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(54) **Electric fan**

(57) An electric fan includes a motor (10), two blade units (20), and two engaging units (50). The motor (10) has a motor shaft (11) that defines an axis (L) and that has two axially opposite end segments (111). Each of the end segments (111) has an engaging region (113). The engaging regions (113) of the end segments (111) are disposed at angularly opposite positions relative to

the axis (L). Each of the blade units (20) includes a hub (21) that is sleeved on a respective one of the end segments (111). Each of the engaging units (50) includes a first engaging member (51) provided on the engaging region (113) of a respective one of the end segments (111), and a second engaging member (52) provided on the hub (21) of a respective one of the blade units (20) and engaging the first engaging member (51).

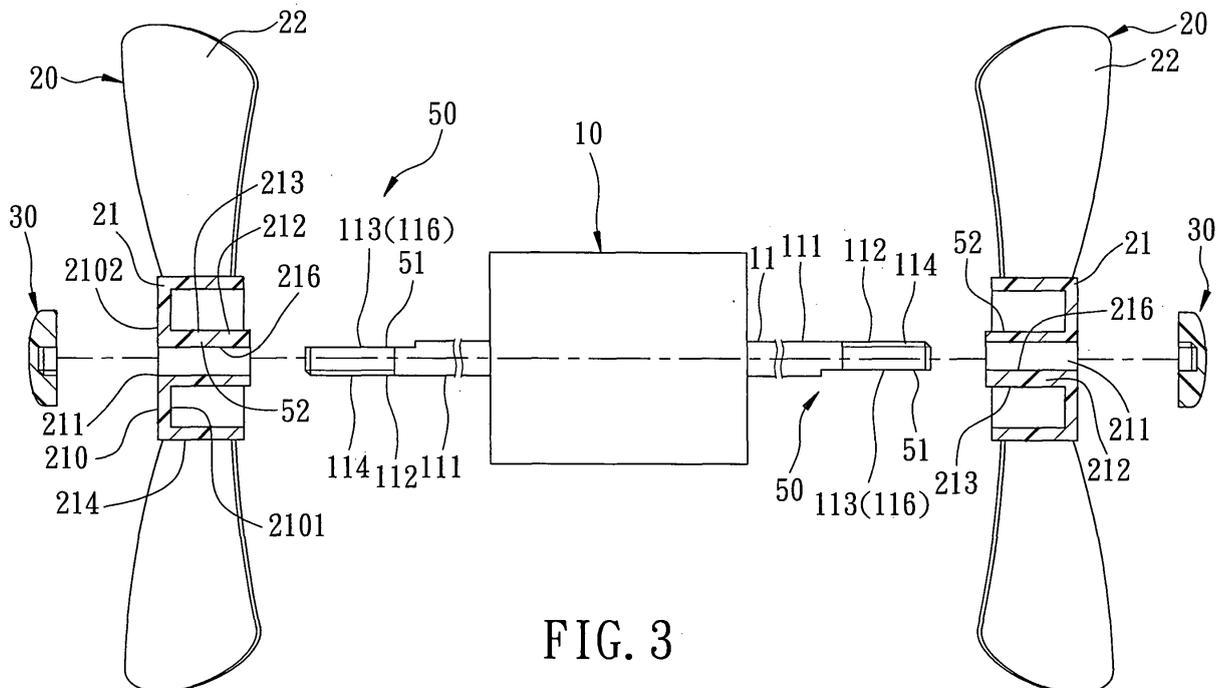


FIG. 3

Description

[0001] The invention relates to an electric fan, more particularly to an electric fan with a pair of blade units.

[0002] Referring to Figure 1, a conventional electric fan is shown to include a motor 1, a pair of blade units 2 respectively driven by the motor 1, and a stand unit 3 for supporting a bottom of the motor 1. When the motor 1 is actuated, the blade units 2 rotate simultaneously so as to generate two streams of air flow blowing in opposite directions relative to an axis so as to dissipate heat.

[0003] Although the aforesaid electric fan is able to dissipate heat effectively, since only one motor 1 is used to simultaneously drive the two blade units 2, vibration tends to occur during rotation of the blade units 2 when the blade units 2 mounted on two end portions of a motor axle 101 of the motor 1 are unbalanced.

[0004] Therefore, the object of the present invention is to provide an electric fan that is capable of overcoming the aforesaid drawback of the prior art.

[0005] Accordingly, an electric fan of this invention comprises a motor, a pair of blade units, and a pair of engaging units.

[0006] The motor has a motor shaft that defines an axis and that has two end segments which are axially opposite to each other. Each of the end segments has an engaging region. The engaging regions of the end segments of the motor shaft are disposed at angularly opposite positions relative to the axis.

[0007] The blade units are coupled respectively to and are driven by the end segments of the motor shaft. Each of the blade units includes a hub that is sleeved on the respective one of the end segments, and a plurality of blades that extend from the hub.

[0008] Each of the engaging units includes a first engaging member that is provided on the engaging region of a respective one of the end segments of the motor shaft, and a second engaging member that is provided on the hub of a respective one of the blade units and that engages the first engaging member, thereby securing the blade units to the end segments of the motor shaft, respectively.

[0009] Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiments with reference to the accompanying drawings, of which:

Fig. 1 is a fragmentary partly sectional view of a conventional electric fan;

Fig. 2 is a fragmentary partly sectional view of the first preferred embodiment of an electric fan according to the present invention;

Fig. 3 is an exploded partly sectional view of an assembly of a motor and a pair of blade units of the first preferred embodiment;

Fig. 4 is a sectional view taken along the line IV-IV in Fig. 2;

Fig. 5 is an exploded partly sectional view of the sec-

ond preferred embodiment of an electric fan according to the present invention;

Fig. 6 is a fragmentary assembled partly sectional view of the second preferred embodiment;

Fig. 7 is a sectional view taken along the line VII-VII in Fig. 6;

Fig. 8 is an exploded partly sectional view of the third preferred embodiment of an electric fan according to the present invention;

Fig. 9 is a fragmentary assembled partly sectional view of the third preferred embodiment; and

Fig. 10 is a sectional view taken along the line X-X in Fig. 9.

[0010] Before the present invention is described in greater detail with reference to the accompanying preferred embodiments, it should be noted herein that like elements are denoted by the same reference numerals throughout the disclosure.

