

May 11, 1937.

C. W. LE VELLE

2,079,942

FOLDING ELECTRIC FAN

Filed May 13, 1935

2 Sheets-Sheet 1

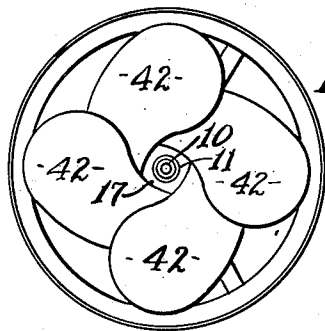


Fig. 3

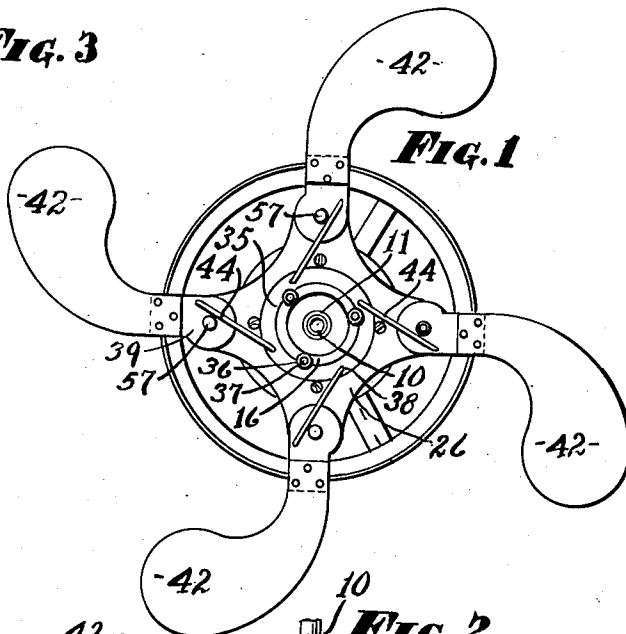


Fig. 1

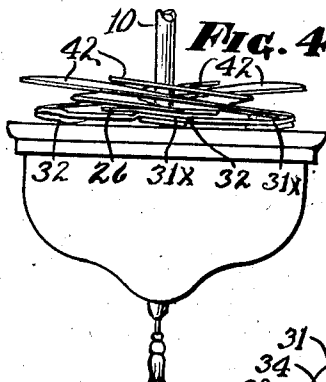


Fig. 4

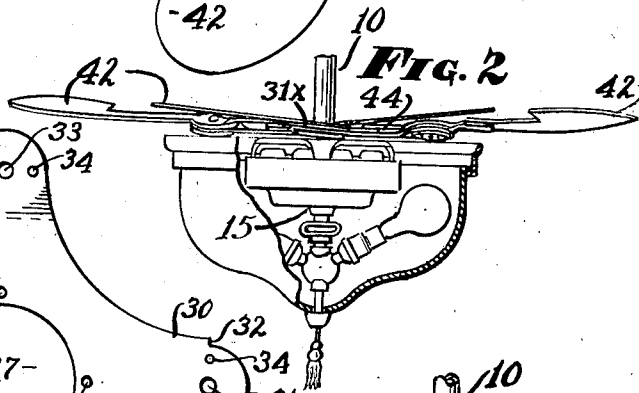


Fig. 2

Fig. 6

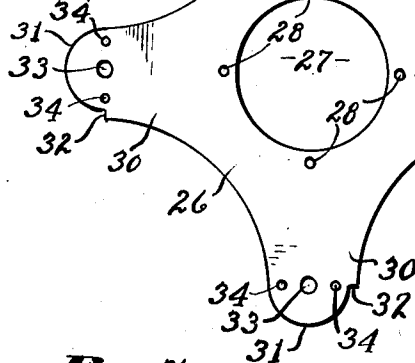


Fig. 7

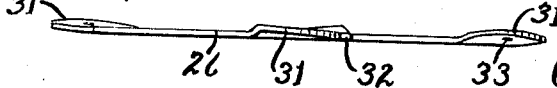
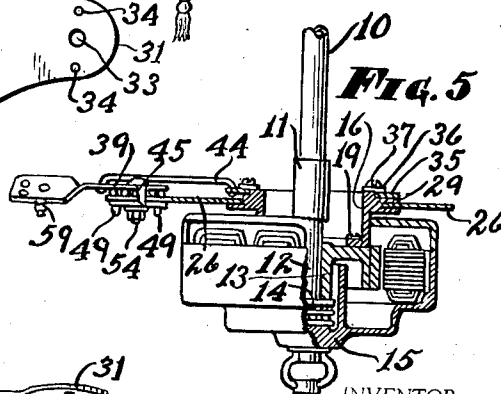


