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(54) Title: A CEILING FAN

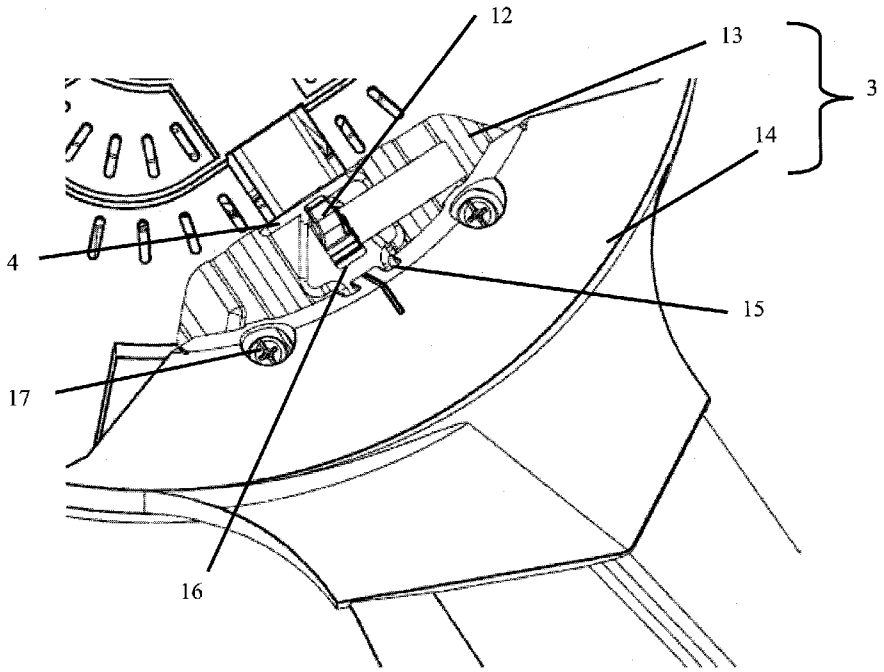

Figure 3

(57) Abstract: The present invention discloses a ceiling fan comprising: a stator (2) with an end supported on a ceiling; a rotor rotatably mounted to the stator (2); a plurality of elongate fan blades (3) extending radially from the rotor; and a blade mounting member (4) associated with each of the fan blades (4) for preventing a fan blade (21) that has broken to become totally detached from the rotor.

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A CEILING FAN

FIELD OF INVENTION

The invention relates generally to ceiling fan, and more particularly, to ceiling fans having safety means to prevent its fan blade to fall when a breakage occurs on root portion of the fan blade.

BACKGROUND OF THE INVENTION

Nowadays, ceiling fans are still well known as an efficient means for circulating air within home or buildings. Typically conventional ceiling fans comprise a number of fan blades rotate in relation to a motorized hub. The fan blade may fall if it is installed improperly or in some cases, broken fan blades and fall as a flying projectile. Even installation of the fan blades to the ceiling fan is ensure competently installed by manufacturers, there is always a risk of a failure resulting the fan blade falling from the ceiling fan.

Therefore, there is a need in the ceiling fan art for form of safety means to protect people from possibly becoming injured upon happening of the fan blade becoming separated from the ceiling fan assembly and increase peace of mind for owners having the ceiling fan. One form of such safety mean associated with the ceiling fan is illustrated in US 20040009064 A1. This particular prior art relates a ceiling fan comprising a plurality of fan blades, each positioned in a slot of a corresponding bracket attached to a rotatable hub. For each fan blade, a brace connects a mid-section of the fan blade to the corresponding bracket. The brace and bracket increase the support base of the fan blade. A brace mount is attached to the fan blade by screws to receive the brace. This modification requires extra screw hole made on the fan blade which in turn will weaken strength of the fan blade and increase probability of fan blade breakage. In addition, the brace does not provide any notification to user if the breakage occurs as the fan blades hold in place by the braces.

There are inadequacies in the current ceiling an art aimed at preventing the potential problem that could arise upon the unlikely event of a fan blade breaking or loosening from the rotating ceiling fan. Accordingly, the present invention is to provide a solution to overcomes the aforementioned inadequacies of the prior art.

