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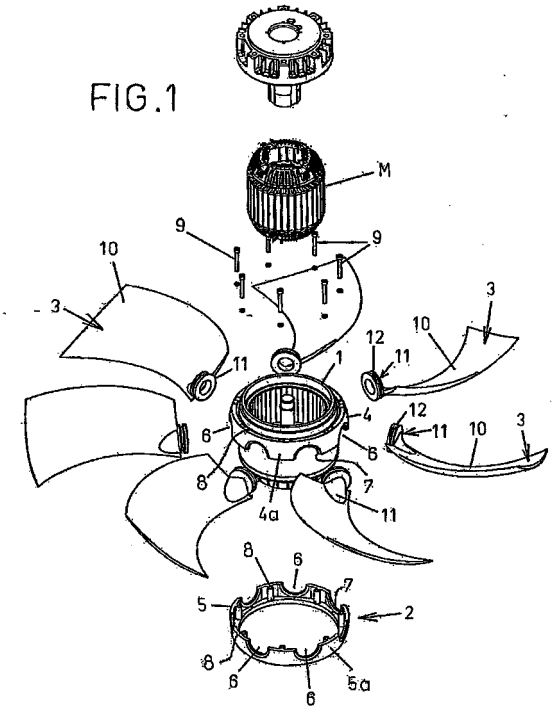
(54) EXTERNAL ROTOR ENGINE FAN

(57) The invention concerns an external rotor engine fan comprising a central rotor-hub (1), a body (4), a closure element (2) consisting of a matching body (5) and a longitudinal pin mounted integral on the central rotor-hub (1). The two bodies (4, 5) have semi-circular openings (6) which define openings for connecting blades (3). A first body (4) is mounted integral on the central rotor-hub and the second body (5) can be connected to the first. The blades comprise a blade zone (10) and a low opposite cylindrical connecting zone (11) which is inserted in each opening. The connecting zone of the blade has a peripheral groove (12) which fits into the circumferential rim formed in each opening of the body. Each blade remains removably connected into the closure element assembly with angular adjustability. The two bodies (4, 5) have longitudinal orifices (8) arranged between the adjacent openings wherein are housed screws (9) which fix the bodies, so that the connecting zone of each blade is immobilized between said bodies.

FIG.1



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Description

[0001] The external rotor engine fan of the present invention essentially comprises a propeller or wheel which is formed by a core or rotor-hub provided with a series of blades and a pin mounted integral with said rotor-hub. The blades are formed by independent elements which are individually assembled in the rotor-hub and distributed radially therein. The individual connecting of the blades in the rotor-hub allows the angular adjustment thereof so as to perform a precise adjustment of the fan according to the installation requirements, which allows performing this adjustment even in installations that are already in use. This angular adjustment can be done without having to remove the propeller from the pin.

[0002] The blades of the fan of the present invention are arranged in the rotor-hub such that they cannot accidentally come off the latter, being fixed to it in a secure and, at the same time, adjustable manner, as will be explained below.

[0003] According to the invention, an external rotor engine fan is particularly provided, incorporating a central rotor-hub, i.e. an engine rotor which works like a hub. This rotor-hub includes a body mounted integral with the former, such body being able to be connected to a closure element formed by a matching body. The body mounted integral on the rotor-hub and the matching body both have semicircular openings or entries defining corresponding openings for connecting a plurality of blades.

[0004] The blades of the fan of the present invention have a blade zone and an opposite connecting zone. This connecting zone has a substantially cylindrical, low height shape to be inserted in each opening formed on the rotor-hub, and a peripheral groove which fits into a circumferential rim formed in each semicircular opening of the bodies. This structural design advantageously allows each blade to be removably connected on the rotor-hub with angular adjustability without the ability of coming off the rotor-hub once it is mounted thereon.

[0005] To that end, the body mounted integral on the rotor-hub and the matching body have longitudinal orifices located between every two adjacent openings wherein there are housed screws which fix the bodies and immobilize the connecting zone of each blade between them.

[0006] A highly versatile external rotor engine fan is thus obtained given that the variation of the tilt of the blades becomes a very simple and quick operation. The blades are further retained in the rotor in a considerably secure manner without there being any risk that the blades will come off it. Another advantage of the invention is that it is possible to mount in the same wheel blades having very different characteristics such that fans with different features can be obtained with a universal rotor design so it can be adapted to different requirements at a reduced cost.

[0007] The features and advantages of the external rotor engine fan object of the present invention shall become clearer based on the following description. Said description corresponds to a preferred embodiment of the invention which will be described hereinafter as a non-limiting example in reference to the attached drawings in which:

Figure 1 shows an exploded perspective view of an embodiment of an external rotor engine fan according to the invention in which the blades are shown separated from the rotor; and

Figure 2 shows an exploded perspective view of the external rotor engine fan of the Figure 1 in which the blades are shown mounted on the engine rotor.

