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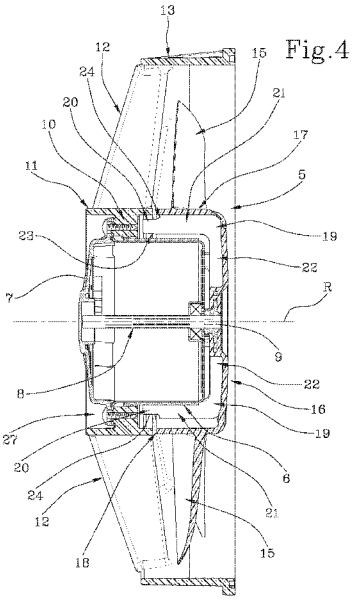
(54) Title: A FAN AND A VENTILATION GROUP COMPRISING THE FAN

Fig.4



(57) Abstract: An axial fan (5) has an axis (R) of rotation and comprises a hub comprising a bottom wall (16) and a lateral wall (17) extending from the bottom wall (16) and having a peripheral edge (18) on an opposite side with respect to the bottom wall (16) along the axis (R) of rotation; the fan comprises a plurality of blades (15) extending from the lateral wall (17) externally of the hub (14) and at least a fin (19) internally of the hub (14) and comprising an end portion (20) projecting axially beyond the bottom wall (15) and the lateral wall (17) forming a cup-shaped structure of the hub (14), the fan comprising an end portion (20) projecting axially beyond the peripheral edge (18) externally of the hub (14).

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DESCRIPTION

A FAN AND A VENTILATION GROUP COMPRISING THE FAN

Technical field

This invention relates to a fan and a ventilation unit comprising a fan and a corresponding shroud.

Background art

The ventilation groups referred to in this specification are those generally formed by a fan and a support shroud of the fan, for cooling radiators in automotive applications.

The fan is usually constituted by an electric motor, preferably of the closed type, for actuating a corresponding fan, of the axial type in the present case.

The electric motor has a casing, a cap for closing the casing and an outlet shaft which is solidly constrained to the fan by means of a cup-shaped hub which at least partly houses the motor itself and from which a plurality of blades project.

The shroud is provided for supporting the motor by means of a corresponding support ring and for at least partly housing the fan in such a way as to optimise heat removal from the radiator.

The shrouds, in particular, generally comprise an external tubular member, having a substantially cylindrical end wall, to which the support ring is connected by means of a plurality of arms or spokes which project from the cylindrical wall internally of the tubular element.

The support ring is coaxial with the cylindrical wall and the motor is mounted coaxially with the support ring.

The prior art solutions have some drawbacks.

The positioning and fixing of the fan in the shroud do not enable effective removal and evacuation of the heat generated by the electric motor in

operation, i.e. an adequate cooling of the cap and the casing is not enabled.

In general, the ring of the shroud for supporting the motor surrounds the motor itself and does not allow the circulation of an air flow suitable carrying of the heat generated in use.

The hub of the fan is in general very closed on the motor and also prevents a circulation of air which cools down the casing and the cap of the electric motor by convection.

Failure to cool the motor limits the operating temperature and therefore the performance.

If, on the other hand, particular levels of performance are required, the duration over time of the motor is limited, should it not be properly cooled.

In this context, the main aim of this invention is to obviate the above-mentioned drawbacks.

Disclosure of the invention

The aim of the present invention is to provide a fan which contributes to generating a flow of air for cooling the electric motor, in particular both the cap and the casing.

Another aim of the invention is to disclose a ventilation group which allows a better passage of air around the cap and the casing of the electric motor than the prior art solutions.

The stated technical purpose and aims of the invention are substantially achieved by a fan according to claim 1 and a ventilation group according to claim 10.

Brief description of drawings

Further characteristics and advantages of the invention will become more apparent from the non-limiting description that follows of a preferred but non-limiting embodiment of a ventilation group as illustrated in the accompanying drawings, in which:

- figure 1 is a ventilation group according to the invention, in a schematic perspective view;
- figure 2 is the ventilation group of figure 1 in a second schematic perspective view;
- figure 3 illustrates the ventilation group of the preceding figures in a schematic perspective partly exploded view, with some parts removed for greater clarity;
- figure 4 is the ventilation group of the present invention in a schematic section view with some parts removed for better clarity.

