

## **CEILING FAN**

### **TECHNICAL FIELD**

This invention relates to a ceiling fan having a cover which is one-piece,  
5 being attached to bottom of fan housing, more especially, one that is  
capable of being remotely controlled.

### **BACKGROUND ART**

US 8770949 B2 discloses a ceiling fan which comprises: a fan motor and  
10 blade assembly, a mounting tube for suspending the fan motor and blade  
assembly from a ceiling, and a power supply mounted within the mounting  
tube configured to power the fan motor. Also disclosed is a ceiling fan  
which comprises: a totally enclosed safety extra low voltage fan motor  
assembly configured to be suspended from an upper side, and a sealing  
15 arrangement, which comprises a lower cover with centrally located Infra-  
Red LED lens, fitting tightly to the lower edges of the blades, within the  
assembly, providing a substantial degree of ingress protection against dust  
and water incident from at least an under side.

JPA-10-306792 discloses remote controller for a ceiling fan which  
20 comprises: a motor controllable by an optical light, being accommodated in  
ceiling fan housing; a light receiving unit which has a light receiver, being  
disposed at the bottom of the motor, wherein said receiver is disposed at  
the centre of the receiving unit; a cover being attached to the bottom of the  
housing, wherein said cover comprises three parts, each being fitted to  
25 another one, to form a convex surface for converging light initiated from a  
remote control unit, which passes through the cover and travels to the  
centre of the receiving unit where the receiver is located.

The cover consisting of a plurality of parts, as disclosed in above-  
mentioned patent has a number of drawbacks. The cover is taking up  
30 more time for assembly. Combination of the constituent parts generates  
visible part lines, rendering appearance of the ceiling fan less streamlined.

Vibration occurs when the fan is in operation. The vibration causes noise, and the parts loosen after the fan operates for an extended period. As for other remotely-controlled ceiling fan whose bottom wall of the cover is planar and of consistent thickness, control signals initiated from a remote  
 5 controller unit fail to pass through the wall and reach the receiving unit, when the unit is located at some oblique angles from the fan.

### **SUMMARY OF THE INVENTION**

According to the invention, the drawbacks are overcome and  
 10 improvements are achieved.

One aspect of the invention provides a ceiling fan which comprises: a connecting unit configured to attach a fan housing to ceiling; a motor being accommodated in the housing; a plurality of blades extending radially from periphery of the motor, capable of being rotated by the motor; a cover,  
 15 being one-piece and attached to bottom of the housing; and a receiver being disposed adjacent the cover, for receiving a control signal; wherein one portion of the cover is thinner than the remaining portion of the cover, such that the signal is capable of passing through and reaching the receiver.

20 Advantageously, the cover comprises a gate portion being disposed adjacent the thinner portion, allowing injection of a molten material into mould cavity during injection moulding process for fabrication of the cover.

One aspect of the invention provides a ceiling fan which comprises: a connecting unit configured to attach a fan housing to ceiling; a motor being  
 25 accommodated in the housing; a plurality of blades extending radially from periphery of the motor, capable of being rotated by the motor; a cover, being one-piece and attached to bottom of the housing, wherein one portion of the cover is thinner than the remaining portion of the cover, and a gate portion is disposed adjacent the thinner portion, allowing injection of  
 30 a molten material into mould cavity during injection moulding process for fabrication of the cover; and a receiver being disposed in a way such that

a control signal is capable of passing through the cover and reaching the receiver.

Preferably, the thinner portion is non-opaque.

Advantageously, the cover is translucent.

- 5 Preferably, the cover is made of a translucent resin.

Advantageously, the ceiling fan further comprises a controller to control the motor in accordance with signals received.

Preferably, the signal is an optical signal initiated from a remote controller.

- Advantageously, the cover further comprises at least one hollow protrusion  
10 for accommodating a light indicator such that light emitted from the indicator concentrates on area enclosed by the protrusion.

Preferably, the cover has at least one perforation being disposed adjacent the thinner portion, opposing the edge of the thinner portion where the gate portion is disposed.