Fig. 5

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2 Sheets-Sheet 2

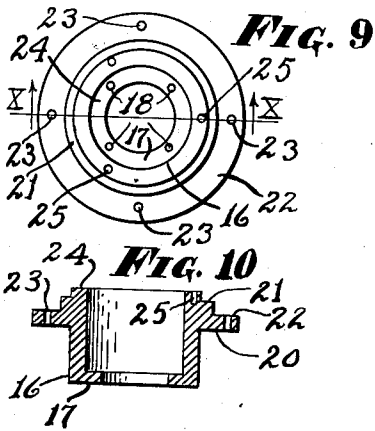
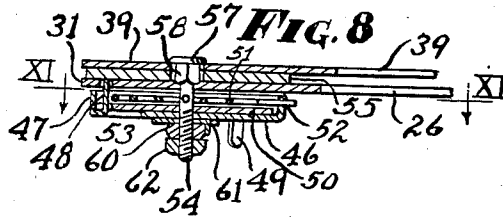


FIG. 11

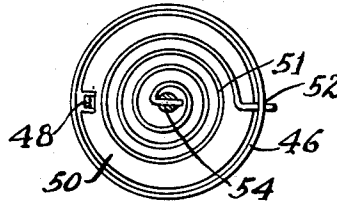
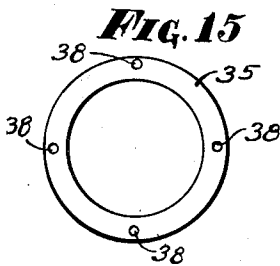
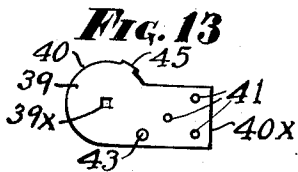


FIG. 13A

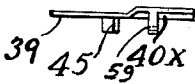


FIG. 13B

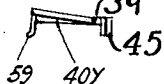


FIG. 12

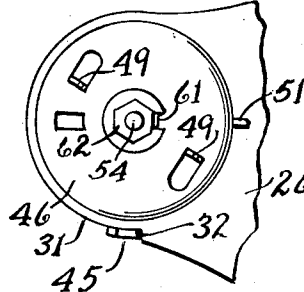


FIG. 14

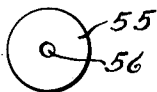


FIG. 14A



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2,079,942

FOLDING ELECTRIC FAN

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Application May 13, 1935, Serial No. 21,104

7 Claims. (Cl. 230—259)

My invention relates to an improvement in folding electric fans in combination with a lighting fixture. The object of my invention is to provide a combination light fixture and an electric fan in which the blades of the fan fold toward the center of the fan and are concealed from view by the light fixture. A still further object is to provide a device of the kind mentioned in which the fan blades become unfolded or extended by centrifugal force during the revolutions of the motor and the blades are held in their extended position as long as the motor continues to run. I am aware that this has been done as shown in previous patents, therefore my present invention resides in the device that synchronizes the folding and unfolding of the fan blades. A still further feature of the invention lies in the construction of the hinge joint mechanism for each blade of the fan. Another feature of the invention lies in the assembly of the fan mechanism which is attached as a unit to the rotor of the electric fan. These features and other objects of the invention will be more fully explained as this description progresses.

Referring to the accompanying drawings, Fig. 1 is a plan view of the combination light fixture and fan showing the fan blades in their extended position. Fig. 2 is a side view of Fig. 1, parts being broken away for convenience of illustration. Fig. 3 is a plan view of the combination light fixture and fan showing the blades of the fan in their folded position. Fig. 4 is a side view of Fig. 3. Fig. 5 is a side view of the motor and associated working parts of a fan, part of which is shown in section for convenience of illustration. Fig. 6 is a plan view of the fan blade spider. Fig. 7 is an edge view of Fig. 6. Fig. 8 is a sectional view through the hinge mechanism employed for each blade of the fan. Fig. 9 is a plan view of the hub element that is attached to the motor rotor that carries the fan blade spider. Fig. 10 is a sectional view taken along the line X—X in Fig. 9. Fig. 11 is a view taken along the line XI—XI in Fig. 8. Fig. 12 is a bottom view of Fig. 8. Fig. 13 is a plan view of the fan blade hanger. Fig. 13A is an edge view of Fig. 13. Fig. 13B is an end view of Fig. 13A. Fig. 14 is a plan view of the graphite washer that is positioned between the fan blade hanger and the fan blade spider. Fig. 14A is an edge view of the washer. Fig. 15 is a plan view of the synchronizing ring.