[0008] The external rotor engine fan described by way of example in relation to the drawings comprises a central rotor-hub or core (1), i.e. an engine rotor functioning as a hub. A pin mounted integral on said rotor, rotating with it, and a closure element (2), are arranged. Arranged between the rotor-hub (1) and the closure element (2) there is a plurality of blades (3) identical to one another. The blades (3) are independent elements that are removably connected to the rotor-hub (1) with angular adjustability, as will be described below.

[0009] The rotor-hub (1) of the fan can be made of plastic, aluminum or any other suitable material and comprises a body (4) mounted integral thereon. The closure element (2) of the fan can also be made of plastic, aluminum or any other suitable material and comprises a matching body (5) that can be connected on the body (4) mounted integral on the rotor-hub (1) such that the blades (3) are trapped between them and immobilized once the connection is done.

[0010] The body (4) mounted integral on the rotor-hub (1) has a low, substantially cylindrical shape and a wide perimetral rim (4a). A series of semicircular openings (6) identical to one another is formed on said perimetral rim (4a). These semicircular openings (6) are evenly distributed in said perimetral rim (4a). Each semicircular opening (6) has a circumferential rim (7).

[0011] The matching body (5) of the closure element (2) also has a low, substantially cylindrical shape and has a wide perimetral rim (5a). A series of semicircular openings (6) identical to one another is formed in said perimetral rim (5a). These semicircular openings (6) are evenly distributed en said perimetral rim (5a). Each semicircular opening (6) has a circumferential rim (7).

[0012] The semicircular openings (6) define circular openings when both bodies (4, 5) are connected to one another to form the rotor-hub assembly (1, 2) inside of which the electric motor (M) of the fan is arranged.

[0013] There are several orifices (8) parallel to the pin mounted integral on the rotor on the perimetral rim (4a) of the body (4). Said orifices (8) also extend to the matching body (5) and are located between every two adjacent openings (6). Screws (9) are housed in said orifices (8) for fixing both bodies (4, 5).

[0014] The blades (3) of the fan comprise a blade zone

(10) and an opposite connecting zone (11). The connecting zone (11) of each blade (3) has a low, substantially cylindrical shape which is suitably sized to be inserted in each opening defined by the semicircular openings (6) of each body (4, 5), as previously indicated. The connecting zone (11) of the blade (3) has a peripheral groove (12) which fits into the circumferential rim (7) formed in each semicircular opening (6) of the bodies (4, 5).

[0015] For connecting the blades (3) in the rotor of the fan which is shown, the connecting zone (11) of each blade (3) is inserted in the openings of the rotor-hub (1) formed when the bodies (4, 5) forming it are interlocked. When the connecting zone (11) of the blade (3) is inserted in the openings of the rotor-hub (1), the circumferential rim (7) of the openings fits into the peripheral groove (12) of the connecting zone (11) of each blade (3) when the bodies (4, 5) are connected to one another. Once this connection is done, the angular position of the blades (3), i.e. the tilt thereof, is adjusted until achieving the desired orientation according to the operating needs. Once this tilt of the blades (3) is obtained, the latter are retained in the rotor-hub (1) and immobilized by tightening the locking screws (9).

[0016] The possibility of arranging projections, ribs or striations to favor retaining the blades (3) in place in relation to the rotor-hub (1) must also be mentioned. The possibility of arranging complementary indications such as a graduated scale and a signaling element for informing the operator of the tilt of the blades (3) in the operation of the assembly is also provided.

[0017] Having sufficiently described the external rotor engine of the present invention in correspondence with the attached drawings, it must be understood that any modification of detail that is considered appropriate can be introduced in such invention provided that the essential features of the invention comprised in the following claims are not altered.

Claims

1. An external rotor engine fan comprising a central rotor-hub (1), said rotor working as a hub, and including a body (4) and a closure element (2) formed by a matching body (5) and a longitudinal pin mounted integral on the central rotor-hub (1), the bodies (4, 5) having semicircular openings (6) defining corresponding openings for connecting a plurality of blades (3), **characterized in that** the mentioned body (4) is mounted integral on said central rotor-hub (1) and **in that** said body (5) can be connected to the body (4), the mentioned blades (3) comprising a blade zone (10) and an opposite connecting zone (11), said connecting zone (11) having a low, substantially cylindrical shape to be inserted in each opening, and the connecting zone (11) of the blade (3) having a peripheral groove (12) which fits into a circumferential rim (7) formed in each semicircular opening (6) of the bodies (4, 5), each blade being removably connected in the assembly-closure element (1, 2) with angular adjustability.

