

FAN OSCILLATING MECHANISM AND CEILING FAN USING THE SAME

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a fan oscillating mechanism and a ceiling fan using the same, and more particularly to a fan oscillating mechanism which is adaptable to conventional electric fan and enables the airflow direction of the fan to be adjusted as desired.

Description of Related Art

In the conventional oscillating mechanism of an electric fan, the speed reduction mechanism is driven by the motor of fan blade, and is connected to one end of a connecting rod, while the other end of the connecting rod is connected to the fan casing or base. In this way, the conventional oscillating mechanism of electric fan is driven indirectly by the fan motor to oscillate.

Please refer to Figure 1 which schematically shows the conventional oscillating mechanism of electric fan. As shown in the figure, a worm

gear 111 meshed with a worm wheel 12 is disposed at the tail end of a primary driving shaft 11 of the fan. A reduction gear unit formed by two gears 13, 14 is operatively coupled to the lower end of the worm wheel 12. The gear 14 has a shaft 15 connected pivotally to one end of a crank plate 16. The other end of the crank plate 16 is connected pivotally to one end of a connecting rod 17. The other end of the connecting rod 17 is connected pivotally to a driving element 171 received in a slot 181 of the casing 18.

The operation of the afore-mentioned conventional oscillating mechanism will be described as follow. Firstly, the fan rotates and the primary driving shaft 11 of the fan drives the speed reduction mechanism formed by the worm gear 111, the worm wheel 12, and the gears 13, 14 of the reduction gear unit. Then, the shaft 15 of the gear 14 moves the crank plate 16 which in turn moves the connecting rod 17. Finally, the driving element 171 moves the casing 18 to oscillate.

However, the oscillation angle of the conventional oscillating mechanism can not be adjusted. If an external force is imposed to vary the oscillation angle of oscillation, potential risks such as the collapse of the gear tooth, fracture of the connecting rod or driving elements might occur.

SUMMARY OF THE INVENTION

The primary object of the present invention is to provide a fan oscillating mechanism and a ceiling fan using the same, which make use of a clutch member for adjusting the oscillation angle of the fan according to users' need, so that undesired damage of the interior mechanisms or motor due to inappropriate rotation can be avoided .

In order to achieve the above and other objects, the fan oscillating mechanism according to a preferred embodiment of the present invention comprises a motor transmission mechanism, a spindle link, a fan suspension tube, and a clutch member. The motor transmission mechanism includes a motor having a driving shaft, a crank plate having one end connected pivotally to the driving shaft, and a connecting rod having a first end connected pivotally to the other end of the crank plate, and a second end. The spindle link includes a head end connected pivotally to the second end of the connecting rod, and a tail end. The fan suspension tube includes a top end connected to the tail end of the spindle link and a bottom end connected to a fan device. The clutch member includes a wave washer disposed between the spindle link and the fan suspension tube to provide rotational resistance. Furthermore,

the clutch member can be formed by clutch lining, dampers or electromagnetic clutch device to achieve its clutch function.

When the motor is actuated, the driving shaft rotates the crank plate to move the connecting rod so as to rotate the spindle link. As the rotating torque induced by the spindle link is smaller than the rotational resistance of the clutch member, the spindle link may move the fan suspension tube. This is the normal operating state in which the oscillation of the fan is actuated by the motor. On the other hand, when the fan suspension tube is subjected to an external rotational force which is greater than the rotational resistance of the clutch member, the fan suspension tube runs free. In other words, when a user applies an external rotational force which is greater than the rotational resistance of the clutch member, the oscillation angle can be changed as desired, while the other members except the fan suspension tube will not rotate or shift following this change so that undesired damage of the mechanism or motor due to inappropriately applied external force can be precluded efficiently. Further, as the motor is designed not to make reverse rotation and can operate continuously, the service life of the motor is prolonged.

Preferably, the clutch member of the present invention may comprises two wave washers and two flat washers with the two wave washers disposed between the two flat washers, and the clutch member is

fitted on the outside of the spindle link. In this manner, the clutch member of the present invention which is formed of two wave washers and two flat washers is simple in construction and low in cost. Further, the rotational resistance of the clutch member can be adjusted as desired by simply changing the quantity or the specification of the wave washer and the flat washer.

Furthermore, the second end of the connecting rod in the present invention has an oval shape slot, and the end face of the head end of the spindle link is provided with an axially extending raised post at one side thereof. The raised post is fitted with a sleeve thereon and received in the oval shape slot along with the sleeve in such a manner that the sleeve is rotatable with respect to the raised post. In this way, as the connecting rod of the present invention has an oval shape slot to provide spaces for rotation and displacement during operation and also owing to the assistance of the sleeve, the connecting rod and the spindle link can have smooth operation without interference occurred therebetween so that the service life can be significantly extended. Moreover, the oval shape slot requires lesser labor force and material than its conventional circular counterpart, and provides an extended permissible tolerance range. Therefore, damage due to assembly error is avoided. However, as compared with a circular slot, the oval shape slot may cause the oscillation of the fan device to lag behind by a few seconds, and the fan

device is prone to vibrate.