With particular reference to figures 1 and 2, reference numeral 1 denotes a ventilation group according to the present invention.

Detailed description of preferred embodiments of the invention

The ventilation group 1 is preferably destined for automotive applications in the sector of radiator cooling.

The ventilation group 1 comprises a fan 2 having an axis R of rotation and a support shroud 3 of the fan 2.

The fan 2 comprises an electric motor 4 and a fan 5 having axial flow, or simply an axial fan, actuated by the motor 2, rotatable about the axis R of rotation.

As illustrated in particular in figure 3, the motor 4, preferably of the closed and sealed type, substantially of known type and described only regarding the parts necessary for understanding the present invention, comprises an external casing 6, a cap 7 for closing the casing and a shaft 8, coaxial with the axis R, to which the fan 5 is connected.

In particular, the shaft 8 comprises an end portion 9 protruding from the casing 6 on the opposite side with respect to the cap 7 to which the fan 5 is connected, for example by interference fitting.

The shroud 3 comprises a ring 10 for supporting the motor 4, to which the motor 4 is fixed in the substantially known way, for example, by means of screws in suitable protrusions extending from the ring 10.

The motor 4 is inserted internally of the fixed ring 10 and is supported thereby.

The ring 10 has a external annular wall 11 from which project, on the side opposite the motor, a plurality of arms or spokes 12 of substantially known type.

The wall annular 11 advantageously projects axially up to the cap 7 on the opposite side to the fan 5.

The wall 11 preferably, has radial dimensions equal to the radial dimensions of the hub 14.

The shroud 3 comprises a tubular element 13 external of the ring 10 and to which the arms 12 are connected.

In general the ventilation group 1 is installed in a generic application, which is not illustrated, by means of the element tubular 13 which in turn, by means of the arms 12 and the ring 10, supports the fan 2.

Observing the fan 5 in more detail, it should be noted that it comprises a cup-shaped hub 14 and a plurality of blades 15 extending from the hub 14 and preferably made in a single body with the hub by moulding using a plastic material.

As illustrated in figure 4, the motor 4 is housed at least partly internally of the hub 14.

The hub 14 comprises an end wall 16 by means of which the fan 5 is connected to the shaft 8.

The hub 14 comprises a lateral wall 17 extending from the end wall 16 and having a peripheral edge 18, substantially circular in shape, on the side opposite the end wall 16 along the axis R of rotation.

The end wall 16 and the lateral wall 17 define a cup-shaped structure for the hub 14.

The blades 15 extend preferably from the lateral wall 17 of the hub 14 towards the outside thereof, externally of the cup-shaped structure.

With reference in particular to figures 3 and 4, it can be observed that the fan 5 comprises a plurality of fins 19, preferably made in a single body with

the hub 14, internal of the cup-shaped structure for generating, in use, a descending flow of tangential air internally of the hub 14 for removing heat from the motor 4.

In the illustrated preferred embodiment, the fins 19 are angularly equi-spaced internally of the hub 14 and are for example seven in number.

Each fin 19 comprises a portion 20 projecting beyond the peripheral edge 18 of the lateral wall 17, externally of the cup-shaped structure, i.e. outside the hub 14.

Preferably, the end portions 20 protrude externally of the hub 14 along an axial direction, substantially parallel with the axis R of rotation of the fan 2.

In the illustrated preferred embodiment, each appendage 19 has a first portion 21 extending from lateral wall 17 internally of the hub 14, preferably radially.

The first portion 21 has main extension direction that is parallel to the axis R of rotation of the fan 5 and preferably extends along the entire axial dimension of the hub 14 towards the inside of the hub 14.

The end portions 20 are preferably defined by an at least partial extension of the first portion 21 beyond the edge 18.

In the preferred embodiment illustrated, each fin 19 comprises a second portion 22 extending from the end wall 16 towards the inside of the hub 14.

Each second portion 22 is connected and extends into a corresponding first portion 21.

Each second portion 22 preferably has a main extension direction that is substantially radial and extends towards the inside of the hub 14.

With reference in particular to figure 4 it may be observed that the fins 19 are substantially L-shaped, with the second radial portion 22 and the first axial portion 21 located inside the hub 14 and the end portion 20 exiting therefrom.

