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**CEILING FAN****Introduction**

This invention relates to a ceiling fan and more  
5 particularly relates to a ceiling fan with retractable  
blades.

**Background of the Invention**

The problem with many ceiling fans is that the  
10 radially projecting blades become unsightly dust  
collectors when the fan is not in use. Ceiling fans that  
often incorporate light fittings and it has been proposed  
to incorporate retractable blades that retract within the  
confines of the light fitting when not in use and expand  
15 radially outwardly when in use to operate as conventional  
fan blades.

Problems with fans of this kind concern ensuring a  
balanced configuration especially as the blades move  
20 between the retracted and operative positions. A further  
problem with fans of this kind is the limit on the length  
of the blades to enable them to retract within the  
confines of the light fitting. This usually requires the  
blades to nest with the tip of one blade above the root of  
25 the adjacent blade, thus leading to an unsightly slack of  
blades. If the blades are made shorter to reduce the need  
for overlapping then the blades lack the aerodynamics to  
move sufficient air to operate efficiently as a fan.

30 It is these issues that have brought about the  
present invention.

**Summary of the invention**

According to one aspect of the present invention  
35 there is provided a fan blade comprising a mount  
supporting a plurality of superimposed fan blade segments  
arranged to slide relative to one another from a retracted

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storage configuration to an extended operative configuration.

According to another aspect of the present invention  
5 there is provided a ceiling fan comprising an electric motor adapted to drive a rotating plate that supports a plurality of equally spaced fan blades that extend radially of the plate, each fan blade comprising a root and a tip joined by leading and trailing edges, the root  
10 being adapted to be secured to the plate, wherein each blade comprises a plurality of fan blade segments arranged to slide telescopically one within the other whereby the fan blade segments can be located substantially within the periphery of the plate in a retracted configuration and  
15 can extend radially outwardly in an operative configuration.

#### **Description of the Drawings**

Embodiments of the present invention will now be  
20 described by way of example only with reference to the accompanying drawings in which:

Figures 1a, 1b and 1c are respectively plan, side and perspective views of a fan in an expanded operative configuration,

25 Figures 2a, 2b, and 2c are respectively plan, side and perspective views of the fan in a retracted inoperative configuration,

Figures 3a and 3b are respectively plan and side elevational views of the fan in the retracted  
30 configuration illustrating a drive assembly,

Figures 4a, 4b and 4c are respectively plan, side and perspective views of the fan in the expanded operative configuration with components omitted for clarity,

35 Figure 5 is a plan view of part of components for the fan in the expanded configuration,

Figure 6 is a plan view of one blade assembly in the expanded configuration,

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Figure 7 is a cross sectional view taken along the lines A-A of Figure 6,

Figure 8 is a cross sectional view taken along the lines B-B of Figure 6, and

5        Figure 9 is a cross sectional view taken along the lines C-C of Figure 6.

#### **Description of the Preferred Embodiments**

The ceiling fan 10 as illustrated in the accompanying  
10 drawings comprises an electric motor 11 that is hung from the ceiling. The electric motor 11 is coupled to a circular plate 12 whereby the motor 11 rotates the plate 12 about a vertical axis. The plate 12 is adapted to support four equally spaced fan blade assemblies 20, 21,  
15 22, 23. Each blade assembly 20 to 23 comprises three fan blade segments 30, 31, 32 that can slide relative to one another from a retracted position (Figure 2) where the fan blade segments are within the confines of the plate 12 to an outward operative position (Figure 1) in which the fan  
20 blade segments 30-32 project radially outwardly of the plate 12 to facilitate movement of air as the plate 12 is rotated by the electric motor 11. It is understood that the electric motor 11 can be either on top of or below the plate 12.

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Each blade assembly 20- 23 is positioned on the periphery of the plate 12 via a mount 40 that is secured to the plate 12. As shown in Figure 2a the mounts 40 are  
equally spaced around the periphery of the plate to be  
30 diametrically opposed to one another.

In this embodiment the blade comprises three blade segments, namely the first outer segment 30, an intermediate segment 31 that is telescopically mounted  
35 within the outer segment 30, and an inner blade tip 32 that is again telescopically mounted within the intermediate section.

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Each mount 40 comprises a pair of support legs 41, 42 having outwardly extending flanges 43, 44 that enable the legs to be screwed to the surface of the plate 12. The support legs 41, 42 support a bridging member 45 that defines a slot 46 that accommodates a first outer blade segment 30. The slot defines a passageway that allows the blade segments 30 to be a smooth sliding fit within the slot 46. The legs 41, 42 of the mount assembly are also arranged so that the slot is on an incline of between 10 and 15 degrees (see Figure 2b). The angle on the slot gives the blade, which is otherwise flat, an angle of incidence to give the desired air movement when in the extended and operative position.

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The blade segments 30, 31, 32 all slide relative to one another so that in the retracted position (Figure 2) the tip 32 is wholly within the intermediate segment 31 which is wholly within the outer segment 30. In the extended position shown in Figure 2 the tip 32 projects radially outwardly of the intermediate segment 31 which is in turn radially outwardly of the outer segment 30. The telescopic arrangement of the three blade segments allows the segments to slide outwardly and the force to urge this outward movement is the centrifugal force generated by rotation of the plate 12 by the electric motor 11.

