate the noise generated by the fan 20.

[0008] The aforementioned conventional noise-reduction fan assembly also has complicated structure and signal communication. Hence, there is plenty of room for improvement in the structural design of the conventional noise-reduction fan assembly.

[0009] Therefore, an object of the disclosure is to provide a fan device that can alleviate at least one of the drawbacks of the prior art.

[0010] According to the disclosure, a fan device includes a casing unit and a fan impeller unit mounted in the casing unit.

[0011] The casing unit has an axis and includes a casing body, a porous plate, and an air-entering tube.

[0012] The casing body is formed with a receiving space and an air outlet port in spatial communication with the receiving space. The porous plate is formed with a plurality of through holes and is disposed in the receiving space to divide the receiving space into an air-flowing room and a noise-reduction room aligned with and spaced apart from each other along the axis. The air-entering tube is connected to the casing body and is in spatial communication with the air-flowing room.

[0013] The fan impeller unit is disposed in the air-flowing room of the receiving space and is rotatable about the axis to generate airflow that partially flows from the air-flowing room into the noise-reduction room through the through holes of the porous plate.

[0014] Other features and advantages of the disclosure will become apparent in the following detailed description of the embodiments with reference to the accompanying drawings, of which:

FIG. 1 is a cross-sectional view illustrating a conventional noise-reduction fan assembly;

FIG. 2 is a schematic view illustrating another conventional noise-reduction fan assembly;

FIG. 3 is an exploded view illustrating a first embodiment of a fan device according to the disclosure;

FIG. 4 is a perspective view illustrating the first em-

bodiment;

FIG. 5 is a cross-sectional view illustrating the first embodiment;

FIG. 6 is a cross-sectional view illustrating a second embodiment of a fan device according to the disclosure;

FIG. 7 is an exploded view illustrating a third embodiment of a fan device, not forming part of the invention;

FIG. 8 is a cross-sectional view illustrating the third embodiment; and

FIG. 9 is a cross-sectional view illustrating a fourth embodiment of a fan device, not forming part of the invention.

[0015] Before the disclosure is described in greater detail, it should be noted that where considered appropriate, reference numerals or terminal portions of reference numerals have been repeated among the figures to indicate corresponding or analogous elements, which may optionally have similar characteristics.

[0016] Referring to FIGS. 3 to 5, a first embodiment of a fan device includes a casing unit 3 and a fan impeller unit 4 that is mounted in the casing unit 3.

[0017] The casing unit 3 has an axis (A) and includes a casing body 31, a porous plate 32, an air-entering tube 33, and an air guiding member 34. The casing body 31 is formed with a receiving space 310 and an air outlet port 318 in spatial communication with the receiving space 310. In this embodiment, the casing body 31 of the casing unit 3 includes a base 312 and a cover 311 connected to the base 312 to cooperatively define the receiving space 310.

[0018] The porous plate 32 is formed with a plurality of through holes 329 and is disposed in the receiving space 310 to divide the receiving space 310 into an air-flowing room 301 and a noise-reduction room 302 aligned with and spaced apart from each other along the axis (A). The base 312 cooperates with the porous plate 32 to define the noise-reduction room 302. The cover 311 cooperates with the porous plate 32 to define the air-flowing room 301. The porous plate 32 is further formed with an inner tube-communicating through hole 321 spaced apart from the through holes 329.

[0019] The air-entering tube 33 is connected to the casing body 31 and is in spatial communication with the air-flowing room 301. The air-entering tube 33 peripherally and outwardly extends from and is in spatial communication with the inner tube-communicating through hole 321.

[0020] The air guiding member 34 is disposed at the air outlet port 318 of the casing body 31 and is in spatial communication with the receiving space 310 of the casing body 31. In one form, the air guiding member 34 may peripherally protrude from the air outlet port 318 of the casing body 31 and tapered along a direction away from the casing body 31, such that an airflow flowing through the air guiding member 34 can be collectively pressurized to have an increased air pressure.

[0021] The fan impeller unit 4 is disposed in the air-flowing room 301 of the receiving space 310 and is rotatable about the axis (A) to generate an airflow that partially flows from the air-flowing room 301 into the noise-reduction room 302 through the through holes 329 of the porous plate 32.

[0022] To be specific, when the fan impeller unit 4 is in operation, ambient air is guided into the air-flowing room 301 through the air-entering tube 33 and the inner tube-communicating through hole 321 of the porous plate 21. The airflow is generated from the air flowing into the air-flowing room 301. A main stream of the airflow mainly flows from the air-flowing room 301 toward the air outlet port 318. A tributary of the airflow flows from the air-flowing room 301 into the noise-reduction room 302 through the through holes 329 of the porous plate 32.

[0023] In this embodiment, the configuration of the casing unit 3, such as the shape and the internal volume of the noise-reduction room 302 is designed in accordance with the noise frequency of the fan impeller unit 4. In addition, the airflow flowing into the noise-reduction room 302 through the through holes 329 of the porous plate 32 is dispersed by the through holes 329 before entering the noise-reduction room 302, so that wind shear produced and concentrated at a certain position can be avoided to reduce the noise.

[0024] Referring to FIG. 6, a second embodiment of the fan device according to the disclosure is illustrated. The second embodiment is structurally similar to the first embodiment. However, the fan device of the second embodiment further includes a sound-absorption member 5 disposed in the noise-reduction room 302. Specifically, the sound-absorption member 5 is porous. Hence, in this embodiment, the noise is further absorbed by the sound-absorption member 5. Furthermore, the volume and the shape of the noise-reduction room 302 can be adjusted by the filling manner of the sound-absorption member 5 therein in compliance with the desired configuration of the casing unit 3.

[0025] Referring to FIGS. 7 and 8, a third embodiment of the fan device according to the disclosure is illustrated. The third embodiment is structurally similar to that of the first embodiment. However, instead of forming the inner tube-communicating through hole 321, the base 312 includes a bottom plate 316 that is distal to the cover 311 and that is formed with an outer tube-communicating through hole 317. The air-entering tube 33 peripherally and outwardly extends from and is in spatial communication with the outer tube-communicating through hole 317.