Another object of the present invention is to provide a ceiling fan with a safety mounting member for holding the fan blade upon the unlikely event of the fan blade breaking or the fan blade becoming loose from the ceiling fan whereby any possible danger of the fan blade to fall will be eliminated and people will not be in danger of being injured.

Another object of the present invention is to provide a ceiling fan with a safety mounting member for use in a ceiling fan assembly, the ceiling fan assembly having a stator with an end supported on a ceiling; a rotor rotatably mounted about periphery of the stator; a plurality of protruding member protruded upwardly from the rotor; and a plurality of fan blades with a through hole each at about its root portion to receive the protruding member respectively for being connected radially from the rotor.

Another object of the present invention is to provide a ceiling fan with a safety mounting member having a design which can be readily utilized in the ceiling fan with minimal modification.

Another object of the present invention is to provide ceiling fan with a safety mounting members which can notification to user, if a breakage occurs on the fan blade.

The present invention is also to provide a ceiling fan with a safety mounting member which utilizes a minimal number of components and therefore economical to manufacture.

SUMMARY OF THE INVENTION

In one embodiment of the invention provides a ceiling fan comprising: a stator with an end supported on a ceiling; a rotor rotatably mounted to the stator; a plurality of elongate fan blades extending radially from the rotor; and a blade mounting member associated with each of the fan blades for preventing a fan blade that has broken to become totally detached from the rotor, wherein the blade mounting member comprises a first portion captively attached to the rotor and a second portion slidably attached to the fan blade, the second portion having an elongate slot closed at one end such that the broken fan blade slides along the slot in a direction away from the rotor until it is prevented from further movement by contact with the closed end of the slot.

The fan blade can further comprise at least one retaining member which is positioned within the elongate slot of the blade mounting member. The fan blade can be connected to the rotor by any fastening member. The rotor can include a plurality of protruding member extended upwardly from the rotor for positioning the fan blade.

Moreover, the blade mounting member can further comprise at least one free end bent around the first portion or second portion to prevent deformation of the blade mounting member. Preferably, the blade mounting member is made up of single wire rod.

Further, fan blades can include a frame portion which is attached with the rotor. The frame portion also can further comprise at least one retaining member which is positioned within the elongate slot of the blade mounting member.

The present invention consists of features and a combination of parts hereinafter fully described and illustrated in the accompanying drawings, it being understood that various changes in the details may be made without departing from the scope of the invention or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

To further clarify various aspects of some embodiments of the present invention, a more particular description of the invention will be rendered by references to specific embodiments thereof, which are illustrated in the appended drawings. It is appreciated that these drawings depict only typical embodiments of the invention and are therefore not to be considered limiting of its scope. The invention will be described and explained with additional specificity and detail through the accompanying drawings in which:

Figure 1 shows a side view of a ceiling fan.

Figure 2 shows a top view of a blade mounting member.

Figure 3 shows a detail cross sectional view of the mounting member provided in a fan blade of the ceiling fan.

Figure 4 shows a detail perspective view of a frame portion of the fan blade.

Figure 5 shows a side view of a state in which the fan blade is held by the mounting member when the fan blade is disconnected from a rotor of the ceiling fan during the ceiling fan rotates.

Figure 6 shows a side view of a state in which the fan blade is held by the mounting member when the fan blade is disconnected from a rotor of the ceiling fan during the ceiling fan stops.

DETAILED DESCRIPTION OF THE INVENTION

The invention relates generally to ceiling fan, and more particularly, to ceiling fans having safety means to prevent its fan blade to fall when a breakage occurs on root portion of the fan blade. A preferable embodiment of the invention is described below.

Referring to Figure 1, a ceiling fan constructed in accordance with the present invention is illustrated. The ceiling fan includes a motor which has a stationary portion or stator (2) and a rotor which is rotatably mounted to the stator. The stator (2) has an end supported on a ceiling (1). A plurality of elongate fan blades (3) is extending radially from the rotor so as to rotate with the rotor. The fan blade (3) is preferably made up of metal or any other material in any suitable shape. Referring to Figure 3, the fan blade (3) of the embodiment comprises generally rectangle shape of thin sheet metal with at least one bore which is provided on a root portion (13) of the fan blade (3). For example, two bores are provided in vicinity of both end and a bore is provided on middle part of width direction in the root portion (13) of the fan blade (3). The bores are provided for fastening purpose of the fan blade (3) to the rotor such that the fan blade is being extended radially from the rotor. It should be understood, the ceiling fan is not limited to that configuration only.

