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Lee et al.

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(54) **FAN MODULE WITH A HEAT DISSIPATION FUNCTION**

(71) Applicant: **Delta Electronics, Inc.**, Taoyuan (TW)

(72) Inventors: **Yang-Hsin Lee**, Taoyuan (TW); **Hsiu-Chuan Li**, Taoyuan (TW); **Chun-Nan Wu**, Taoyuan (TW)

(73) Assignee: **DELTA ELECTRONICS, INC.**, Taoyuan (TW)

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(51) **Int. Cl.**

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F04D 25/06	(2006.01)
F04D 25/08	(2006.01)
F04D 29/053	(2006.01)
F04D 29/38	(2006.01)

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

CPC ***F04D 29/582*** (2013.01); ***F04D 19/002*** (2013.01); ***F04D 25/082*** (2013.01); ***F04D 29/053*** (2013.01); ***F04D 29/38*** (2013.01); *F04D 25/06* (2013.01)

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USPC 416/95

See application file for complete search history.

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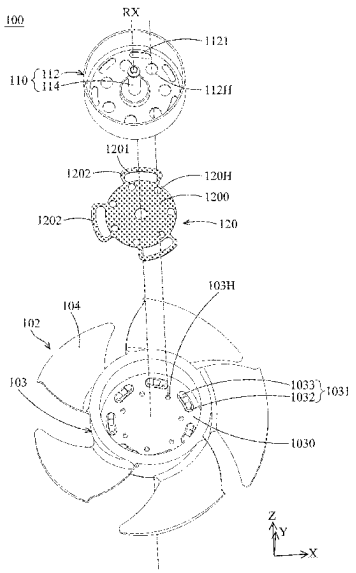
Primary Examiner — J. Todd Newton

(74) *Attorney, Agent, or Firm* — MUNCY, GEISSLER, OLDS & LOWE, P.C.

(57) **ABSTRACT**

A fan module includes a blade assembly, a rotating shaft assembly and a plate member. The blade assembly has a plurality of fan blades and a bottom plate. The bottom plate is connected to the fan blades, and at least one first opening and at least one protrusion are formed on the bottom plate. The rotating shaft assembly is affixed to the bottom plate and has at least one first slot and at least one second opening. The plate member is movably disposed between the bottom plate and the rotating shaft assembly, and the plate member has at least one second slot. The second slot is sleeved on the protrusion. When the rotating shaft assembly drives the blade assembly to rotate, the plate member rotates relative to the bottom plate, thereby selectively covering the first opening or exposing the first opening.

20 Claims, 19 Drawing Sheets



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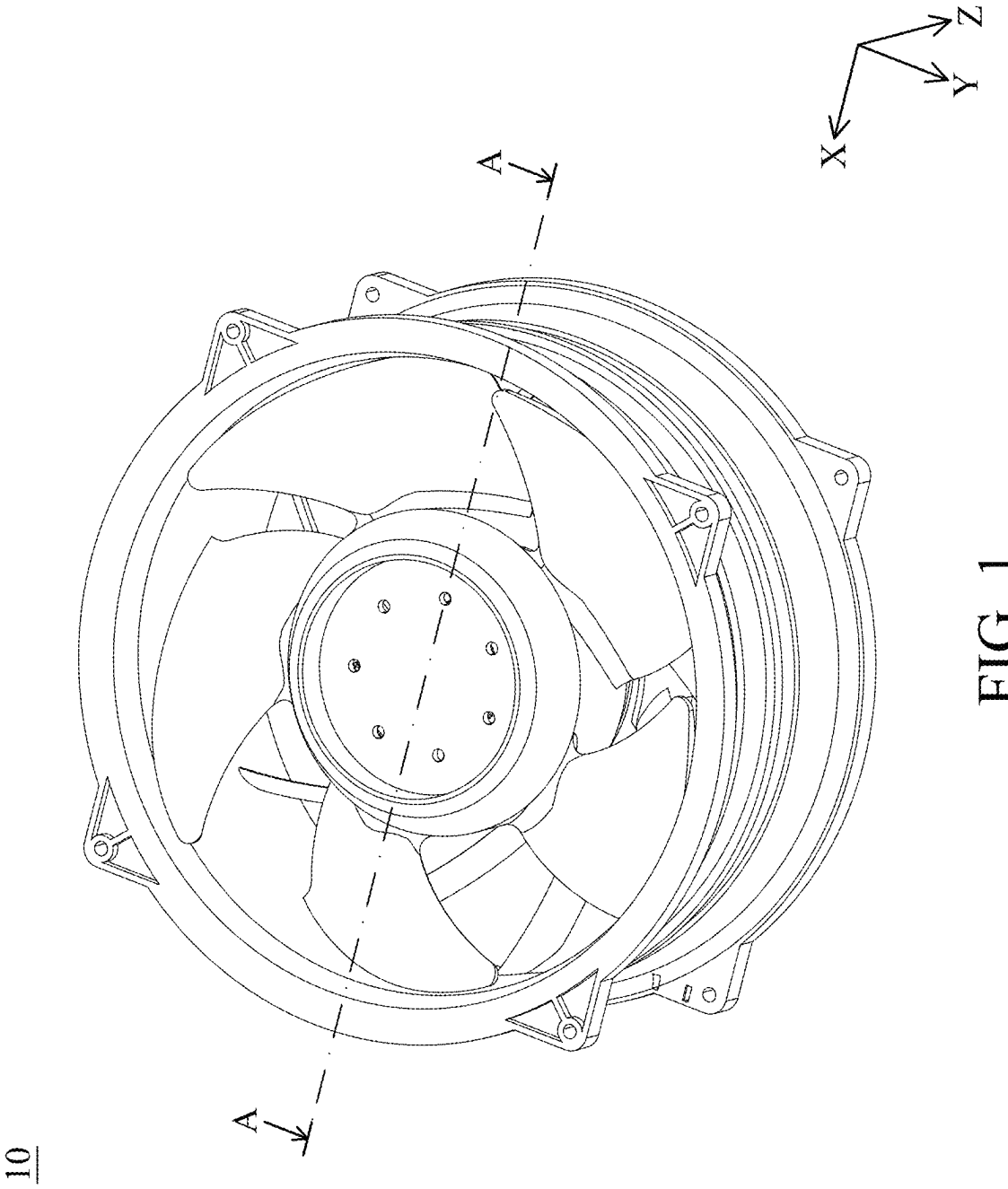