[0026] Referring to FIG. 9, a fourth embodiment of the fan device according to the disclosure is illustrated. The fourth embodiment is structurally similar to that of the first embodiment. However, instead of forming the inner tube-communicating through hole 321, the casing body 31 of the casing unit 3 is formed with an outer tube-communicating through hole 317' in spatial communication with

the receiving space 310. The outer tube-communicating through hole 317' and the porous plate 32 are located at two opposite sides of the fan impeller unit 4 along the axis (A), such that the noise-reduction room 302 is distal to the air-entering tube 33. The air-entering tube 33 peripherally and outwardly extends from and is in spatial communication with the outer tube-communicating through hole 317'.

[0027] To sum up, by virtue of the design of the casing body 31 and the inclusion of the porous plate 32, the airflow generated by the fan impeller unit 4 partially flows from the air-flowing room 301 into the noise-reduction room 302 through the porous plate 32, and the airflow is simultaneously dispersed by the porous plate 32 to reduce wind shear. Therefore, the noise generated by the fan impeller unit 4 of the fan device according to the disclosure can be reduced.

[0028] In the description above, for the purposes of explanation, numerous specific details have been set forth in order to provide a thorough understanding of the embodiments. It will be apparent, however, to one skilled in the art, that one or more other embodiments may be practiced without some of these specific details. It should also be appreciated that reference throughout this specification to "one embodiment," "an embodiment," an embodiment with an indication of an ordinal number and so forth means that a particular feature, structure, or characteristic may be included in the practice of the disclosure. It should be further appreciated that in the description, various features are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of various inventive aspects, and that one or more features or specific details from one embodiment may be practiced together with one or more features or specific details from another embodiment, where appropriate, in the practice of the disclosure.

Claims

1. A fan device including:

   a casing unit (3) having an axis (A) and including

   a casing body (31) that is formed with a receiving space (310) and an air outlet port (318) in spatial communication with said receiving space (310),
   a porous plate (32) that is formed with a plurality of through holes (329) and that is disposed in said receiving space (310) to divide said receiving space (310) into an air-flowing room (301) and a noise-reduction room (302) aligned with and spaced apart from each other along the axis (A), and
   an air-entering tube (33) that is connected to said casing body (31) and that is in spatial communication with said air-flowing room (301); and

   a fan impeller unit (4) mounted in said casing unit (3), disposed in said air-flowing room (301) of said receiving space (310) and being rotatable about the axis (A) to generate airflow that partially flows from said air-flowing room (301) into said noise-reduction room (302) through said through holes (329) of said porous plate (32);
   characterized in that said casing body (31) of said casing unit (3) includes a base (312) and a cover (311) connected to said base (312) to cooperatively define said receiving space (310), said base (312) cooperating with said porous plate (32) to define said noise-reduction room (302), said cover (311) cooperating with said porous plate (32) to define said air-flowing room (301), said porous plate (32) being further formed with an inner tube-communicating through hole (321) spaced apart from said through holes (329), said air-entering tube (33) peripherally and outwardly extending from and in spatial communication with said inner tube-communicating through hole (321) and extending out of said casing body (31) to the external environment.

2. The fan device of claim 1, **characterized by** a sound-absorption member (5) disposed in said noise-reduction room (302).

3. The fan device of claim 2, **characterized in that** said sound-absorption member (5) is porous.

4. The fan device of any one of claims 1 to 3, **characterized in that** said casing unit (3) further includes an air guiding member (34) disposed at said air outlet port (318) of said casing body (31) and in spatial communication with said receiving space (310) of said casing body (31).

Patentansprüche

1. Eine Lüftervorrichtung, die Folgendes beinhaltet:

   eine Gehäuseeinheit (3), die eine Achse (A) aufweist und einen Gehäusekörper (31) beinhaltet, der mit einem aufnehmenden Raum (310) und einer Luftaustrittsöffnung (318) in räumlicher Kommunikation mit dem genannten aufnehmenden Raum (310) ausgebildet ist,
   eine löchrige Platte (32), die mit einer Vielzahl von Durchgangslöchern (329) ausgebildet ist und die in dem genannten aufnehmenden Raum (310) angeordnet ist, um den genannten aufnehmenden Raum (310) in einen Luftströ-

mungsraum (301) und einen Geräuschreduzierungsraum (302) zu unterteilen, die entlang der Achse (A) aufeinander ausgerichtet und voneinander beabstandet sind, und
ein Lufteintrittsrohr (33), das mit dem genannten Gehäusekörper (31) verbunden ist und das mit dem genannten Luftströmungsraum (301) in räumlicher Kommunikation steht; und
eine Lüfterradeinheit (4), die in der genannten Gehäuseeinheit (3) montiert, in dem genannten Luftströmungsraum (301) des genannten aufnehmenden Raums (310) angeordnet und um die Achse (A) drehbar ist, um eine Luftströmung zu generieren, die teilweise von dem genannten Luftströmungsraum (301) in den genannten Geräuschreduzierungsraum (302) durch die genannten Durchgangslöcher (329) der genannten löchrigen Platte (32) strömt;
dadurch gekennzeichnet, dass der genannte Gehäusekörper (31) der genannten Gehäuseeinheit (3) eine Basis (312) und eine Abdeckung (311), die mit der genannten Basis (312) verbunden ist, beinhaltet, um zusammenwirkend den genannten aufnehmenden Raum (310) zu definieren, wobei die genannte Basis (312) mit der genannten löchrigen Platte (32) zusammenwirkt, um den genannten Geräuschreduzierungsraum (302) zu definieren, wobei die genannte Abdeckung (311) mit der genannten löchrigen Platte (32) zusammenwirkt, um den genannten Luftströmungsraum (301) zu definieren, wobei die genannte löchrige Platte (32) ferner mit einem Innenrohr-Kommunikationsdurchgangsloch (321) ausgebildet ist, das von den genannten Durchgangslöchern (329) beabstandet ist, wobei sich das genannte Lufteintrittsrohr (33) peripher und auswärts von und in räumlicher Kommunikation mit dem genannten Innenrohr-Kommunikationsdurchgangsloch (321) erstreckt und von dem genannten Gehäusekörper (31) zu der außenliegenden Umgebung heraus erstreckt.