Each end portion 20 has an internal edge 23 facing internally of the hub 14, i.e., towards the electric motor 4, and an external edge 24 facing externally of the hub 14, i.e. towards the blades 15.

In the illustrated preferred embodiment, the external edge 24 is at a radial distance from the axis R of rotation that is less than a radial distance of the lateral wall 17 from the axis R of rotation.

In practice, each portion 20 is slimmed in a radial direction relative to the corresponding first portion 21 of the respective fin 19.

To facilitate outflow of the air moved by the fins 19 in use, the hub 14 has a plurality of through-holes 25 at a connecting zone 26 of the end wall 16 and the lateral wall 17.

The connecting zone 26 preferably has a curved extension and the holes 25 preferably have rounded edges.

The heat removed from the casing and the cap, in a flow having a prevalently axial component, advantageously flows out from the hub 14 through the holes 25.

With reference in particular to figure 4, it can be observed that the annular wall 11 delimits, with the external surface of the electric motor 4, an annular channel 27.

The end portions 20 of the fins 19 are preferably at least partly inserted internally of the channel 27.

More precisely, the portions 20 are slimmed as described in the foregoing so as to be inserted internally of the channel 27.

The lateral wall 11 of the ring 10 preferably has a radial dimension substantially corresponding to the radial dimension of the hub 14 and in particular of the lateral wall 17 thereof. More precisely, a substantially cylindrical internal surface of the wall 11 has the same internal diameter as the lateral wall 17 of the hub 14.

In this way, a descending flow of tangential air is guided about the casing 6 and the cap 7 of the motor so as to carry heat away from both.

In particular, a component of the tangential flow for cooling the cap is

determined by the portions 20 of the fins which extend outside the hub internally of the annular channel 27.

CLAIMS

1. An axial fan having an axis (R) of rotation and comprising

a hub (14) comprising a bottom wall (16) and a lateral wall (17) extending from the bottom wall (16) and having a peripheral edge (18) on an opposite side with respect to the bottom wall (16) along the axis (R) of rotation, the bottom wall (16) and the lateral wall (17) forming a cup-shaped structure of the hub (14), the fan comprising

a plurality of blades (15) extending from the lateral wall (17) externally of the cup-shaped structure;

at least a fin (19) internal of the cup-shaped structure for generating, in use, a tangential flow of air internally of the hub (14), the fan being characterised in that the fin (19) comprises an end portion (20) projecting beyond the peripheral edge (18) externally of the hub (14).

2. The fan according to claim 1 wherein the fin (19) has a first portion (21) extending from the lateral wall (17) towards the inside of the hub (14), the end portion (20) being defined by an at least partial extension of the first portion (21).

3. The fan according to claim 2 wherein the first portion (21) is parallel to the axis (R) of rotation.

4. The fan according to any one of claims from 1 to 3 wherein the fin (19) comprises a second portion (22) extending from the bottom wall (16) towards the inside of the hub (14).

5. The fan according to claim 4 wherein the second portion (22) extends radially from the axis (R) of rotation.

6. The fan according to any one of the preceding claims, wherein the end portion (20) extends mainly parallel to the axis (R) of rotation.

7. The fan according to any one of the preceding claims, wherein the hub (14) has a plurality of through-holes (25) at a zone (26) connecting the bottom wall (16) and the lateral wall (17).

8. The fan according to any of the preceding claims, wherein the end portion (20) has an internal edge (23) facing internally of the hub (14) and

an external edge (24), facing externally of the hub (14), the external edge (24) being positioned at a radial distance from the from the axis (R) of rotation that is less than a radial distance of the lateral wall (17) from the axis (R) of rotation.

9. The fan according to any one of the preceding claims, wherein the hub (14), the blades (15) and the fin (19) are made in a single part by moulding.

10. A ventilation group comprising

a fan (2) and a support shroud (3) of the fan (2),

the fan (2) comprising an electric motor (4) and a fan (5) actuated by the electric motor

the electric motor (4) comprising a casing (6), a cap (7) for closing the casing (6) and a shaft (8) to which the fan (5) is connected,

the shroud (3) comprising a support ring (10) of the electric motor (4) having an external annular wall (11), the ventilation group being characterised in that the fan (5) is of the type according to any one of claims from 1 to 9 and the electric motor (4) is at least partly housed internally of the hub (14).

