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(19) **United States**(12) **Patent Application Publication****Fedeli et al.**(10) **Pub. No.: US 2007/0036654 A1**(43) **Pub. Date: Feb. 15, 2007**(54) **CEILING FAN****Publication Classification**(51) **Int. Cl.****B63H 15/00** (2006.01)(52) **U.S. Cl.** **416/169 R**(76) Inventors: **Christine Fedeli**, Naples, FL (US);
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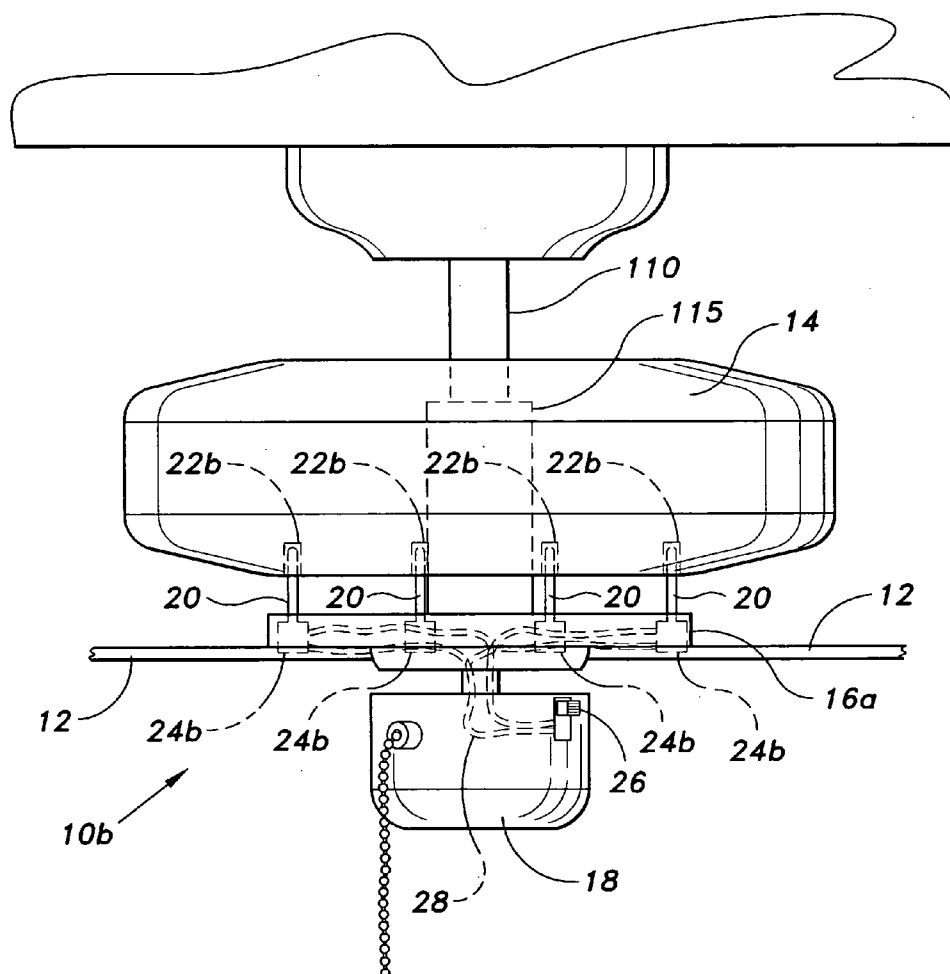
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ABSTRACT

The ceiling fan of the present invention has at least one locking mechanism, i.e., rotor brake, that may be an integral subsystem of the ceiling fan, or an add on attachment kit, either of which holds the fan rotor stationary to prevent the fan blades from rotating during cleaning or other maintenance of the fan. The rotor brake may comprise an electrically actuated mechanical system that prevents rotation of the rotor. Alternatively, the rotor brake may comprise an electrically actuated electromagnetic field to prevent rotation of the rotor. In yet another embodiment, the rotor brake may comprise a retractable or pivotal yoke that attaches to the fan so that the yoke may extend or pivot to engage a stationary fan blade or blade iron to prevent the blades from rotating. The yoke may be operated by a switch, a pull chain, or manually.

(21) Appl. No.: **11/501,006**(22) Filed: **Aug. 9, 2006****Related U.S. Application Data**

(60) Provisional application No. 60/706,448, filed on Aug. 9, 2005.