A through hole (16) is also provided on the root portion (13) of the fan blade (3). The through hole (16) can be provided separately from the bores of the fan blade (3). The through hole (16) is almost a rectangular hole which is positioned on middle part in width in the root portion (13) of the fan blade (3). It should be understood that shape and size of the through hole (16) is determined by shape and size of part of ceiling fan to be received.

The fan blade (3) further includes a corresponding of frame portion (14). The frame portion (14) may be made by plastic or other suitable material, an embodiment of which is illustrated in Figure 4. The embodiment pictured includes four corresponding frame portion (14) within four fan blades (3). The frame portion (14) can be attached to the rotor so as to rotate therewith. The frame portion (14) further includes at least

one retaining member (18, 19, 20), each being generally cylindrical in shape, corresponding to the bores through the root portion (13) of the fan blade (3). The embodiment pictured shows three retaining members (18, 19, 20) which are included two of the retaining members (19, 20) positioned near both ends of the frame portion (14) and the other retaining member (18) positioned almost central part of the frame portion (14).

Referring to Figure 3, a plurality of protruding member (12) of substantially L-shaped configuration is extending upwardly from a peripheral edge of the rotor. When fastening the fan blade (3) to the rotor, the protruding member (12) is inserted into the through hole (16) to hook the through hole (16) and to hold the fan blade (3) and therefore the fan blade (3) can be fastening to the rotor. A fastening member (17) such as screw extends through the bores and into the retaining members (18, 19, 20) to fix the frame portion (14) to the root portion (12) of the fan blade (3). The screw is then inserted into rotor for the root portion (12) of the fan blade (3) to be attached to the rotor in mounting state. Alternate fastening methods such as bolt and a nut threaded thereabout may be employed to fix the fan blade (3) to the rotor.

Figure 2 and 3 show a blade mounting member (4) associated with each of the fan blades (3) for preventing a fan blade that has broken to become totally detached from the rotor. The mounting member (4) consists of a piece of wire rod bent into a particular shape. The mounting member has a first portion (5) and second portion (6) and the second portion (6) is formed as a longer portion in length than the first portion (5). The first portion (5), intended to be secured to the protruding member (12) and the second portion (6) intended to hold the fan blade (3). The first portion (5) is defined by two unclose loops (7, 8). One of the unclose loops takes shape of a roughly rectangular loop (7) while the other takes shape almost of a triangular loop (8). The second portion (6) is defined by two long, generally straight, parallel sides, joined at their rear ends with a closed end (11) to form an elongate slot (10). Diameter of the rectangular and triangular loops (8) of the first portion (5) is selected to receive the protruding member (12) of the rotor. Diameter of the elongate slot (10) of the second portion (6) is selected to surround the central retaining member (18) of the frame

portion (14) via two slits (15) provided on the frame portion (14). The triangular loop (8) ends with a free end (9) bent around the rectangular loop (7) of the first portion (5) to prevent deformation of the mounting member (5). It will be understood, the mounting member (5) is not limited to that design only.

Besides that, the mounting member (4) has a clip function for fixing to the root portion (13) of the fan blade (3). The mounting member (4) is placed with upper and lower surface of the fan blade interposed by the wire rod. This feature allows improve efficiency during an assembly process. For example, the mounting member (4) is attached in a proper position for the fan blade at the time of factory shipment. When the ceiling fan is to be assembled, it is possible to carry out an assembling work without paying attention to the mounting member (4). Accordingly, it is possible to prevent the attachment of the mounting member (4) to be forgotten.

A variety of materials may be used in constructing the mounting member (4). In general, the material should be shaped easily and strong enough to hold the fan blade (3) from falls. Wire rods are especially effective, particularly because they provide a relatively inexpensive material for the mounting member.

During installation of the mounting member (4), the first portion (5) is disposed so that the protruding portion (12) hooks the first portion (5) with both rectangular (7) and triangular loops (8). The elongate slot (10) of second portion penetrates two slits (15) provided on the frame portion (14) and surrounds the central retaining member (18) provided by the frame portion (14) of the fan blade (3). When the fan blade (3) falls, weight of the fan blade (3) imposed on the mounting member (4) is then transmitted through the second portion (6) to the first portion (5). When the mounting member (4) tends to deform by bending the first portion (5), this will result the first portion (5) to open at its free end (9). But with the free end (9) bent around the rectangular loop (7) of the first portion (5), the free end will engage the rectangular loop (7) of first portion (5) to prevent the loop open in deformation of the mounting member (4).