2. Lüftervorrichtung nach Anspruch 1, **gekennzeichnet durch** ein Schallabsorptionsglied (5), das in dem genannten Geräuschreduzierungsraum (302) angeordnet ist.

3. Lüftervorrichtung nach Anspruch 2, **gekennzeichnet dadurch, dass** das genannte Schallabsorptionsglied (5) löchrig ist.

4. Lüftervorrichtung nach einem der Ansprüche 1 bis 3, **gekennzeichnet dadurch, dass** die genannte Gehäuseeinheit (3) ferner ein Luftführungsglied (34) beinhaltet, das an der genannten Luftaustrittsöffnung (318) des genannten Gehäusekörpers (31) angeordnet ist und mit dem genannten aufnehmenden Raum (310) des genannten Gehäusekörpers (31) in räumlicher Kommunikation steht.

Revendications

1. Dispositif de ventilation :

une unité de boîtier (3) ayant un axe (A) et incluant
un corps de boîtier (31) qui est formé avec un espace de réception (310) et un orifice d'évacuation d'air (318) en communication spatiale avec ledit espace de réception (310),
une plaque poreuse (32) qui est formée avec une pluralité de trous traversants (329) et qui est disposée dans ledit espace de réception (310) pour diviser ledit espace de réception (310) en une chambre d'écoulement d'air (301) et une chambre de réduction de bruit (302) alignées l'une avec l'autre et espacées l'une de l'autre le long de l'axe (A), et
un tube d'admission d'air (33) qui est connecté audit corps de boîtier (31) et qui est en communication spatiale avec ladite chambre d'écoulement d'air (301) ; et
une unité de roue de ventilateur (4) montée dans ladite unité de boîtier (3), disposée dans ladite chambre d'écoulement d'air (301) dudit espace de réception (310) et étant capable de tourner autour de l'axe (A) pour générer un écoulement d'air qui s'écoule partiellement de ladite chambre d'écoulement d'air (301) jusque dans ladite chambre de réduction de bruit (302) à travers lesdits trous traversants (329) de la plaque poreuse (32) ;
caractérisé en ce que ledit corps de boîtier (31) de ladite unité de boîtier (3) inclut une base (312) et une couverture (311) connectée à ladite base (312) pour définir de manière coopérative ledit espace de réception (310), ladite base (312) coopérant avec ladite plaque poreuse (32) pour définir ladite chambre de réduction de bruit (302), ladite couverture (311) coopérant avec ladite plaque poreuse (32) pour définir ladite chambre d'écoulement d'air (301), ladite plaque poreuse (32) étant formée en outre avec un trou traversant communiquant avec un tube interne (321) espacé desdits trous traversant (329), ledit tube d'admission d'air (33) s'étendant de manière périphérique et vers l'extérieur à partir dudit trou traversant communiquant avec un tube interne (321) et en communication spatiale avec celui-ci et s'étendant hors dudit corps de boîtier (31) vers l'environnement externe.

2. Ventilateur selon la revendication 1, **caractérisé par** un élément d'absorption du son (5) disposé dans

ladite chambre de réduction de bruit (302).

3. Ventilateur selon la revendication 2, **caractérisé en ce que** ledit élément d'absorption de son (5) est poreux.

4. Ventilateur selon l'une quelconque des revendications 1 à 3, **caractérisé en ce que** ladite unité de boîtier (3) inclut en outre un élément de guidage d'air (34) disposé au niveau dudit orifice d'évacuation d'air (318) dudit corps de boîtier (31) et en communication spatiale avec ledit espace de réception (310) dudit corps de boîtier (31).