FIG. 1

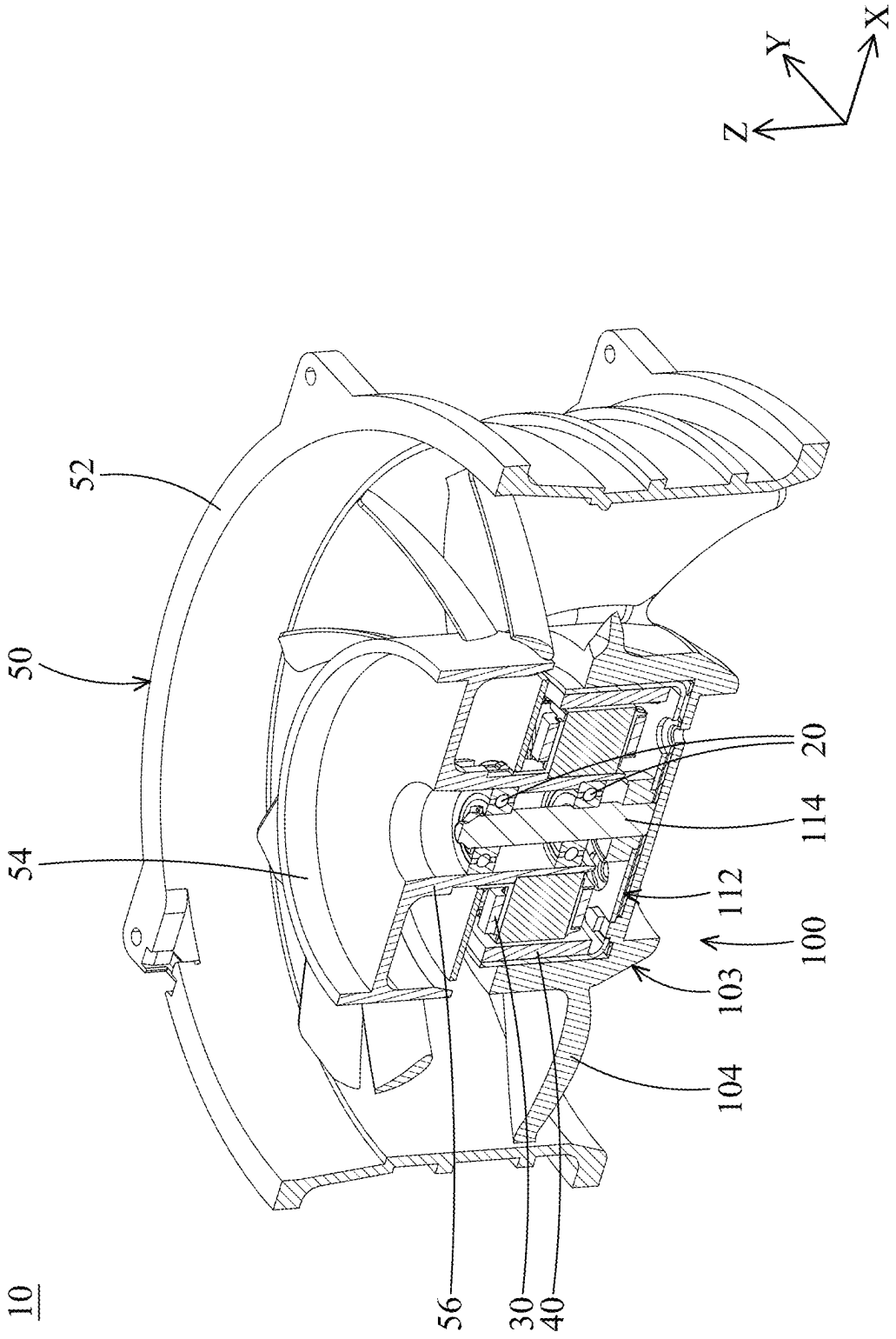


FIG. 2

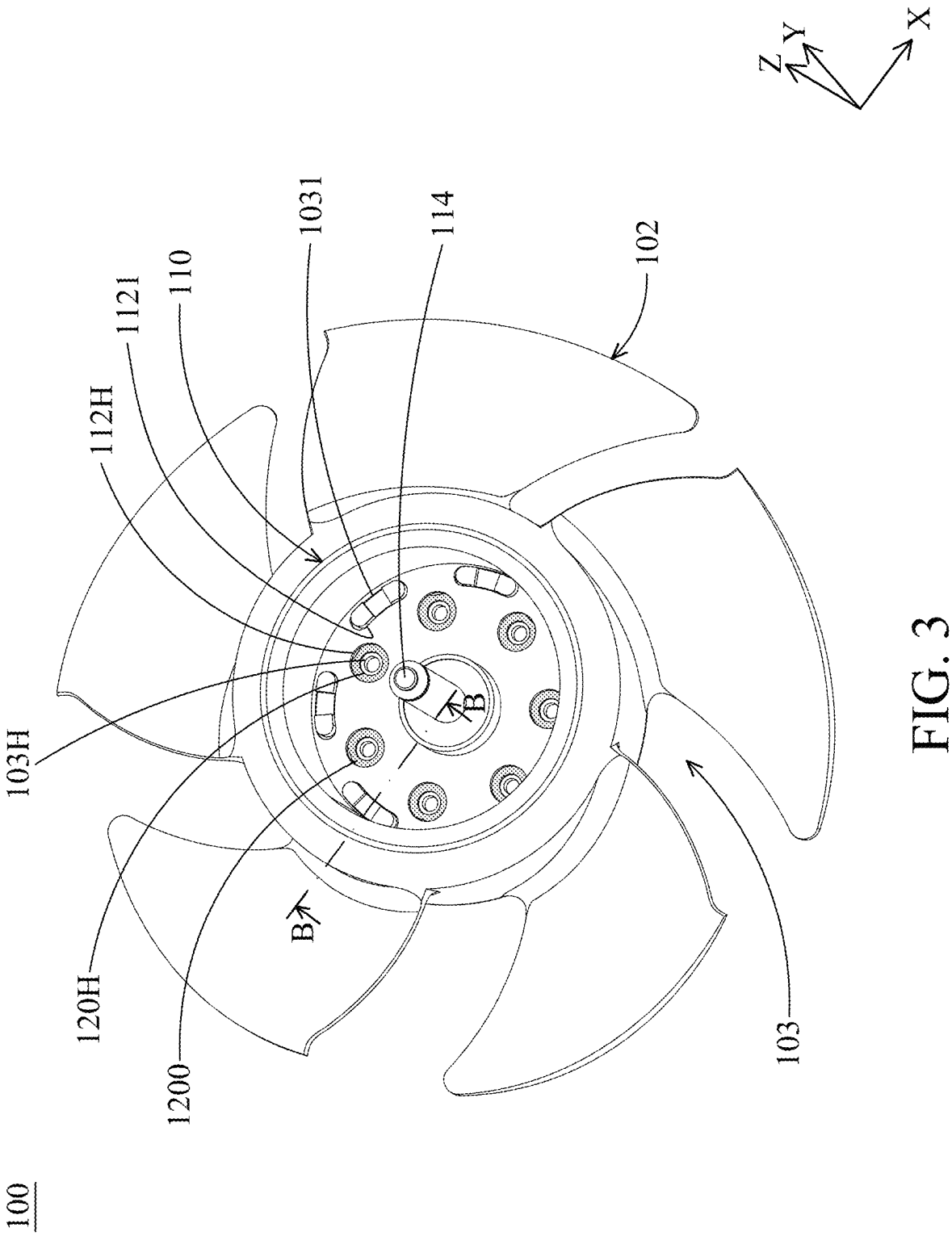


FIG. 3

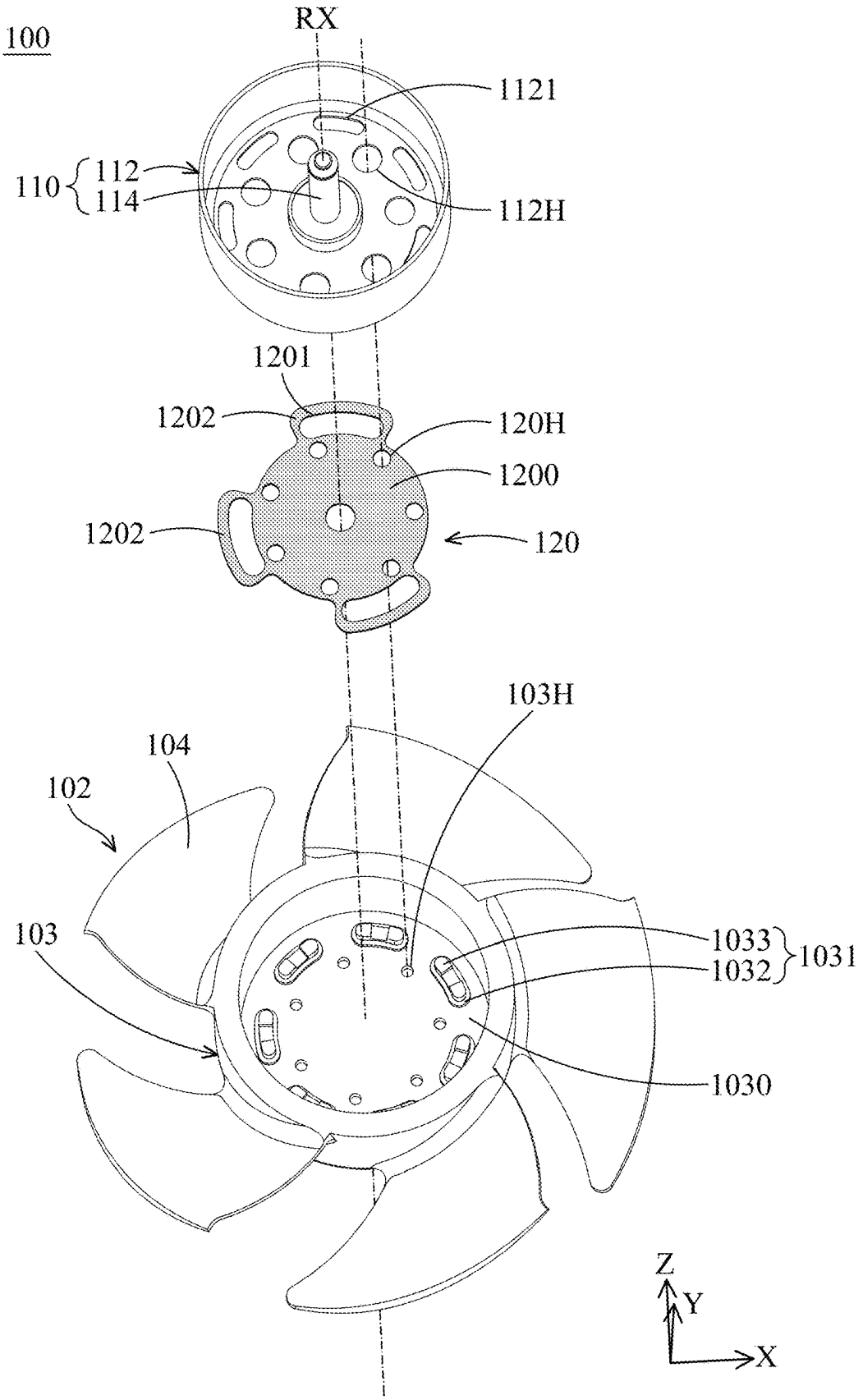

100
RX
1121
110
112
114
112H
1201
1202
120H
1200
1202
120
103H
104
102
103
1033
1032
1031
1030
Z
Y
X

FIG. 4

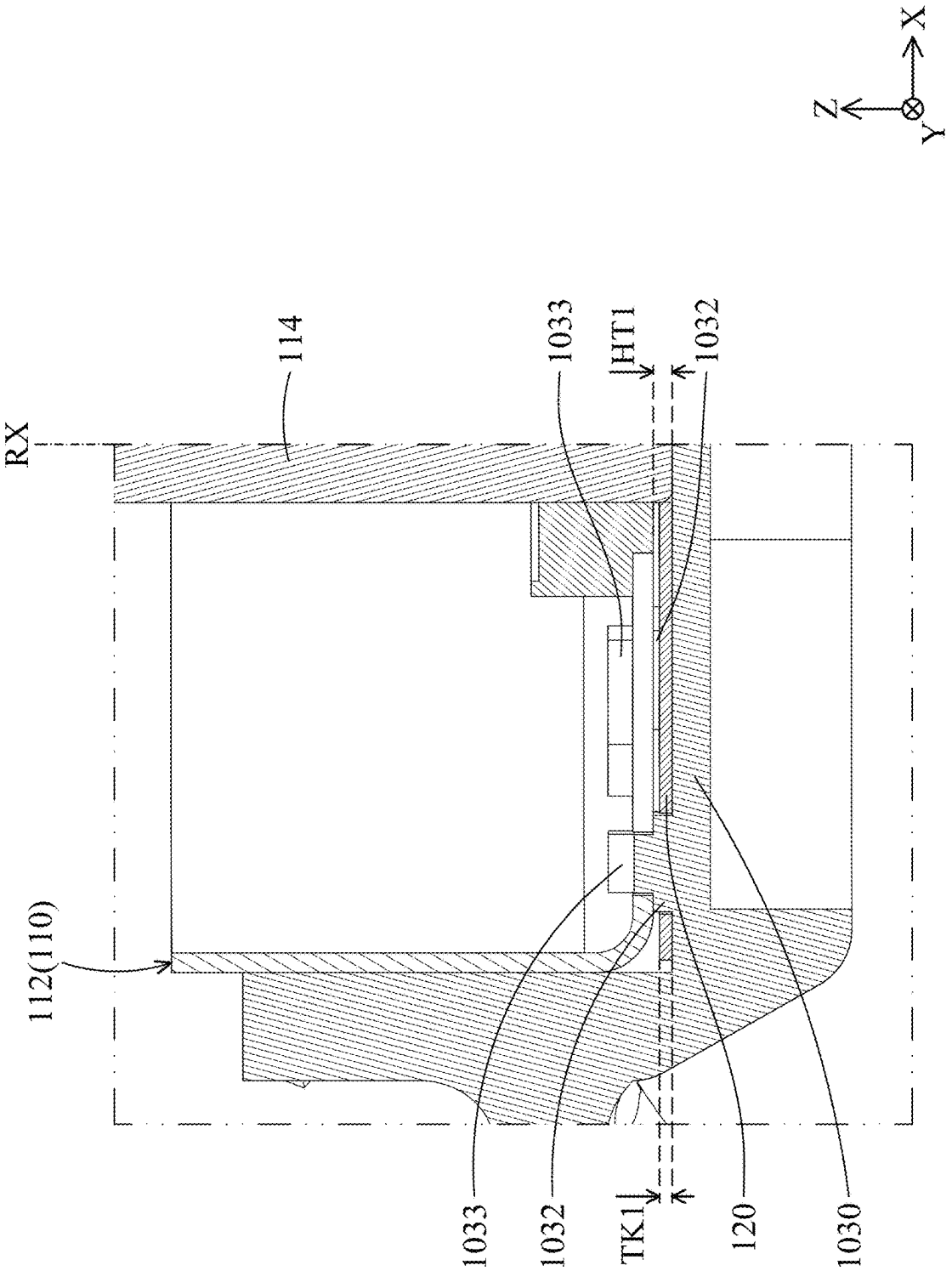


FIG. 5

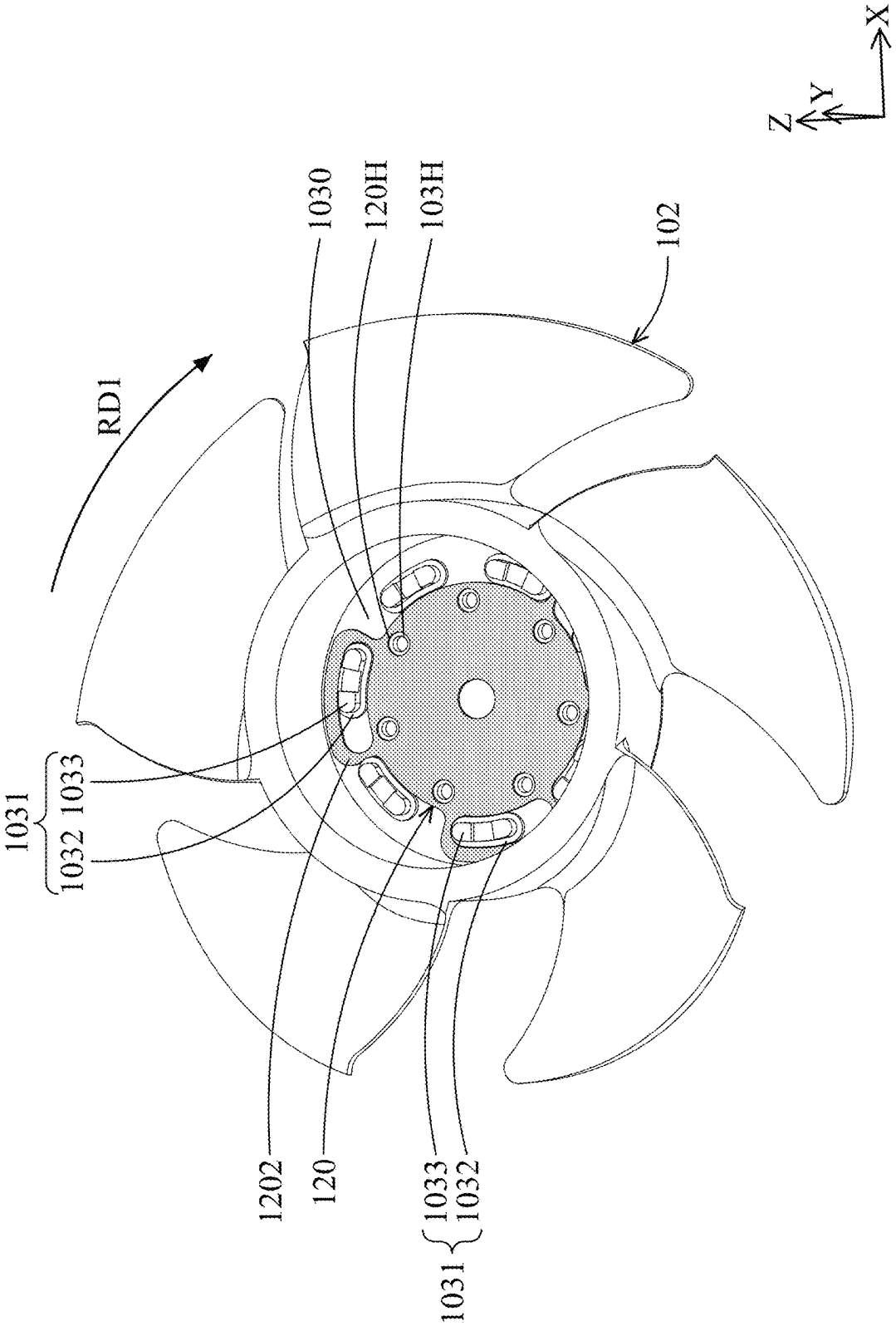
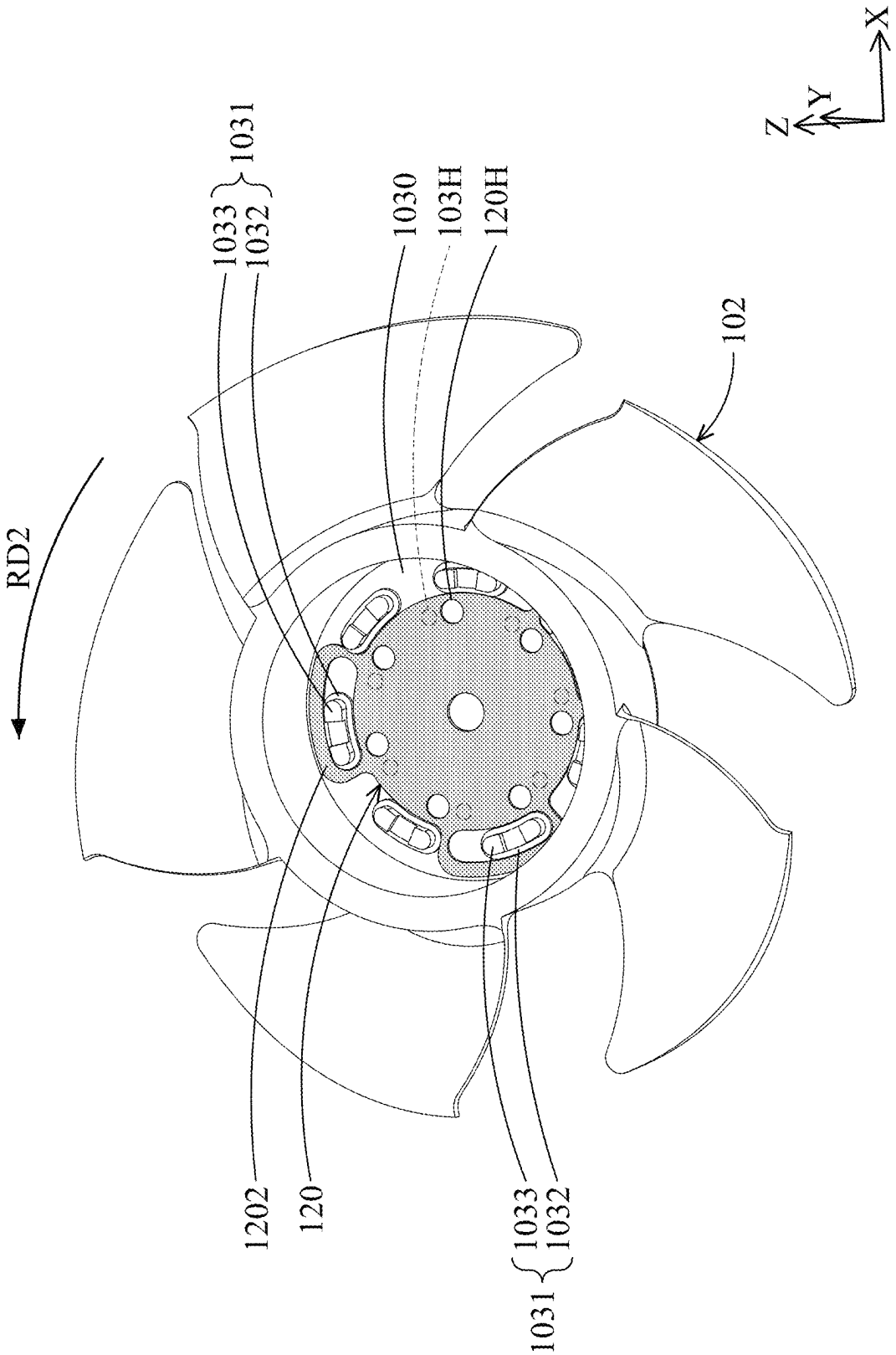