[0011] Referring to Figures 2 to 4, the first preferred embodiment of an electric fan according to the present invention is shown to include a motor 10, a pair of blade units 20, and a pair of engaging units 50. The first preferred embodiment further includes a stand unit 40 for supporting the motor 10. The stand unit 40 includes a connecting rod 41 coupled to a bottom of the motor 10, and a stand 42 connected to the connecting rod 41.

[0012] The motor 10 has a motor shaft 11 that defines an axis (L) and that has two end segments 111 axially opposite to each other. Each of the end segments 111 has an engaging region 113. The engaging regions 113 of the end segments 111 of the motor shaft 11 are disposed at angularly opposite positions relative to the axis (L).

[0013] The blade units 20 are coupled respectively to and are driven by the end segments 111 of the motor shaft 11. Each of the blade units 20 includes a hub 21 that is sleeved on a respective one of the end segments 111, and a plurality of blades 22 that extend from the hub 21.

[0014] Each of the engaging units 50 includes a first engaging member 51 that is provided on the engaging region 113 of a respective one of the end segments 111 of the motor shaft 11, and a second engaging member 52 that is provided on the hub 21 of a respective one of the blade units 20 and that engages the first engaging member 51, thereby securing the blade units 20 to the end segments 111 of the motor shaft 11, respectively.

[0015] In the first embodiment, each of the end segments 111 of the motor shaft 11 has a free end portion 112 with a non-circular cross-section. The free end portion 112 of each of the end segments 111 has a flat surface 116 that is disposed at the engaging region 113 and that defines the first engaging member 51 of the respective one of the engaging units 50. The hub 21 of each of the blade units 20 includes a sleeve part 212 that is sleeved on the respective one of the end segments 111 and that has a free end portion 213 with a non-circular

cross-section. The free end portion 213 of the sleeve part 212 of the hub 21 of each of the blade units 20 has a flat surface 216 that defines the second engaging member 52 and that conforms to and that contacts the flat surface 116 of the free end portion 112 of the respective one of the end segments 111 of the motor shaft 11. Moreover, the hub 21 of each of the blade units 20 further includes a hub base 210 and an outer annular wall 214 that extends axially from a periphery of the hub base 210 and that surrounds the sleeve part 212, which extends axially from an inner portion of the hub base 210. The hub base 210 has an inner side 2101 and an outer side 2102 that is opposite to the inner side 2101. The sleeve part 212 of the hub 21 of each of the blade units 20 further has an open outer end 211 that is opposite to the free end portion 213 of the sleeve part 212. Each of the end segments 111 of the motor shaft 11 has a threaded portion 114 that extends axially and outwardly through the open outer end 211 of the sleeve part 212 of the hub 21 of the respective blade unit 20. The electric fan further comprises a pair of screw nuts 30, each of which is disposed at the outer side 2102 of the hub base 210 of a respective blade unit 20 and each of which engages threadedly the threaded portion 114 of a respective one of the end segments 111 of the motor shaft 11 so as to secure the blade units 20 to the end segments 111 of the motor shaft 11 after engagement between the first and second engaging members 51, 52 of the engaging units 50.

[0016] After assembly, since the engaging units 50 are disposed at angularly opposite positions relative to the axis (L), balance between the blade units 20 mounted respectively on the end segments 111 of the motor shaft 11 can be achieved, and vibration during actuation of the motor 10 can be reduced significantly.

[0017] Referring to Figures 5, 6 and 7, the second preferred embodiment of this invention differs from the first preferred embodiment in that: each of the end segments 111 of the motor shaft 11 is formed with an engaging hole 116 that is disposed in the engaging region 113 and that defines the first engaging member 51 of the respective one of the engaging units 50. The sleeve part 212 of the hub 21 of each blade unit 20 is formed with a threaded hole 215. The second engaging member 52 of each of the engaging units 50 is in the form of a screw 30 that engages threadedly and that extends through the threaded hole 215 in the sleeve part 212 of the hub 21 of the respective one of the blade units 20 and that engages the engaging hole 116 in the respective one of the end segments 111 so as to secure the blade units 20 to the end segments 111 of the motor shaft 11 after engagement between the first and second engaging members 51, 52 of the engaging units 50. Moreover, the sleeve part 212 of the hub 21 of each of the blade units 20 is formed with a blind hole 217 for insertion of the respective one of the end segments 111 of the motor shaft 11

[0018] Referring to Figures 8 to 10, the third preferred embodiment of this invention differs from the first preferred embodiment in that: the engaging region 113 of

each end segment 111 is formed with at least one engaging protrusion 116 (in this embodiment, two engaging protrusions 116 are formed on the engaging region 113) that defines the first engaging member 51 of the respective one of the engaging units 50. The sleeve part 212 of the hub 21 of each blade unit 20 has a free end portion 213 formed with an engaging groove 215 (in this embodiment, two engaging grooves 215 are formed in the free end portion 213 of the sleeve part 212) which extends axially, which opens in a direction toward the motor 10, and which defines the second engaging member 52 of the respective one of the engaging units 50. Each engaging protrusion 116 of each of the end segments 111 extends into the corresponding engaging groove 215 in the free end portion 213 of the sleeve part 212 of the hub 21 of the respective one of the blade units 20, as best shown in Figure 10, thereby securing the blade units 20 to the end segments 111 of the motor shaft 11.

[0019] By disposing the engaging units 50 at the angularly opposite positions relative to the axis (L), the aforesaid drawback associated with the prior art can be alleviated.

Claims

1. An electric fan comprising:

a motor (10) with a motor shaft (11) defining an axis (L) and having two end segments (111) that are axially opposite to each other, each of said end segments (111) having an engaging region (113), said engaging regions (113) of said end segments (111) being disposed at angularly opposite positions relative to said axis (L);
 a pair of blade units (20) coupled respectively to and driven by said end segments (111) of said motor shaft (11), each of said blade units (20) including a hub (21) that is sleeved on the respective one of said end segments (111), and a plurality of blades (22) that extend from said hub (21); and
 a pair of engaging units (50), each of which includes a first engaging member (51) that is provided on said engaging region (113) of a respective one of said end segments (111) of said motor shaft (11), and a second engaging member (52) that is provided on said hub (21) of a respective one of said blade units (20) and that engages said first engaging member (51), thereby securing said blade units (20) to said end segments (111) of said motor shaft (11), respectively.