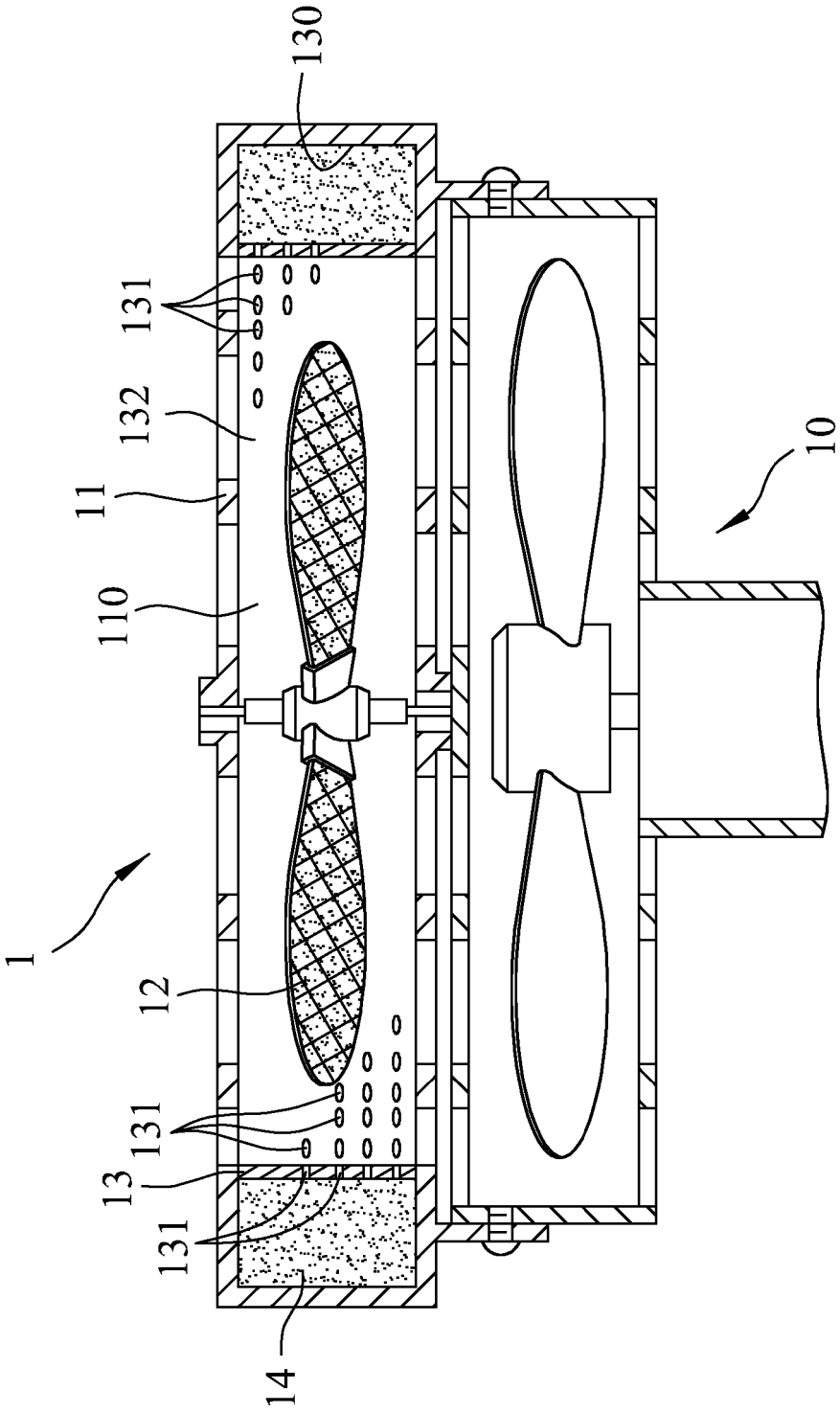

FIG.1
PRIOR ART

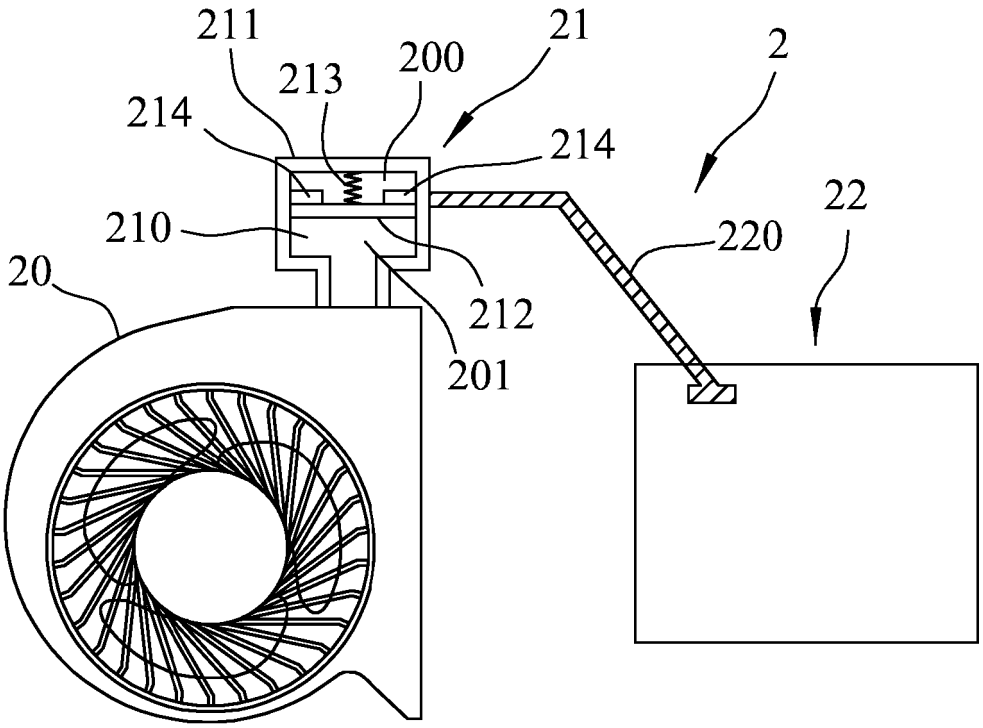

FIG.2