X
Y
Z
RD1
1030
120H
103H
102
1031
1033
1032
1202
120
1033
1032
1031

FIG. 6


X
Y
Z
1031
1033
1032
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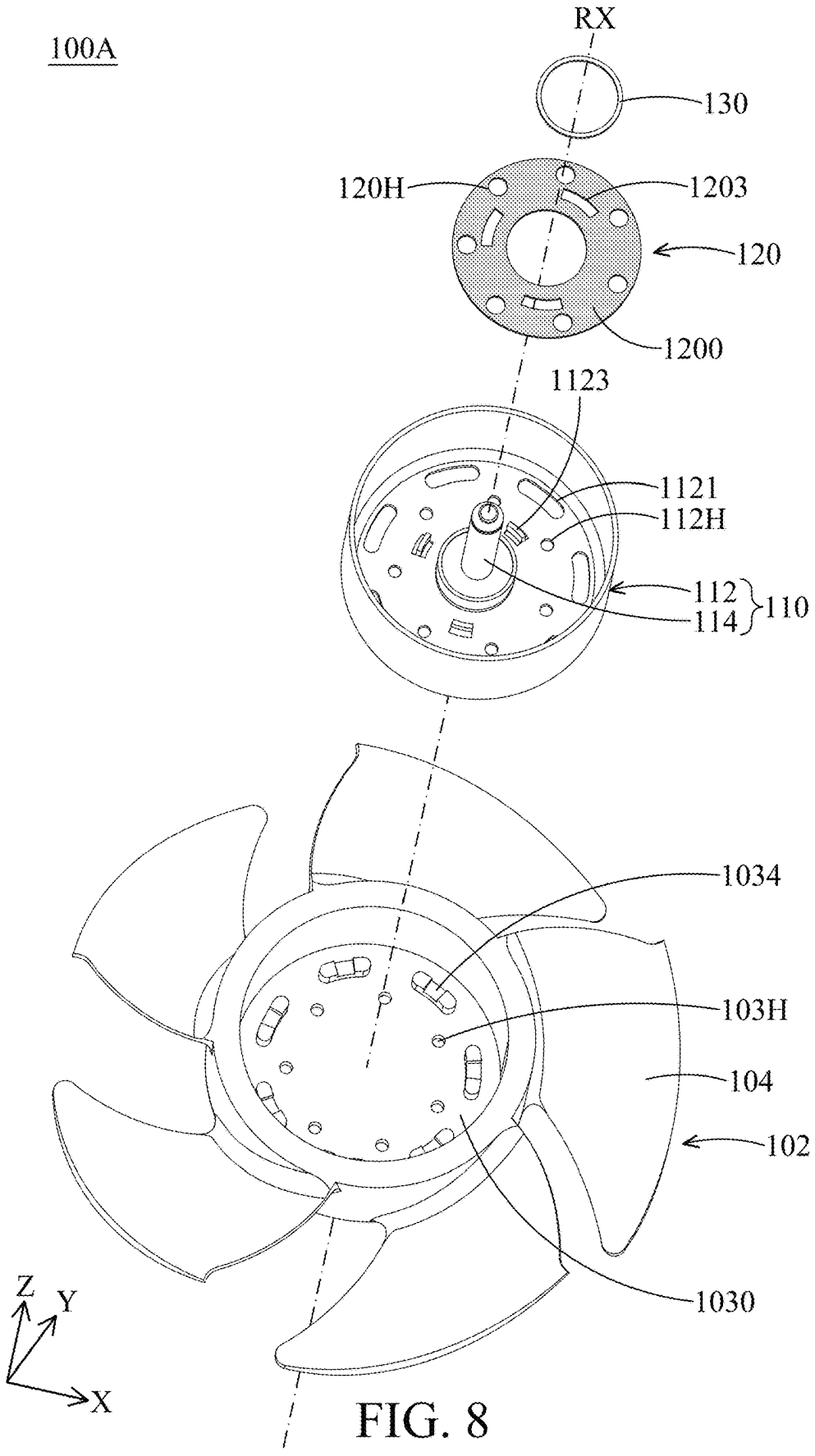
103H
120H
102
RD2
1202
120
1033
1032
1031

FIG. 7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120H
1203
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1200
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1121
112H
112
114
110
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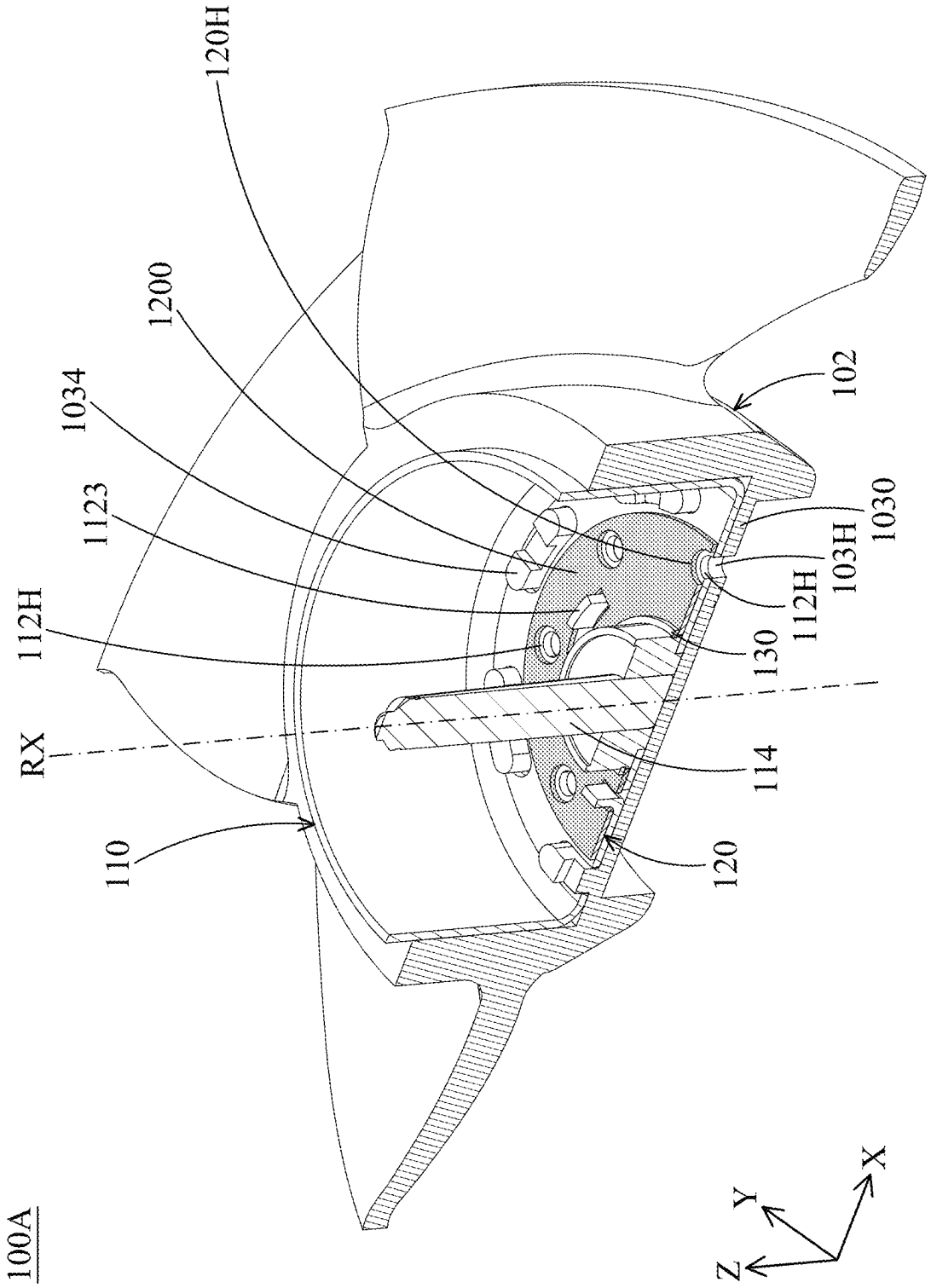
103H
104
102
1030
Z
Y
X

FIG. 8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1123
112H
RX
110
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102
1030
103H
112H
130
114
120
Y
X
Z