2. The electric fan as claimed in Claim 1, wherein each of said end segments (111) of said motor shaft (11) has a free end portion (112) with a non-circular cross-section, said free end portion (213) of each of said

end segments (111) having a flat surface (116) that defines said first engaging member (51) of the respective one of said engaging units (50), said hub (21) of each of said blade units (20) including a sleeve part (212) that is sleeved on the respective one of said end segments (111) and that has a free end portion (213) with a non-circular cross-section, said free end portion (213) of said sleeve part (212) of said hub (21) of each of said blade units (20) having a flat surface (216) that defines said second engaging member (52) and that conforms to and that contacts said flat surface (116) of said free end portion (112) of the respective one of said end segments (111) of said motor shaft (11).

3. The electric fan as claimed in Claim 1, wherein each of said end segments (111) of said motor shaft (11) is formed with an engaging hole (116) that defines said first engaging member (51) of the respective one of said engaging units (50), said hub (21) of each of said blade units (20) including a sleeve part (212) that is sleeved on the respective one of said end segments (111) and that is formed with a threaded hole (215), said second engaging member (52) of each of said engaging units (50) being in the form of a screw (30) that engages threadedly and that extends through said threaded hole (215) in said sleeve part (212) of said hub (21) of the respective one of said blade units (20) and that engages said engaging hole (116) in the respective one of said end segments (111).

4. The electric fan as claimed in Claim 1, wherein each of said end segments (111) of said motor shaft (11) is formed with an engaging protrusion (116) that defines said first engaging member (51) of the respective one of said engaging units (50), said hub (21) of each of said blade units (20) including a sleeve part (212) that is sleeved on the respective one of said end segments (111) and that has a free end portion (213) formed with an engaging groove (215) which extends axially, which opens in a direction toward said motor (10), and which defines said second engaging member (52) of the respective one of said engaging units (50), said engaging protrusion (116) of each of said end segments (111) extending into said engaging groove (215) in said free end portion (213) of said sleeve part (212) of said hub (21) of the respective one of said blade units (50).

5. The electric fan as claimed in Claim 2, wherein said hub (21) of each of said blade units (20) further includes a hub base (210) and an outer annular wall (214) that extends axially from a periphery of said hub base (210) and that surrounds said sleeve part (212), said hub base (210) having an inner side (2101) and an outer side (2102) that is opposite to said inner side (2101), said sleeve part (212) of said

hub (21) of each of said blade units (20) further having an open outer end (211) that is opposite to said free end portion (213) of said sleeve part (212), each of said end segments (111) of said motor shaft (11) having a threaded portion (114) that extends axially and outwardly through said open outer end (211) of said sleeve part (212) of said hub (21) of the respective one of said blade units (20), said electric fan further comprising a pair of screw nuts (30), each of which is disposed at said outer side (2102) of said hub base (210) of a respective one of said blade units (20) and each of which engages threadedly said threaded portion (114) of a respective one of said end segments (111) of said motor shaft (11).