PRIOR ART

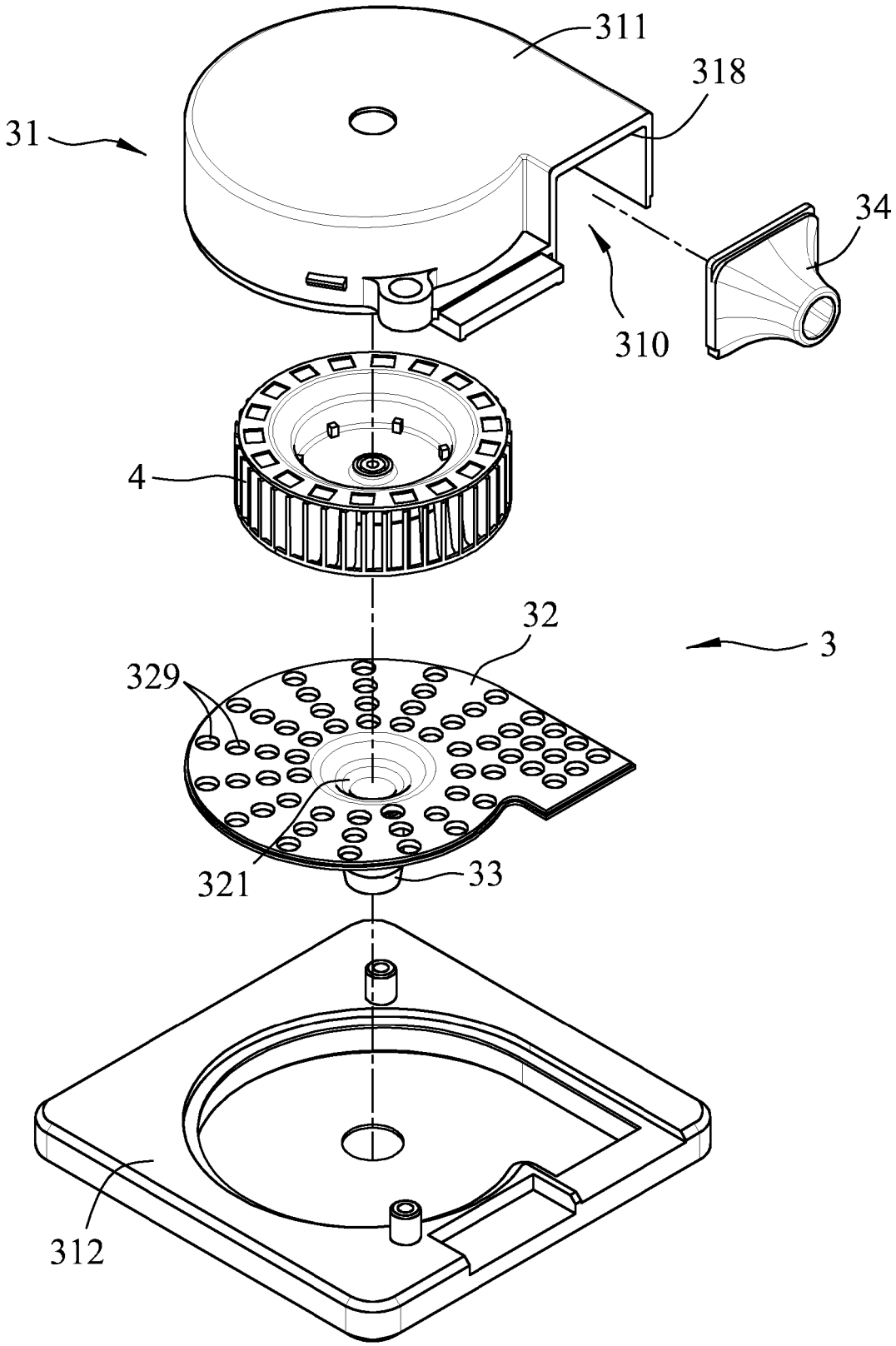

FIG.3

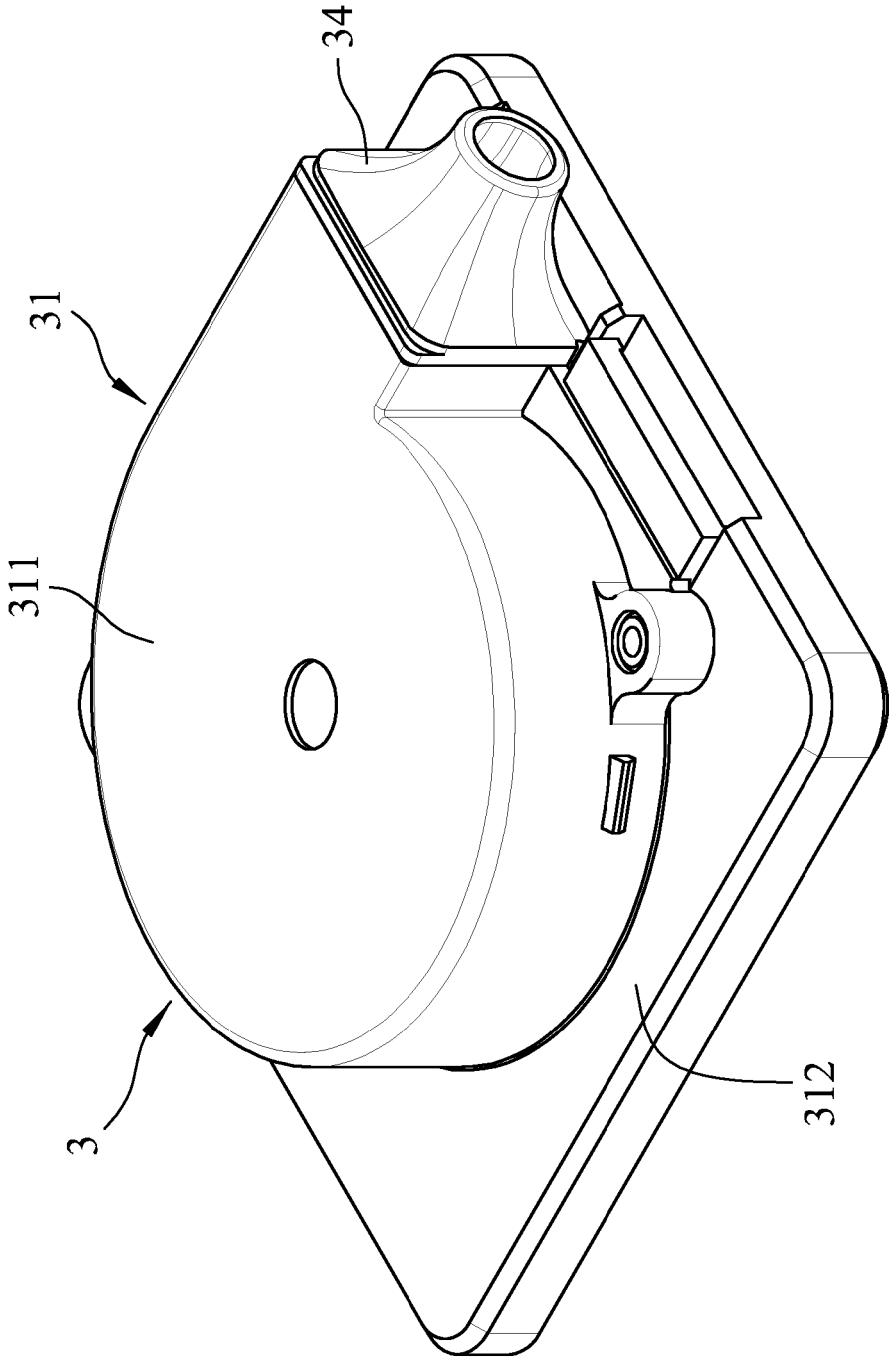

FIG.4