In the drawings, similar numerals of reference, refer to the same parts throughout the several figures of the drawings.

Referring to Fig. 5, at 10 is a tubular supporting element for the combination light fixture and fan. The tubular element 10 is threaded into a coupling 11 which is threaded onto a hardened shaft 12 on which is revolvably mounted the motor rotor 13 which is supported on ball bearings 14 that roll in a ball race carried by the motor frame 15.

At 16 in Figs. 9 and 10 is a hub element having an inwardly turned flange 17 at the bottom thereof and in which are holes 18 through which screws 19 are passed and screwed into the motor rotor 13 to rigidly hold the hub 16 on the motor rotor in Fig. 5. At the top of the hub is an outwardly extending flange like element 20 on the upper side of which is formed two annular ledges 21 and 22, the larger ledge 22 being positioned slightly below the ledge 21. The ledge 22 is provided with threaded holes 23 to receive screws as will later be explained. In the upper edge 24 of the hub 16 are threaded holes 25 to receive screws for purposes that will be later explained. At 26, Fig. 11 is a spider plate having a hole 27 in the center thereof so that the plate 26 may be received by and rest on the ledge 22 of the hub 16. Around the hole 27 and in the spider plate 26 is a plurality of holes 28 to receive screws 29 that screw into the holes 23 in the ledge 22 to bind the spider plate rigid on the hub 16. The spider plate 26 is provided with a plurality of radially extending portions 30 having rounded ends 31 with a stop shoulder 32 for each rounded end 31. At 33 is shown a round hole positioned at the center of each of the round ends 31 to pass a bolt as will be later described. In each end of the spider element is a pair of adjustment lock holes 34 that are equally spaced on either side of the holes 33, the purpose of which will be later explained. The outer ends of the spider 26 are twisted or tipped as illustrated at 31x in Figs. 2, 4 and 12 to provide a pitch for the fan blades as shown in Figs. 2 and 4.

At 35 in Fig. 15 is a synchronizing ring that is adapted to fit around the upper edge 24 of the hub 16, the ring 35 being retained on the ledge 21 by means of washers 36 that overlap the ring 35, the washers 36 being rigidly held in place on the hub 16 by means of screws 37 that screw into the holes 25 in the upper edge 24 of the hub 16. It will be understood that the washers 36 do not bind the ring 35 and the ring 35 is free to revolve on the hub. At 38 are holes equally spaced apart around the ring 35. The object of these holes 38 will be later explained.

At 39 in Fig. 13 is a fan blade hanger having

a rounded head portion 40 that is provided with a square hole 39x centrally positioned therein, and is also provided with a laterally extending portion 40x for the attachment and support of the fan blade. The laterally extending portion 40x is twisted or tilted slightly as shown at 40y in Fig. 13, to provide an additional pitch for the fan blade that is to be attached thereto. In the portion 40x of each fan blade hanger is a plurality of holes 41 to receive rivets for holding its respective fan blade 42 on said fan blade hanger arm 40x. In each fan blade hanger 39 is a round hole 43 to receive one end of a connecting rod 44, Fig. 1, the opposite end of the connecting rod 44 being received in a hole 38 in the synchronizing ring 35. At one side of the fan blade hanger 39 is a downwardly extending stop lip 45, the function of which will be later described.

At 46, Fig. 6, is a spring tensioning cup having an upwardly turned edge 47 and an upwardly extending lock lip 48 and downwardly projecting wings 49. In the spring tensioning cup 46, Fig. 8, is a graphite washer 50, above which is a coil spring 51, one end of which passes through a hole in the wall of the spring tensioning cup 46 as illustrated at 52, Fig. 6 and the opposite end of the spring 51 passes through a hole 53 in a bolt 54. At 55, Fig. 14 is a graphite washer having a hole 56 therein, said washer being positioned between the fan blade hanger 39 and the rounded portion 31 of the spider 26. The assembly of the fan blade hanger and spring tensioning device therefor is held together by bolt 54 having a head 57 and a square shoulder 58 which fits in the square hole 39x in the blade hanger 39, the bolt passing through the round hole 33 in the spider thence through the graphite washer 50 and the lower plate of the spring tensioning cup 46, the spring tensioning cup having been turned to wind the spring 51 so that the tension thereof will turn the bolt 54 to cause the fan blade hanger and fan blades thereon to turn to the folded position as shown in Fig. 3, there being a stop element 59, Fig. 5, on the fan blade hanger that will strike on the spider 26 when the fan blades are folded to prevent excessive folding of the fan blades. After the proper tension has been adjusted on the spring 51, the lip 48 is entered into one of the holes 34 in the spider 26 and the spring tensioning cup is then permanently fastened in its adjusted position by nut 60, screwed against a graphite washer 61 with a lock nut 62 screwed against the nut 60.

