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(54) Title: FAN COVER

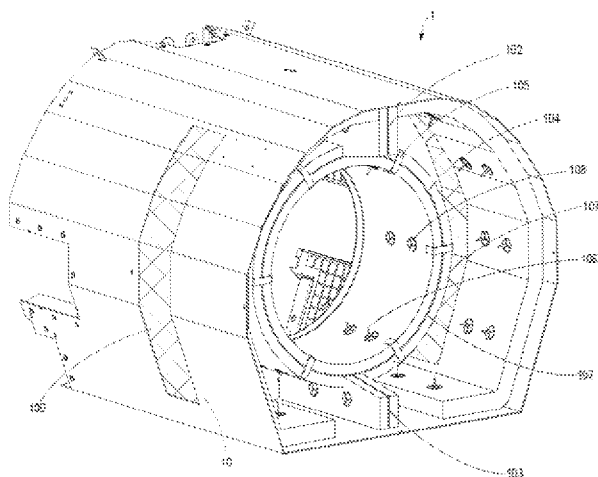


Figure 4

(57) Abstract: Embodiments of the present disclosure provide a fan cover (1) for use with a fan, comprising: a fan chamber (2), enclosing a space to accommodate the fan; an air chamber (3), configured to intake air to flow through the fan; and one or more air inlets (10) provided at a sidewall of the air chamber (3) of the fan cover (1) which are used for the flow of the air. Embodiments of the present disclosure also provide a motor comprising a fan for cooling the motor and the fan cover (1).



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GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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FAN COVER

FIELD

[0001] Embodiments of the present disclosure generally relate to a fan cover for reducing
5 the noise and temperature rise of the motor.

BACKGROUND

[0002] Fans are commonly used to enhance cooling of electrical machines, allowing for
increased power density. For example, a motor or a generator may include a fan for
10 cooling the motor or the generator. In general, a fan is installed within a fan cover. For
example, a large fan is needed to cool a motor whose temperature may rise during the
operation. For decreasing the temperature by a fan, the resulted noise will definitely
increase. In the conventional fan cover, the cooling air enters from a non-drive end of the
fan cover and blows to the motor after many bends, resulting in high air resistance and low
15 cooling efficiency and leading to high noise and high temperature rise.

[0003] Hence, there is a need to propose a fan cover that overcomes the above
disadvantages in the art.

SUMMARY

[0004] In order to overcome the disadvantages in the prior art, in a first aspect of the
20 present disclosure, a fan cover for use with a fan is provided. The fan cover comprises: a
fan chamber, enclosing a space to accommodate the fan; an air chamber, configured to
intake air to flow through the fan; and one or more air inlets provided at a sidewall of the
air chamber of the fan cover which are used for the flow of the air. By the arrangement of
25 the air inlets, the cooling air enters and blows to the motor after less bends, resulting in low
noise and high cooling efficiency.

[0005] In some embodiments, the fan cover further comprises a middle partition plate
provided between the fan chamber and the air chamber. With these features, the interior
of the fan cover can be divided into two function parts.

30 [0006] In some embodiments, the fan cover further comprises an air guide ring configured

to extend axially from the middle partition plate. With these features, the flow of the air can be better guided.

[0007] In some embodiments, the fan cover further comprises sound isolation foams provided on an interior of the fan cover. By the arrangement of the sound isolation foams, the sound can be absorbed which leads to a low noise.

[0008] In some embodiments, the fan cover further comprises one or more stop blocks provided at the air guide ring and configured to fix the sound isolation foams. With these features, the sound isolation foams can be well fixed.

[0009] In some embodiments, the fan cover further comprises an end plate detachably mounted at an end of the air chamber. By the arrangement of the end plate, it is easy to conduct the maintenance and replacement of the interior components. Meanwhile, when there is a need of more air passages for drawing more cooling air, the end plate can form an additional air passage.

[0010] In some embodiments, one end of the air guide ring is fixed to the middle partition plate and the other end of the air guide ring is open and at a distance from the end plate, and wherein the air guide ring is hollow. With these features, the flow of the air can be better guided.