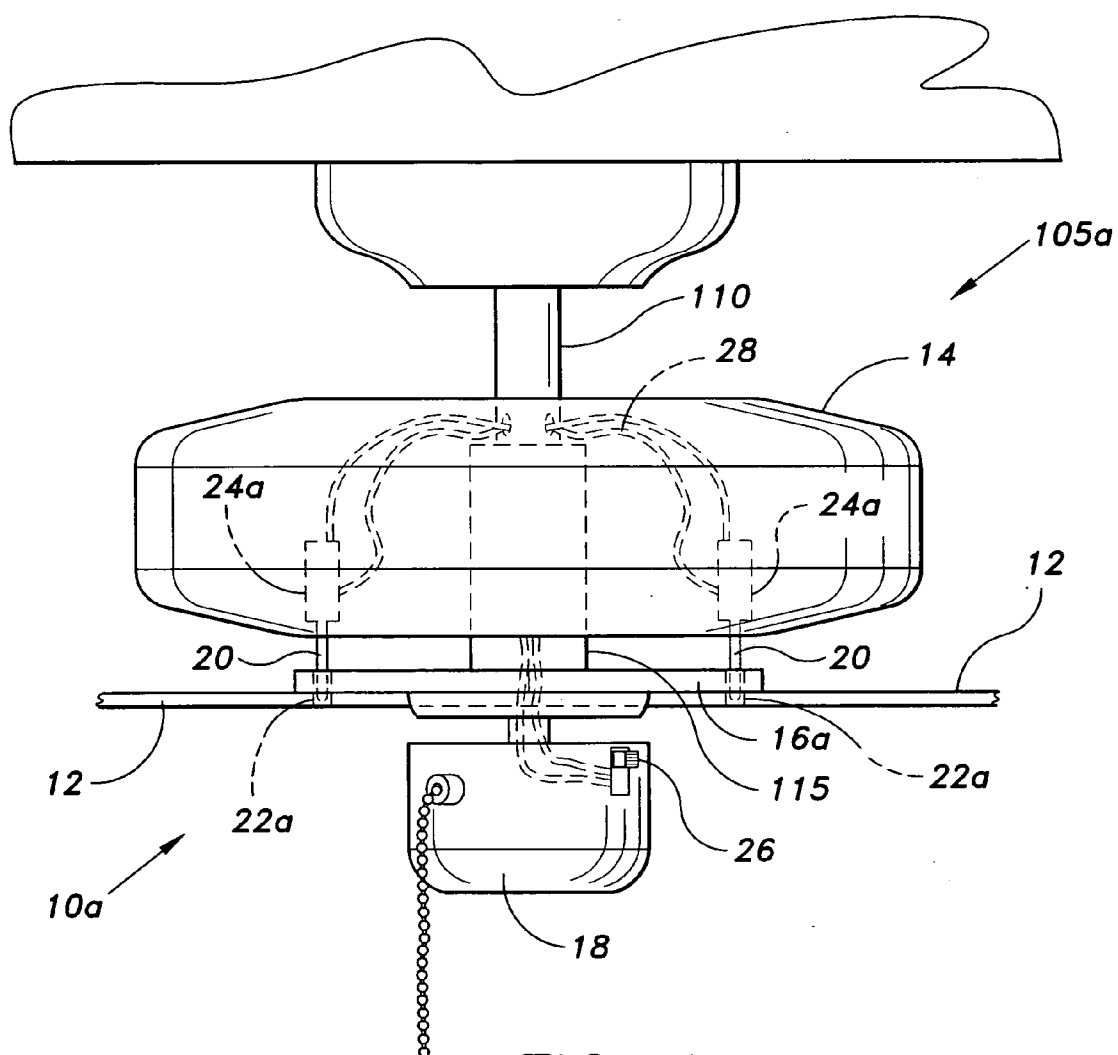


FIG. 1