Therefore, the present invention may adopt the oval shape slot or circular slot in the preferred embodiment. However, the present invention is not limited to the oval or circular slot. Slots having other shapes such as rectangular shape, curved shape, polygonal shape and the like can also be adapted in the present invention.

Further, a transverse cut-out is provided at one side of the head end of the spindle link, which is provided to prevent interference between the elements during operation and effectively reduce the volume occupied by the entire elements. Likewise, the design of the cut-out of the present invention can save material, reduce labor cost, extend the tolerance range so that damage caused by assembly error is reduced.

Moreover, the present invention comprises two wave washers, two flat washers and a fixing device. The first end of the connecting rod is held between the two wave washers and then the two flat washers are respectively disposed on the upper side and the lower side of the two wave washers. The fixing device is to maintain the connecting rod being held between the two wave washers. The fixing device can be a locking screw which penetrates through the two wave washers, the two flat washers, and the first end of the connecting rod, and is threaded or

fixed to the other end of the crank plate. In this way, the arrangement of the wave washers and the flat washers in the present invention can provide sufficient cushion and connection tolerance between the connecting rod and the crank plate so that the service life of the components is prolonged. Besides, the extension in tolerance range facilitates the assembly of the elements.

Moreover, the present invention comprises a motor base and a spindle base. The motor can be mounted on the motor base and the spindle base can be fixed to the motor base. The spindle base includes a bearing collar through which the spindle link penetrates and connects to the top end of the fan suspension tube. The spindle base can be a U shaped base, and two limiting screws are screwed onto the surface of the base plate of the spindle base. A stop block extends radially outwards from the end face of the head end of the spindle link and the stop block, and can reciprocate between the two limiting screws along with the rotation of the spindle link. In this way, when the spindle link rotates to move the stop block to urge against one of the two limiting screws, the driving shaft of the motor discontinues its rotation and revolves to cause the fan to revolve and in turn to oscillate in cycle. In this manner, the two limiting screws can be used to limit the oscillation range of the fan.

Furthermore, the tail end of the spindle link in the present invention has an external thread provided thereon, while the top end of the fan

suspension tube has an inner thread provided thereon. The inner thread on the top end of the fan suspension tube is to be engaged with the external thread on the tail end of the spindle link and the clutch member is held therebetween in such a manner that the fan suspension tube and spindle link are not fully fastened with each other so as to achieve free rotation relative to each other.

Moreover, the fan suspension tube in the present invention has a baffle plate provided on its top end, while one of the two limiting screws is a longer screw which penetrates through the base plate of the spindle base and has an abutting segment protruding downwards. When the fan suspension tube is in an idling state, the abutting segment stops the baffle plate from rotating beyond 360 degrees and breaking the wire. What is more, the fan suspension tube in threading with the spindle link can also be prevented from over-rotation which may result in the loosening and falling off of the suspension tube.

BRIEF DESCRIPTION OF THE DRAWINGS

The structure and the technical means adopted by the present invention to achieve the above and other objects can be best understood by referring to the following detailed description of the preferred embodiments and the accompanying drawings, wherein

FIG. 1 is a schematic view showing a conventional fan oscillating mechanism;

FIG. 2 is an exploded view of an embodiment of the present invention;

FIG. 3 is a perspective view of an embodiment of the present invention; and

FIG. 4 is a perspective view of an embodiment of of the present invention as viewed from another direction.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

With reference to the accompanying drawings, FIG. 2 is an exploded view of the fan oscillating mechanism according to a embodiment of the present invention; FIG. 3 is a perspective view of the fan oscillating mechanism of the present invention; and FIG. 4 is a perspective view of the fan oscillating mechanism according to the present invention as viewed from another direction. The following embodiments are given using the ceiling fan as an implement example. However, the present invention is not restricted to the ceiling fan, some other fans which include an oscillating mechanism therein such as the desk fan, standing

fan or hanging fan are also within the realm of the present invention.

As shown in the figures, a motor 2 comprises a driving shaft 21 through which the motor output the rotating torque. The motor 2 is fixed on a motor base 22 which can be attached to the wall or the ceiling, depending on the installation site desired. The driving shaft 21 of the motor 2 is connected pivotally to one end of a crank plate 3, while the other end of the crank plate 3 is connected pivotally to a first end 41 of a connecting rod 4. In this embodiment, the first end 41 of the connecting rod 4 is held between two wave washers 31, and two flat washers 32 are respectively disposed on the upper side and lower side of the two respective wave washers 31. A locking screw 33 is provided to penetrate through the two wave washers 31, the two flat washers 32, and the first end 41 of the connecting rod 4, and is threaded to the other end of the crank plate 3 so that the first end 41 of the connecting rod 4 is pivotally connected with the locking screw 33. In this way, the arrangement of the wave washers 31 and the flat washers 32 provides sufficient cushion and connection tolerance between the connecting rod 4 and the crank plate 3 so that the service life of the components is prolonged. Besides, the extension of the tolerance range facilitates the convenient assembly.