[0011] In some embodiments, an inner wall of the fan chamber, the middle partition plate, an inner wall of the air chamber, an inner wall of the air guide ring, an outer wall of the air guide ring, the partitions and the end plate are provided with a plurality of stop pins and snap rings for fixing the sound isolation foams. With these features, the sound isolation foams can be well fixed.

[0012] In some embodiments, one or more stop pins and snap rings provided at an interior of the fan cover and configured to fix the sound isolation foams to the interior of the fan cover. With these features, the sound isolation foams can be well fixed.

[0013] In some embodiments, one or more partitions at the air chamber of the fan cover which extends from the middle partition plate to an end of the fan cover in an axial direction and is connected with the air guide ring, wherein the partitions are configured to divide the air chamber of the fan cover into a plurality of spaces. With these features, there is no annular turbulence produced in the air chamber of the fan cover, the noise is reduced and the cooling efficiency is improved.

[0014] In some embodiments, the one or more partitions include an upper partition and a lower partition. With these features, there is no annular turbulence produced in the air chamber of the fan cover, the noise is reduced and the cooling efficiency is improved.

[0015] In some embodiments, the fan cover further comprises a mesh provided at each of the one or more air inlets, wherein the mesh is made of metal and configured as a filter screen. With these features, the sound isolation foams are prevented from falling and obstructing the fan.

[0016] In some embodiments, the fan cover further comprises another mesh at the inner wall of the fan chamber of the fan cover. With these features, the sound isolation foams are prevented from falling and obstructing the fan.

[0017] In some embodiments, a total area of all the air inlets is less than an area of a hollow section of the air guide ring. With these features, the flow of the air can be better guided.

[0018] In some embodiments, the fan cover comprises two air inlets at two sides of the sidewall of the fan cover. With these features, the flow of the air can be better guided. And by the arrangement of the air inlets, the cooling air enters and blows to the motor after less bends, resulting in low noise and high cooling efficiency.

[0019] In a second aspect of the present disclosure, a motor is provided. The motor comprises a fan for cooling the motor and the fan cover. By the arrangement of the air inlets, the cooling air enters and blows to the motor after less bends, resulting in low noise and high cooling efficiency.

[0020] It is to be understood that the Summary is not intended to identify key or essential features of embodiments of the present disclosure, nor is it intended to be used to limit the scope of the present disclosure. Other features of the present disclosure will become easily comprehensible through the description below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The above and other objectives, features and advantages of the present disclosure will become more apparent through more detailed depiction of example embodiments of the present disclosure in conjunction with the accompanying drawings, wherein in the example embodiments of the present disclosure, same reference numerals usually represent

the same components.

[0022] Figure 1 is a perspective view of a fan cover according to embodiments of the present disclosure;

5 [0023] Figure 2 is a perspective view of a fan cover according to embodiments of the present disclosure;

[0024] Figure 3 is a sectional view of a fan cover according to embodiments of the present disclosure;

[0025] Figure 4 is a perspective view of a fan cover according to embodiments of the present disclosure;

10 [0026] Figure 5 is a sectional view of a fan cover according to embodiments of the present disclosure;

[0027] Figure 6 is a sectional view of a fan cover according to embodiments of the present disclosure;

15 [0028] Figure 7 is a sectional view of a fan cover according to embodiments of the present disclosure.

[0029] Throughout the drawings, the same or similar reference symbols are used to indicate the same or similar elements.

DETAILED DESCRIPTION

20 [0030] The present disclosure will now be discussed with reference to several example embodiments. It is to be understood these embodiments are discussed only for the purpose of enabling those skilled persons in the art to better understand and thus implement the present disclosure, rather than suggesting any limitations on the scope of the subject matter.

25 [0031] As used herein, the term “comprises” and its variants are to be read as open terms that mean “comprises, but is not limited to.” The term “based on” is to be read as “based at least in part on.” The term “one embodiment” and “an embodiment” are to be read as “at least one embodiment.” The term “another embodiment” is to be read as “at least one other embodiment.” The terms “first,” “second,” and the like may refer to different or
30 same objects. Other definitions, explicit and implicit, may be comprised below. A

definition of a term is consistent throughout the description unless the context clearly indicates otherwise.