FIG. 9

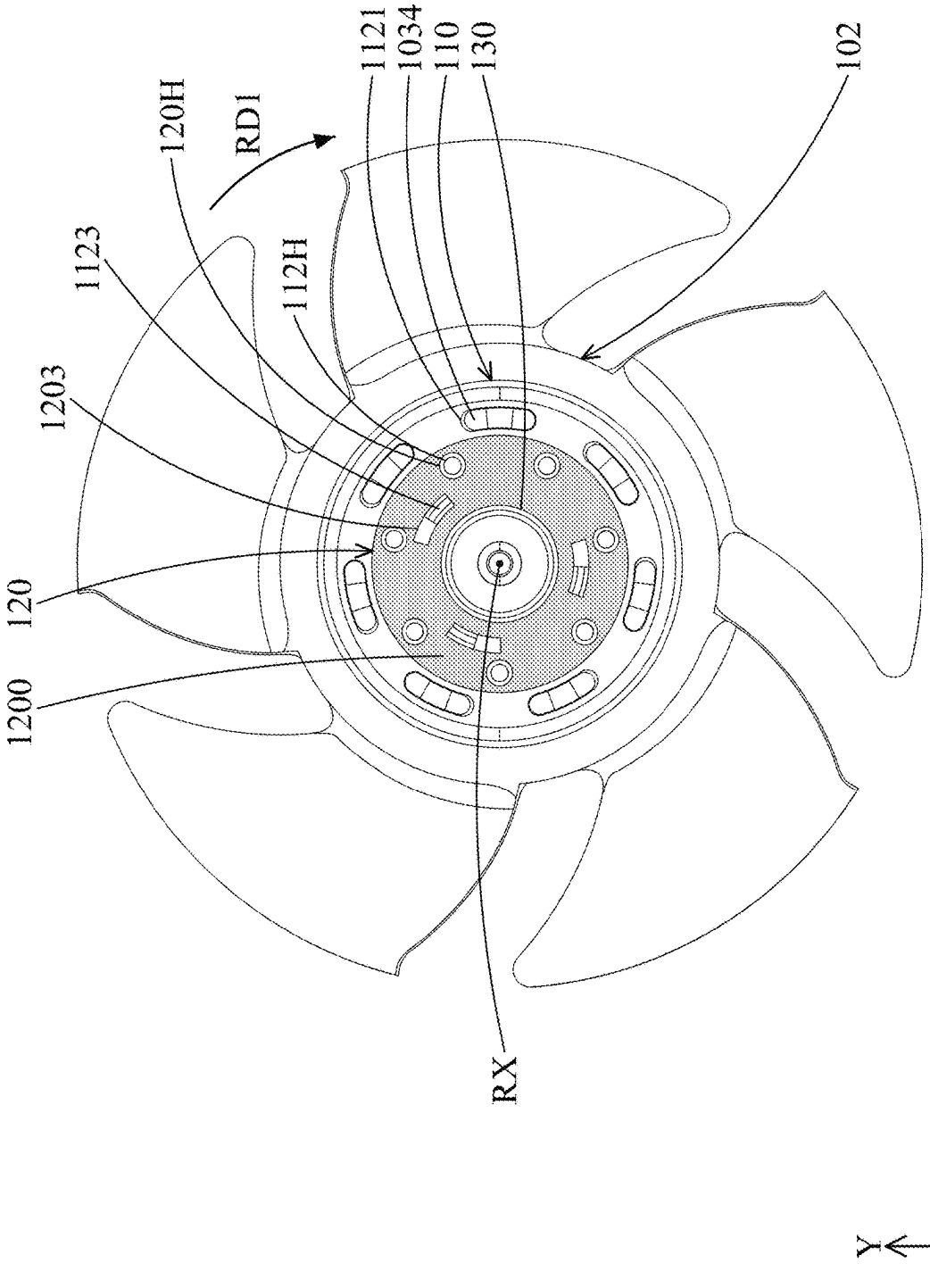


FIG. 10

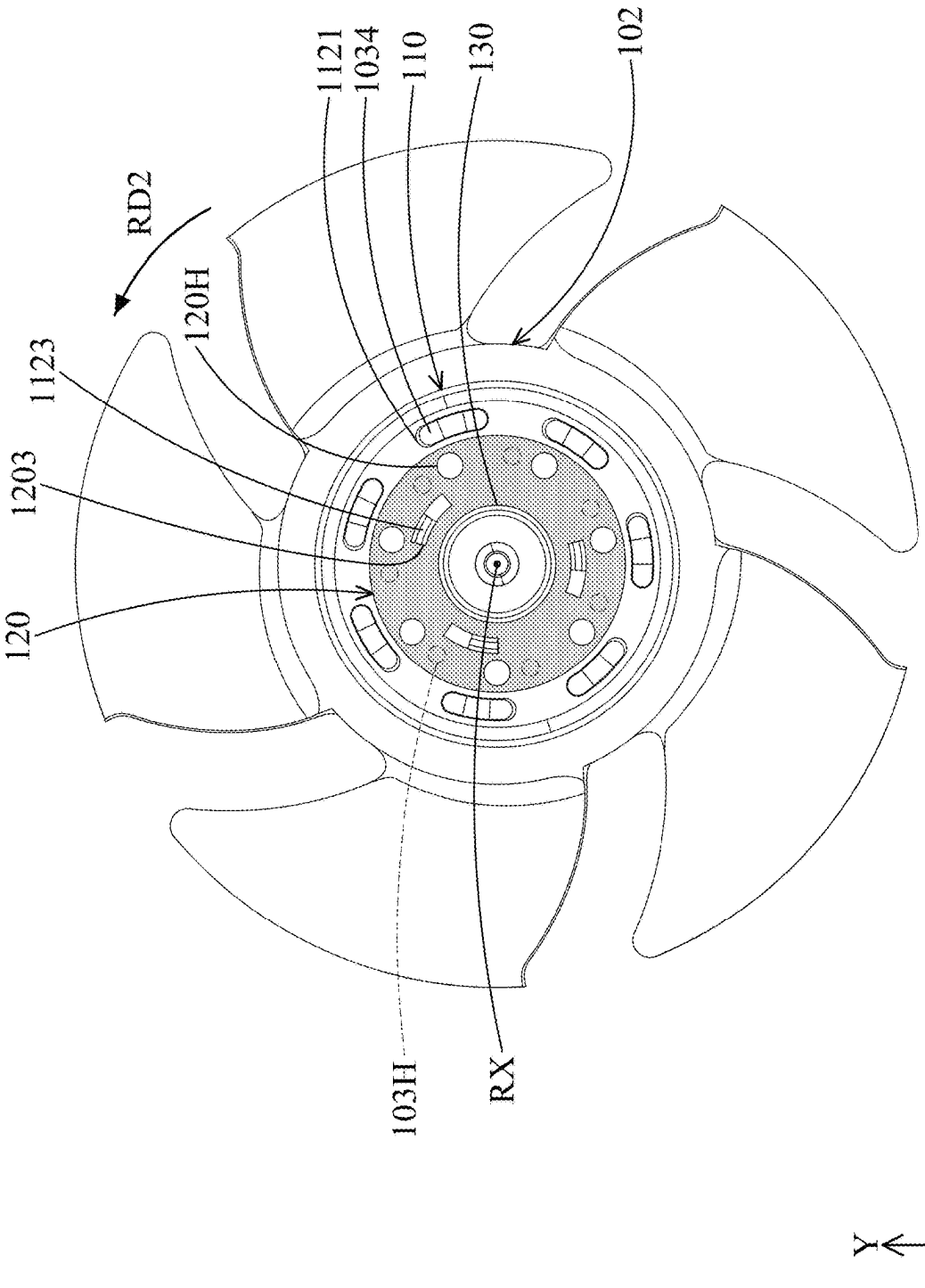
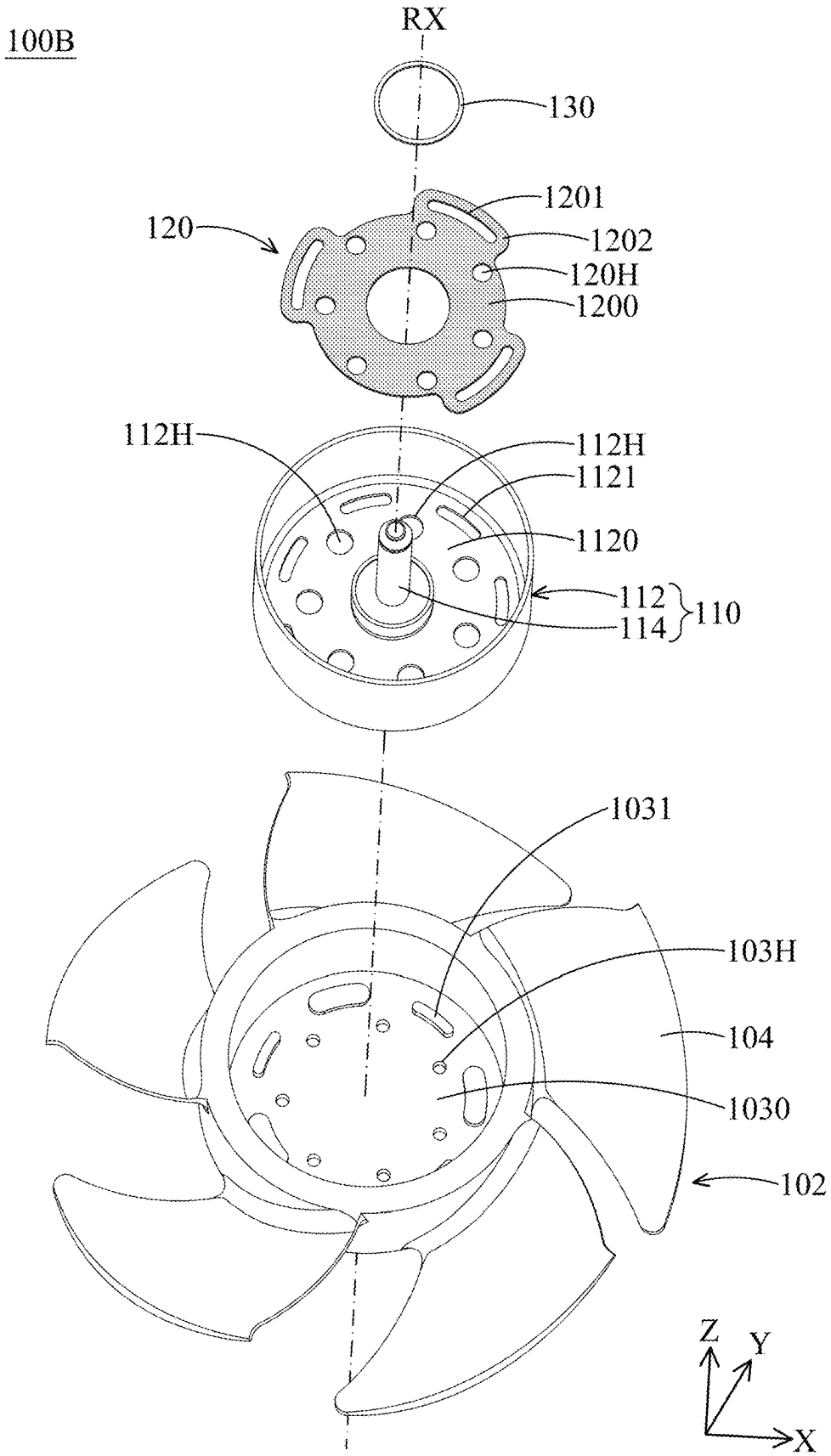


FIG. 11


100B
RX
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120
1201
1202
120H
1200
112H
112H
1121
1120
112
114
110
1031
103H
104
1030
102
Z
Y
X