Although the mounting member (4) with the design shown in Figure 2 has been described, it is possible to employ the mounting member in which one closed loop is provided. For example, a continuous length of wire has been bent or otherwise shape into a loop which extends laterally with its free end bent around the other end. The loop can be disposed so that the protruding portion (12) hooks the loop and penetrated the slits (15) of the frame portion (14) and surrounds the central retaining member (18) provided by the frame portion (14) of the fan blade (3).

The case in which the elongate slot (10) of the mounting member (4) is surrounded the central retaining member (18) has been described. However, the configuration of the retaining member (18) is not restricted to only this case. In the fan blade, it is preferably to provide a structure with which the elongate slot (10) of the mounting member can be surrounded and slidably attached to the fan blade (3). It is possible to employ various structures other than the retaining member (18) as described.

If for any reason one the fan blades (21) ceases to be attached to the rotor during operation of the ceiling fan, the broken fan blade (21) tends to move away from the rotating rotor of the ceiling fan. When the broken fan blade (21) direct away from the rotor, the broken fan blade (21) can be slide through the elongate slot (10) until the central retaining member (18) of the frame portion (14) is held by the closed end (11) of the second portion (6) from further sliding movement. Therefore, the fall of the broken fan blade (21) can be prevented. The mounting member (4) tries to hold the broken fan blade (21) in extend radially position. However, the root portion (13) of the broken fan blade (21) is disposed at a position outside the rotor while the other fan blades (3) remain attached to the rotor as shown in Figure 5. Rotating posture of the broken fan blade (21) can be brought into unstable state compared with other fan blades (3). This can provide notification for a user about the broken fan blade (21).

When the ceiling is stopped from operation, the broken fan blade (21) is suspended in an inclined position as shown in Figure 6. The user can clearly recognise the inclined fan blade as a broken fan blade (21).

Overall, the present invention advances the art of ceiling fan by providing one mounting member (4) to prevent the fan blade (3) from fall when the fan blade (3) detaches from the rotor in any reason. The mounting member (4) is universal to fit variety of commonly sized and shaped fan blade and ceiling fan, and provides minimal to no interference with normal operation of the fan blade (3). The mounting member (4) which is made of wire bent into a particular shape would employ a minimal construction of material in its structure. Further, the mounting member (4) holds the broken fan blade (21) in a state which can be provided notification for the user.

The present invention may be embodied in other specific forms without departing from its essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore indicated by the appended claims rather than by the foregoing description. All changes, which come within the meaning and range of equivalency of the claims, are to be embraced within their scope.

CLAIMS

1. A ceiling fan comprising:

a stator (2) with an end supported on a ceiling (1);

a rotor rotatably mounted to the stator (2);

a plurality of elongate fan blades (3) extending radially from the rotor; and

a blade mounting member (4) associated with at least one of the fan blades (3)for preventing a fan blade (21) that has broken to become totally detached from the rotor,

wherein the blade mounting member (4) comprises a first portion (5) captively attached to the rotor and a second portion (6) slidably attached to the fan blade (3), the second portion (6) having an elongate slot (10) closed at one end (11) such that the broken fan blade (21) slides along the slot (10) in a direction away from the rotor until it is prevented from further movement by contact with the closed end (11) of the slot (10).

2. A ceiling fan according to claim 1, wherein the fan blade (3) further comprises at least one retaining member (18) which is positioned within the elongate slot (10) of the blade mounting member (4).

3. A ceiling fan according to claim 1, wherein the fan blades include a frame portion (14) which is attached with the rotor.

4. A ceiling fan according to claim 3, wherein the frame portion (14) further comprises at least one retaining member (18) which is positioned within the elongate slot (10) of the blade mounting member (4).

5. A ceiling fan according to any one of claims 1 to 4, wherein the blade mounting member (4) further comprises at least one free end (9) bent around the first portion (5) or second portion (6) to prevent deformation of the blade mounting member (4).