Furthermore, a second end 42 of the connecting rod 4 is connected

pivotal to a head end 51 of a spindle link 5. The second end 42 of the connecting rod 4 has a slot 421. The end face 510 of the head end 51 of the spindle link 5 is provided with an axially extending raised post 511 at one side thereof. The raised post 511 is fitted with a sleeve 422 thereon and placed in the slot 421 along with the sleeve 422 in such a manner that the sleeve 422 is rotatable with respect to the raised post 511.

The slot 421 located at the second end 42 of the connecting rod 4 according to the present embodiment can be an oval shape slot. The slot 421 provides spaces for rotation and displacement during operation. Moreover, with the assistance of the sleeve 422, there is smooth operation between the connecting rod 4 and the spindle link 5 without interference occurred therebetween. Therefore, the service life of the elements is significantly extended. The slot 421 in oval shape requires lesser labor force and material than its conventional circular counterparts. Furthermore, as the tolerance range of the slot is extended, damage due to assembly error is reduced.

As compared with a circular slot, the oval shape slot may cause the oscillation of the fan device to lag behind by a few seconds, and the fan device is prone to vibrate. To inhibit the vibration of the fan device, the slot 421 located at the second end 42 of the connecting rod 4 could be the conventional circular slot, so as to meet users' different demands.

At the side of the end face of the head end 51 of the spindle link 5 opposite to the side where the raised post 511 is located, a cut-out 512 is provided. The cut-out 512 serves to reduce the spaces between the elements thus preventing interference between the elements. Specifically, when the motor 2 rotates, the flat washers 32 below the crank plate 3 and the connecting rod 4 will interfere with the head end 51 of the spindle link 5. The cut-out 512 can effectively avoid such interference from happening. Likewise, the design of the cut-out 512 can save material, reduce labor cost, and extend the tolerance range. Consequently, interference due to assembly error can be avoided.

As shown in FIGS. 2 and 3, a bearing collar 531 is mounted on a spindle base 53 which is fixed on the motor base 2. The spindle link 5 passes through the bearing collar 531. A stop block 54 extends radially outwards from the end face 510 of the head end 51 of the spindle link 5, at a location in proximity to the raised post 511. In this embodiment, the spindle base 53 is a U shaped base, and two limiting screws 533 are screwed onto the upper surface 532 of the base plate 530. The stop block 54 provided on the head end 51 of the spindle link 5 reciprocates between the two limiting screws 533 along with the rotation of the spindle link 5. In this way, when the spindle link 5 rotates to move the stop block 54 to urge against one of the two limiting screws 533, the driving shaft 21 of the motor 2 revolves to cause the fan to rotate and in

turn to oscillate in cycle. That is to say, the two limiting screws 533 are used to limit the rotation range of the spindle link 5, i.e., the oscillation angle of the fan, which is set to be 110 degrees in this embodiment.

Further, the spindle link 5 is connected in series with a clutch member 7 and a tail end 52 of the spindle link 5 is connected to a fan suspension tube 6. In this embodiment, the clutch member 7 includes two wave washers 71 and two flat washers 72. The two wave washers 71 are disposed between the two flat washers 72. The clutch member 7 is fitted on the spindle link 5. In this manner, the clutch member 7 of this embodiment which is formed of two wave washers 71 and two flat washers 72 is simple in construction and low in cost. Besides, the rotational resistance of the clutch member 7 can be adjusted as desired by simply changing the quantity or the specification of the wave washer 71 and the flat washer 72.

Referring back to FIG. 2, in this embodiment, the tail end 52 of the spindle link 5 has an external thread 520 provided thereon, while the top end 61 of the fan suspension tube 6 has an inner thread 610 provided thereon. The inner thread 610 on the top end 61 of the fan suspension tube 6 is to be engaged with the external thread 520 on the tail end 52 of the spindle link 5. Moreover, one of the two limiting screws 533 is a longer screw 534 which extends through the base plate 530 of the spindle

base 53 and has an abutting segment 535 that protrudes downwards. In addition, a baffle plate 611 is provided on the top end 61 of the fan suspension tube 6. The baffle plate 611 is designed to be stopped by the abutting segment 535 so as not to rotate beyond 360 degrees. When the fan suspension tube 6 is in a free state, the abutting segment 535 stops the baffle plate 611 from rotating beyond 360 degrees and breaking the wire. Furthermore, the connected fan suspension tube 6 is precluded from over-rotation and subsequently loosening and falling off. As to a tail end 62 of the fan suspension tube 6, it is connected to a fan device 8.