FIG. 12

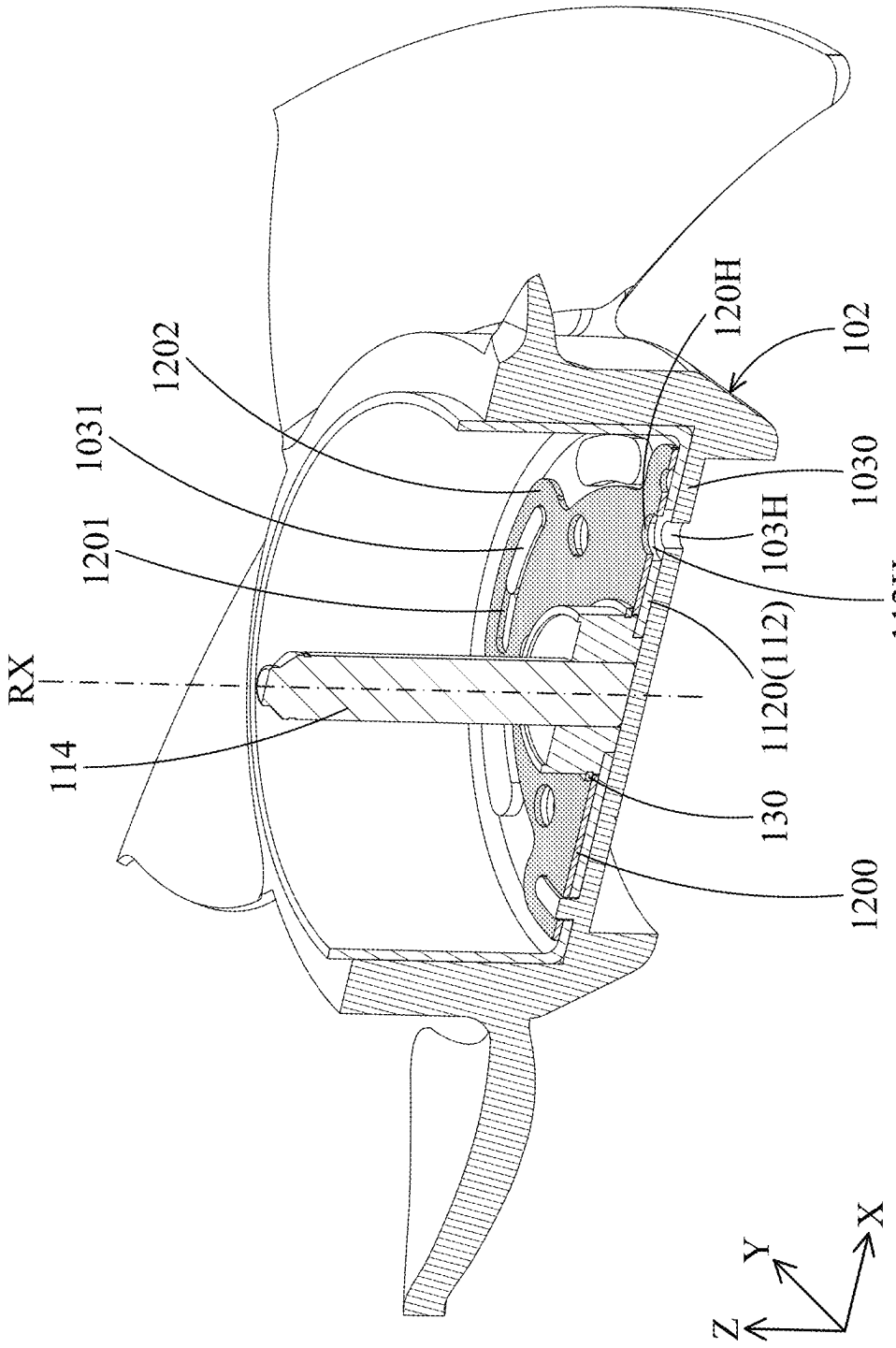

120H
102
1202
1031
1030
1201
103H
112H
RX
1120(112)
114
130
1200
Y
X
Z

FIG. 13

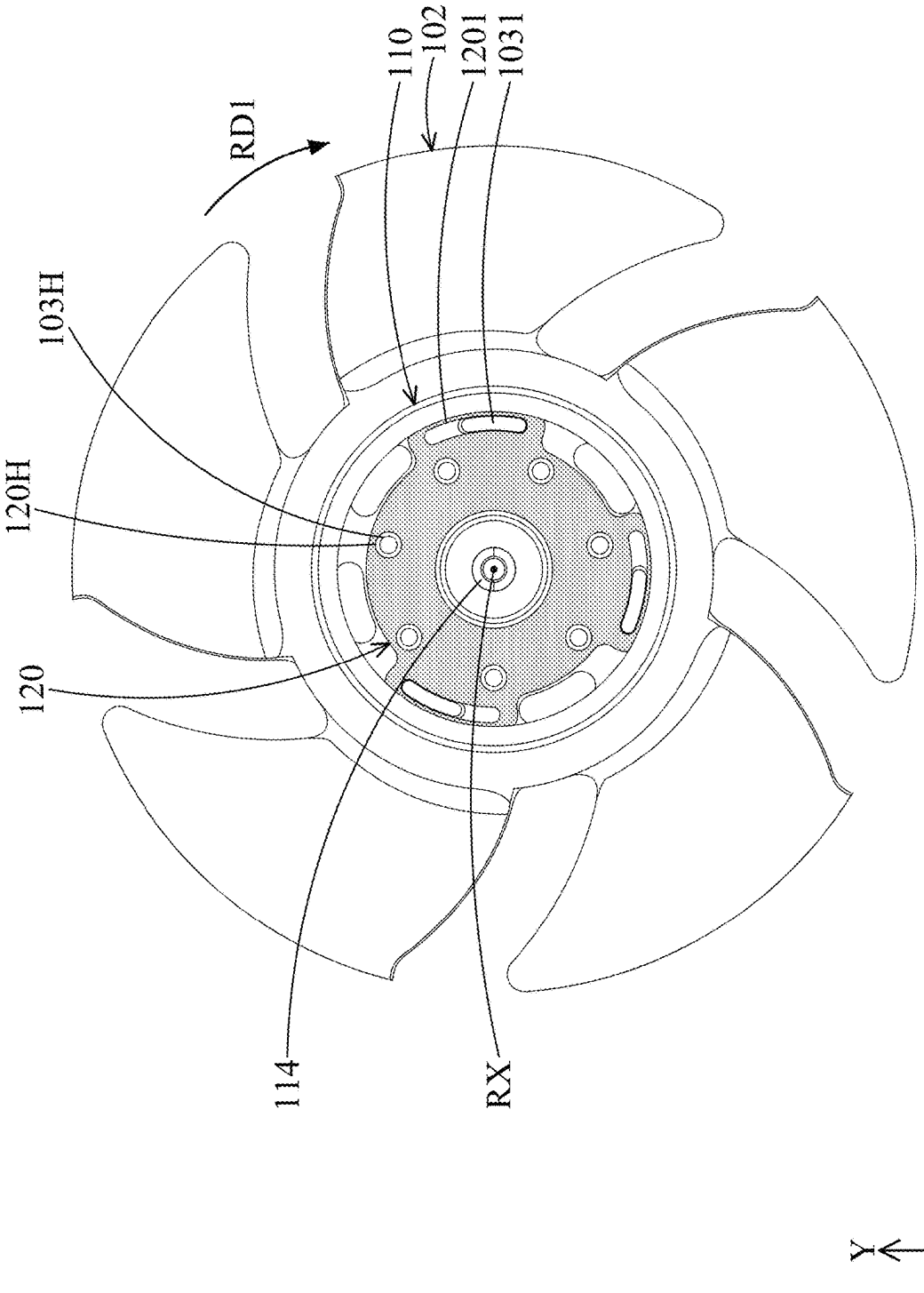


FIG. 14

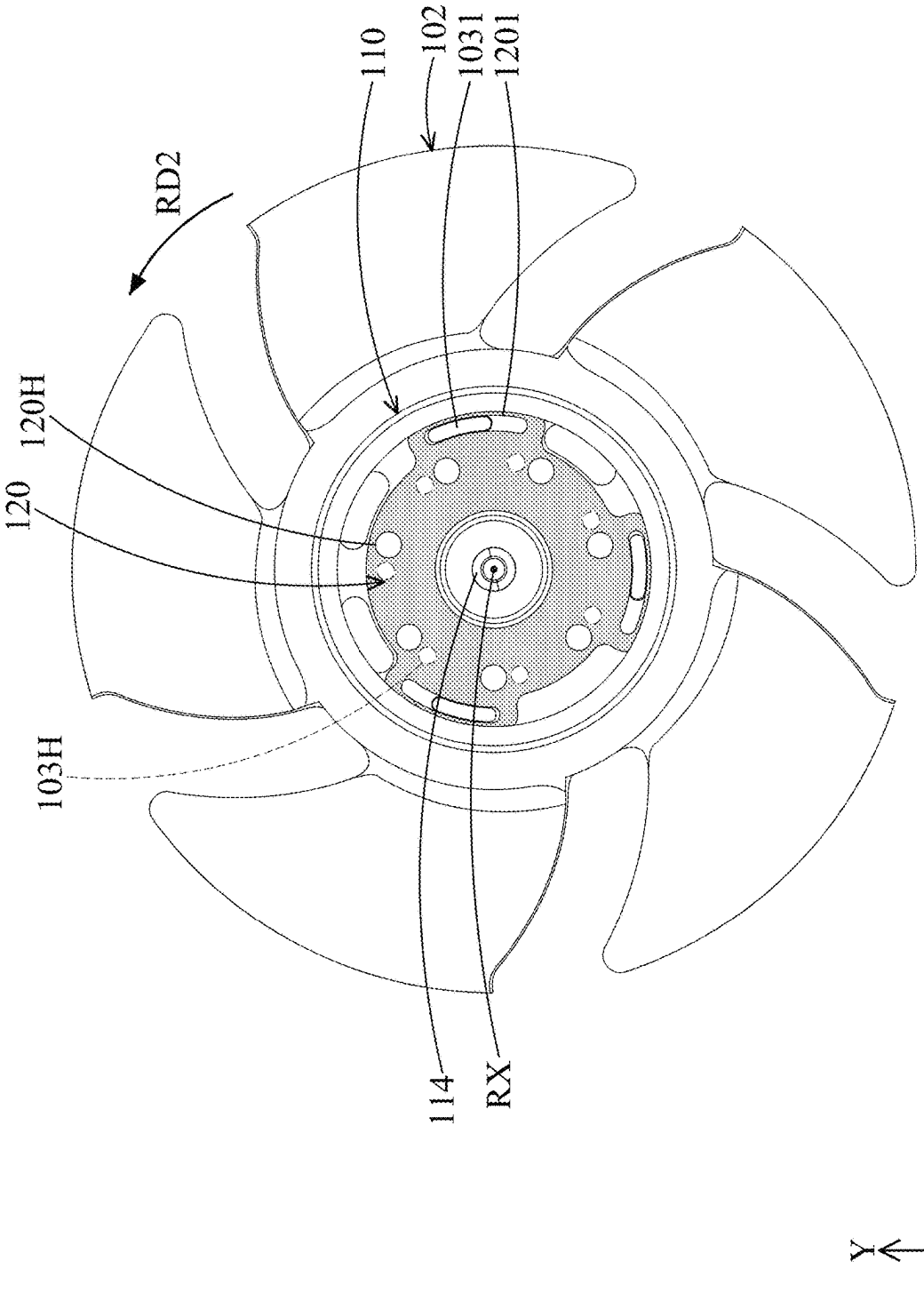


FIG. 15

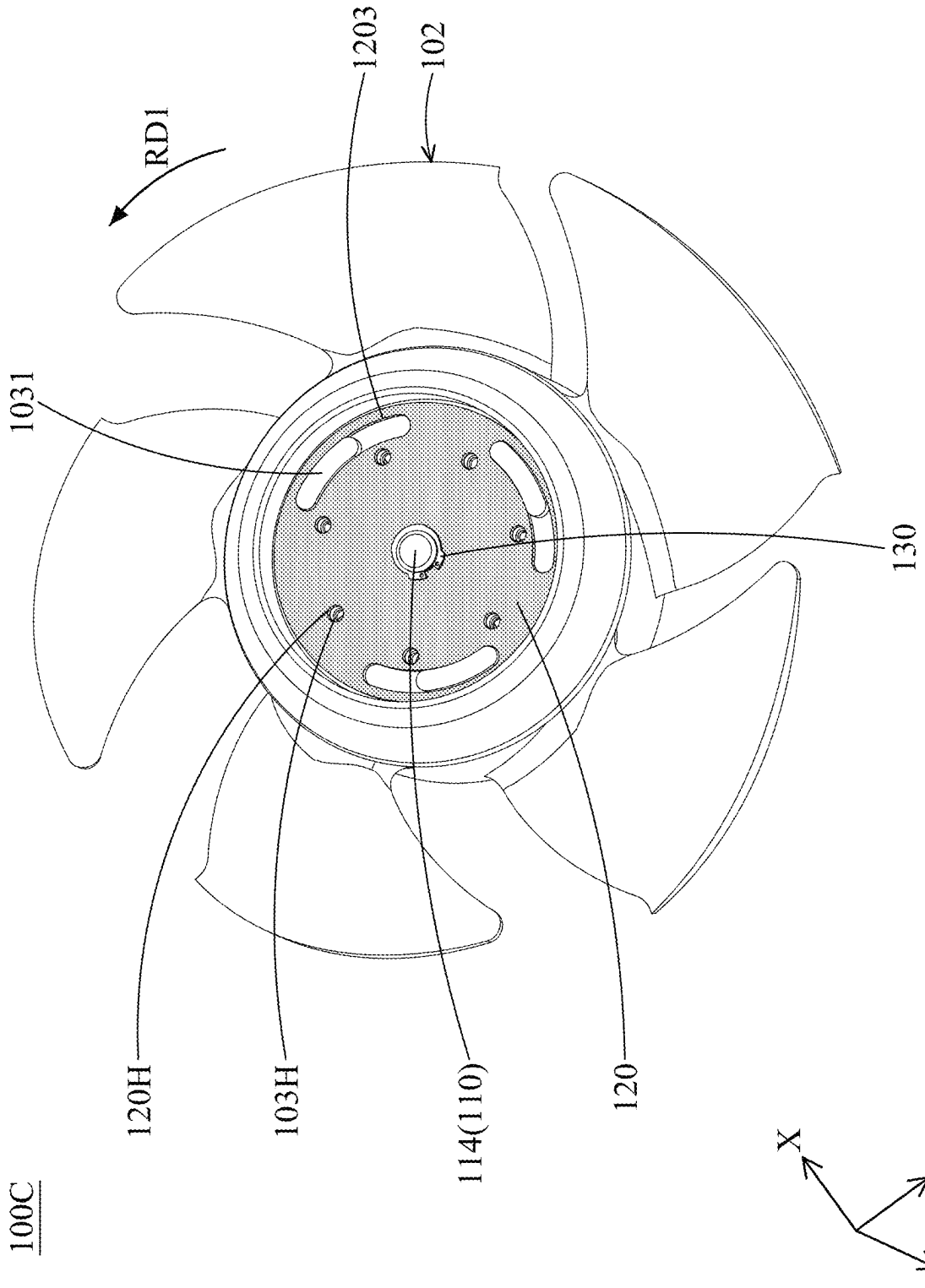
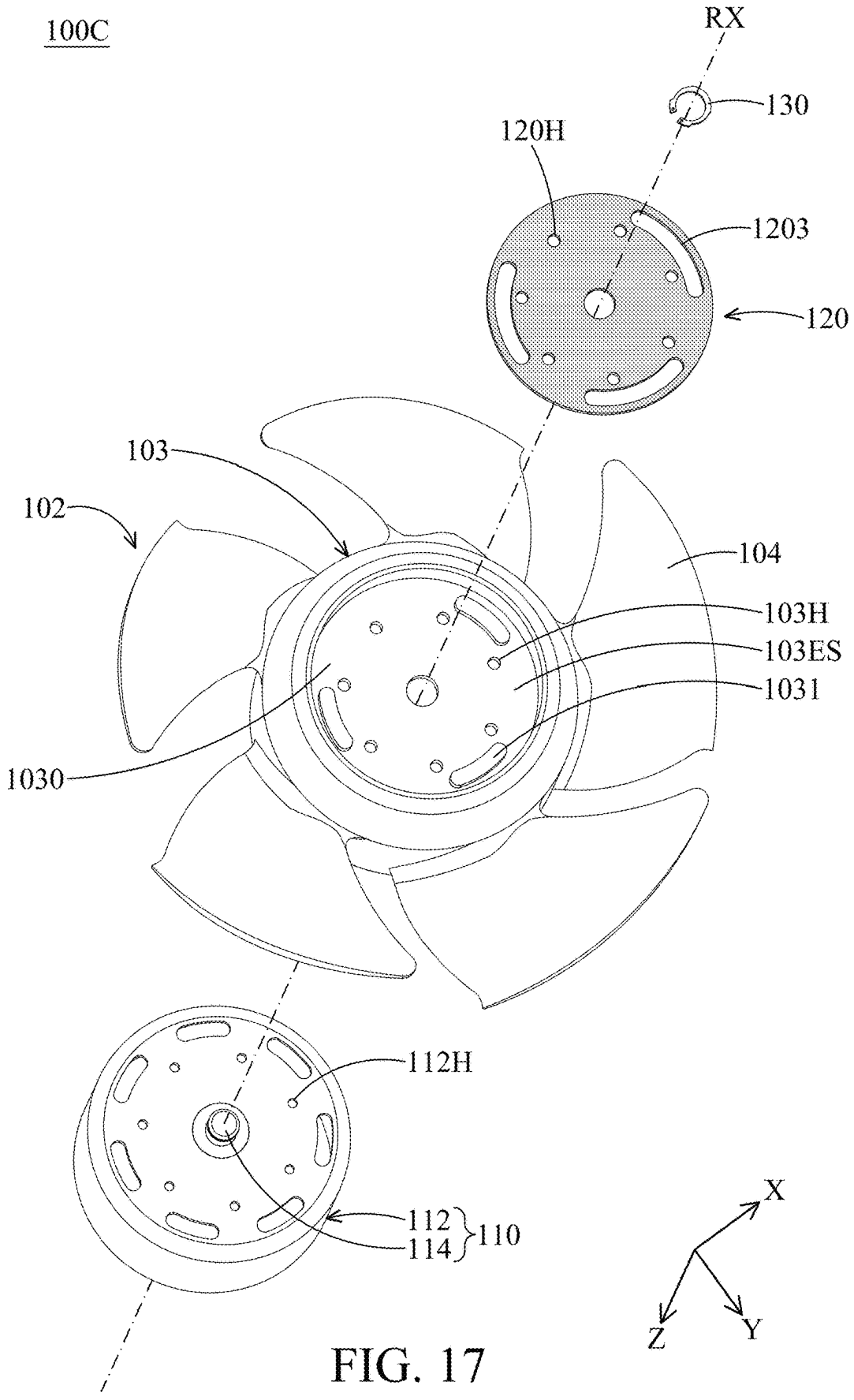


FIG. 16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RX
130
120H
1203
120
103
102
104
103H
103ES
1031
1030
112H
112
114
110
X
Z
Y