6. A ceiling fan according to any one of claims 1 to 5, wherein the blade mounting member (4) is made up of single wire rod.

7. A ceiling fan according to any one of claims 1 to 6, wherein the fan blade (3) is connected to the rotor by any fastening member (17).

8. A ceiling fan according to any one of claims 1 to 7, wherein the rotor includes a plurality of protruding member (12) extended upwardly from the rotor for positioning the fan blade (3).

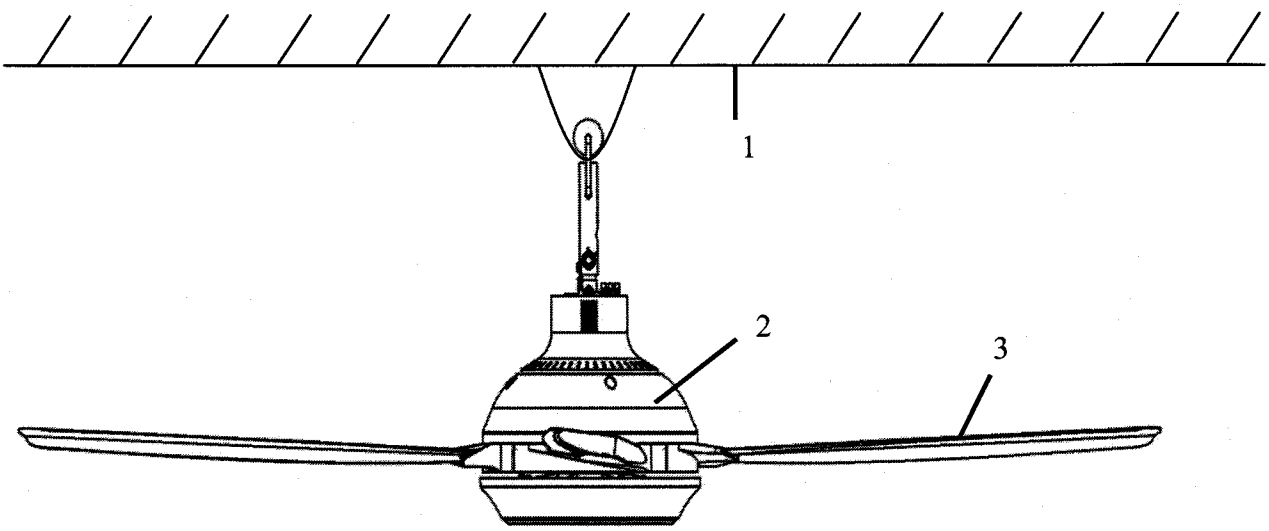