The operation of this embodiment is detailed as follows. As the clutch member 7 is formed of the wave washers 71 and the flat washers 72, a rotational resistance is provided. When the motor 2 is actuated, the driving shaft 21 rotates the crank plate 3 to move the connecting rod 4 so as to rotate the spindle link 5. However, as the rotating torque induced by the spindle link 5 is smaller than the rotational resistance of the clutch member 7 in magnitude, the fan suspension tube 6 is moved by the spindle link 5 so as to facilitate the oscillation of the fan device 8. This is the normal operating state in which the oscillation of the fan device 8 is actuated by the motor 2. On the other hand, when it is desired to adjust the orientation of the fan device 8, an external rotational force is applied onto the fan device 8. When the external rotational force is greater than the rotational resistance of the clutch member 7, the fan suspension tube 6

runs free and the oscillation angle can be freely adjusted as desired. In this manner, due to the provision of the clutch member 7, the oscillation angle of the fan can be adjusted at the user's will. In addition, the damage to the oscillating mechanism or the motor resulting from inappropriately applied external force can be effectively precluded.

While the present invention has been described and illustrated by the above embodiments and accompanying drawings, it is to be understood that this invention is not limited to these embodiments. The scope of this invention is defined by the appended claims.

WHAT IS CLAIMED IS:

1. A fan oscillating mechanism, comprising:
 - a motor having a driving shaft;
 - a crank plate having one end connected pivotally to said driving shaft;
 - a connecting rod having a first end connected pivotally to the other end of said crank plate, and a second end;
 - a spindle link having a head end connected pivotally to said second end of said connecting rod, and a tail end;
 - a fan suspension tube having a top end connected to said tail end of said spindle link, and a bottom end connected to a fan device; and
 - a clutch member having at least one wave washer disposed between said spindle link and said fan suspension tube;

wherein said clutch member provides a rotational resistance such that when said motor is actuated, said driving shaft rotates said crank plate to move said connecting rod to rotate said spindle link, whereby said spindle link induces a rotating torque that is smaller than said rotational resistance of said clutch member, and thus the spindle link moves said fan suspension tube to rotate; and when said fan suspension tube is subjected to an external rotational force greater than said rotational resistance of said clutch member, said fan suspension tube runs free.

2. The fan oscillating mechanism as claimed in claim 1, wherein said clutch member includes two wave washers and two flat washers, said two wave washers being disposed between said two flat washers; said clutch member being fitted on said spindle link.
3. The fan oscillating mechanism as claimed in claim 1, wherein said head end of said spindle link is provided with a transverse cut-out at one side of an end face thereof.
4. The fan oscillating mechanism as claimed in claim 1, further comprising two wave washers, two flat washers, and one locking screw, said first end of said connecting rod being held between said two wave washers; said two flat washers being respectively disposed on the upper side and the lower side of said two wave washers; said locking screw is disposed to penetrate through said two wave washers, said two flat washers and said first end of said connecting rod and is screwed onto the other end of said crank plate.
5. The fan oscillating mechanism as claimed in claim 1, further comprising a motor base on which said motor is mounted, and a spindle base fixed to said motor base; said spindle base including a bearing collar through which said spindle link penetrates and connects to said top end of

said fan suspension tube.

6. The fan oscillating mechanism as claimed in claim 5, wherein said spindle base is a U shaped base having a base plate, two limiting screws being screwed onto the upper surface of the base plate; a stop block is transversely disposed on the end face of said head end of said spindle link and is arranged to reciprocate between said two limiting screws along with the rotation of said spindle link.

7. The fan oscillating mechanism as claimed in claim 6, wherein said fan suspension tube has a baffle plate provided on the top, and one of said two limiting screws is a longer screw extending through said base plate of said spindle base, said longer screw has a downwardly protruding abutting segment configured to stop said baffle plate from rotating beyond 360 degrees when said fan suspension tube is in a free state.

8. A ceiling fan, comprising:

- a motor transmission mechanism;

- a clutch member connecting to a fan suspension tube; and

- a spindle link coupling said motor transmission mechanism with said clutch member;

wherein said clutch member provides a rotational resistance; when said motor is actuated, said driving shaft rotates said crank plate to move

said connecting rod so as to rotate said spindle link, whereby said spindle link induces a rotating torque that is smaller than said rotational resistance of said clutch member; and thus the spindle link moves said fan suspension tube to rotate; when said fan suspension tube is subjected to an external rotational force greater than said rotational resistance of said clutch member, said fan suspension tube runs free.

9. The ceiling fan as claimed in claim 8, wherein said clutch member includes at least one wave washer disposed between said spindle link and said fan suspension tube.