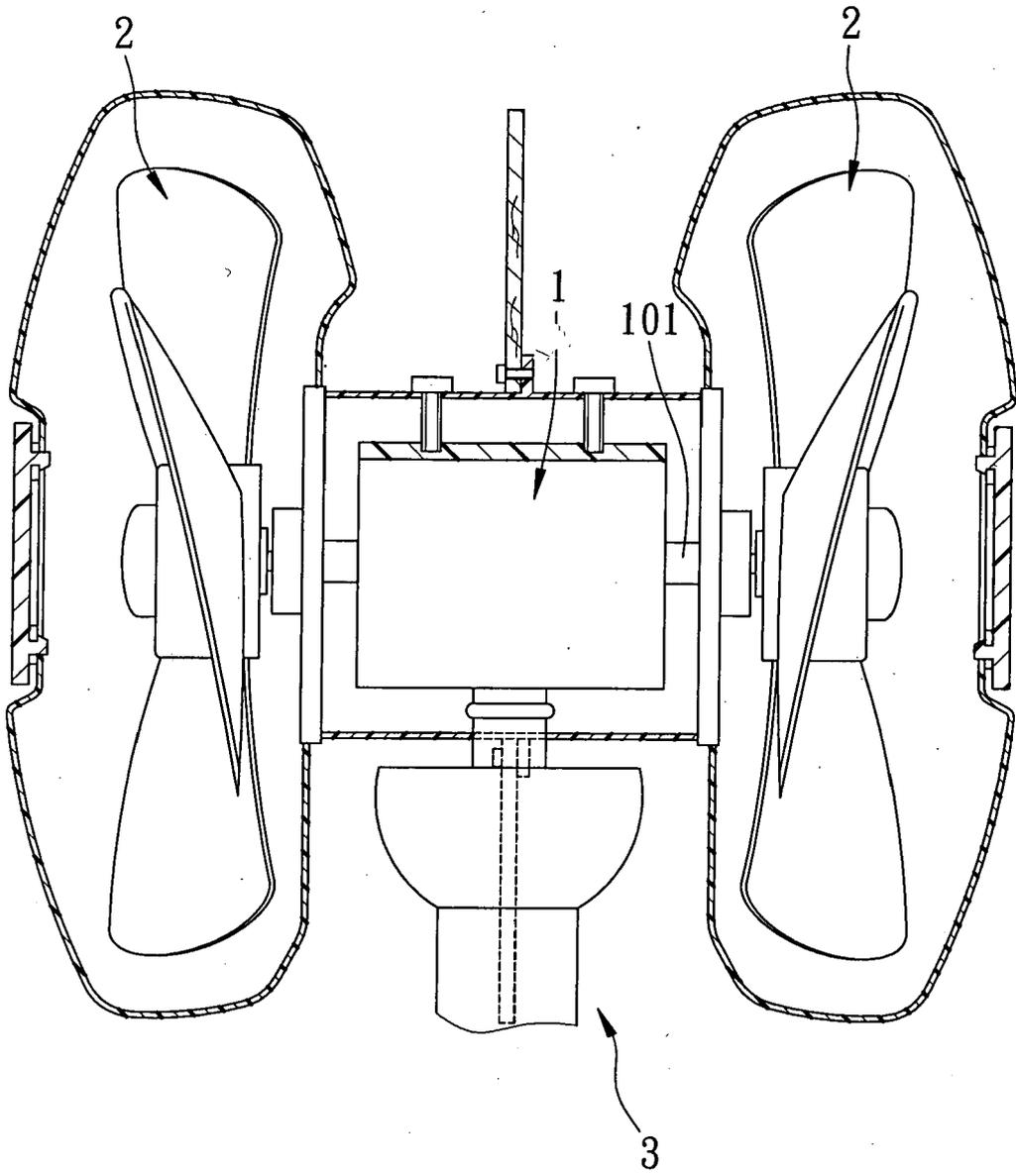


FIG. 1
PRIOR ART

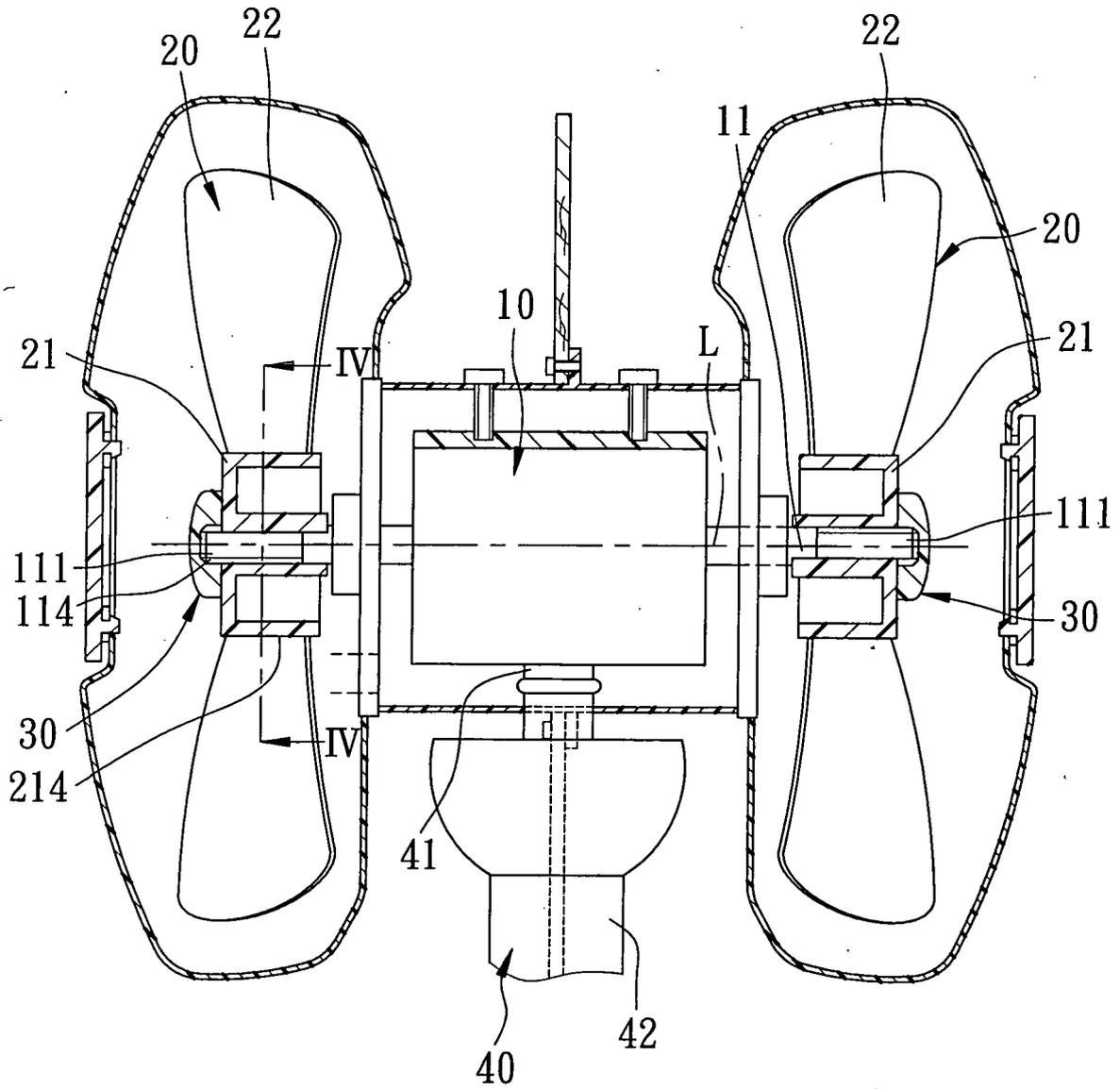


FIG. 2

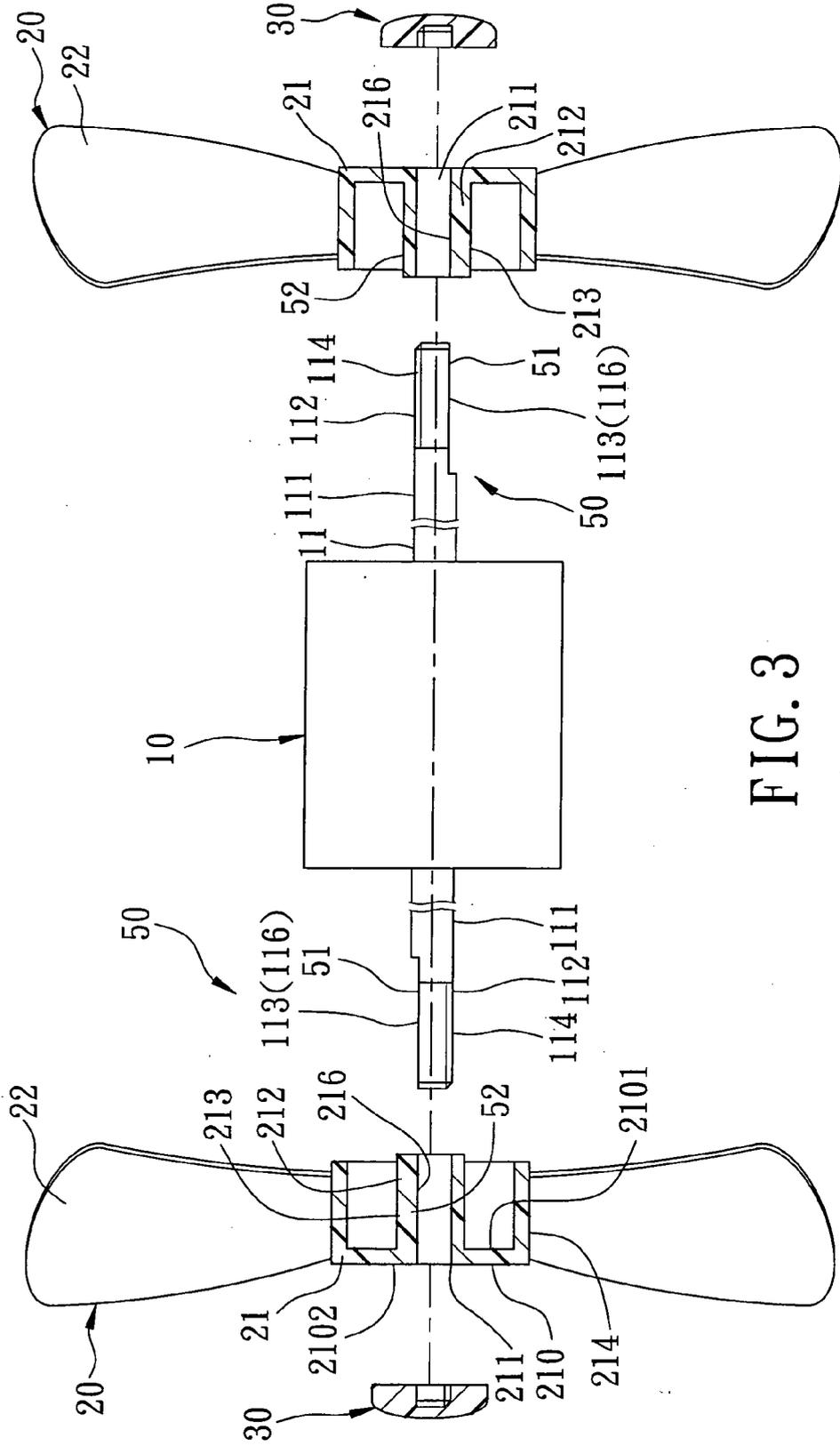


FIG. 3

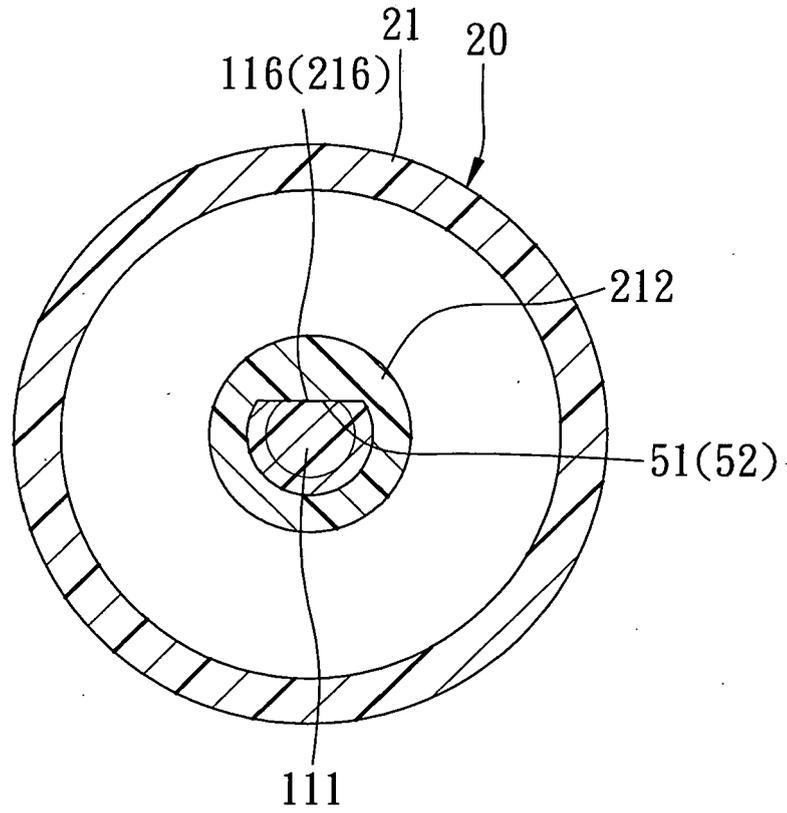


FIG. 4