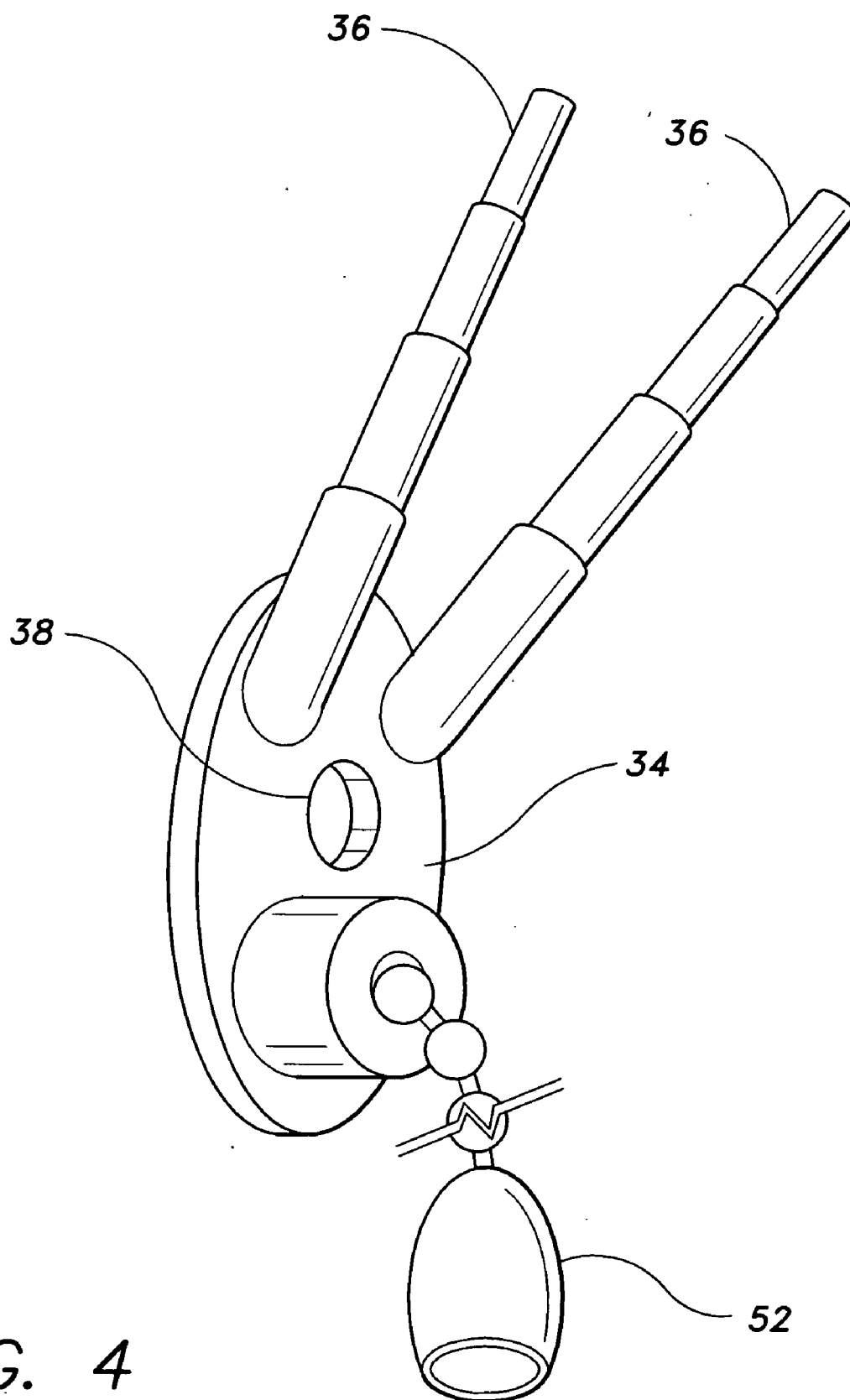


FIG. 4

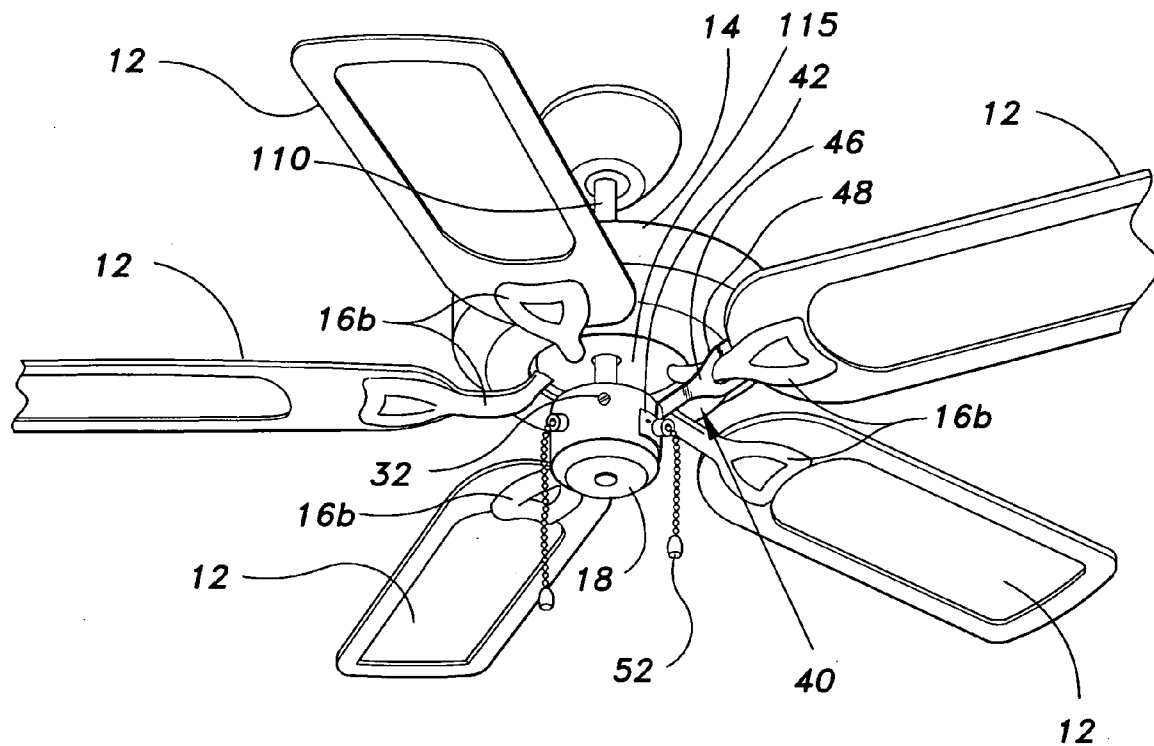