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Each diametrically opposed pair of blade assemblies 21, 22 or 23, 24 are interconnected by a chain 50 that rotates about a sprocket 51 located on the underside of each mount 40. The chain is also coupled to a centrally located sprocket 52 that is in turn coupled to a coil spring 53 located within a housing 54. The chain 50 is attached to an elongate rod 60 via an adjustable linkage.

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As shown in Figure 6 the rod 60 extends parallel to the chain 50 and is coupled to an inner end of the outer

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blade segment 32. Movement of the chain 50 pulls the rod  
60 radially inwards to pull the outer blade segment 32  
into the intermediate segment 31 until the inner end of  
the blade segment 32 abuts stop 63 on the inner end of the  
5 intermediate segment 31. Further movement of the rod 60  
causes inward displacement of the intermediate segment 31  
until it engages stops 64 on the inner end of the first  
blade segment 30. All these segments 30, 31, 32 are then  
pulled by the rod 60 under the mount 40 to assume the  
10 fully retracted position shown in Figure 2.

As the centrifugal force of the fan 10 forces the  
blade 30-32 segments outwardly the movement of the  
segments causes rotation of the sprocket 51 under the  
15 mount 40 to drive the chain 50 to in turn rotate the  
central sprocket 52 against the spring 53. As the fan 10  
slows down the coil spring 53 urges the central sprocket  
52 to rotate the chain 50 and pull back the fan segments  
30-32 to the retracted position. In this manner, the  
20 sprocket and chain drive not only controls the outward  
movement of the fan segments but through the spring 53  
brings the segments back into the retracted position when  
not in use. To avoid collision of the chains 50 two  
central sprockets 52 are provided in different vertical  
25 planes with the upper sprocket driving the fan blade  
assemblies 20 and 21 and the lower sprocket driving the  
other pair of fan blade assemblies 22 and 23.

The fan blade segments 30-32 are moulded in plastics  
30 to define leading and trailing edges. The blade segments  
30-32 are substantially flat and the tip segment 32 has a  
curved end.

The fan described above has a number of advantages  
35 over conventional fans with retractable blades. Because  
the blades do not pivot from the operative to the  
retracted positions there is no danger of collision

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between the blades during the retraction process.  
Furthermore, the fact that the blade segments expand  
radially or in a longitudinal sense means that the blades  
can be designed to have increased length to thereby  
5 increase the airflow. Furthermore, the telescopic  
location of the blade segments allows the fan to assume a  
compact and comparatively thin configuration in the  
retracted position which makes the fan, especially when it  
incorporates a light fitting, much more attractive in the  
10 retracted position than is the case with other fans with  
retractable blades where the blades form an unsightly nest  
above the light fitting.

In the claims which follow and in the preceding  
15 description of the invention, except where the context  
requires otherwise due to express language or necessary  
implication, the word "comprise" or variations such as  
"comprises" or "comprising" is used in an inclusive sense,  
i.e. to specify the presence of the stated features but  
20 not to preclude the presence or addition of further  
features in various embodiments of the invention.

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**CLAIMS:**

1. A fan blade comprising a mount supporting a plurality  
of superimposed fan blade segments arranged to slide  
5 relative to one another from a retracted storage  
configuration to an extended operative configuration.
2. The fan blade according to claim 1 wherein the fan  
blade segments slide telescopically one within the  
10 other.
3. The fan blade according to either claim 1 or 2  
wherein, the mount is adapted to be secured to a  
rotating plate whereby the fan blade, in the  
15 operative configuration extends radially of the  
rotating plate.
4. The fan blade according to any one of the proceeding  
claims wherein the mount supports three fan blade  
20 segments, the outer blade segment defining a tip of  
the blade.
5. The fan blade according to any one of the preceding  
claims wherein the fan blade segments are  
25 substantially flat.
6. A ceiling fan comprising an electric motor adapted to  
drive a rotating plate that supports a plurality of  
equally spaced fan blades that extend radially of the  
30 plate, each fan blade comprising a root and a tip  
joined by leading and trailing edges, the root being  
adapted to be secured to the plate, wherein each  
blade comprises a plurality of fan blade segments  
arranged to slide telescopically one within the other  
35 whereby the fan blade segments can be located  
substantially within the periphery of the plate in a

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retracted configuration and can extend radially outwardly in an operative configuration.

- 5           7. The ceiling fan according to claim 6 wherein as the fan rotates the fan blade segments slide outwardly due to centrifugal forces.
- 10           8. The ceiling fan according to claim 7 wherein biasing means pulls the fan blade segments back into the retracted configuration against the centrifugal force as the fan slows down to a stop.
- 15           9. The ceiling fan according to claim 8 wherein opposed blades are interconnected by a chain driven by a sprocket including biasing means which rotates the chain to pull back the blade segments as the fan slows to a stop.
- 20           10.       The ceiling fan according to any one of claims 6 to 9 wherein each blade has an angle of incidence to the horizontal, preferably between 10 and 15 degrees.
- 25           11.       The ceiling fan according to any one of claims 6 to 10 wherein the rotating plate supports four equally spaced radially extending blades.
- 30           12.       The ceiling fan according to any one of claims 6 to 11 wherein each blade is secured to the plate by a mount.
13.       The ceiling fan according to claim 12 wherein the mount includes a slot through which the blade slides.