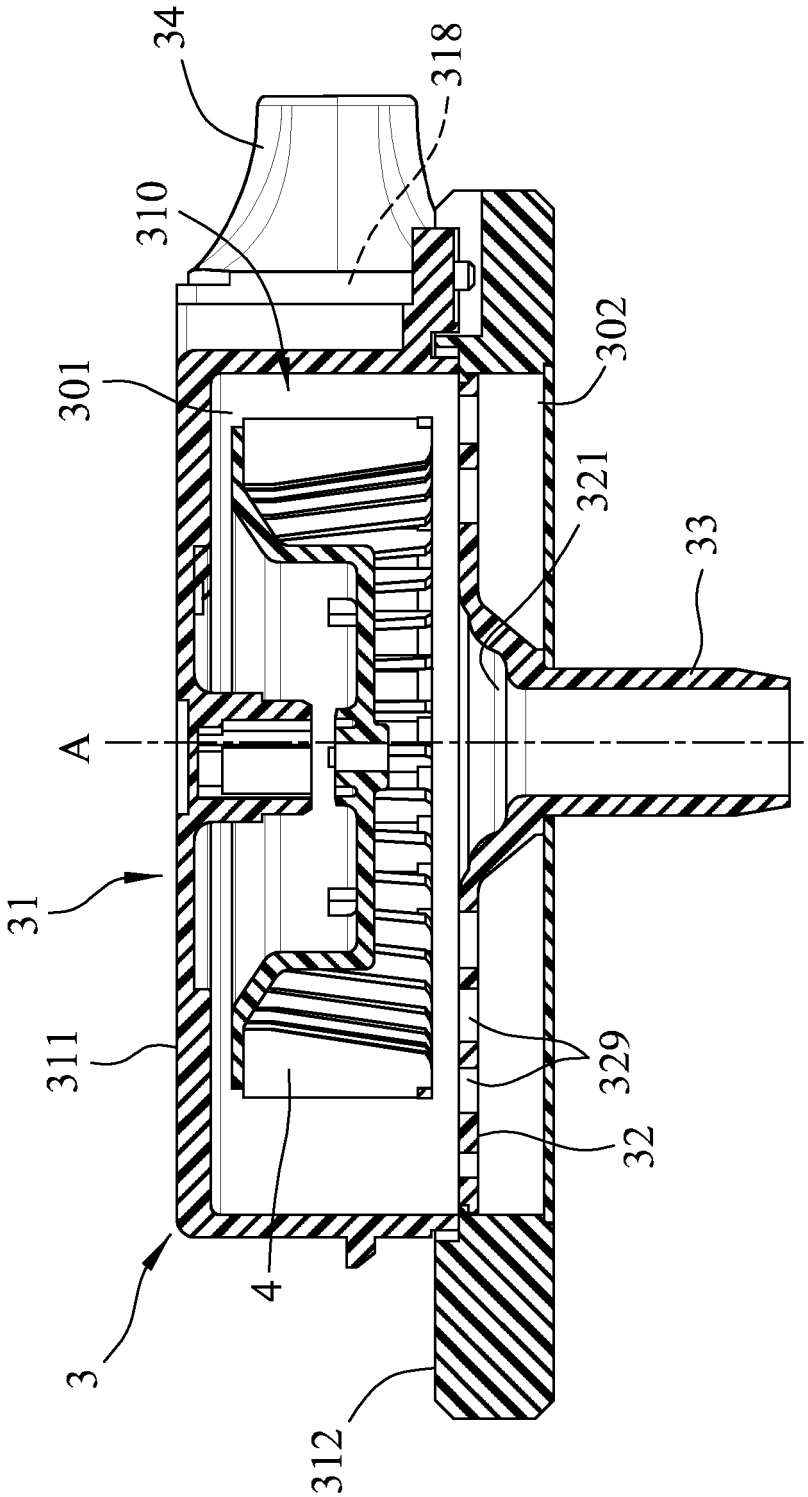

FIG.5

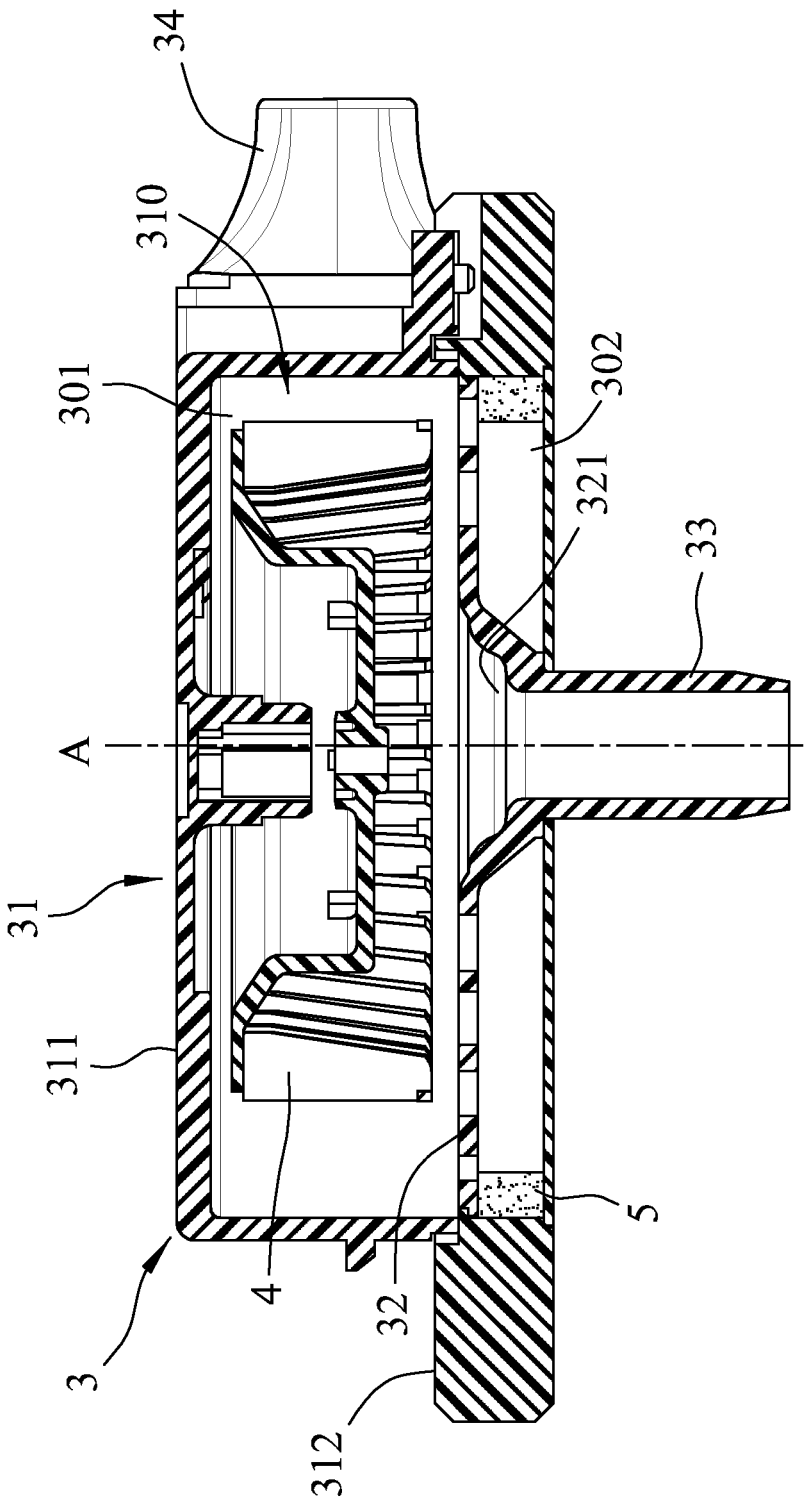

FIG.6