- 15 Advantageously, the perforation, the thinner portion, and the gate portion of the cover, are disposed in a row.

Preferably, internal surface of the cover comprises at least one fastener to attach the cover to the bottom of the housing.

Advantageously, at least one portion of the cover is opaque.

- 20 Preferably, peripheral portion of the cover is opaque.

Advantageously, one portion of the cover, encircling the point where the indicator faces, is opaque.

Preferably, the portion is made opaque by applying an opaque layer.

Advantageously, the cover is curved and/or flat.

- 25 One aspect of the invention provides a ceiling fan which comprises: a connecting unit configured to attach a fan housing to ceiling; a motor being accommodated in the housing; a plurality of blades extending radially from periphery of the motor, capable of being rotated by the motor; a cover,

being one-piece and attached to bottom of the housing; and a receiver being disposed in a way such that a control signal is capable of passing through the cover and reaching the receiver.

5 The 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 invention.

## 10 **BRIEF DESCRIPTION OF THE DRAWINGS**

To further clarify various aspects of some embodiments of the 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  
15 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:

Fig. 1 is a perspective view of a ceiling fan comprising first embodiment of  
20 cover, according to the invention, attached to bottom of fan housing;

Fig. 2 is a cross-sectional view of the housing having said first embodiment of the cover attached to the bottom of the housing;

Fig. 3 is a perspective view of the first embodiment of the cover;

Fig. 4 is top view of the first embodiment of the cover;

25 Fig. 5 is another perspective view of the first embodiment of the cover;

Fig. 6 is bottom view of the first embodiment of the cover;

Fig. 7 is a cross-sectional view of the housing having second embodiment of cover, according to the invention, attached to the bottom of the housing;

Fig. 8 is a cross-sectional view of said second embodiment of the cover;

Fig. 9 is top view of the second embodiment of the cover; and

Fig. 10 is bottom view of the second embodiment of the cover.

### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

- 5 As shown in Fig. 1, the ceiling fan comprises: a housing assembly 1 which includes top 2, intermediate 3, and tail members; and a plurality of blades 5 extending radially from periphery of the intermediate member 3. A one-piece, translucent cover 6, which can be made of a translucent resin, is attached to bottom of the tail member.
- 10 Fig. 2, 3, 4, 5, and 6 show the first embodiment of the cover 6.
- Referring to Fig. 2, the top member 2 of the assembly houses a shaft 7, top end of which having a transverse hole through which a screw 8 passes through to fasten a pair of clamp members 9 to said end. The clamp members 9 each having a holed planar arm 10 which extends beyond said
- 15 top end of the shaft 7, between which a centrally-holed pulley 11 is sandwiched, and a screw 12 passes through aligned holes of the arms 10 and the pulley 11. The pulley 11 is suspended on a U-hanger bracket 13, base of which is attached on ceiling. Bottom end of the shaft 7 extends beyond bottom of the top member 2, and is connected to a switch mode
- 20 power supply module 14 which is housed within the intermediate member 3. The power supply module 14 is connected to a motor 15, periphery of which is attached to the blades 5. Central axis of the power supply module 14 has a shaft 16 which passes through central axis of the motor 15, and extends to centre of the tail member 4 which houses a printed circuit board
- 25 (PCB) 17. A gap exists between the bottom of the intermediate member 3 and the tail member 4, through which the blades 5 extend radially. The PCB 17 comprises signal receiver, i.e. an infra-red receiver, a controller, an LED indicator, a connector for connecting the PCB 17 to the motor 15, and a connector for connecting the PCB 17 to the power supply module
- 30 14. The first embodiment of the cover 6, which has a planar bottom wall, is attached to the bottom of the tail member 4.

The PCB may not have a signal receiver, in which case operations of the fan is regulated through wired connection, and the cover attached to the bottom of the housing is of one-piece design, and has a bottom wall of a consistent overall thickness.

- 5 As shown in Fig. 3 and 4, one portion 18 of the cover 6, where the receiver faces, after installation of the cover 6 onto the tail member 4, is thinner than the remaining portion of the cover 6, such that control signals, i.e. infra-red, initiated from a remote controller are capable of passing through and reaching the receiver. Said signals are transferred to the controller  
10 where operation instructions, i.e. start rotating, stop rotating, speed of blade rotation, etc, are generated.