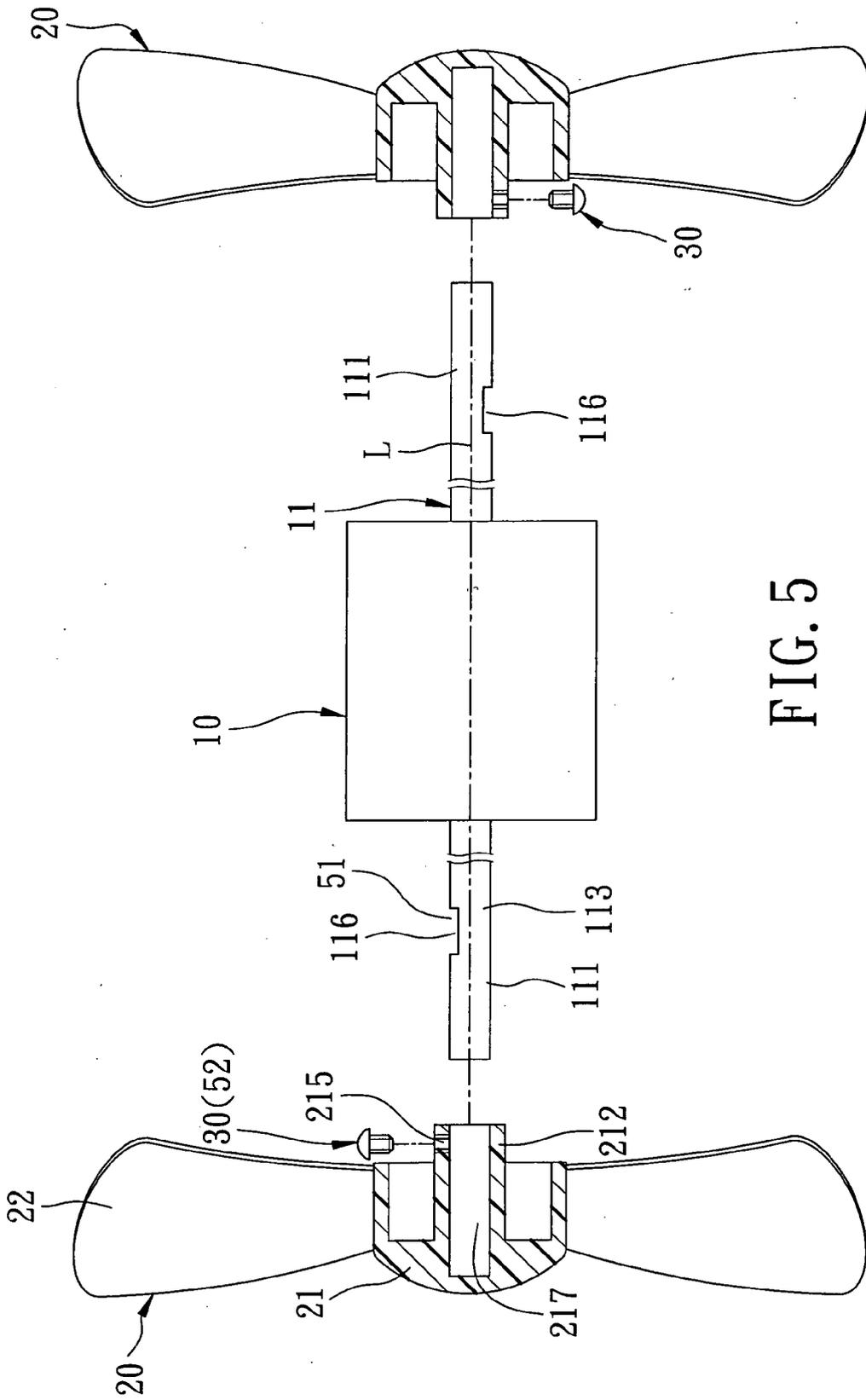


FIG. 5

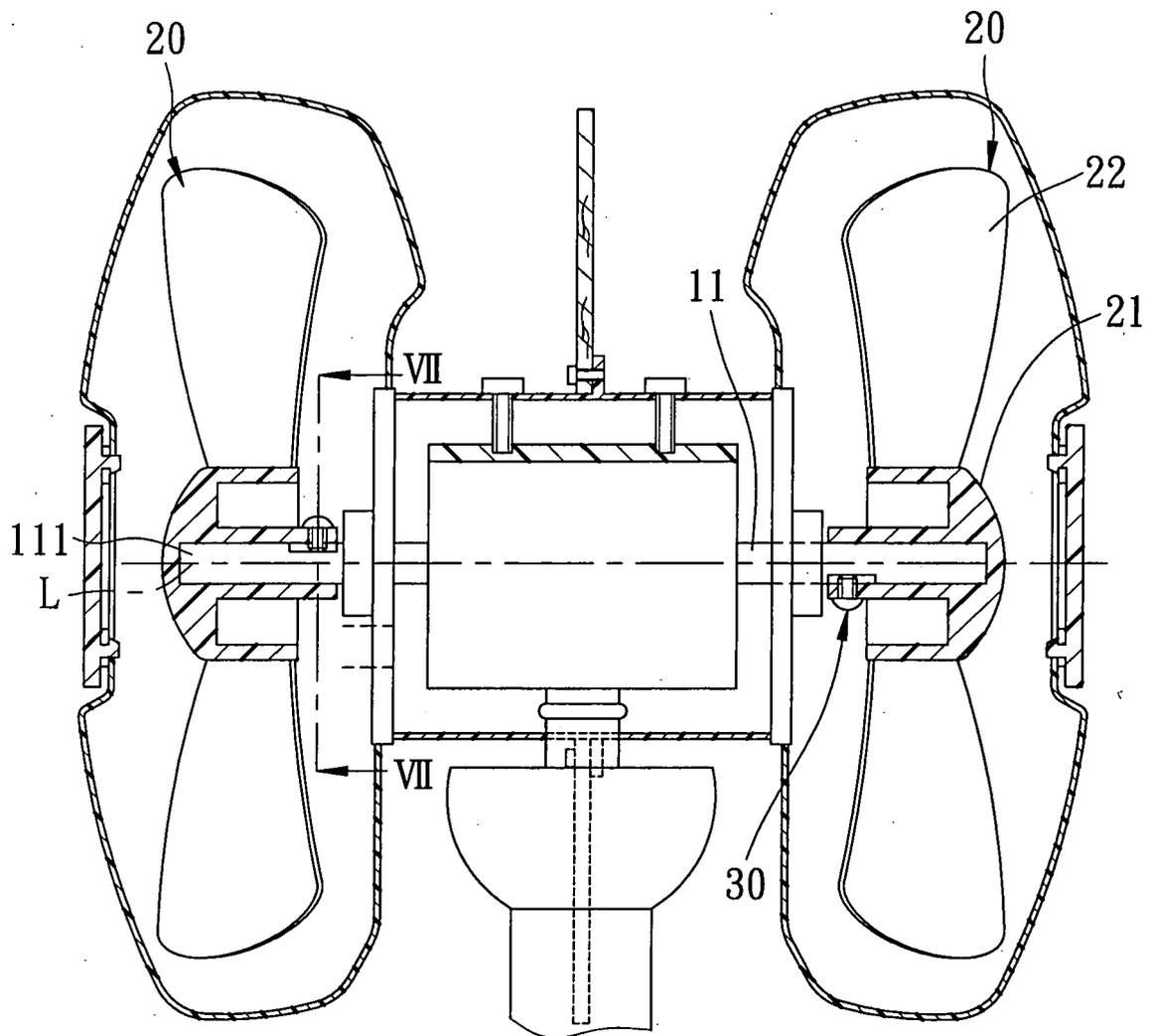


FIG. 6

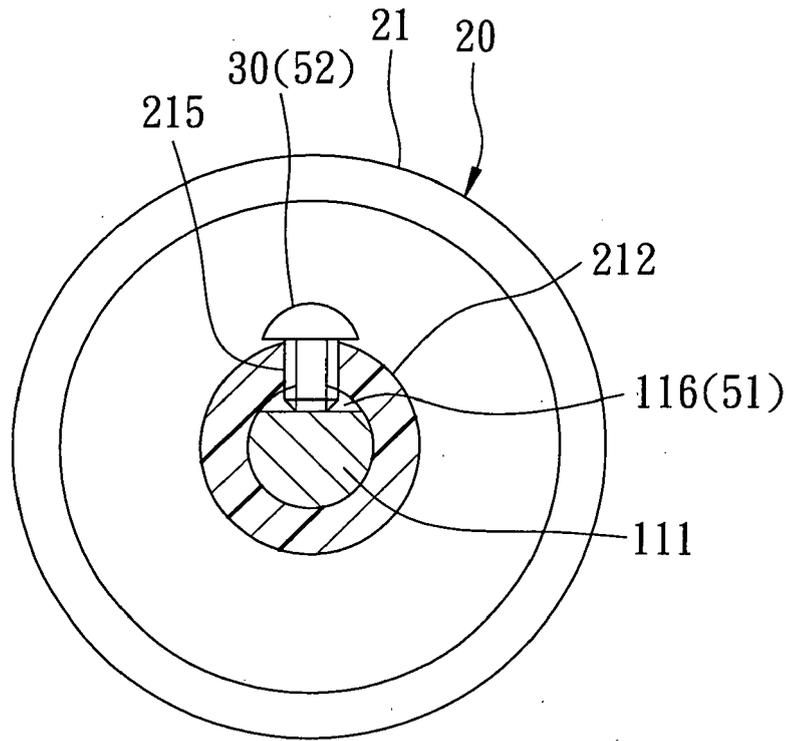


FIG. 7

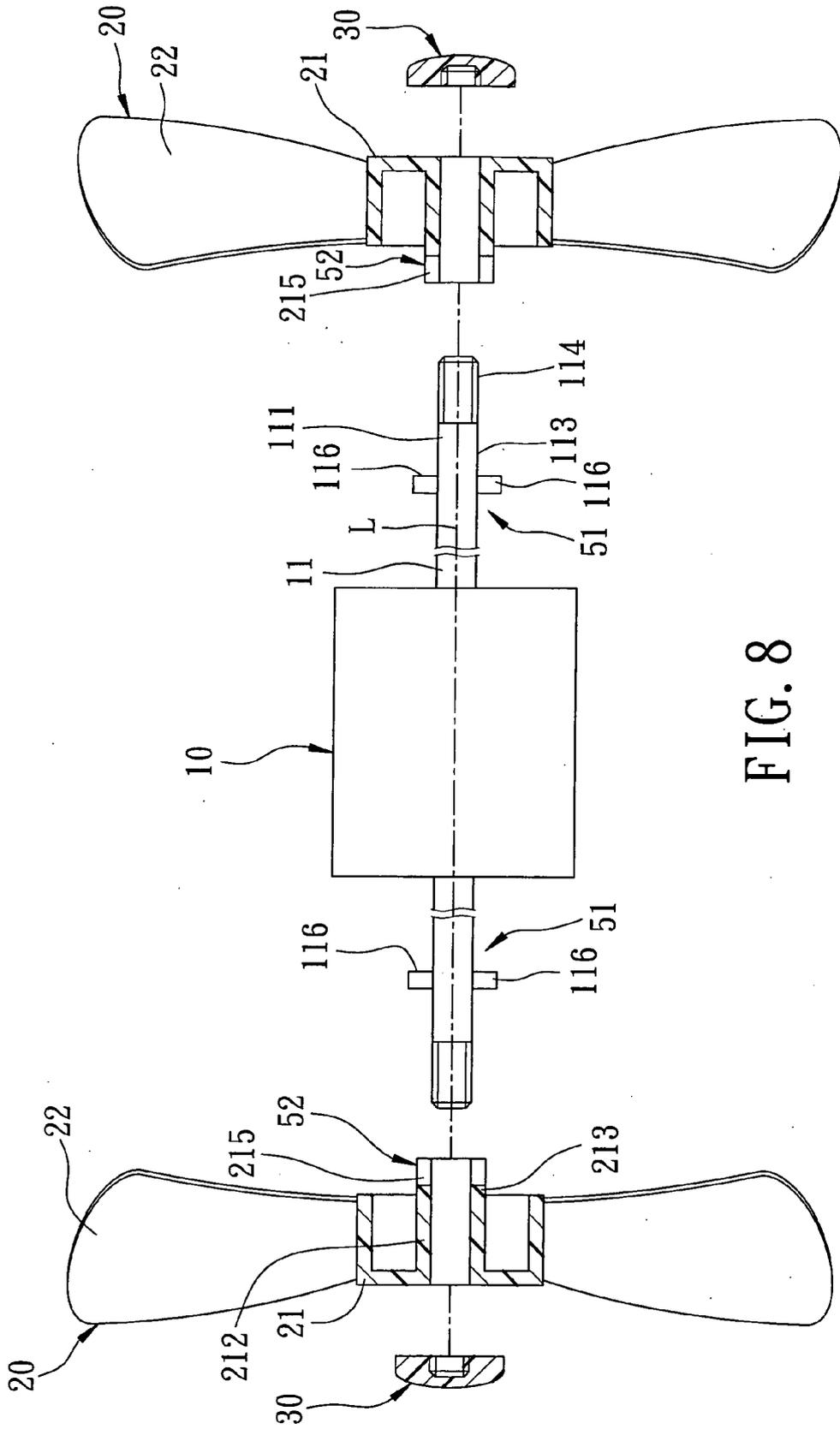


FIG. 8

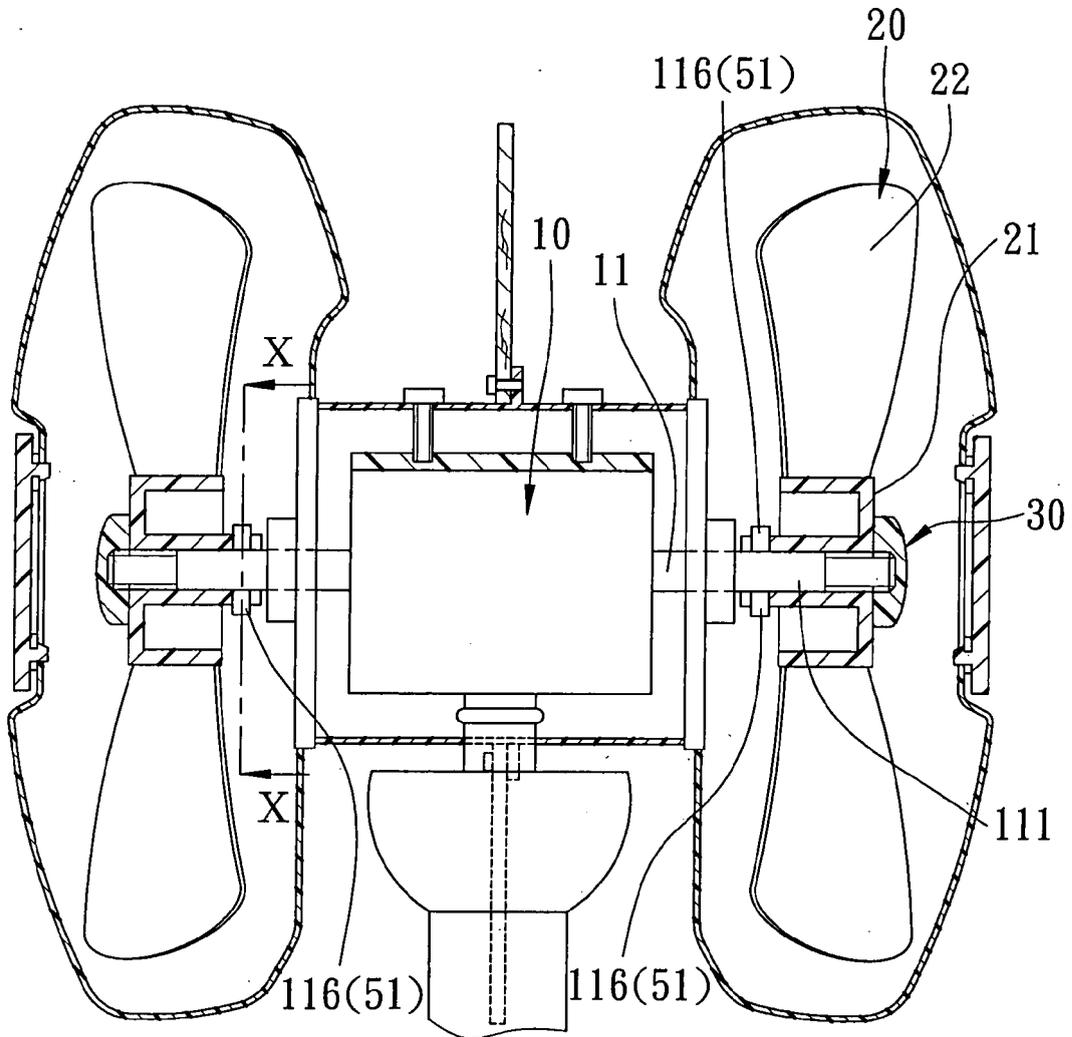