11. The ventilation group according to claim 10 wherein the external annular wall (11) delimits, with the electric motor (4), an annular channel (27), the end portion (20) of the fin (19) being at least partly inserted in the annular channel (27).

12. A ventilation group according to claim 10 or 11, wherein the shaft (8) comprises an end portion (9), protruding from the casing (6) on the opposite side from the cap (7), to which the hub (14) of the fan (5) is connected, the external annular wall (11) extending axially up to the cap (7) on the opposite side with respect to the fan (5).

13. The ventilation group according to any of the claims from 10 to 12 wherein the external annular wall has a radial dimension (11) that is equal to the radial dimension of the hub (14).

Fig.1

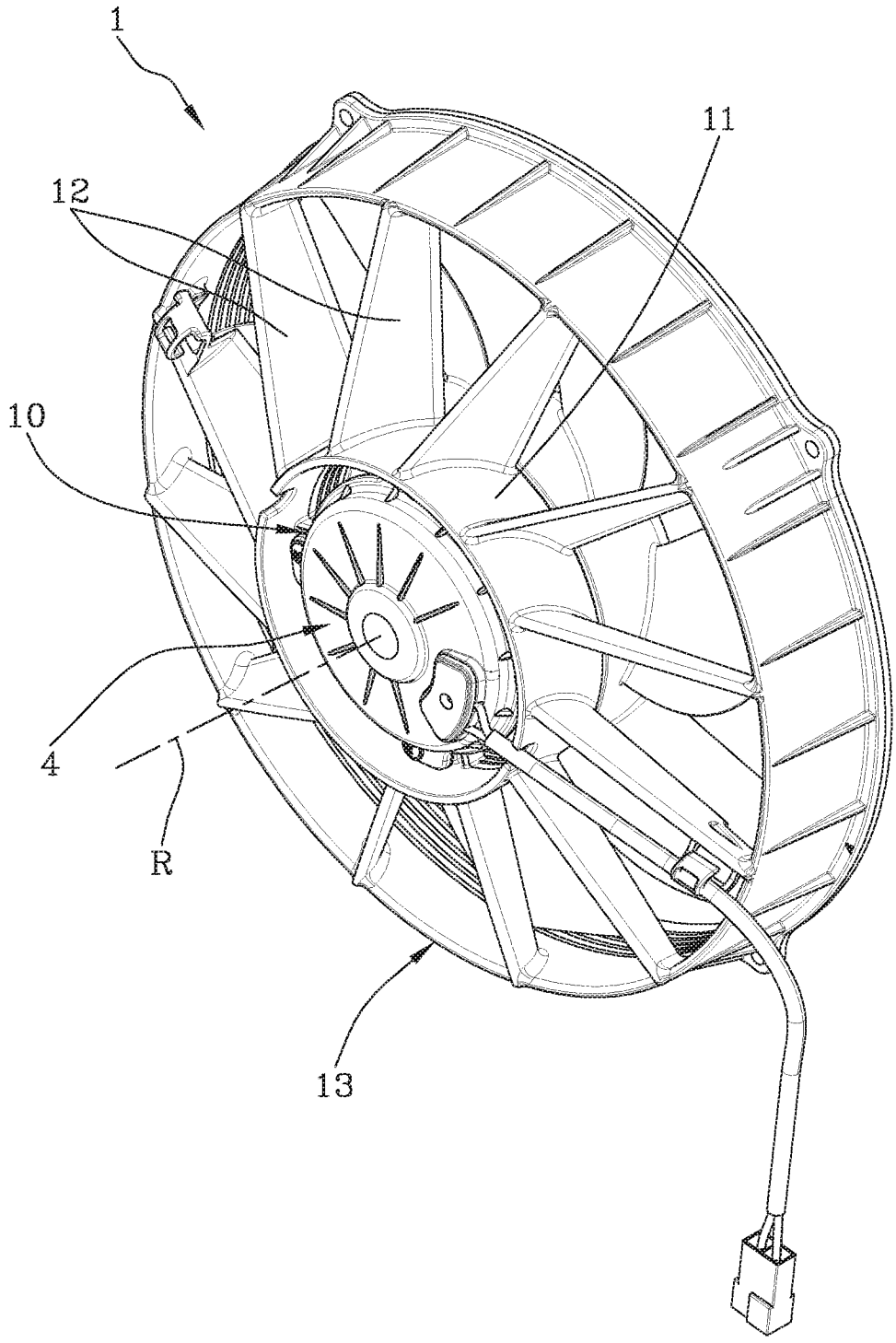


Fig.2

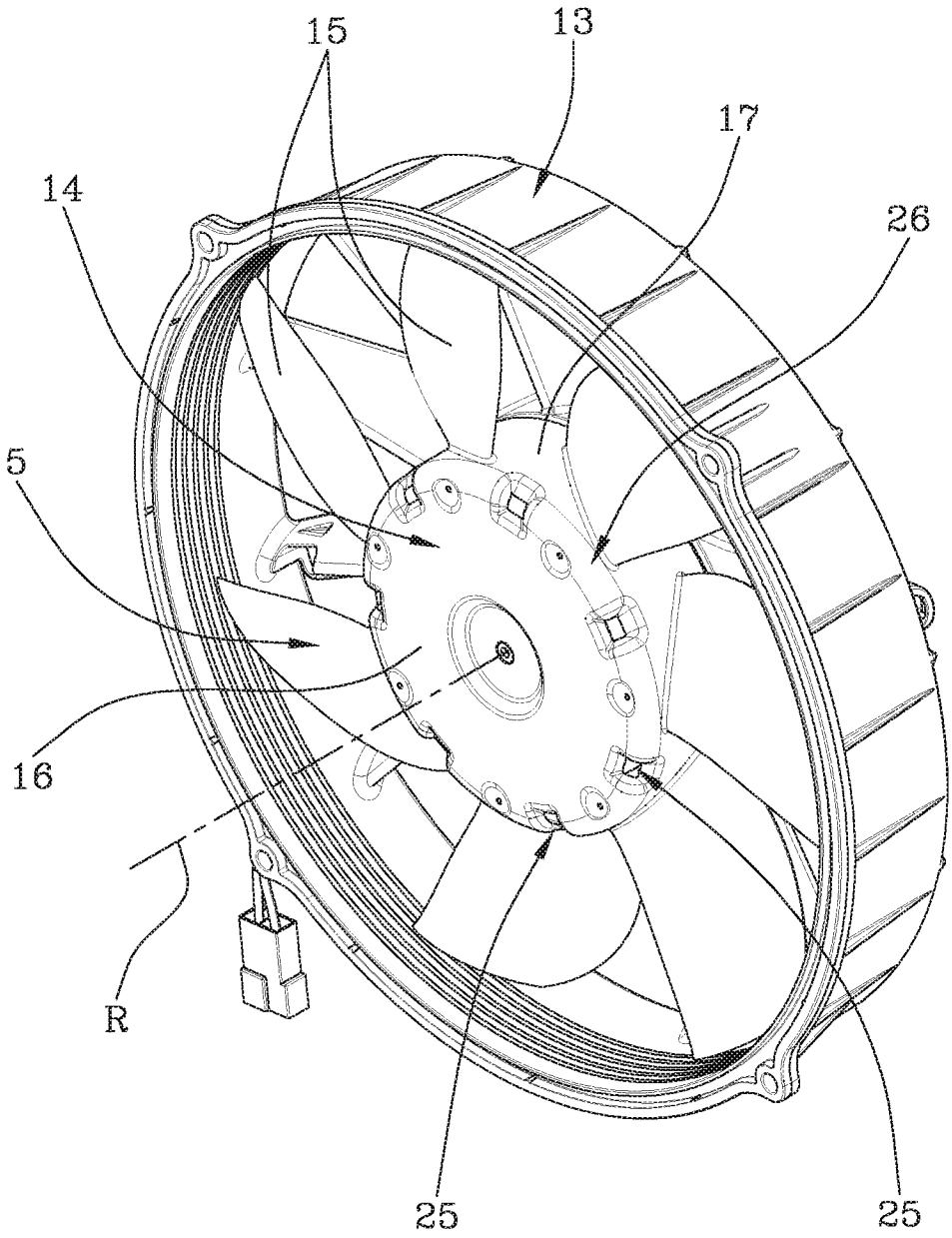


Fig.3

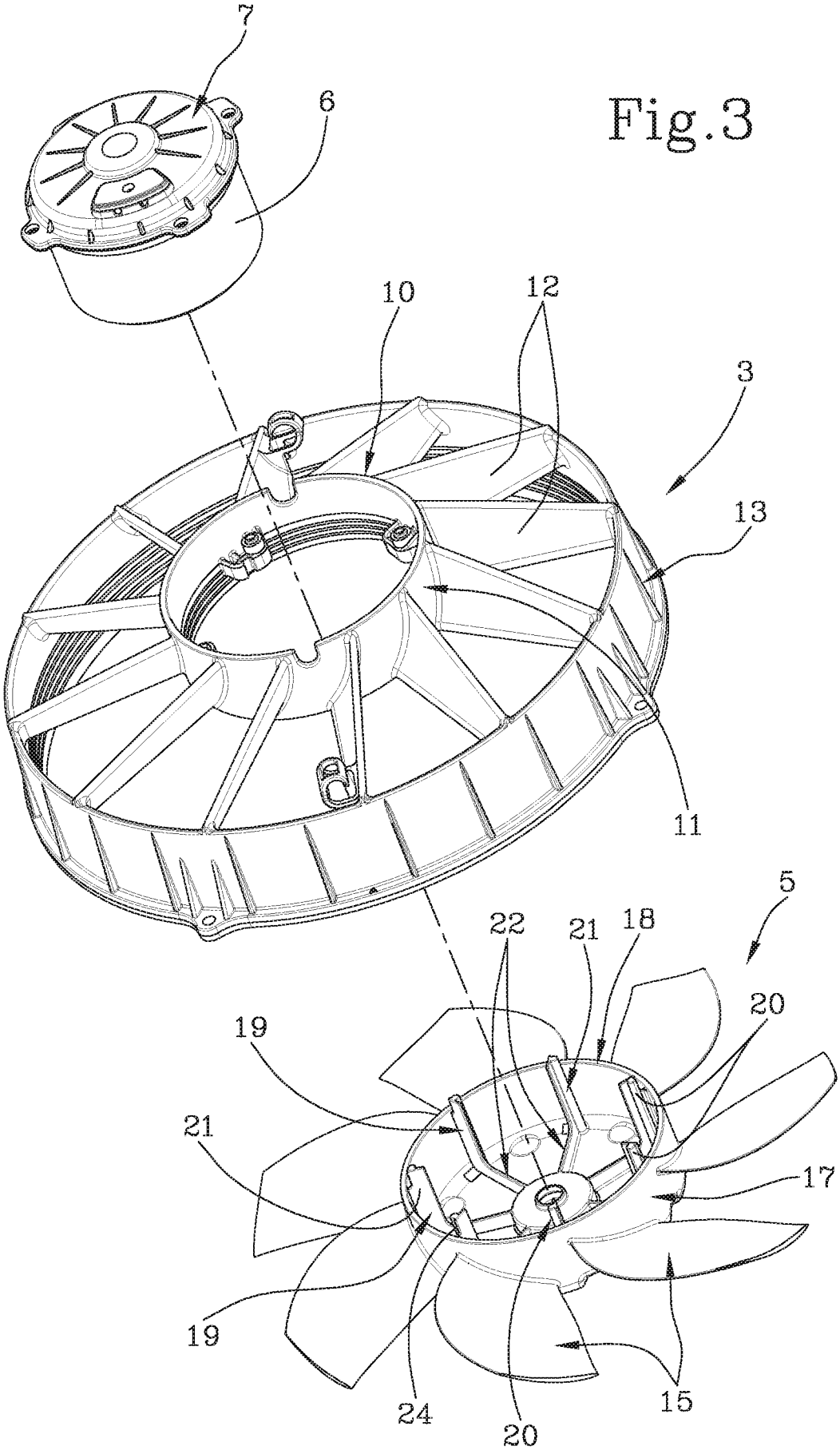
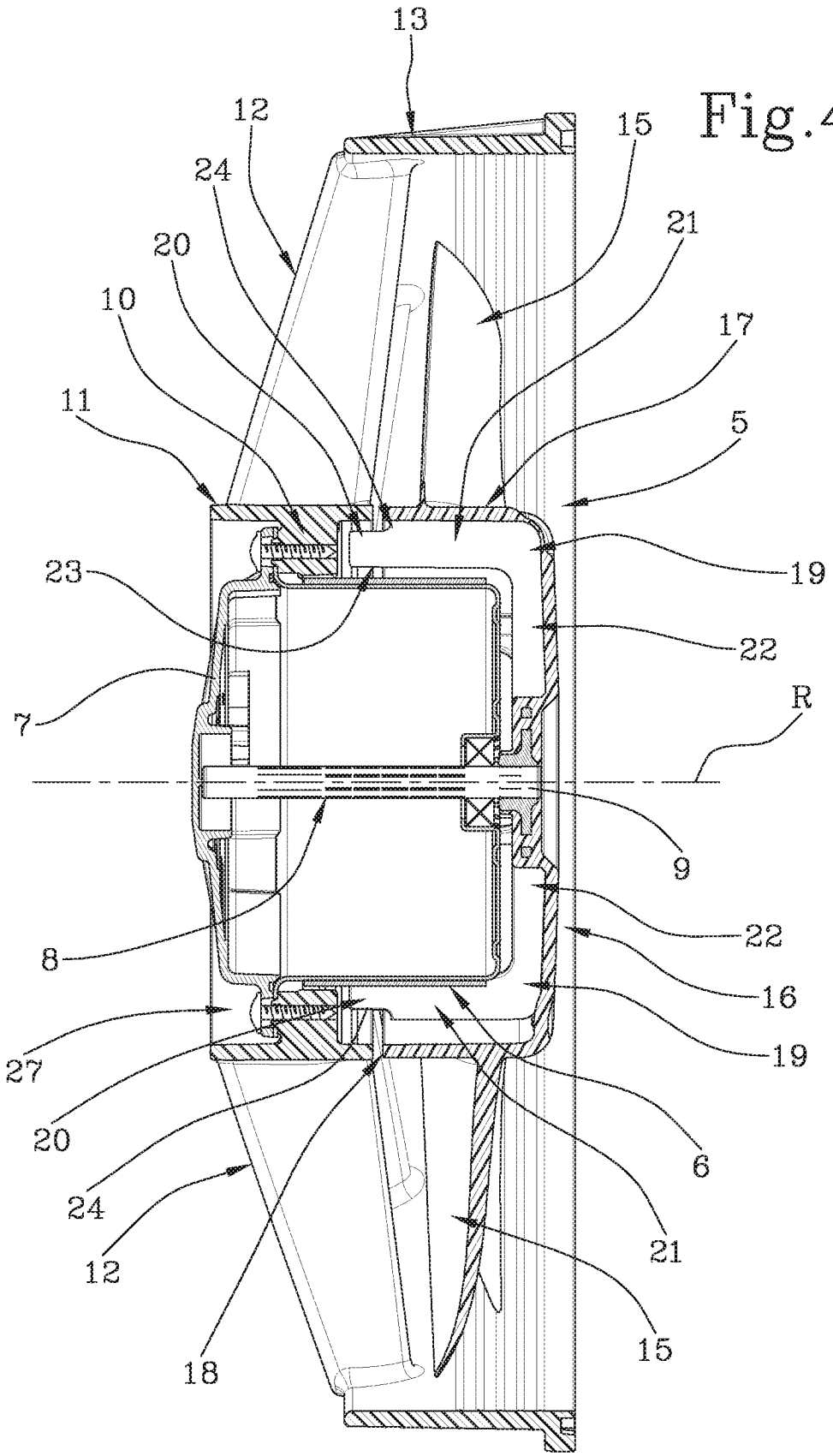


Fig.4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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2016/053893

A. CLASSIFICATION OF SUBJECT MATTER
INV. F04D25/08 F04D29/58
ADD.

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)
F04D

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	figure 1	8

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X	EP 1 621 773 A1 (SIEMENS AG [DE]) 1 February 2006 (2006-02-01) figure 1	1,10

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2016/053893

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