The cover 6 comprises one hollow protrusion 33 for accommodating a light indicator, such that light emitted from the indicator concentrates on area enclosed by the protrusion 33.

- 15 A peripheral portion 19 and one portion 20 of the cover encircling the point where the indicator faces, after the installation of the cover onto the housing, are made opaque by painting on their internal surfaces. Said portions can also be made opaque by painting on their external surfaces.

- Opacity of the portion 19 prevents light from passing from one side of the  
20 cover to the other side. When the cover is installed onto the bottom of the housing, said opacity prevents room light from passing from the upper portion to the lower portion of the cover.

Opacity of the portion 20 prevents light emitted from the indicator from passing through.

- 25 The cover 6, which can be fabricated via an injection moulding process, comprises a gate portion 21 being disposed adjacent the thinner portion 18, allowing injection of molten plastic into mould cavity during said process. Said arrangement of the gate portion 21 adjacent the thinner portion 18 prevents formation of weld line in the thinner portion 18 during  
30 fabrication, which deteriorates efficiency of the transfer of control signals from the remote controller to the receiver.

There is a protrusion in the mould where the thinner portion 18 has to be created. Said protrusion is an obstacle to melt-front of the molten material, around which the melt-front flows from one edge and meets at the opposite edge of the protrusion. The weld line, also known as a knit line or a meld line, tends to form around the protrusion and at the position where the melt-front comes together again. During design phase, a mould-flow study is conducted to determine where the gate portion 21 should be disposed in the mould such that formations of weld lines in the thinner portion 18 can be prevented. In the first embodiment, the gate portion 21 is disposed adjacent the thinner portion 18. Said arrangement, together with suitably adjusted temperatures of the melt and the mould, prevents formations of weld lines in the thinner portion 18. After the injection moulding process, the gate portion 21, for example, includes a small protrusion.

The cover 6 comprises a flange 22 along its edge for shielding the interior of the housing against light from exterior. Internal surface of the cover comprises a plurality of protrusions 23a, 23b, 23c each having a screw-threaded hole for receiving a screw which attaches the cover 6 to the bottom of the housing 1. The internal surface of the cover 6 also comprises a pair of cantilever beams 24a, 24b, disposed oppositely to each other, wherein end of each beam 24a, 24b is wedge-shaped for snap fitting the cover onto the bottom of the housing 1.

Fig. 7, 8, 9, and 10 show the second embodiment of the cover 25.

For the second embodiment, only points which are different from the first embodiment are described hereunder. Referring to Fig. 7, the second embodiment of the cover 25 has a bottom wall curving outwards. As shown in Fig. 9, the cover has two hollow protrusions 30a, 30b each for accommodating a light indicator. Instead of painting on one surface of the cover as of the first embodiment, external surface 26 of the cover 25, except for the thinner portion 28 and the points 32a, 32b where the indicators face, is made opaque by film moulding.

Perforations 27 are disposed adjacent the thinner portion 28, opposing the edge of the thinner portion 28 where the gate portion 29 is disposed. The perforations 27, the thinner portion 28, and the gate portion 29 are disposed in a row. Said arrangement of the perforations 27, the thinner  
5 portion 28, and the gate portion 29 prevents formation of weld line in the thinner portion 28 during fabrication, which deteriorates efficiency of the transfer of control signals from the remote controller to the receiver.

In the second embodiment, the gate portion 29 is disposed adjacent the thinner portion 28, and the perforations 27 opposing the edge of the  
10 thinner portion 28 where the gate portion 29 is disposed. Said arrangement, together with suitably adjusted temperatures of the melt and the mould, prevents formations of weld lines in the thinner portion 28.

A bulging portion 31 is disposed across one edge of the thinner portion 28, opposing the edge of the thinner portion 28 where the gate portion 29 is  
15 located.