FIG. 17

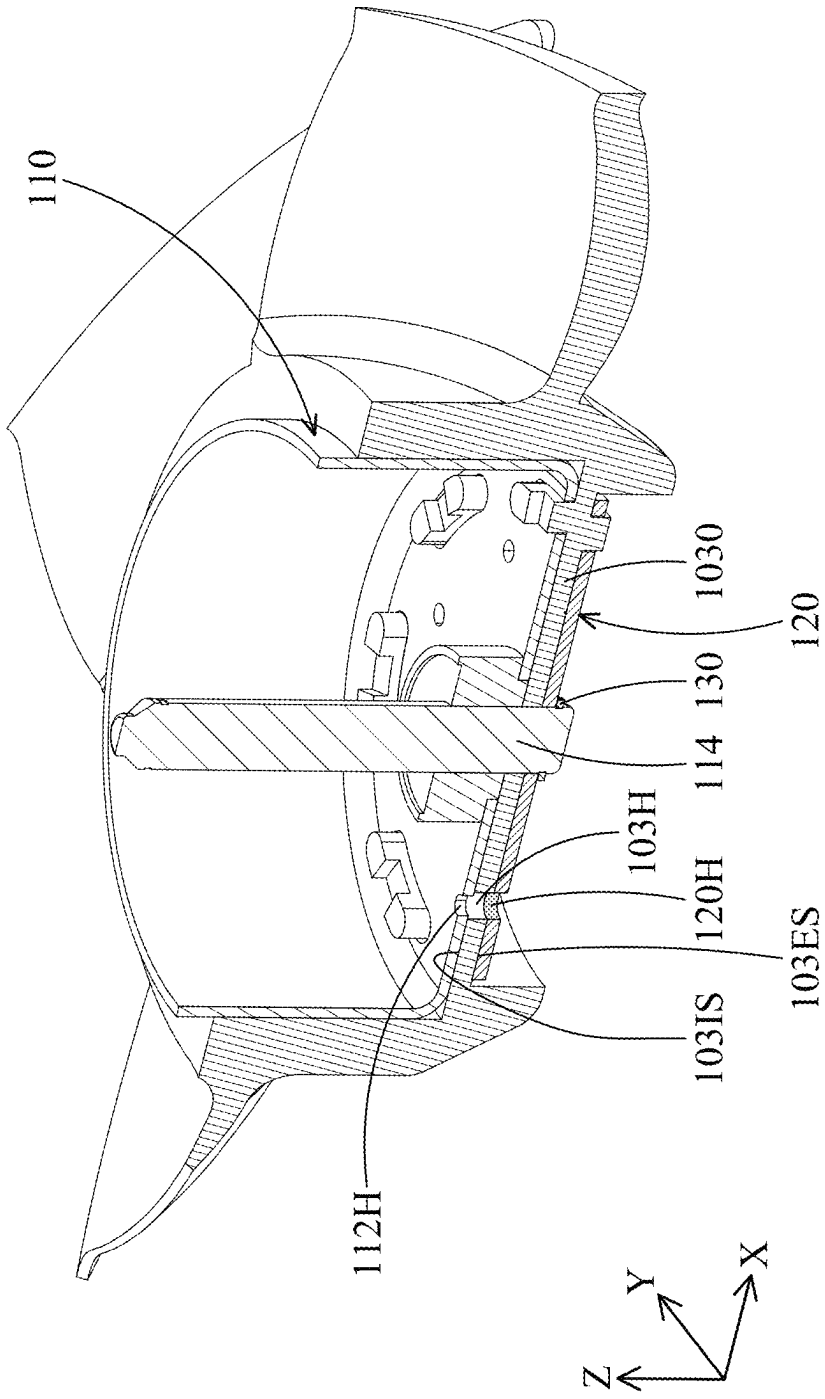

FIG. 18

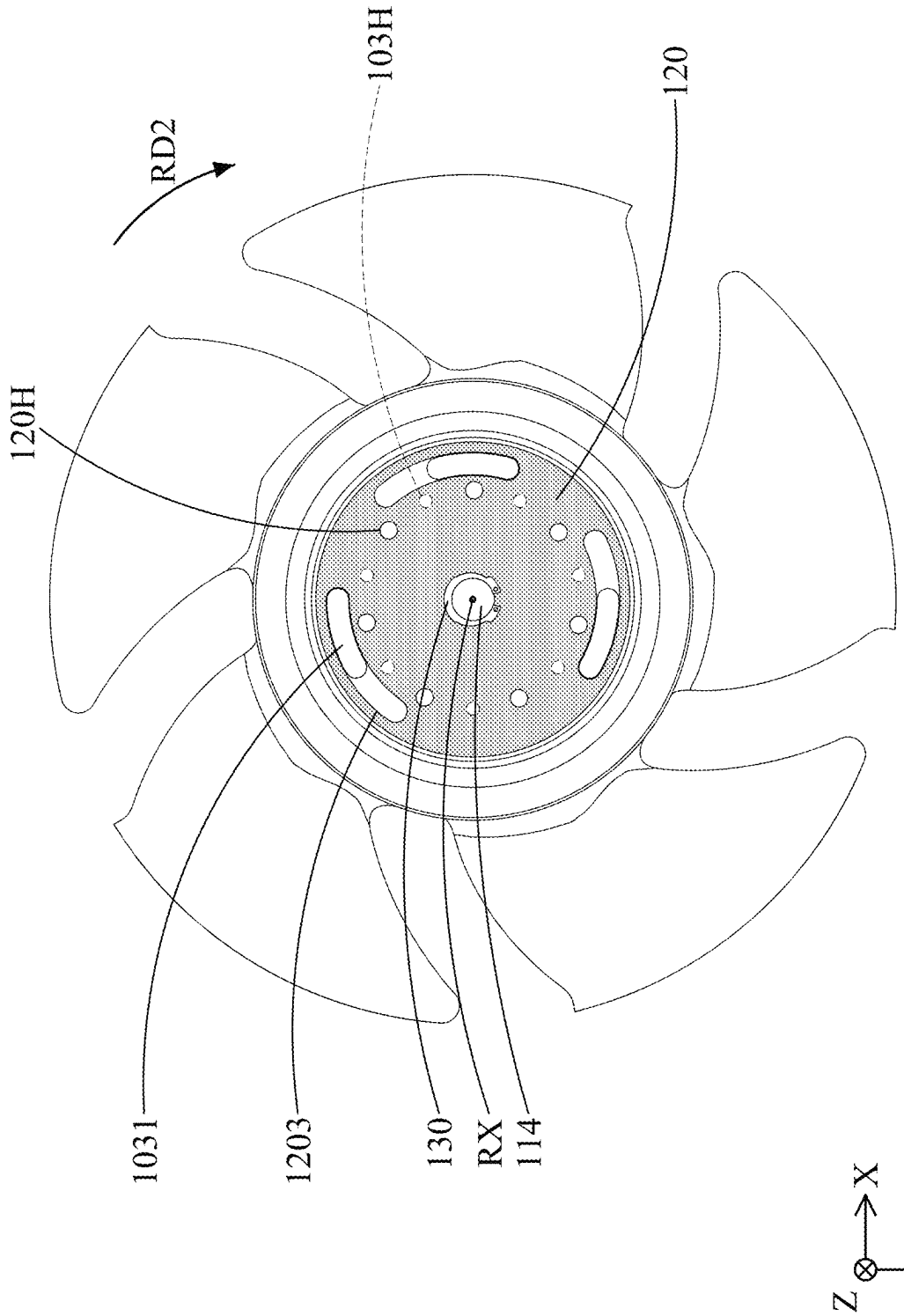

FIG. 19

FAN MODULE WITH A HEAT DISSIPATION FUNCTION

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of China Patent Application No. 202410046796.8, filed on Jan. 12, 2024, the entirety of which is incorporated by reference herein.

BACKGROUND OF THE INVENTION

Field of the Disclosure

The present disclosure relates to a fan module, and in particular it relates to a fan module with a heat dissipation function.

Description of the Related Art

As technology has developed, many of today's electronic devices (such as notebook computers) have become quite popular products nowadays. For the purpose of heat dissipation, the electronic devices are equipped with at least one fan module to assist the electronic device in dissipating heat.

Generally speaking, fan modules operate at high speed, so the heat energy generated by the fan module itself also affects the lifetime of the fan module. If heat dissipation holes are formed on the fan module for heat dissipation, external dust and water vapor may easily enter the fan module, which further reduces the lifetime of the fan module.

Therefore, how to design a fan module that can effectively dissipate heat is a topic nowadays that needs to be discussed and solved.

BRIEF SUMMARY OF THE INVENTION

Accordingly, one objective of the present disclosure is to provide a fan module to solve the above problems.

According to some embodiments of the disclosure, a fan module is provided. The fan module includes a blade assembly, a rotating shaft assembly and a plate member. The blade assembly has a plurality of fan blades and a bottom plate. The bottom plate is connected to the fan blades. At least one first opening and at least one protrusion are formed on the bottom plate. The rotating shaft assembly is affixed to the bottom plate, and the rotating shaft assembly has at least one first slot and at least one second opening. The first slot corresponds to the at least one protrusion, and the at least one second opening corresponds to the at least one first opening. The plate member is movably disposed between the bottom plate and the rotating shaft assembly, and the plate member has at least one second slot. The at least one second slot is sleeved on the at least one protrusion, and the size of the at least one second slot is greater than the size of the at least one protrusion. When the rotating shaft assembly drives the blade assembly to rotate, the plate member rotates relative to the bottom plate, thereby selectively shielding the first opening or exposing the first opening.

According to some embodiments, the plate member further has at least one third opening, and when the plate member rotates relative to the bottom plate to expose the at least one first opening, the at least one third opening overlaps the at least one first opening and the at least one second opening.

According to some embodiments, the at least one protrusion has a platform structure and a protruding structure, the platform structure extends from the bottom plate along a rotating axis of the rotating shaft assembly, and the protruding structure extends and protrudes from the platform structure along the rotating axis.

According to some embodiments, the plate member further has a disc structure and a lateral protruding structure, the lateral protruding structure extends radially from the disc structure, the at least one third opening is formed on the disc structure, and the at least one second slot is formed on the lateral protruding structure.

According to some embodiments, the thickness of the plate member is less than the height of the platform structure along the rotating axis.

According to some embodiments, the at least one second slot is sleeved on the platform structure, and the shape of the platform structure corresponds to the shape of the at least one second slot, so that the platform structure guides the lateral protruding structure to move relative to the bottom plate.

According to some embodiments, the platform structure is configured to support the rotating shaft assembly. The size of the at least one first slot matches the size of the protruding structure, and the size of the at least one first slot is smaller than the size of the platform structure.

According to some embodiments, the blade assembly is made of a plastic material, and the protruding structure is processed through a hot melt process or a hot riveting process, so that the rotating shaft assembly is affixed to the blade assembly through the protruding structure, which is processed by the hot melt process or the hot riveting process.

According to some embodiments, when the rotating shaft assembly rotates in a first rotational direction, the plate member rotates in the first rotational direction relative to the bottom plate, so that the at least one third opening overlaps the at least one first opening to expose the at least one first opening.

According to some embodiments, when the rotating speed of the rotating shaft assembly in the first rotational direction decreases, the rotating speed of the plate member in the first rotational direction is greater than a rotating speed of the blade assembly and the rotating shaft assembly, so that the plate member shields the at least one first opening.

According to some embodiments, when the rotating shaft assembly rotates in a second rotational direction, the plate member rotates in the second rotational direction relative to the bottom plate, so that the plate member shields the at least one first opening. The second rotational direction is opposite to the first rotational direction.

According to some embodiments of the disclosure, a fan module is provided. The fan module includes a blade assembly, a rotating shaft assembly and a plate member. The blade assembly has a plurality of fan blades and a bottom plate, the bottom plate is connected to the fan blades, and at least one first opening is formed on the bottom plate. The rotating shaft assembly is affixed to the bottom plate, the rotating shaft assembly has at least one first protrusion and at least one second opening, and the at least one second opening corresponds to the at least one first opening. The plate member is movably disposed on the rotating shaft assembly, and the plate member has at least one opening groove. The at least one opening groove is sleeved on the at least one first protrusion, and the size of the at least one opening groove is larger than the size of the at least one first protrusion. When the rotating shaft assembly drives the blade assembly to rotate, the plate member rotates relative to

the bottom plate, thereby selectively shielding the first opening or exposing the first opening.

According to some embodiments, the fan module further includes a blocking member, which is fixedly disposed on a shaft of the rotating shaft assembly, and when viewed in a direction perpendicular to the shaft, the plate member is disposed between the blocking member and the bottom plate. There is a gap between the blocking member and the plate member.

According to some embodiments, at least one second protrusion is formed on the bottom plate and passes through the rotating shaft assembly, the plate member has a disc structure, and the disc structure does not contact the at least one second protrusion. The plate member further has at least a third opening corresponding to the at least one second opening, and when viewed along a rotating axis of the shaft, the at least one third opening is located between the at least one second protrusion and the at least one first protrusion.

According to some embodiments of the disclosure, a fan module is provided and includes a blade assembly, a rotating shaft assembly and a plate member. The blade assembly has a plurality of fan blades and a bottom plate. The bottom plate is connected to the fan blades, and at least one first opening and at least one protrusion are formed on the bottom plate. The rotating shaft assembly is fixedly disposed on the bottom plate, and the rotating shaft assembly has at least one first slot and at least one second opening. The first slot corresponds to the at least one protrusion, and the at least one second opening corresponds to the at least one first opening. The plate member is movably disposed on the rotating shaft assembly, and the plate member having at least one second slot. The at least one second slot is sleeved on the at least one protrusion, and the size of the at least one second slot is greater than the size of the at least one protrusion. When the rotating shaft assembly drives the blade assembly to rotate, the plate member rotates relative to the rotating shaft assembly, thereby selectively shielding the first opening or exposing the first opening.

According to some embodiments, the fan module further includes a blocking member which is fixedly disposed on a shaft of the rotating shaft assembly, and when viewed in a direction perpendicular to the shaft, the plate member is disposed between the blocking member and the bottom plate. There is a gap between the blocking member and the plate member.

According to some embodiments of the disclosure, the plate member further has at least one third opening corresponding to the at least one first opening and the at least one second opening, and when the plate member rotates relative to the bottom plate to expose the at least one first opening, the at least one third opening overlaps the at least one first opening and the at least one second opening.

According to some embodiments of the disclosure, a fan module is provided and includes a blade assembly, a rotating shaft assembly and a plate member. The blade assembly has a plurality of fan blades and a bottom plate, the bottom plate is connected to the fan blades, at least one first opening and at least one protrusion are formed on the bottom plate, and the at least one protrusion is formed from an outer surface of the bottom plate. The rotating shaft assembly is fixedly disposed on an inner surface of the bottom plate, and the rotating shaft assembly has at least one second opening. The at least one second opening corresponds to the at least one first opening. The plate member is movably disposed on the outer surface, and the plate member has at least one opening groove. The at least one opening groove is sleeved on the at least one protrusion, and the size of the at least one opening groove is greater than the size of the at least one protrusion. When the rotating shaft assembly drives the blade assembly to rotate, the plate member rotates relative to the bottom plate, thereby selectively shielding the first opening or exposing the first opening.

According to some embodiments, the fan module further includes a blocking member which is fixedly disposed on a shaft of the rotating shaft assembly, and when viewed in a direction perpendicular to the shaft, the plate member is disposed between the blocking member and the bottom plate. There is a gap between the blocking member and the plate member.

According to some embodiments, the plate member further has at least one third opening corresponding to the at least one first opening, and when the plate member rotates relative to the bottom plate to expose the at least one first opening, the at least one third opening overlaps the at least one first opening and the at least one second opening.

The present disclosure provides a fan module which includes a blade assembly, a rotating shaft assembly and a plate member. In some embodiments, the rotating shaft assembly is affixed to the blade assembly, at least one first opening is formed on the first base body of the blade assembly, and at least one second opening is formed on the second base body of the rotating shaft assembly for aligning with the first opening. At least one third opening is formed on the plate member for corresponding to the first opening and the second opening.

When the fan module is operating normally, the rotating shaft assembly drives the blade assembly to rotate, and the plate member rotates with the blade assembly so that the third opening is aligned with the first opening and the second opening, and therefore the fan module can effectively dissipate heat during operation.

Before the operation of the fan module is stopped, the rotating shaft assembly can be rotated in the opposite direction or the rotation speed can be reduced, so that the plate member rotates relative to the blade assembly or the rotating shaft assembly, thereby shielding the first opening and the second opening. Therefore, after the fan module stops operating, it can effectively isolate external dust or moisture from entering its interior, thereby increasing the service life of the fan module.

Additional features and advantages of the disclosure will be set forth in the description which follows, and, in part, will be obvious from the description, or can be learned by practice of the principles disclosed herein. The features and advantages of the disclosure can be realized and obtained by means of the instruments and combinations pointed out in the appended claims. These and other features of the disclosure will become more fully apparent from the following description and appended claims, or can be learned by the practice of the principles set forth herein.

BRIEF DESCRIPTION OF THE DRAWINGS

Aspects of the present disclosure are best understood from the following detailed description when read with the accompanying figures. It is noted that, in accordance with the standard practice in the industry, various features are not drawn to scale. In fact, the dimensions of the various features may be arbitrarily increased or reduced for clarity of discussion.

FIG. **1** is a three-dimensional schematic diagram of a fan module **10** according to an embodiment of the present disclosure.

FIG. **2** is a three-dimensional cross-sectional view of the fan module **10** along the line A-A in FIG. **1** according to an embodiment of the present disclosure.

FIG. **3** is a three-dimensional schematic diagram of the rotating assembly **100** according to an embodiment of the present disclosure.

FIG. **4** is an exploded diagram of the rotating assembly **100** according to an embodiment of the present disclosure.

FIG. **5** is a cross-sectional view of the rotating assembly **100** along line B-B in FIG. **3** according to an embodiment of the present disclosure.

FIG. **6** is a schematic three-dimensional diagram illustrating that the plate member **120** is located in an open position according to an embodiment of the present disclosure.

FIG. **7** is a schematic three-dimensional diagram illustrating that the plate member **120** is located in a closed position according to an embodiment of the present disclosure.

FIG. **8** is an exploded diagram of a rotating assembly **100**A according to another embodiment of the present disclosure.

FIG. **9** is a perspective cross-sectional view of the rotating assembly **100**A according to another embodiment of the present disclosure.