[0032] In the conventional fan cover, the cooling air enters from a non-drive end of the fan cover and blows to the motor after many bends, resulting in high air resistance and low cooling efficiency and leading to high noise and high temperature rise. Embodiments of the present disclosure therefore provide a fan cover that overcomes the above disadvantages in the art.

[0033] A motor or a generator may generally include a fan for cooling the motor or the generator and the fan may be housed within a fan cover. Figure 1 is a perspective view of a fan cover 1 according to embodiments of the present disclosure. The fan cover 1 is used for housing a fan (not shown in Figure 1). The fan cover 1 has a sidewall and an end portion. The fan cover 1 includes air inlets 10 at the sidewall (only one air inlet is shown in Figure 1) and an end plate 11 at the end portion. In some embodiments, the fan cover 1 may have one or more air inlets 10. In some embodiments as shown in Figure 1, the fan cover 1 has two air inlets 10 at two sides of the fan cover. The air inlet 10 is used for inflow of cooling air to cool one or more components to be cooled. A mesh 100 is provided at the air inlet 10. In some embodiments, the mesh 100 is made of metal and used as a filter screen, in which air can flow through the mesh 100 but other objects can be blocked by the mesh 100.

[0034] According to embodiments of the present disclosure, one or more air inlets 10 allow air for cooling to enter the interior of the fan cover to cool the components that are to be cooled. The one or more air inlets 10 are provided at the sides of the fan cover, which decreases the noise and improves the cooling efficiency, as discussed in details below.

[0035] In some embodiments, the end plate 11 is detachably mounted at an end of the fan cover 1. In Figure 1, the end plate 11 has circular shape and is mounted at the end of the fan cover 1. The diameter of the circular of the end plate is less than the diameter of an end face of the fan cover. When the end plate is mounted at the end of the fan cover 1, it hermetically closes the end face of the fan cover 1. In other embodiments, the end plate 11 has other shapes, for example, oval.

[0036] Figure 2 is a perspective view of a fan cover according to embodiments of the present disclosure. In Figure 2, the end plate 11 is removed from the end of the fan cover 1 to show the interior of the fan cover 1. On one hand, when the end plate 11 is removed

from the end of the fan cover 1, it allows access to the interior of the fan cover 1 for maintenance and replacement of the interior components. On the other hand, when there is a need of more air passages for drawing more cooling air, the end plate can be removed to form an additional air passage.

5 [0037] Figure 3 is a sectional view of a fan cover 1 according to embodiments of the present disclosure. In Figure 3, the fan cover 1 has a middle partition plate 101, and the middle partition plate 101 divides the fan cover into two parts: one part is a fan chamber 2 for housing a fan (not shown in Figure 3) as shown in the left of Figure 3; the other part is an air chamber 3 for flow of air as shown in the right of Figure 3. An end of the fan cover
10 is closed by the end plate 11.

[0038] Figure 4 is a perspective view of a fan cover according to embodiments of the present disclosure. Referring to Figure 3 and Figure 4, the fan cover 1 has an air guide ring 104 extending axially from the middle partition plate 101. In some embodiments, one end of the air guide ring 104 is fixed to the middle partition plate 101. For example, one
15 end of the air guide ring 104 is welded to the middle partition plate 101. In some embodiments, the other end of the air guide ring 104 is open and at a distance from the end plate 11 for directing air. The air guide ring 104 is hollow for flow of air. In some embodiments, the air guide ring 104 is has a cylinder shape.

[0039] For decreasing the noise, a sound isolation foam 107 is adhered on the inner wall
20 of the air guide ring 104 and a sound isolation foam 107 is adhered on the outer wall of the air guide ring 104. In some embodiments, one or two ends of the air guide ring 104 are provided with stop blocks 105. For example, one or more stop blocks 105 are welded to one or two ends of the air guide ring 104. In Figure 4, there are six stop blocks 105 welded at a rim of the air guide ring 104. In other embodiments, other number of stop
25 blocks 105 can be used. The stop blocks 105 are used to fix the sound isolation foams. The air guide ring 104 is also provided with a plurality of stop pins 106 on the inner wall and outer wall of the air guide ring 104. Each stop pin 106 is used together with a snap ring 108 for fixing the sound isolation foams 107. In particular, each stop pin 106 pierces a piece of the sound isolation foam 107 and is snap-fitted and interlocked with a snap ring
30 108, so that the sound isolation foam 107 is clamped and fixed in position.