The 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  
20 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 connecting unit configured to attach a fan housing (1) to ceiling;
  - a motor (15) being accommodated in the housing (1);
  - 5 a plurality of blades (5) extending radially from periphery of the motor (15), capable of being rotated by the motor (15);
  - a cover (6), being one-piece and attached to bottom of the housing (1); and
  - a receiver being disposed adjacent the cover (6), for receiving a control signal;
  - 10 wherein one portion (18) of the cover is thinner than the remaining portion of the cover (6), such that the signal is capable of passing through and reaching the receiver.
- 15 2. A ceiling fan as claimed in claim 1, wherein the cover (6) comprises a gate portion (21) being disposed adjacent the thinner portion (18), allowing injection of a molten material into mould cavity during injection moulding process for fabrication of the cover (6).
- 20 3. A ceiling fan comprising:
  - a connecting unit configured to attach a fan housing (1) to ceiling;
  - a motor (15) being accommodated in the housing (1);
  - a plurality of blades (5) extending radially from periphery of the motor (15), capable of being rotated by the motor (15);
  - 25 a cover (6), being one-piece and attached to bottom of the housing (1), wherein one portion (18) of the cover is thinner than the remaining portion of the cover (6), and a gate portion (21) is disposed adjacent the thinner portion (18), allowing injection of a molten material into mould cavity during injection moulding process
  - 30 for fabrication of the cover (6); and

a receiver being disposed in a way such that a control signal is capable of passing through the cover (6) and reaching the receiver.

- 5 4. A ceiling fan as claimed in any one of claims 1 to 3, wherein the thinner portion (18) is non-opaque.
- 5 5. A ceiling fan as claimed in any one of claims 1 to 4, wherein the cover (6) is translucent.
- 10 6. A ceiling fan as claimed in any one of claims 1 to 5, wherein the cover (6) is made of a translucent resin.
- 15 7. A ceiling fan as claimed in any one of claims 1 to 6, further comprising a controller to control the motor (15) in accordance with signals received.
8. A ceiling fan as claimed in any one of claims 1 to 7, wherein the signal is an optical signal initiated from a remote controller.
- 20 9. A ceiling fan as claimed in any one of claims 1 to 8, wherein the cover (6) further comprises at least one hollow protrusion (33) for accommodating a light indicator such that light emitted from the indicator concentrates on area enclosed by the protrusion (33).
- 25 10. A ceiling fan as claimed in any one of claims 3 to 9, wherein the cover (25) has at least one perforation (27) being disposed adjacent the thinner portion (28), opposing the edge of the thinner portion (28) where the gate portion (29) is disposed.
- 30 11. A ceiling fan as claimed in claim 10, wherein the perforation (27), the thinner portion (28), and the gate portion (29) of the cover (25), are disposed in a row.

12. A ceiling fan as claimed in any one of claims 1 to 11, wherein internal surface of the cover (6) comprises at least one fastener (23a, 23b, 23c, 24a, 24b) to attach the cover (6) to the bottom of the housing (1).
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13. A ceiling fan as claimed in any one of claims 1 to 12, wherein at least one portion of the cover (6) is opaque.
14. A ceiling fan as claimed in any one of claims 1 to 12, wherein peripheral portion (19) of the cover (6) is opaque.
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15. A ceiling fan as claimed in in any one of claims 9 to 14, wherein one portion (20) of the cover, encircling the point where the indicator faces, is opaque.
- 15
16. A ceiling fan as claimed in any one of claims 13 to 15, wherein the portion is made opaque by applying an opaque layer.
17. A ceiling fan as claimed in any one of claims 1 to 16, wherein the cover is curved and/or flat.
- 20
18. A ceiling fan comprising:
- a connecting unit configured to attach a fan housing (1) to ceiling;
  - a motor (15) being accommodated in the housing (1);
  - 25 a plurality of blades (5) extending radially from periphery of the motor (15), capable of being rotated by the motor (15);
  - a cover (6), being one-piece and attached to bottom of the housing (1); and
  - a receiver being disposed in a way such that a control signal is capable of passing through the cover (6) and reaching the receiver.
- 30