2. An external rotor engine fan according to claim 1, **characterized in that** the bodies (4, 5) have longitudinal orifices (8) located between every two adjacent openings (6) wherein screws (9) are housed for fixing said bodies (4, 5) and immobilizing the connecting zone (11) of each blade (3) between them.

FIG.1

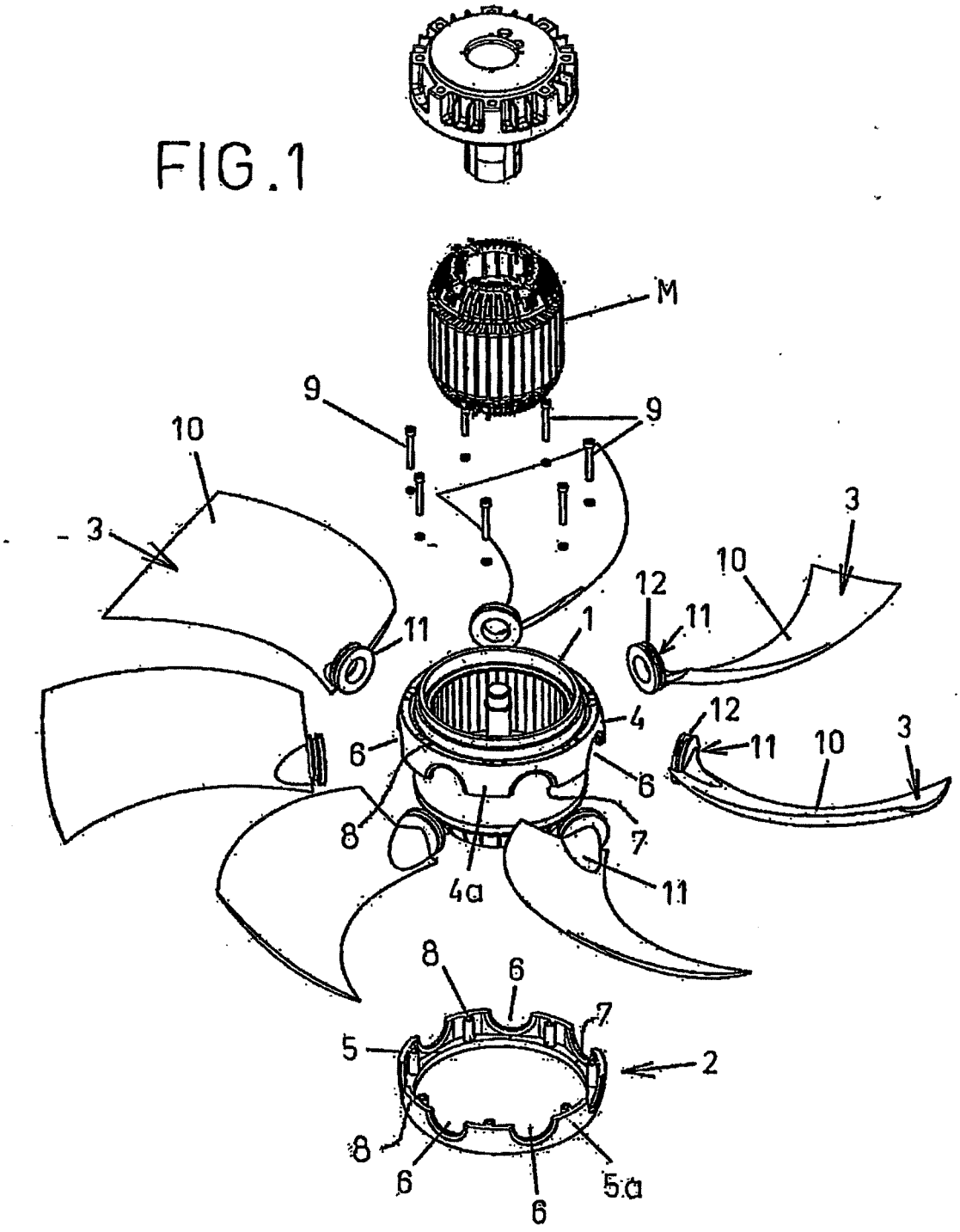
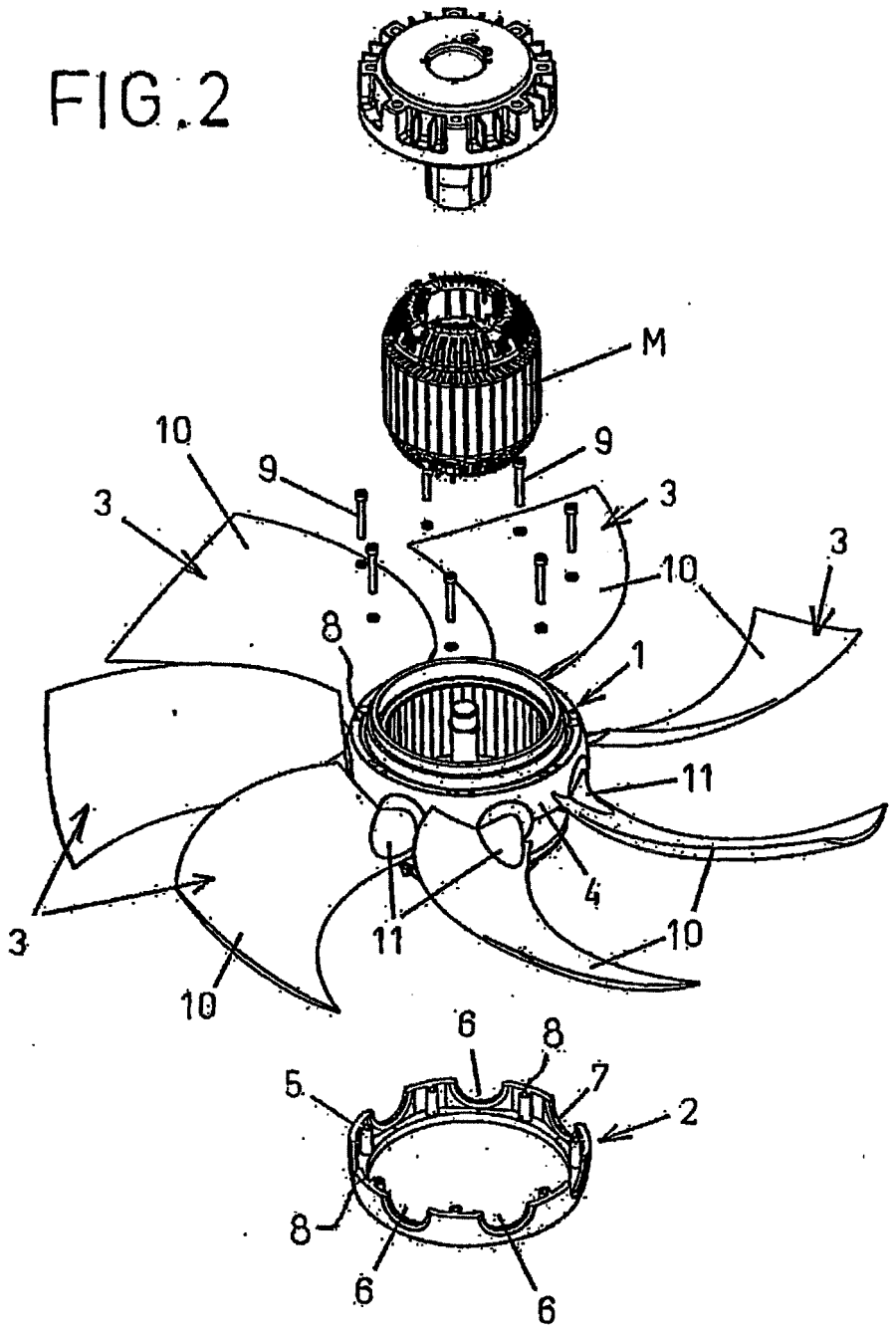


FIG.2



INTERNATIONAL SEARCH REPORT

International application No.
PCT/ ES 2004/000398

A. CLASSIFICATION OF SUBJECT MATTER

IPC[7] F04D29/34, 29/36

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[7] F04D29/26

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)

CIBEPAT,EPODOC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4715784 A (MOSIEWICZ) 29.12.1987; column 1, line 57 - column 2, line 10; figure 6	1-2
X	FR 1514597 A (M. KAMPMANN) 15.01.1968; the whole document.	1-2
X	EP 0744337 A2 (BAILSCO BLADES & CASTINGS, INC.) 27.11.1996; column 5, line 31 - column 6, line 28; figures 1-2	1
A	column 8, lines 17 - 19	2
A	ES 2156818 A1 (SOLER Y PALAU, S.A.) 16.07.2001; column 3, line 2 - column 4, line 39; figure 2	1-2
A	US 3130677 A (D. M. LIEBHART) 28.04.1964; the whole document.	1-2

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 October 2004 (21.10.04)	27 October 2004 (27.10.04)
Name and mailing address of the ISA/ SPTO Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/ ES 2004/000398

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Form PCT/ISA/210 (patent family annex) (July 1992)