FIG. **10** is a three-dimensional schematic diagram illustrating that the plate member **120** is located in the open position according to another embodiment of the present disclosure.

FIG. **11** is a three-dimensional schematic diagram illustrating that the plate member **120** is located in the closed position according to another embodiment of the present disclosure.

FIG. **12** is an exploded diagram of the rotating assembly **100**B according to another embodiment of the present disclosure.

FIG. **13** is a perspective cross-sectional view of the rotating assembly **100**B according to another embodiment of the present disclosure.

FIG. **14** is a three-dimensional schematic diagram illustrating that the plate member **120** is located in the open position according to another embodiment of the present disclosure.

FIG. **15** is a three-dimensional schematic diagram illustrating that the plate member **120** is located in the closed position according to another embodiment of the present disclosure.

FIG. **16** is a schematic three-dimensional diagram illustrating that the plate member **120** is located in an open position according to another embodiment of the present disclosure.

FIG. **17** is an exploded diagram of a rotating assembly **100**C according to another embodiment of the present disclosure.

FIG. **18** is a three-dimensional cross-sectional view of the rotating assembly **100**C according to another embodiment of the present disclosure.

FIG. **19** is a schematic diagram illustrating that the plate member **120** is located in a closed position according to another embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE INVENTION

The following disclosure provides many different embodiments, or examples, for implementing different features of the provided subject matter. Specific examples of components and arrangements are described below to simplify the present disclosure. These are, of course, merely examples and are not intended to be limiting. For example, the formation of a first feature over or on a second feature in the description that follows may include embodiments in which the first and second features are in direct contact, and may also include embodiments in which additional features may be disposed between the first and second features, such that the first and second features may not be in direct contact.

In addition, the present disclosure may repeat reference numerals and/or letters in the various examples. This repetition is for the purpose of simplicity and clarity and does not in itself dictate a relationship between the various embodiments and/or configurations discussed. Moreover, the formation of a feature on, connected to, and/or coupled to another feature in the present disclosure that follows may include embodiments in which the features are in direct contact, and may also include embodiments in which additional features may be disposed interposing the features, such that the features may not be in direct contact. In addition, spatially relative terms, for example, "vertical," "above," "over," "below,", "bottom," etc. as well as derivatives thereof (e.g., "downwardly," "upwardly," etc.) are used in the present disclosure for ease of description of one feature's relationship to another feature. The spatially relative terms are intended to cover different orientations of the device, including the features.

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure belongs. It should be appreciated that each term, which is defined in a commonly used dictionary, should be interpreted as having a meaning conforming to the relative skills and the background or the context of the present disclosure, and should not be interpreted in an idealized or overly formal manner unless defined otherwise.

Use of ordinal terms such as "first", "second", etc., in the claims to modify a claim element does not by itself connote any priority, precedence, or order of one claim element over another or the temporal order in which acts of a method are performed, but are used merely as labels to distinguish one claim element having a certain name from another element having the same name (but for use of the ordinal term) to distinguish the claim elements.

In addition, in some embodiments of the present disclosure, terms concerning attachments, coupling and the like, such as "connected" and "interconnected", refer to a relationship wherein structures are secured or attached to one another either directly or indirectly through intervening structures, as well as both movable or rigid attachments or relationships, unless expressly described otherwise.

Please refer to FIG. **1** and FIG. **2**. FIG. **1** is a three-dimensional schematic diagram of a fan module **10** according to an embodiment of the present disclosure, and FIG. **2** is a three-dimensional cross-sectional view of the fan module **10** along the line A-A in FIG. **1** according to an embodiment of the present disclosure. The fan module **10** may include a fixed assembly **50** and a rotating assembly **100**. The rotating assembly **100** can rotate relative to the fixed assembly **50**.

The fixed assembly **50** may include a fixed housing **52**, a central fixed structure **54**, and a central tubular portion **56**. The central fixed structure **54** is affixed to the fixed housing **52**, and the central tubular portion **56** is affixed to the central fixed structure **54**. The fixed housing **52**, the central fixed

structure **54** and the central tubular portion **56** can be integrally formed as one piece, for example, made of plastic material.

Next, please refer to FIG. **1** to FIG. **4**. FIG. **3** is a three-dimensional schematic diagram of the rotating assembly **100** according to an embodiment of the present disclosure, and FIG. **4** is an exploded diagram of the rotating assembly **100** according to an embodiment of the present disclosure. The rotating assembly **100** may include a blade assembly **102**, a rotating shaft assembly **110** and a plate member **120**. The blade assembly **102** includes a first base body **103** and a plurality of fan blades **104**, and the fan blades **104** are fixedly connected to the first base body **103**. The rotating shaft assembly **110** includes a second base body **112** and a shaft **114**. The shaft **114** is fixedly connected to the second base body **112**.

The fan module **10** further includes two bearings **20**, a plurality of coils **30** and a magnet **40**. The coil **30** is fixedly disposed on the central tubular portion **56**, the magnet **40** is affixed to the second base body **112**, and the bearings **20** are disposed between the shaft **114** and the central tubular portion **56**. When the coil **30** is energized and interacts with the magnet **40**, the rotating assembly **100** can be driven to rotate.

In this embodiment, the first base body **103** has a bottom plate **1030** which is connected to the fan blades **104**, and at least one first opening **103**H and at least one protrusion **1031** are formed on the bottom plate **1030**. For example, the first base body **103** of this embodiment has seven first openings **103**H and seven protrusion **1031**, but they are not limited thereto.

The rotating shaft assembly **110** is fixedly disposed on the bottom plate **1030**, and the second base body **112** of the rotating shaft assembly **110** has at least one first slot **1121** and at least one second opening **112**H. The first slot **1121** corresponds to the corresponding protrusion **1031**, and the second opening **112**H corresponds to the corresponding first opening **103**H.

The plate member **120** is movably disposed between the bottom plate **1030** and the rotating shaft assembly **110**, and the plate member **120** has at least one second slot **1201** and at least one third opening **120**H. The second slot **1201** sheathes on the corresponding protrusion **1031**, and the size of second slot **1201** is larger than the size of protrusion **1031**.

Specifically, the plate member **120** has a disc structure **1200** and at least one lateral protruding structure **1202**, and the lateral protruding structure **1202** extends radially from the disc structure **1200**. The third opening **120**H is formed on the disc structure **1200**, and the second slot **1201** is formed on the lateral protruding structure **1202**. The number of third opening **120**H is equal to the number of first opening **103**H or to the number of second opening **112**H.

When the magnet **40** acts with the coil **30** so that the magnet **40** and the rotating shaft assembly **110** drive the blade assembly **102** to rotate, the plate member **120** rotates relative to the bottom plate **1030**, thereby selectively shielding the first opening **103**H or exposing the first opening **103**H.

As shown in FIG. **3**, when the plate member **120** rotates relative to the bottom plate **1030** to expose the first opening **103**H, the third opening **120**H overlaps the corresponding first opening **103**H and the corresponding second opening **112**H.

Please refer to FIG. **3** to FIG. **5**. FIG. **5** is a cross-sectional view of the rotating assembly **100** along line B-B in FIG. **3** according to an embodiment of the present disclosure. As shown in FIG. **4** and FIG. **5**, the protrusion **1031** has a platform structure **1032** and a protruding structure **1033**. The platform structure **1032** extends from the bottom plate **1030** along a rotating axis RX of the rotating shaft assembly **110**, and the protruding structure **1033** extends and protrudes from the platform structure **1032** along the rotating axis RX.

As shown in FIG. **5**, the thickness TK**1** of the plate member **120** is smaller than the height HT**1** of the platform structure **1032** along the rotating axis RX. That is, the second base body **112** does not contact the plate member **120**, so that the plate member **120** can move relative to the bottom plate **1030**.

Furthermore, the second slot **1201** sheathes on the platform structure **1032**, and the shape of the platform structure **1032** corresponds to the shape of the second slot **1201**, so that the platform structure **1032** can guide the lateral protruding structure **1202** to move relative to the bottom plate **1030**.

As shown in FIG. **3** and FIG. **5**, the platform structure **1032** is configured to support the second base body **112** of the rotating shaft assembly **110**, the size of the first slot **1121** matches the size of the protruding structure **1033**, and the size of the first slot **1121** is smaller than the size of platform structure **1032**. For example, the first slot **1121** and the protruding structure **1033** are co-shape, and the size of the first slot **1121** is equal to or slightly larger than the size of the protruding structure **1033**, such as larger than 5%.

In this embodiment, the blade assembly **102** is made of plastic material, and the rotating shaft assembly **110** can be made of metal material. Therefore, the protruding structure **1031** can be processed through a hot melt process or a hot riveting process, so that the rotating shaft assembly **110** is affixed to the blade assembly **102** through the protruding structure **1033** which is processed by the process. For example, the size of the protruding structure **1033** that has undergone the hot riveting process is larger than the size of the first slot **1121** so as to affix the rotating shaft assembly **110** to the bottom plate **1030**.

Next, please refer to FIG. **3**, FIG. **6** and FIG. **7**. FIG. **6** is a schematic three-dimensional diagram illustrating that the plate member **120** is located in an open position according to an embodiment of the present disclosure, and FIG. **7** is a schematic three-dimensional diagram illustrating that the plate member **120** is located in a closed position according to an embodiment of the present disclosure. When the rotating shaft assembly **110** rotates in a first rotational direction RD**1**, the platform structure **1032** of the protrusion **1031** is in contact with one side of the lateral protruding structure **1202** (the right side in FIG. **6**) to drive the plate member **120** to rotate relative to the bottom plate **1030** in the first rotational direction RD**1** so that the third opening **120**H overlaps the corresponding first opening **103**H to expose the first opening **103**H.

On the other hand, as shown in FIG. **7**, when the rotating shaft assembly **110** rotates in a second rotational direction RD**2**, the platform structure **1032** of the protrusion **1031** is in contact with the other side of the lateral protruding structure **1202** (the left side in FIG. **7**) in order to drive the plate member **120** to rotate in the second rotational direction RD**2** relative to the bottom plate **1030**, so that the plate member **120** shields the first opening **103**H. The second rotational direction RD**2** is opposite to the first rotational direction RD**1**.

The manner of the plate member **120** shielding the first opening **103**H is not limited to the above embodiment. For example, in some embodiments, when the rotating speed of the rotating shaft assembly **110** in the first rotational direction RD**1** decreases, for example, from 500 rpm (Revolution

Per Minute) to 50 or approaches 0 rpm, the rotating speed of the plate member **120** in the first rotational direction RD**1** is greater than the rotating speed of the blade assembly **102** and the rotating shaft assembly **110**, so that the plate member **120** will shield the first opening **103**H. For example, when the blade assembly **102** and the rotating shaft assembly **110** brake, the plate member **120** will continue to rotate in the first rotational direction RD**1** due to inertia, thereby shielding the first opening **103**H.

Next, please refer to FIG. **8** to FIG. **11**. FIG. **8** is an exploded diagram of a rotating assembly **100**A according to another embodiment of the present disclosure, FIG. **9** is a perspective cross-sectional view of the rotating assembly **100**A according to another embodiment of the present disclosure, FIG. **10** is a three-dimensional schematic diagram illustrating that the plate member **120** is located in the open position according to another embodiment of the present disclosure, and FIG. **11** is a three-dimensional schematic diagram illustrating that the plate member **120** is located in the closed position according to another embodiment of the present disclosure.

Similar to the previous embodiment, the rotating assembly **100**A has the blade assembly **102**, the rotating shaft assembly **110** and the plate member **120**. In this embodiment, the rotating shaft assembly **110** is fixedly disposed on the bottom plate **1030**. The rotating shaft assembly **110** has at least one first protrusion **1123** and at least one second opening **112**H, and the second opening **112**H corresponds to the first opening **103**H of the bottom plate **1030**.

Furthermore, the plate member **120** is movably disposed on the rotating shaft assembly **110**, and the plate member **120** has at least one opening groove **1203**. The opening groove **1203** is sleeved on the corresponding first protrusion **1123**, and the size of the opening groove **1203** is larger than the size of the first protrusion **1123**.

As shown in FIG. **10**, when the rotating shaft assembly **110** drives the blade assembly **102** to rotate, the first protrusion **1123** is in contact with one side of the opening groove **1203** (the right side in FIG. **10**) to drive the plate member **120** to rotate relative to the rotating shaft assembly **110** so that the third opening **120**H is aligned with the second opening **112**H and the first opening **103**H so as to expose the first opening **103**H.

In addition, as shown in FIG. **11**, when the rotating shaft assembly **110** rotates in the second rotational direction RD**2**, the first protrusion **1123** is in contact with the other side of the opening groove **1203** (the left side in FIG. **11**) to drive the plate member **120** to rotate in the second rotational direction RD**2** relative to the rotating shaft assembly **110** so that the plate member **120** shields the first opening **103**H.

It is worth noting that the rotating assembly **100**A may further include a blocking member **130** which is fixedly disposed on the shaft **114** of the rotating shaft assembly **110**, and as shown in FIG. **9**, when viewed in a direction perpendicular to the shaft **114** (such as the Y-axis), the plate member **120** is disposed between the blocking member **130** and the bottom plate **1030**.

Because the plate member **120** is not fixed on the rotating shaft assembly **110**, when the rotating shaft assembly **110** rotates, the blocking member **130** is configured to block the plate member **120** to avoid the problem that the plate member **120** may be detached from the rotating shaft assembly **110**. In addition, it should be noted that there is a gap between the blocking member **130** and the plate member **120**. That is, the blocking member **130** does not press the plate member **120** to ensure that the plate member **120** can rotate relative to the second base body **112**.

In addition, in this embodiment, at least one second protrusion **1034** is further formed on the bottom plate **1030** and passes through the first slot **1121** of the rotating shaft assembly **110**. Furthermore, the plate member **120** has a disc structure **1200**, and the disc structure **1200** does not contact the second protrusion **1034**. As shown in FIG. **11**, when viewed along the rotating axis RX, the third opening **120**H is located between the second protrusion **1034** and the first protrusion **1123**.

Next, please refer to FIG. **12** to FIG. **15**. FIG. **12** is an exploded diagram of the rotating assembly **100**B according to another embodiment of the present disclosure. FIG. **13** is a perspective cross-sectional view of the rotating assembly **100**B according to another embodiment of the present disclosure. FIG. **14** is a three-dimensional schematic diagram illustrating that the plate member **120** is located in the open position according to another embodiment of the present disclosure. FIG. **15** is a three-dimensional schematic diagram illustrating that the plate member **120** is located in the closed position according to another embodiment of the present disclosure.