FIG. 9

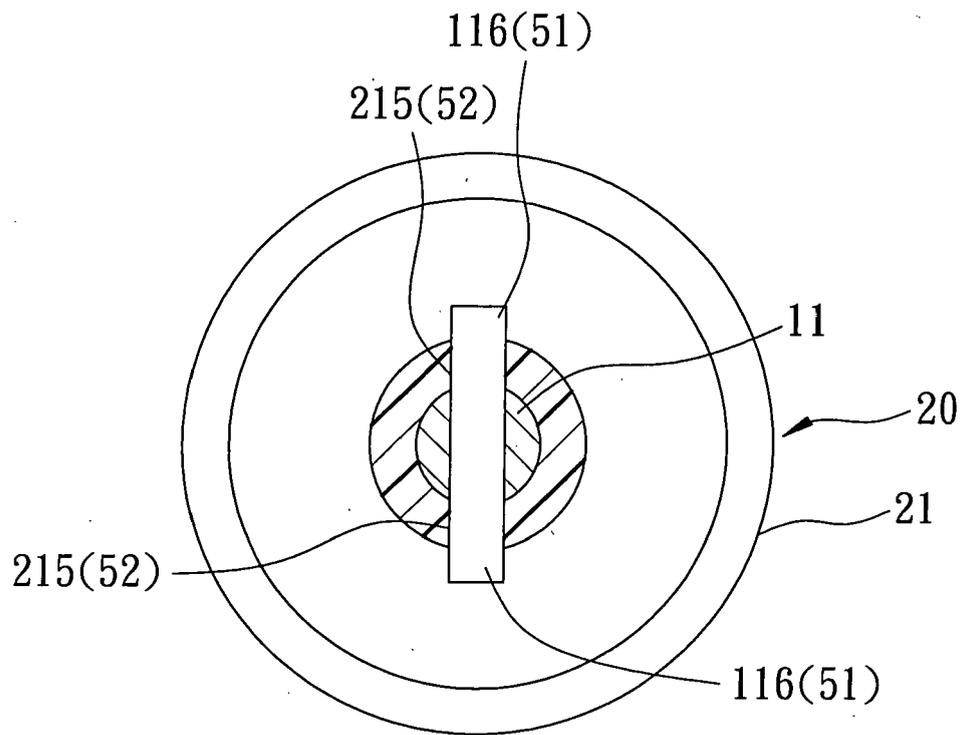


FIG. 10



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	GB 2 014 239 A (CHEN SHEAN-HUEI; LIN MU-KUEI) 22 August 1979 (1979-08-22) * the whole document *	1-5	INV. F04D29/26 F04D25/16
A	----- US 2 869 651 A (ROSE STANLEY E) 20 January 1959 (1959-01-20) * figure 3 *	2	
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A	----- US 2004/213687 A1 (CHENG CHUNG-YIN) 28 October 2004 (2004-10-28) -----		TECHNICAL FIELDS SEARCHED (IPC) F04D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 10 July 2006	Examiner Teerling, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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