[0040] As shown in Figure 4, an upper partition 102 is provided at the air chamber 3 of the fan cover 1 and a lower partition 103 is provided at the air chamber 3 of the fan cover 1.

In some embodiments, the upper partition 102 extends from the middle partition plate 101 to the end of the fan cover in an axial direction A. In some embodiments, the upper partition 102 has the same axial length as that of the air chamber 3 of the fan cover 1. The upper partition 102 extends from the inner wall of the air chamber 3 of the fan cover 1 and is connected with the air guide ring 104. In some embodiments, the upper partition 102 has a trapezoidal sectional shape. In other embodiments, the upper partition 102 may have a rectangular sectional shape or other sectional shapes.

[0041] As shown in Figure 4, the lower partition 103 extends from the middle partition plate 101 to the end of the fan cover in an axial direction A. In some embodiments, the lower partition 103 has the same axial length as that of air chamber 3 of the fan cover 1. The lower partition 103 extends from the inner wall of the air chamber 3 of the fan cover 1 and is connected with the air guide ring 104. In some embodiments, the lower partition 103 has a trapezoidal sectional shape. In other embodiments, the lower partition 103 may have a rectangular sectional shape or other sectional shapes.

[0042] Figure 5 is a sectional view of a fan cover according to embodiments of the present disclosure. As shown in Figure 5, the upper partition 102 and the lower partition 103 divide the air chamber 3 of the fan cover 1 into two spaces: a left space and a right space as shown in Figure 5. In this way, an annular turbulence can be prevented by the upper partition 102 and the lower partition 103. In the embodiments as shown in Figure 5, there are two partitions: the upper partition 102 and the lower partition 103. In other embodiments, there are other number of the partitions and other number of the spaces. For example, if there are three, four, five, six ... partitions, there are three, four, five, six ... spaces. Since there is no annular turbulence produced in the air chamber of the fan cover, the noise is reduced and the cooling efficiency is improved.

[0043] Figure 6 is a sectional view of a fan cover according to embodiments of the present disclosure. As shown in Figure 6, the inner wall of the fan chamber 2 of the fan cover 1 is provided with several stop pins. In addition, a mesh 200 is provided at the inner wall of the fan chamber 2 of the fan cover 1 for preventing the sound isolation foam from falling and obstructing the fan. The mesh 200 may be made of metal. In some embodiments, each stop pin 106 pierces a piece of the sound isolation foam. The mesh 200 is provided outside of the sound isolation foam. And the stop pin 106 is snap-fitted and interlocked with a snap ring 108, so that the sound isolation foam is clamped and fixed in position.

[0044] Figure 7 is a sectional view of a fan cover 1 according to embodiments of the present disclosure. The fan cover 1 has one or more air inlets 10. The air inlet 10 is located near the middle partition plate 101 in the axial direction A. In some embodiments, the air inlet 10 is located at a position within 70% of a distance from the middle partition plate 101 between the middle partition plate 101 and the end plate 11 in the axial direction A. Preferably, the air inlet 10 is located at a position of 5% to 60% of a distance from the middle partition plate 101 between the middle partition plate 101 and the end plate 11 in the axial direction A. More preferably, the air inlet 10 is located at a position of 10% to 40% of a distance from the middle partition plate 101 between the middle partition plate 101 and the end plate 11 in the axial direction A. Most preferably, the air inlet 10 is located at a position of 15% to 30% of a distance from the middle partition plate 101 between the middle partition plate 101 and the end plate 11 in the axial direction A. In some embodiments, the location of the air inlet can be calculated by the middle line of the air inlet 10 along the radial direction R.

[0045] In some embodiments, the air inlet 10 has a rectangle shape on a projection view. In some embodiments, the length of the air inlet along the axial direction A is less than the width of the air inlet along the radial direction R. In some embodiments, the ratio of the length of the air inlet along the axial direction A and the width of the air inlet along the radial direction R is about 1:2 to 1:10. More preferably, the ratio of the length of the air inlet along the axial direction A and the width of the air inlet along the radial direction R is about 1:3 to 1:8. Most preferably, the ratio of the length of the air inlet along the axial direction A and the width of the air inlet along the radial direction R is about 1:4 to 1:6.

