

CEILING FAN

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

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Ceiling fans with retractable blades are well known. One of the advantages of having retractable blades in a ceiling fan is that when the fan incorporates a light the fan in the retracted non use condition can constitute
10 an attractive ceiling mounted centre light without unsightly blades. When the fan is operated the blades project radially outwardly to operate as a fan and then are retracted when the fan is not in use.

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Ceiling fans with retractable blades are not new but they do suffer from inherent weaknesses often caused by out of balance forces generated as the blades swing outwardly. These forces can cause the blades contact each other during the retraction process. These fans are also
20 prone to clonking noises as the blades either expand outwardly or retract. All of these issues reduce the attractiveness of the proposition and it the consideration of these issues that have brought about the present invention.

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According to the present invention there is provided a ceiling fan comprising an electric motor that drives a circular plate, the circular plate has three or four equally spaced quadrants positioned adjacent its
30 periphery each quadrant is secured to the plate to be pivotal thereto to provide limited arcuate movement about the pivot axis, each quadrant having a fan blade secured thereto, the arcuate movement of each quadrant being confined from a first position where the blades are within
35 the periphery of the plate to a second position where the blades extend radially outwardly of the plate, each quadrant being attached to the plate by a coil spring which urges the quadrant into the first position, each

quadrant being directly joined to the adjacent quadrant by a rigid tie bar so that any movement of one quadrant causes the same movement of all the other quadrants.

5 The fan may incorporate a light and is understood that the fan could comprise three or four blades.

 In use, as the plate spins the centrifugal forces cause the blades to move to the second position to extend
10 radially outwardly of the plate. When the power is switched off and the plate slows down the coil springs draw the blades back to the first position substantially within the periphery of the plate.

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

 Figure 1 is perspective view of a ceiling fan
20 with blades in a radially expanded operative position,

 Figure 2 is a plan view of part of the fan with the blades in a retracted position,

 Figure 3 is the same view with the blades shown in dotted profile,

25 Figure 4 is a plan view of part of the fan showing the blades in a partially expanded configuration,

 Figure 5 is a detailed view within the circle A of Figure 4,

 Figure 6 is a plan view showing interconnection
30 of adjacent blades,

 Figure 7 is a side elevational view of the two blades shown in Figure 6,

 Figure 8 is a perspective view of the two blades, and

35 Figure 9 is a perspective exploded view illustrating the connection of one blade to the plate.

 The ceiling fan 10 shown in the accompanying drawings comprising a central ceiling mounted shaft 11

coupled to a housing 12 that houses an electric motor (not shown) that drives a rotor 15 that is mounted centrally of a circular plate 20. The periphery of the plate 20 supports four equally spaced fan blades 21, 22, 23, 24.

5 The underside of the plate 20 supports a light (not shown) covered as shown in Figure 1 by a curved cover 25. The four blades 21 to 24 are attached to the plate 20 to be retractable from an open position shown in Figure 1 in which the blades extend radially outwardly to a closed

10 position shown in Figure 2 in which the blades are confined within or close to the periphery of the plate 20.

As shown in Figures 2 to 9 of the accompanying drawings each blade 21 to 24 has a curved profile

15 terminating at one end in a root 30 and at the other end in a curved tip 32. The root 30 of each blade is secured by fasteners 33 to a quadrant 40 that is in turn pivotally secured to the plate 20 at a position spaced inwardly of the outer periphery of the plate 20. As shown in Figure 4

20 each quadrant 40 is equally spaced around the periphery of the plate 20.

The mounting of each quadrant 40 to the plate 20 is shown in particular detail in Figure 9 which is an

25 exploded view of the assembly. The quadrant 40 is a metal flange 44 of substantially rectangular configuration having a central boss 41. The root 30 of the fan blade 21 is screwed to one end of the flange 44 as shown in Figure 9. The central boss 41 accommodates a bearing assembly 42

30 and spacer 43 that is located within a hole 45 in the plate 20 to elevate the quadrant 40 above the plate 20 whilst allowing the quadrant 40 to rotate about the bearing 42 about a vertical axis. The plate 20 has an arcuate slot 27 formed therein and the quadrant 40 has a

35 downwardly projecting lug 46 that is screwed to the underside of the flange 44 to locate within the arcuate slot 27. The location of the lug 46 in the slot 27 restricts the pivoting movement of the quadrant 40 from a

first position X in which the blade 21 is in a retracted configuration to a second position Y in which the blade has expanded radially outwardly and is an open operative position.