Similar to the previous embodiments, the rotating assembly **100**B has the blade assembly **102**, the rotating shaft assembly **110** and the plate member **120**. In this embodiment, the rotating shaft assembly **110** is fixedly disposed on the bottom plate **1030**, and the rotating shaft assembly **110** has at least one first slot **1121** and at least one second opening **112**H. The first slot **1121** corresponds to the protrusion **1031** on the bottom plate **1030**, and the second opening **112**H corresponds to the first opening **103**H on the bottom plate **1030**.

Furthermore, the plate member **120** is movably disposed on the rotating shaft assembly **110**, and the plate member **120** has at least one second slot **1201**. The second slot **1201** is sleeved on the corresponding protrusion **1031**, and the size of the second slot **1201** is larger than the size of the protrusion **1031**.

As shown in FIG. **14**, when the rotating shaft assembly **110** drives the blade assembly **102** to rotate, the protrusion **1031** is in contact with one side of the second slot **1201** (the lower side in FIG. **14**) to drive the plate member **120** to rotate relative to the rotating shaft assembly **110** so that the third opening **120**H is aligned with the second opening **112**H and the first opening **103**H to expose the first opening **103**H. At this time, the third opening **120**H completely overlaps the corresponding first opening **103**H and second opening **112**H.

On the other hand, as shown in FIG. **15**, when the rotating shaft assembly **110** rotates in the second rotational direction RD**2**, the protrusion **1031** is in contact with the other side of the second slot **1201** (the upper side in FIG. **15**) to drive the plate member **120** to rotate in the second rotational direction RD**2** relative to the rotating shaft assembly **110**, so that the plate member **120** shields the first opening **103**H.

Similarly, the rotating assembly **100**B also includes a blocking member **130**, which is fixedly disposed on the shaft **114** of the rotating shaft assembly **110**. As shown in FIG. **13**, when viewed in a direction perpendicular to the shaft **114** (such as the Y-axis), the plate member **120** is disposed between the blocking member **130** and a bottom plate **1120** of the second base body **112** (and the bottom plate **1030**) in order to avoid the problem that the plate member **120** may be detached from the rotating shaft assembly **110**. There is a gap between the blocking member **130** and the plate member **120** to ensure that the plate member **120** can rotate relative to the second base body **112**.

Next, please refer to FIG. **16** to FIG. **19**. FIG. **16** is a schematic three-dimensional diagram illustrating that the

plate member **120** is located in an open position according to another embodiment of the present disclosure. FIG. **17** is an exploded diagram of a rotating assembly **100**C according to another embodiment of the present disclosure. FIG. **18** is a three-dimensional cross-sectional view of the rotating assembly **100**C according to another embodiment of the present disclosure. FIG. **19** is a schematic diagram illustrating that the plate member **120** is located in a closed position according to another embodiment of the present disclosure.

Similar to the previous embodiment, the rotating assembly **100**C has the blade assembly **102**, the rotating shaft assembly **110** and a plate member **120**. In this embodiment, at least one first opening **103**H and at least one protrusion **1031** are formed on the bottom plate **1030** of the first base body **103** of the blade assembly **102**, and the protrusion **1031** is formed from an outer surface **103**ES of the bottom plate **1030**.

As shown in FIG. **18**, the rotating shaft assembly **110** is fixedly disposed on an inner surface **103**IS of the bottom plate **1030**, the rotating shaft assembly **110** has at least one second opening **112**H, and the at least one second opening **112**H corresponds to the first opening **103**H. Furthermore, the plate member **120** is movably disposed on the outer surface **103**ES, and the plate member **120** has at least one opening groove **1203**. The opening groove **1203** is sleeved on the corresponding protrusion **1031**, and the size of the opening groove **1203** is larger than the size of the protrusion **1031**.

As shown in FIG. **16**, when the rotating shaft assembly **110** drives the blade assembly **102** to rotate in the first rotational direction RD**1**, the protrusion **1031** is in contact with one side of the opening groove **1203** (the left side in FIG. **16**), so as to drive the plate member **120** to rotate relative to the bottom plate **1030**, so that the third opening **120**H is aligned with the second opening **112**H and the first opening **103**H to expose the first opening **103**H. At this time, the third opening **120**H completely overlaps the corresponding first opening **103**H and second opening **112**H.

In addition, as shown in FIG. **19**, when the rotating shaft assembly **110** rotates in the second rotational direction RD**2**, the first protrusion **1123** is in contact with the other side of the opening groove **1203** (the right side in FIG. **19**) to drive the plate member **120** to rotate in the second rotational direction RD**2** relative to the bottom plate **1030**, so that the plate member **120** shields the first opening **103**H.

Similarly, the rotating assembly **100**C also includes a blocking member **130**, which is fixedly disposed on the shaft **114** of the rotating shaft assembly **110**, and as shown in FIG. **18**, when viewed in a direction perpendicular to the shaft **114** (the Y-axis), the plate member **120** is disposed between the blocking member **130** and the bottom plate **1030**, and there is a gap between the blocking member **130** and the plate member **120** to ensure that the plate member **120** can rotate relative to the bottom plate **1030**.

In conclusion, the present disclosure provides a fan module **10** which includes a blade assembly **102**, a rotating shaft assembly **110** and a plate member **120**. In some embodiments, the rotating shaft assembly **110** is affixed to the blade assembly **102**, at least one first opening **103**H is formed on the first base body **103** of the blade assembly **102**, and at least one second opening **112**H is formed on the second base body **112** of the rotating shaft assembly **110** for aligning with the first opening **103**H. At least one third opening **120**H is formed on the plate member **120** for corresponding to the first opening **103**H and the second opening **112**H.

When the fan module **10** is operating normally, the rotating shaft assembly **110** drives the blade assembly **102** to rotate, and the plate member **120** rotates with the blade assembly **102** so that the third opening **120**H is aligned with the first opening **103**H and the second opening **112**H, and therefore the fan module **10** can effectively dissipate heat during operation.

Before the operation of the fan module **10** is stopped, the rotating shaft assembly **110** can be rotated in the opposite direction or the rotation speed can be reduced, so that the plate member **120** rotates relative to the blade assembly **102** or the rotating shaft assembly **110**, thereby shielding the first opening **103**H and the second opening **112**H. Therefore, after the fan module **10** stops operating, it can effectively isolate external dust or moisture from entering its interior, thereby increasing the service life of the fan module **10**.

Although the embodiments and their advantages have been described in detail, it should be understood that various changes, substitutions, and alterations can be made herein without departing from the spirit and scope of the embodiments as defined by the appended claims. Moreover, the scope of the present application is not intended to be limited to the particular embodiments of the process, machine, manufacture, composition of matter, means, methods, and steps described in the specification. As one of ordinary skill in the art will readily appreciate from the disclosure, processes, machines, manufacture, compositions of matter, means, methods, or steps, presently existing or later to be developed, that perform substantially the same function or achieve substantially the same result as the corresponding embodiments described herein can be utilized according to the disclosure. Accordingly, the appended claims are intended to include within their scope such processes, machines, manufacture, compositions of matter, means, methods, or steps. In addition, each claim constitutes a separate embodiment, and the combination of various claims and embodiments are within the scope of the disclosure.

What is claimed is:

1. A fan module, comprising:

a blade assembly, having a plurality of fan blades and a bottom plate, wherein the bottom plate is connected to the fan blades, and at least one first opening and at least one protrusion are formed on the bottom plate;

a rotating shaft assembly, affixed to the bottom plate, wherein the rotating shaft assembly has at least one first slot and at least one second opening, the first slot corresponds to the at least one protrusion, and the at least one second opening corresponds to the at least one first opening; and

a plate member, movably disposed between the bottom plate and the rotating shaft assembly, and the plate member having at least one second slot,

wherein the at least one second slot is sleeved on the at least one protrusion, and a size of the at least one second slot is greater than a size of the at least one protrusion;

wherein when the rotating shaft assembly drives the blade assembly to rotate, the plate member rotates relative to the bottom plate, thereby selectively shielding the first opening or exposing the first opening.

2. The fan module as claimed in claim **1**, wherein the plate member further has at least one third opening, and when the plate member rotates relative to the bottom plate to expose the at least one first opening, the at least one third opening overlaps the at least one first opening and the at least one second opening.

3. The fan module as claimed in claim **2**, wherein the at least one protrusion has a platform structure and a protruding structure, the platform structure extends from the bottom

plate along a rotating axis of the rotating shaft assembly, and the protruding structure extends and protrudes from the platform structure along the rotating axis.

4. The fan module as claimed in claim **3**, wherein the plate member further has a disc structure and a lateral protruding structure, the lateral protruding structure extends radially from the disc structure, the at least one third opening is formed on the disc structure, and the at least one second slot is formed on the lateral protruding structure.

5. The fan module as claimed in claim **4**, wherein a thickness of the plate member is less than a height of the platform structure along the rotating axis.

6. The fan module as claimed in claim **4**, wherein the at least one second slot is sleeved on the platform structure, and a shape of the platform structure corresponds to a shape of the at least one second slot, so that the platform structure guides the lateral protruding structure to move relative to the bottom plate.

7. The fan module as claimed in claim **4**, wherein the platform structure is configured to support the rotating shaft assembly, a size of the at least one first slot matches a size of the protruding structure, and the size of the at least one first slot is smaller than a size of the platform structure.

8. The fan module as claimed in claim **7**, wherein the blade assembly is made of a plastic material, and the protruding structure is processed through a hot melt process or a hot riveting process, so that the rotating shaft assembly is affixed to the blade assembly through the protruding structure which is processed by the hot melt process or the hot riveting process.

9. The fan module as claimed in claim **2**, wherein when the rotating shaft assembly rotates in a first rotational direction, the plate member rotates in the first rotational direction relative to the bottom plate, so that the at least one third opening overlaps the at least one first opening to expose the at least one first opening.

10. The fan module as claimed in claim **9**, wherein when a rotating speed of the rotating shaft assembly in the first rotational direction decreases, a rotating speed of the plate member in the first rotational direction is greater than a rotating speed of the blade assembly and the rotating shaft assembly, so that the plate member shields the at least one first opening.

11. The fan module as claimed in claim **9**, wherein when the rotating shaft assembly rotates in a second rotational direction, the plate member rotates in the second rotational direction relative to the bottom plate, so that the plate member shields the at least one first opening, wherein the second rotational direction is opposite to the first rotational direction.

12. A fan module, comprising:

a blade assembly, having a plurality of fan blades and a bottom plate, wherein the bottom plate is connected to the fan blades, and at least one first opening is formed on the bottom plate;

a rotating shaft assembly, affixed to the bottom plate, wherein the rotating shaft assembly has at least one first protrusion and at least one second opening, and the at least one second opening corresponds to the at least one first opening; and

a plate member, movably disposed on the rotating shaft assembly, and the plate member having at least one opening groove,

wherein the at least one opening groove is sleeved on the at least one first protrusion, and a size of the at least one opening groove is greater than a size of the at least one first protrusion;

wherein when the rotating shaft assembly drives the blade assembly to rotate, the plate member rotates relative to the bottom plate, thereby selectively shielding the first opening or exposing the first opening.

13. The fan module as claimed in claim **12**, wherein the fan module further includes a blocking member, which is fixedly disposed on a shaft of the rotating shaft assembly, and when viewed in a direction perpendicular to the shaft, the plate member is disposed between the blocking member and the bottom plate, wherein there is a gap between the blocking member and the plate member.

14. The fan module as claimed in claim **13**, wherein at least one second protrusion is formed on the bottom plate and passes through the rotating shaft assembly, the plate member has a disc structure, and the disc structure does not contact the at least one second protrusion, wherein the plate member further has at least a third opening corresponding to the at least one second opening, and when viewed along a rotating axis of the shaft, the at least one third opening is located between the at least one second protrusion and the at least one first protrusion.

15. A fan module, comprising:

a blade assembly, having a plurality of fan blades and a bottom plate, wherein the bottom plate is connected to the fan blades, and at least one first opening and at least one protrusion are formed on the bottom plate;

a rotating shaft assembly, fixedly disposed on the bottom plate, and the rotating shaft assembly having at least one first slot and at least one second opening, wherein the first slot corresponds to the at least one protrusion, and the at least one second opening corresponds to the at least one first opening; and

a plate member, movably disposed on the rotating shaft assembly, and the plate member having at least one second slot, wherein the at least one second slot is sleeved on the at least one protrusion, and a size of the at least one second slot is greater than a size of the at least one protrusion,

wherein when the rotating shaft assembly drives the blade assembly to rotate, the plate member rotates relative to the rotating shaft assembly, thereby selectively shielding the first opening or exposing the first opening.

16. The fan module as claimed in claim **15**, wherein the fan module further includes a blocking member which is fixedly disposed on a shaft of the rotating shaft assembly, and when viewed in a direction perpendicular to the shaft, the plate member is disposed between the blocking member and the bottom plate, wherein there is a gap between the blocking member and the plate member.

17. The fan module as claimed in claim **15**, wherein the plate member further has at least one third opening corresponding to the at least one first opening and the at least one second opening, and when the plate member rotates relative to the bottom plate to expose the at least one first opening, the at least one third opening overlaps the at least one first opening and the at least one second opening.

18. A fan module, comprising:

a blade assembly, having a plurality of fan blades and a bottom plate, wherein the bottom plate is connected to the fan blades, at least one first opening and at least one protrusion are formed on the bottom plate, and the at least one protrusion is formed from an outer surface of the bottom plate;

a rotating shaft assembly, fixedly disposed on an inner surface of the bottom plate, and the rotating shaft assembly having at least one second opening, wherein

the at least one second opening corresponds to the at least one first opening; and

a plate member, movably disposed on the outer surface, and the plate member having at least one opening groove,

wherein the at least one opening groove is sleeved on the at least one protrusion, and a size of the at least one opening groove is greater than a size of the at least one protrusion;

wherein when the rotating shaft assembly drives the blade assembly to rotate, the plate member rotates relative to the bottom plate, thereby selectively shielding the first opening or exposing the first opening.

19. The fan module as claimed in claim **18**, wherein the fan module further includes a blocking member which is fixedly disposed on a shaft of the rotating shaft assembly, and when viewed in a direction perpendicular to the shaft, the plate member is disposed between the blocking member and the bottom plate, wherein there is a gap between the blocking member and the plate member.

20. The fan module as claimed in claim **18**, wherein the plate member further has at least one third opening corresponding to the at least one first opening, and when the plate member rotates relative to the bottom plate to expose the at least one first opening, the at least one third opening overlaps the at least one first opening and the at least one second opening.

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