[0046] In other embodiments, other shapes of the air inlet are possible. The area of the air inlet is calculated by multiplying the length of the air inlet by the width of the air inlet. In some embodiments, there are one or more air inlets, preferably two air inlets. The total area of all the air inlets is less than the area of hollow section of the air guide ring. In some embodiments, two air inlets are located at the same position on two sides and opposite to each other. In other embodiments, two air inlets are located at different positions on two sides and not opposite to each other. In other embodiments, there can be other number of air inlets.

[0047] By the arrangement of the air inlets, the cooling air enters and blows to the motor after less bends, resulting in low noise and high cooling efficiency.

[0048] As shown in Figure 3 to Figure 7, the inner wall of the fan chamber, the middle partition plate, the inner wall of the air chamber, the inner wall of the air guide ring, the outer wall of the air guide ring, the partitions and the end plate are provided with a plurality of stop pins and snap rings. The stop pins and snap rings are used to fix the sound isolation foams. The sound isolation foams are used to absorb the sound and low the noise.

[0049] It should be appreciated that the above detailed embodiments of the present disclosure are only for exemplifying or explaining principles of the present disclosure and do not limit the present disclosure. Therefore, any modifications, equivalent alternatives and improvements, etc. without departing from the spirit and scope of the present disclosure shall be comprised in the scope of protection of the present disclosure. Meanwhile, appended claims of the present disclosure aim to cover all the variations and modifications falling under the scope and boundary of the claims or equivalents of the scope and boundary.

WHAT IS CLAIMED IS:

1. A fan cover (1) for use with a fan, comprising:
5 a fan chamber (2), enclosing a space to accommodate the fan;
an air chamber (3), configured to intake air to flow through the fan; and
one or more air inlets (10) provided at a sidewall of the air chamber (3) of the fan
cover (1) which are used for the flow of the air.
- 10 2. The fan cover (1) of claim 1, further comprising:
a middle partition plate (101) provided between the fan chamber (2) and the air
chamber (3).
- 15 3. The fan cover (1) of claim 2, further comprising:
an air guide ring (104) configured to extend axially from the middle partition plate
(101).
4. The fan cover (1) of claim 1, further comprising:
20 sound isolation foams (107) provided on an interior of the fan cover (1).
5. The fan cover (1) of claim 4, further comprising:
one or more stop blocks (105) provided at the air guide ring (104) and configured to
fix the sound isolation foams (107).
- 25 6. The fan cover (1) of claim 4, further comprising:
an end plate (11) detachably mounted at an end of the air chamber (3).
7. The fan cover (1) of claim 6, wherein one end of the air guide ring (104) is fixed
to the middle partition plate (101) and the other end of the air guide ring (104) is open and
30 at a distance from the end plate (11), and wherein the air guide ring (104) is hollow.
8. The fan cover (1) of claim 6, wherein an inner wall of the fan chamber (2), the
middle partition plate (101), an inner wall of the air chamber (3), an inner wall of the air

guide ring (104), an outer wall of the air guide ring (104), the partitions (102, 103) and the end plate (11) are provided with a plurality of stop pins and snap rings for fixing the sound isolation foams (107).

5 9. The fan cover (1) of claim 1, further comprising:
 one or more stop pins (106) and snap rings (108) provided at an interior of the fan cover (1) and configured to fix the sound isolation foams (107) to the interior of the fan cover (1).

10 10. The fan cover (1) of claim 1, further comprising:
 one or more partitions (102, 103) at the air chamber (3) of the fan cover (1) which extends from the middle partition plate (101) to an end of the fan cover (1) in an axial direction and is connected with the air guide ring (104), wherein the partitions (102, 103) are configured to divide the air chamber (3) of the fan cover (1) into a plurality of spaces.

15 11. The fan cover (1) of claim 10, wherein the one or more partitions (102, 103) include an upper partition (102) and a lower partition (103).

 12. The fan cover (1) of claim 1, further comprising:
20 a mesh (100) provided at each of the one or more air inlets (10), wherein the mesh (100) is made of metal and configured as a filter screen.

 13. The fan cover (1) of claim 1, further comprising:
 another mesh (200) at the inner wall of the fan chamber (2) of the fan cover (1).