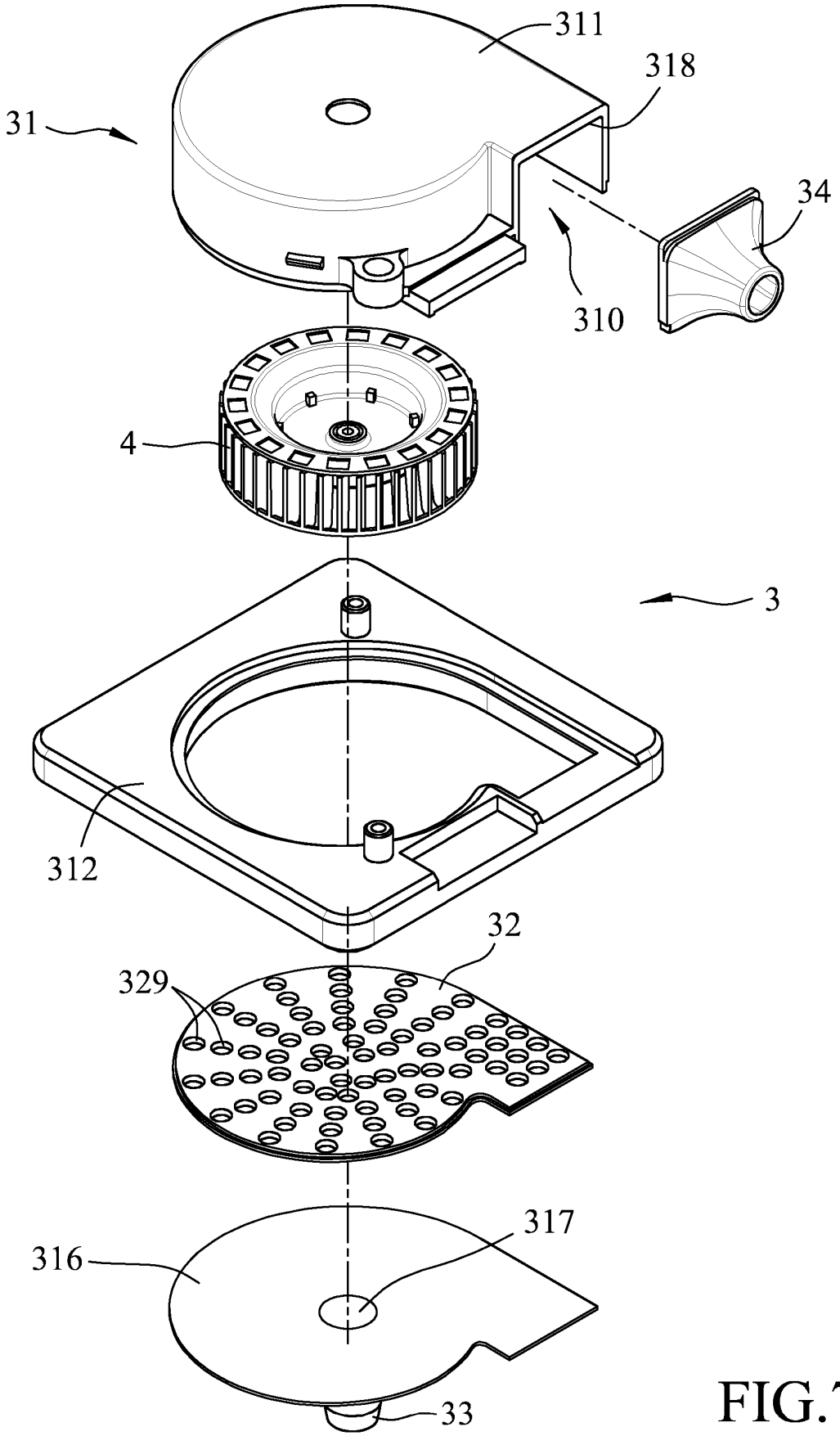

FIG.7

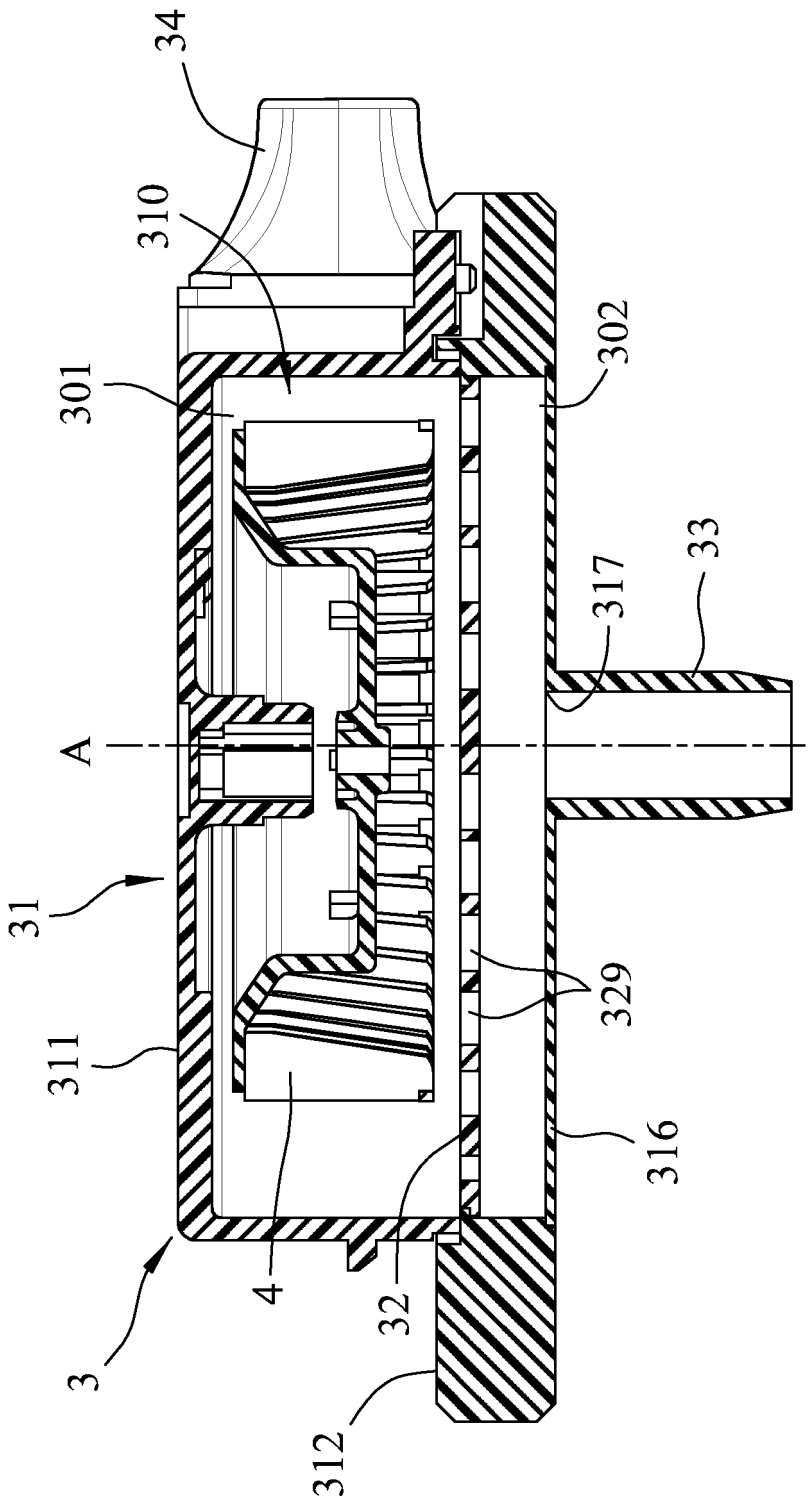

FIG.8

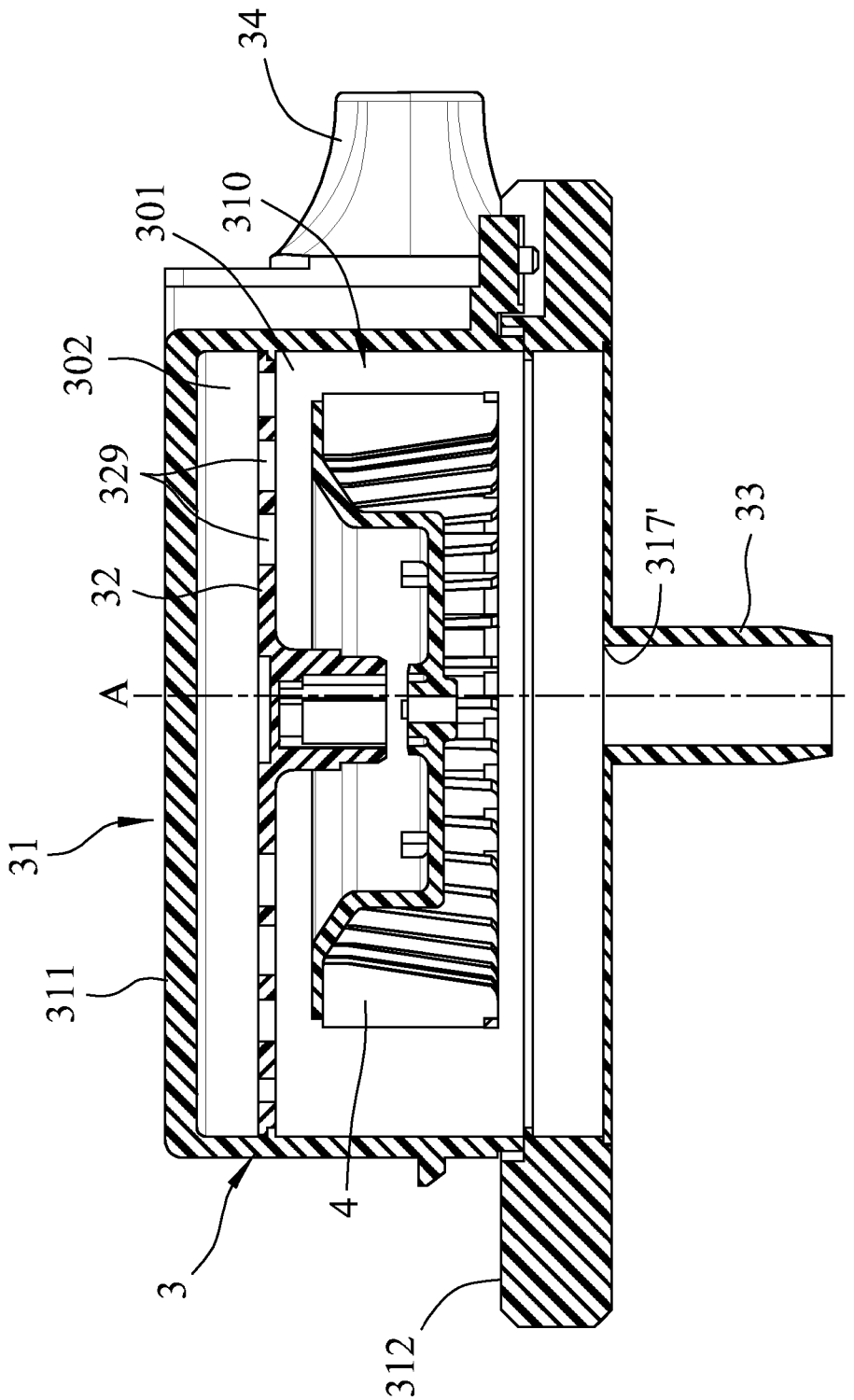

FIG.9

REFERENCES CITED IN THE DESCRIPTION

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