The operation of the device is as follows: When the fan is not running, the fan blades 42 are folded in the position shown in Fig. 3. Then as the fan is started, the blades are thrown outwardly by centrifugal force to the position shown in Fig. 1, at which time the stop lip 45 on the fan blade hanger engages the shoulder 32 on the radial extending portions 30 of the spider 26 which functions as a means of uniformly positioning each fan blade in its own position.

Attention is called to the fact that each fan blade hanger 39 is attached to the synchronizing ring 35 by connecting rods 44, so that by the opening of the fan blades the synchronizing ring 35 is caused to turn a part of a turn on the hub 16 and all the fan blade hangers being attached to the synchronizing ring will simultaneously swing outwardly to the position shown in Fig. 1.

Now when the fan motor is stopped, and centrifugal force is no longer in effect, the spring 51, acting on each of the fan blade hangers 39, will cause the fan to fold in the position shown in

Fig. 3 and in so doing, the synchronizing ring 35 has been turned a part of a turn which governing the movement of all of the fan blades causes them to be folded simultaneously.

Such modifications may be employed as lie within the scope of the appended claims. Having fully described my invention, what I now claim as new and desire to secure by Letters Patent is:

1. In a folding fan device, a motor having a rotor therein, a hub carried on said rotor and a spider element carried on said hub, fan blades carried on said spider and pivotally mounted thereon, spring means in the pivotal mounting of each blade functioning to cause the fan blade to fold in a forward direction toward the center of the motor; a synchronizing ring, said synchronizing ring being revolvably mounted on the hub; and connecting rods, one for each fan blade, each fan blade being linked to the synchronizing ring by a connecting rod.

2. In a device of the class described; a tubular supporting element and a motor having a rotor revolvably mounted thereon; a hub having a pair of annular ledges, a spider plate secured to the first ledge, said plate having a plurality of radially extending portions; a synchronizing ring revolvably retained on the second ledge; fan blade hangers, one for each spider portion and pivotally mounted there; a fan blade rigidly extending from each blade hanger and a rod linking the blade hanger to the synchronizing ring.

3. In a device as claimed in claim 2; characterized by the further fact that spring tensioning means engage intermediate each blade hanger and the spider and normally cause the synchronizing ring to slidably shift and cause the fan blades to nest adjacent the supporting element.

4. In a device as claimed in claim 2; characterized by the further fact that the fan blades and blade hangers supporting said blades are given a desired pitch for fan purposes.

5. In a device as claimed in claim 2; characterized by the further fact that spring tensioning means, engage intermediate each blade hanger and the spider for normally holding the fan blades in a nested arrangement when the motor is stopped; and during rotation of the rotor, said spring means permit movement of the synchronizing ring upon the hub, and through the linking means associated therewith cause the fan blades to assume similar outwardly extending positions under the action of centrifugal force in overcoming the spring tension, and upon the elimination of the centrifugal force by the stopping of the motor, said spring means then return the said fan blades, simultaneously, to their nested position.

6. In a device of the class described; a tubular supporting element and a motor having a rotor revolvably mounted thereon; a hub having a pair of annular ledges, a spider plate secured to the first ledge, said plate having a plurality of radially extending portions; a synchronizing ring revolvably retained on the second ledge; fan blade hangers, one for each spider portion and pivotally mounted thereon; a fan blade rigid to each blade hanger and a rod linking the blade hanger to the synchronizing ring; spring tensioning means engaging intermediate each blade hanger and the spider and normally holding the fan blades in a nested arrangement; and, during rotation of the rotor, said spring means permitting movement of the synchronizing ring upon the hub and through the linking means cause the fan blades to assume similar outwardly extended position.

tions through the action of centrifugal force in overcoming the spring tension; and, upon the elimination of the centrifugal force, by stopping the motor, said spring means then return said fan blades, simultaneously, to their normal nested position; and stop means associated with the blade hangers and the spider plate for limiting the blade nesting arrangement.

5 7. An electric fan assembly comprising a supporting ring having a shoulder, a loosely mounted synchronizing ring mounted on the shoulder,

a fan blade carrier rigidly fastened to the supporting ring, fan blades, each having an end provided with an angular opening, a bolt having an angular portion engaging the opening, the bolt extending through the fan blade support, a 5 graphite washer between each support and its fan blade, a spring for rotating the bolt in one direction and link connections between the fan blades and the synchronizing ring.

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