25 14. The fan cover (1) of claim 1, wherein a total area of all the air inlets (10) is less than an area of a hollow section of the air guide ring (104).

 15. The fan cover (1) of any one of claims 1 to 14, wherein the fan cover (1)
30 comprises two air inlets (10) at two sides of the fan cover (1).

 16. A motor, comprising:
 a fan for cooling the motor; and
 the fan cover (1) of any one of claims 1 to 15.

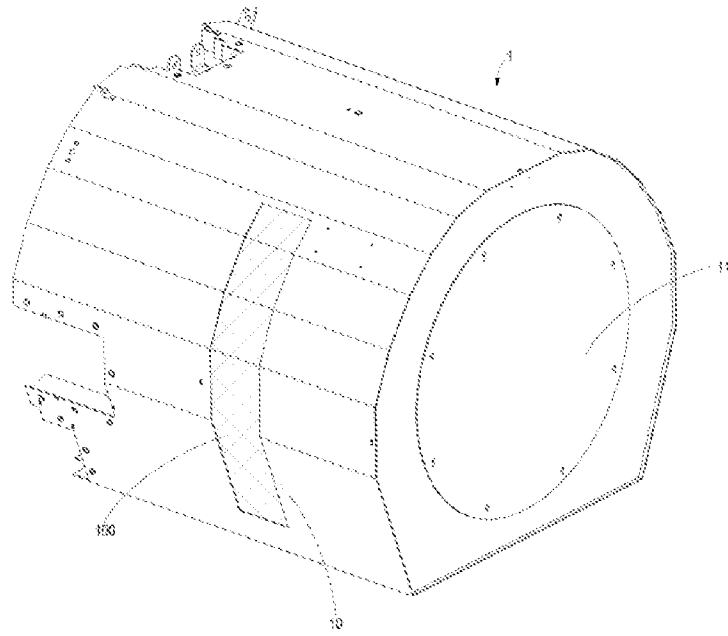


Figure 1

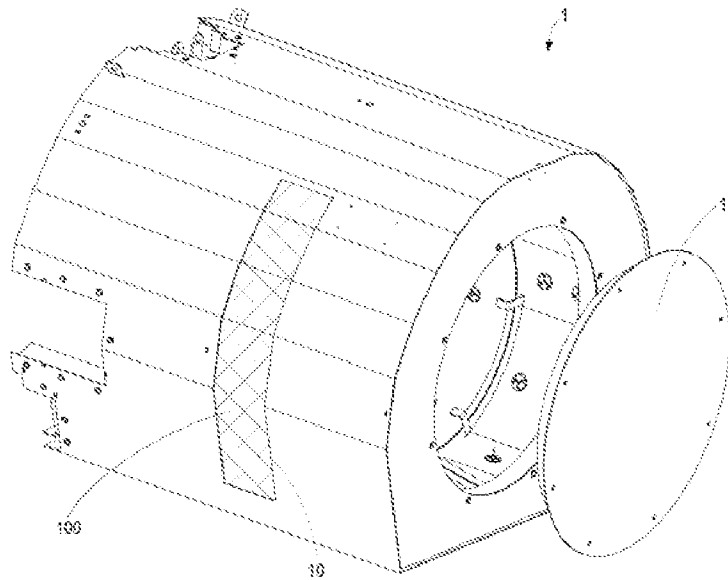


Figure 2

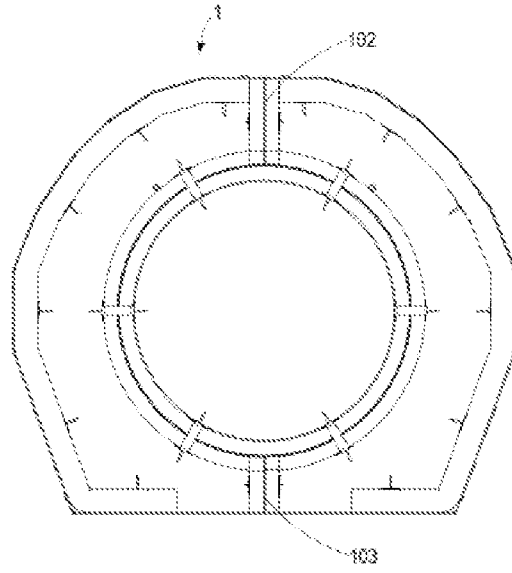


Figure 5

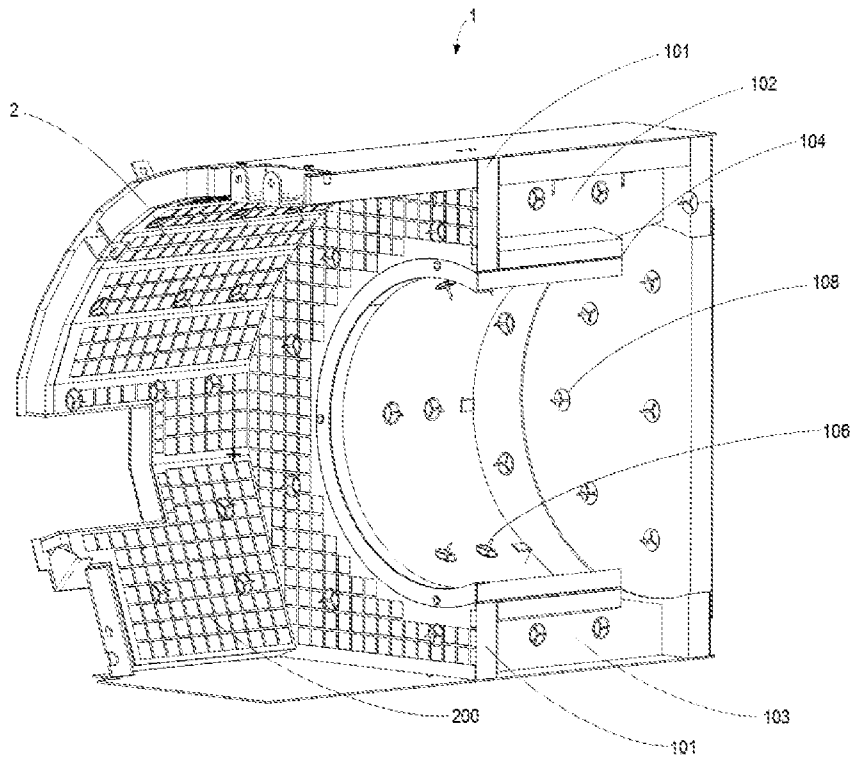


Figure 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2023/082074

A. CLASSIFICATION OF SUBJECT MATTER		
H02K9/06(2006.01)i; F04D25/08(2006.01)i; F01N1/00(2006.01)i		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) IPC:H02K9/+,F04D25/+,F01N1/+,F04D29/+		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNTXT, VEN, CJFD: low,noise,sound,fan,cover,cool+,temperature,annular,turbulence,absorb+,air, part+,plate,guid+,ring, foam,hollow		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2020096008 A1 (ABB SCHWEIZ AG.) 26 March 2020 (2020-03-26) description paragraphs 11 to 20 and figures 1-4	1-16
A	CN 103840607 A (GUANGXI SUNLIGHT TECHNOLOGY DEVELOPMENT CO., LTD.) 04 June 2014 (2014-06-04) the whole document	1-16
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A	CN 115313761 A (CRRC ZHUZHOU ELECTRIC CO., LTD.) 08 November 2022 (2022-11-08) the whole document	1-16
A	CN 210669788 U (ZHEJIANG PANGOOD POWER TECHNOLOGY CO., LTD.) 02 June 2020 (2020-06-02) the whole document	1-16
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "D" document cited by the applicant in the international application "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 06 September 2023		Date of mailing of the international search report 23 October 2023
Name and mailing address of the ISA/CN CHINA NATIONAL INTELLECTUAL PROPERTY ADMINISTRATION 6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088, China		Authorized officer LI, Li Telephone No. (+86) 010-53961160

INTERNATIONAL SEARCH REPORT

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT
Information on patent family members

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				EP	3470683	A1	17 April 2019
CN	115313761	A	08 November 2022	None			
CN	210669788	U	02 June 2020	None			
GB	2147948	A	22 May 1985	GB	8327325	D0	16 November 1983