Figure 1

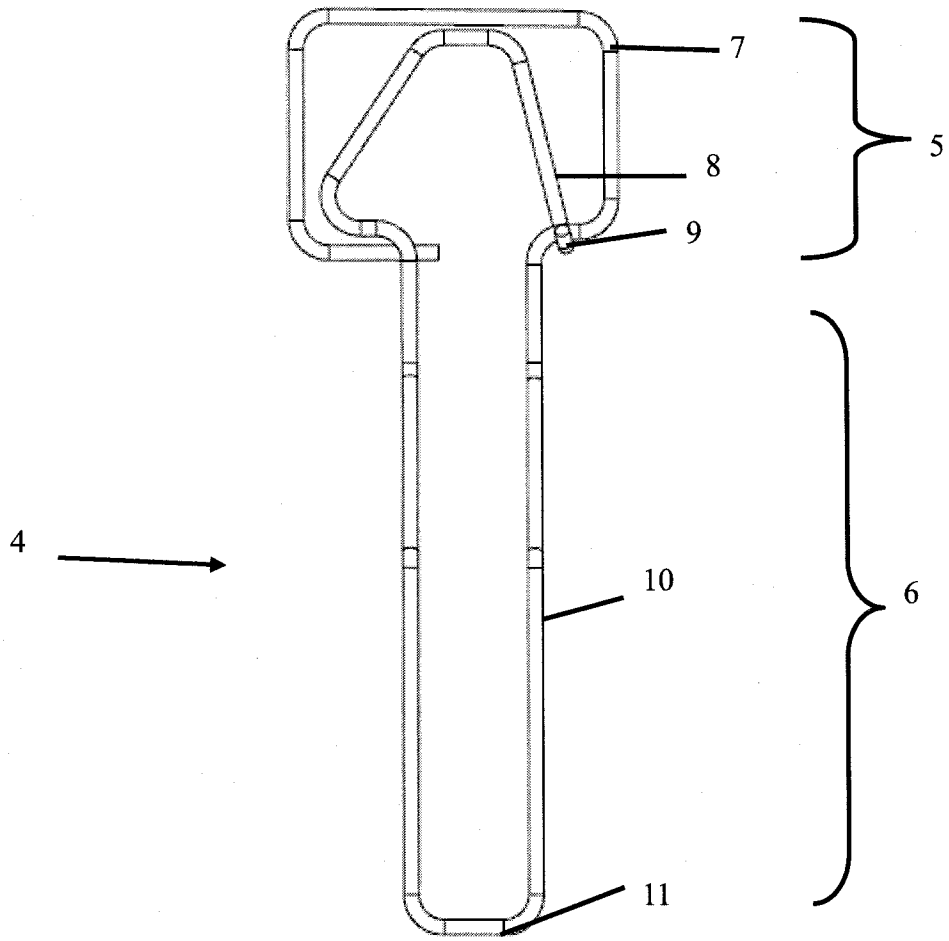

Figure 2

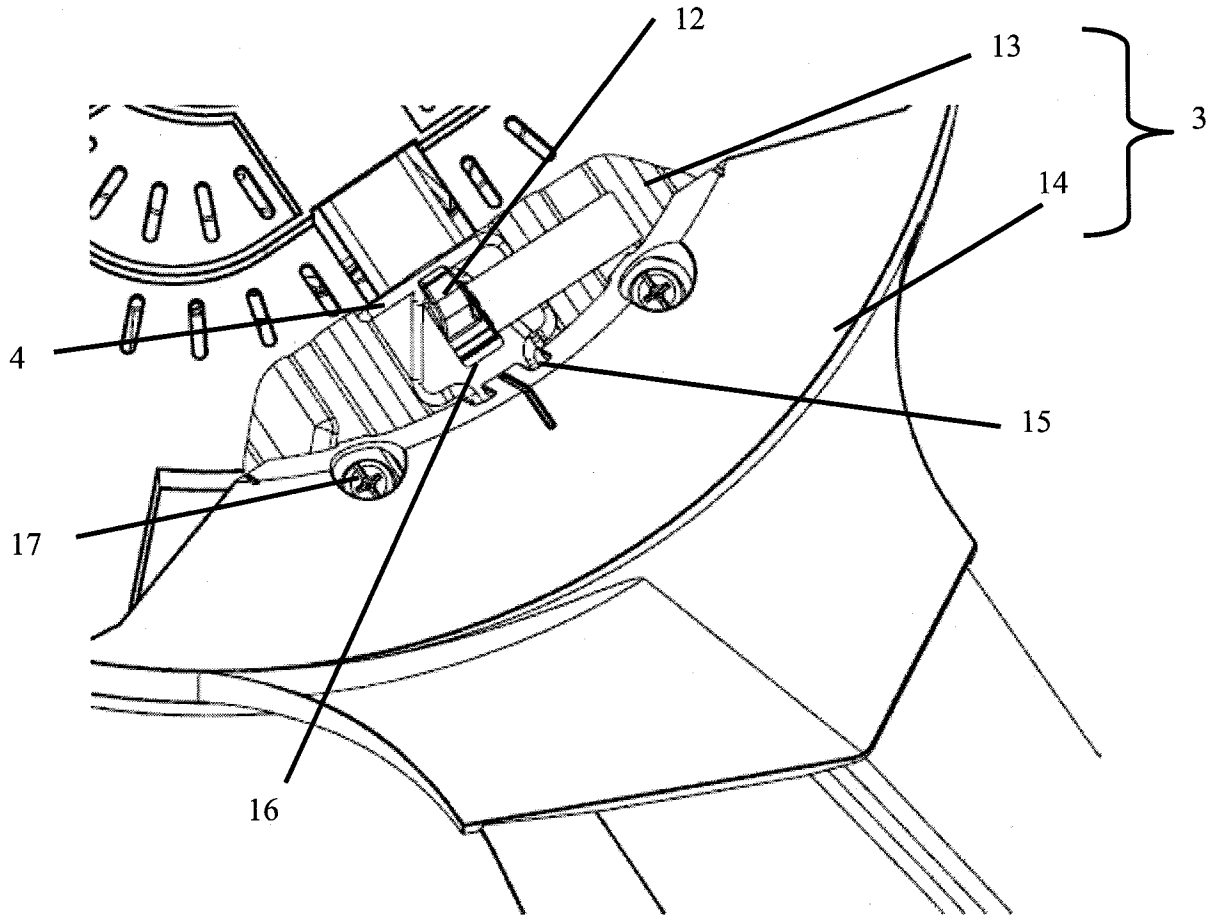

Figure 3

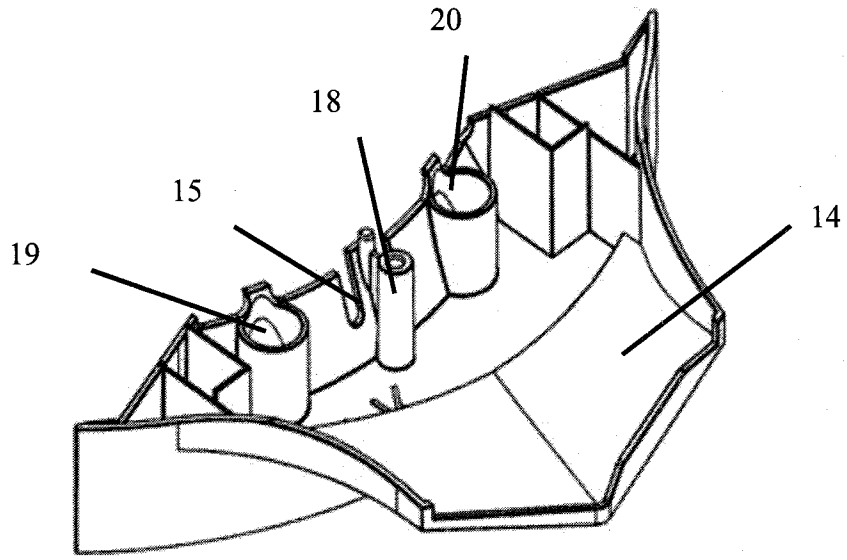

Figure 4

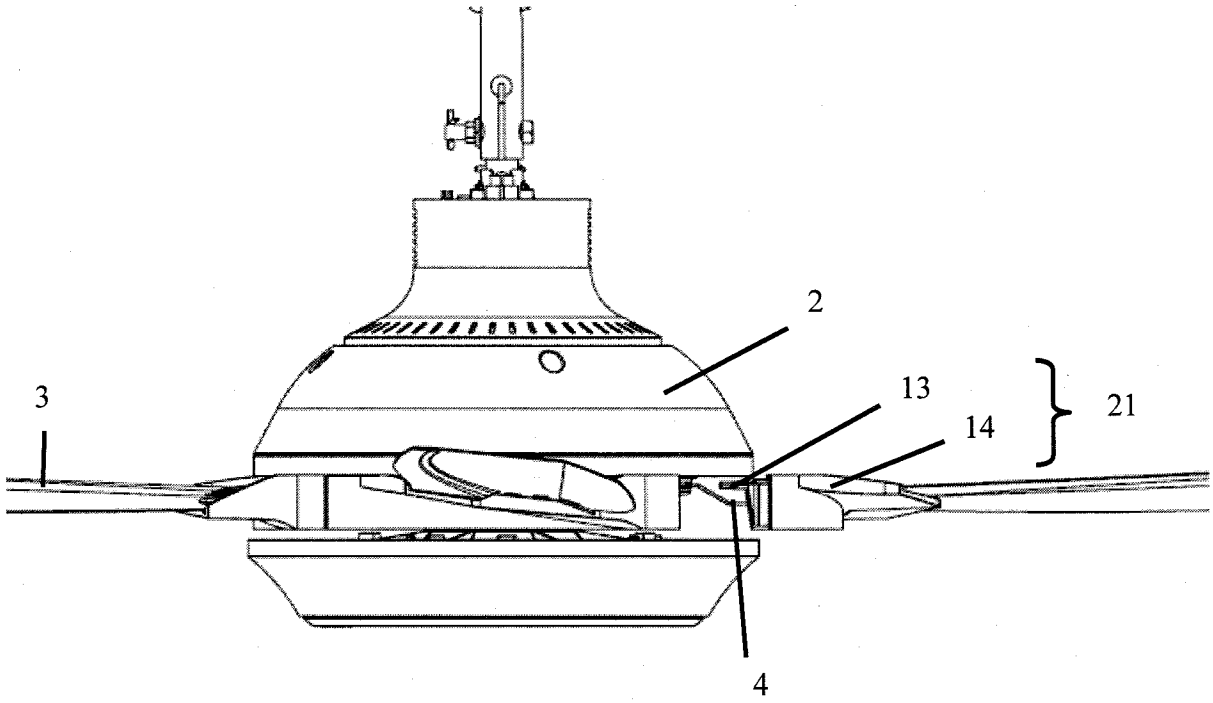

Figure 5

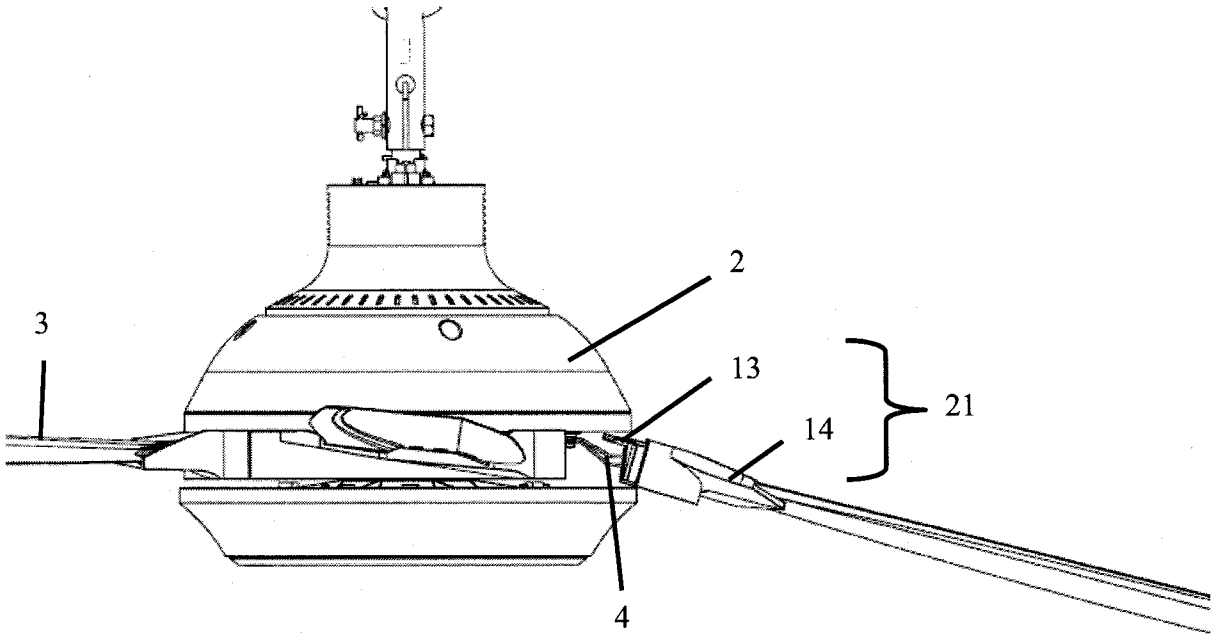

Figure 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/MY2016/050028

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. F04D25/08(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)

Int.Cl. F04D25/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2016
Registered utility model specifications of Japan 1996-2016
Published registered utility model applications of Japan 1994-2016

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 2010/0129225 A1 (ITOU,Shigeo) 2010.05.27, Paragraphs [0069] to [0080],Figs.8 to 12 & WO 2009/019838 A1	1-4,7-8 5-6
Y	US 6619919 B2 (KERR,Jack Russell Jr.) 2003.09.16, column 3,line 48 to column 5,line 47 & CA 2418463 A1	5-6

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

☐ 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

"E" earlier application or patent but published on or after the international filing date

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"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

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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
09.08.2016	16.08.2016

Name and mailing address of the ISA/JP	Authorized officer	
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