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An elongate coil spring 50 is attached to a hole 47 in one corner of the flange 44 and extends across the plate 20 to be attached to a location point 51 a location point spaced away from the quadrant 40. The coil spring 10 50 urges the quadrant 40 to assume the closed position and when the blade 21 pivots radially outwardly the quadrant 40 moves to place the spring 50 under tension. As shown in Figure 4 each quadrant 40 is coupled to the plate 20 in the same manner and each quadrant includes a coil spring 15 50 secured to the plate 20 at a position remote from the quadrant.

As shown in Figure 9 the root 30 of each blade 21 to 24 is slightly upwardly stepped 31 and the blades are 20 configured so that when retracted as shown in Figure 2 the blades do not contact each other. Similarly as the blades pivot outwardly to the operative position it is understood that the surface of the blades do not contact each other.

25 Figures 3 and 4 illustrate that each quadrant is connected to the adjacent quadrant through a tie bar 60 as shown in Figure 6 each tie bar 60 comprises a straight section 61 that joins a curved section 62 that in turn has a perpendicular leg 63 that is secured to the adjacent 30 quadrant 40. The curved section 62 and leg 63 of each tie bar 60 allows the quadrants 40 to rotate through the confined arcuate movement without impeding the tie bars 60. The tie bars of a rigid construction and are screwed at either end to adjacent quadrants 40.

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As shown in Figure 7 the mounting point for the legged end 63 of a quadrant is lower than the elongate end 61. This height difference ensures that the tie bars 60

do not impede each other during movement of the quadrants 40. Thus the tie bars 60 join each quadrant 40 so that any movement of one quadrant 40 has to be controlled by the tie bars 60 to equate to the movement of all the other
5 quadrants. In this way the radial outward movement of the fan blades is synchronised and each blade can only move in or out in synchronisation with the three other blades.

Thus, in use, the four coil springs 50 cause the
10 fan blades to assume the configurations shown in Figures 2 and 3, that is the folded configuration. As the fan commences to rotate the centrifugal forces cause the blades to move radially outwardly causing the quadrants to pivot and the legs 46 to move within the arcuate slots 27
15 against the coil springs 50 until the blades assume a fully expanded configuration where the lug 46 in each arcuate slot 27 is located at the end Y of that slot. This is the fully operational position of the blades allowing the fan to operate as a conventional ceiling
20 sweep fan. When the motor is switched off the coil springs 50 pull the blades back to the folded configuration shown in Figures 2 and 3.

Although, not essential, the underside of the
25 plate carries a light fitting so that when the blades are in the retracted position the fan assumes the role of a ceiling mounted light.

The shape of the blades and the mounting
30 configuration is arranged to ensure that the assembly is balanced and that there is no contact between the blades as they expand or retract. The tie bars 60 also operate to ensure synchronisation of movement which is essential to keep the assembly balanced.

CLAIMS

1. A ceiling fan comprising an electric motor that drives a circular plate, the circular plate has three or
5 four equally spaced quadrants positioned adjacent its periphery each quadrant is secured to the plate to be pivotal thereto to provide limited arcuate movement about the pivot axis, each quadrant having a fan blade secured thereto, the arcuate movement of each quadrant being
10 confined from a first position where the blades are within the periphery of the plate to a second position where the blades extend radially outwardly of the plate, each quadrant being attached to the plate by a coil spring which urges the quadrant into the first position, each
15 quadrant being directly joined to the adjacent quadrant by a rigid tie bar so that any movement of one quadrant causes the same movement of all the other quadrants.
2. The ceiling fan according to claim 1 wherein adjacent
20 tie bars overlap one another without contact as the blades move from the first to the second positions.
3. The ceiling fan according to either claim 1 or claim
25 2 wherein each quadrant has an arcuate slot in which is located a pin that projects upwardly from the plate.
4. The ceiling fan according to any one of the preceding claims wherein the plate is positioned over a stationary housing that contains a light.