FIG. 5

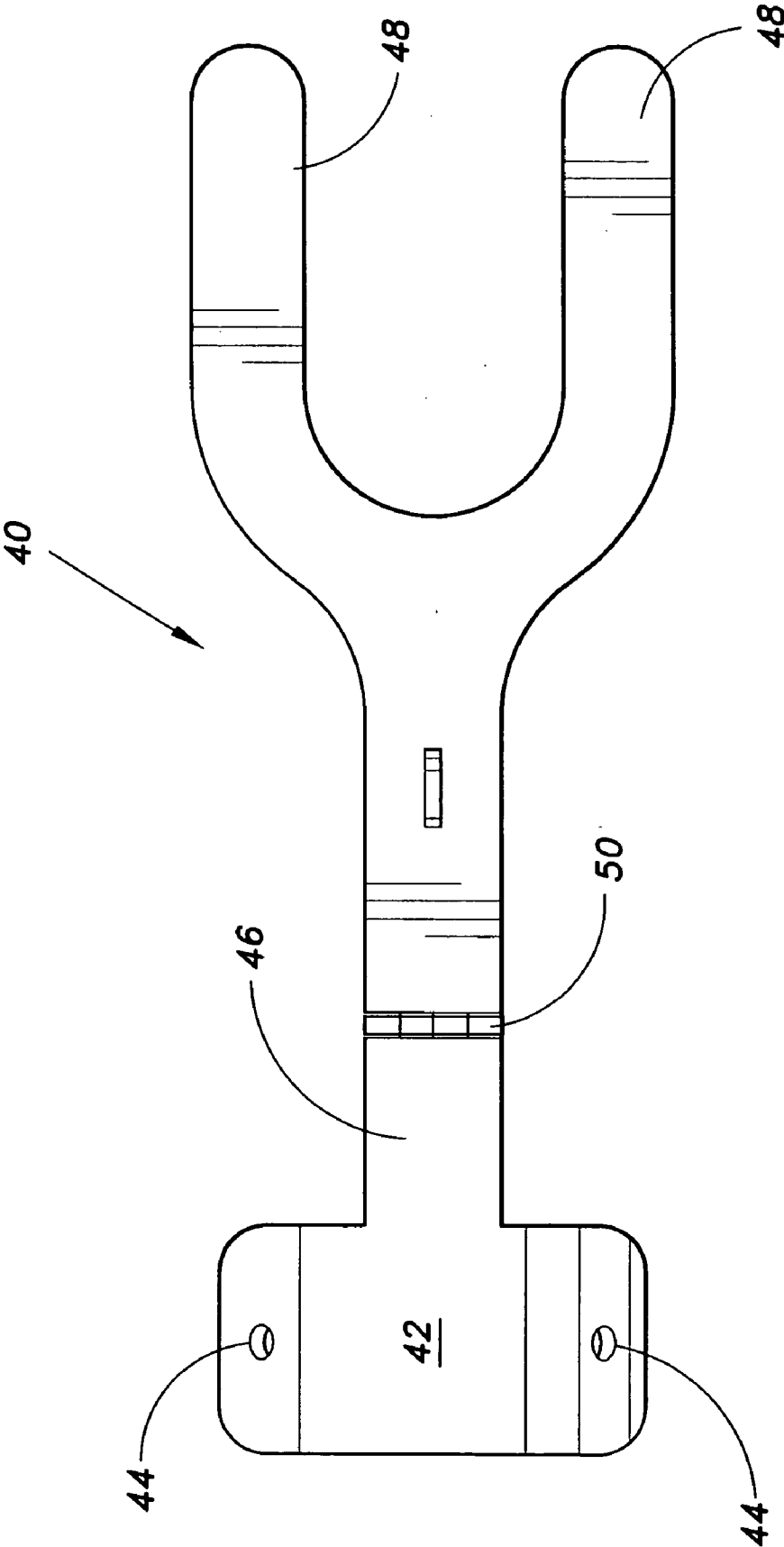
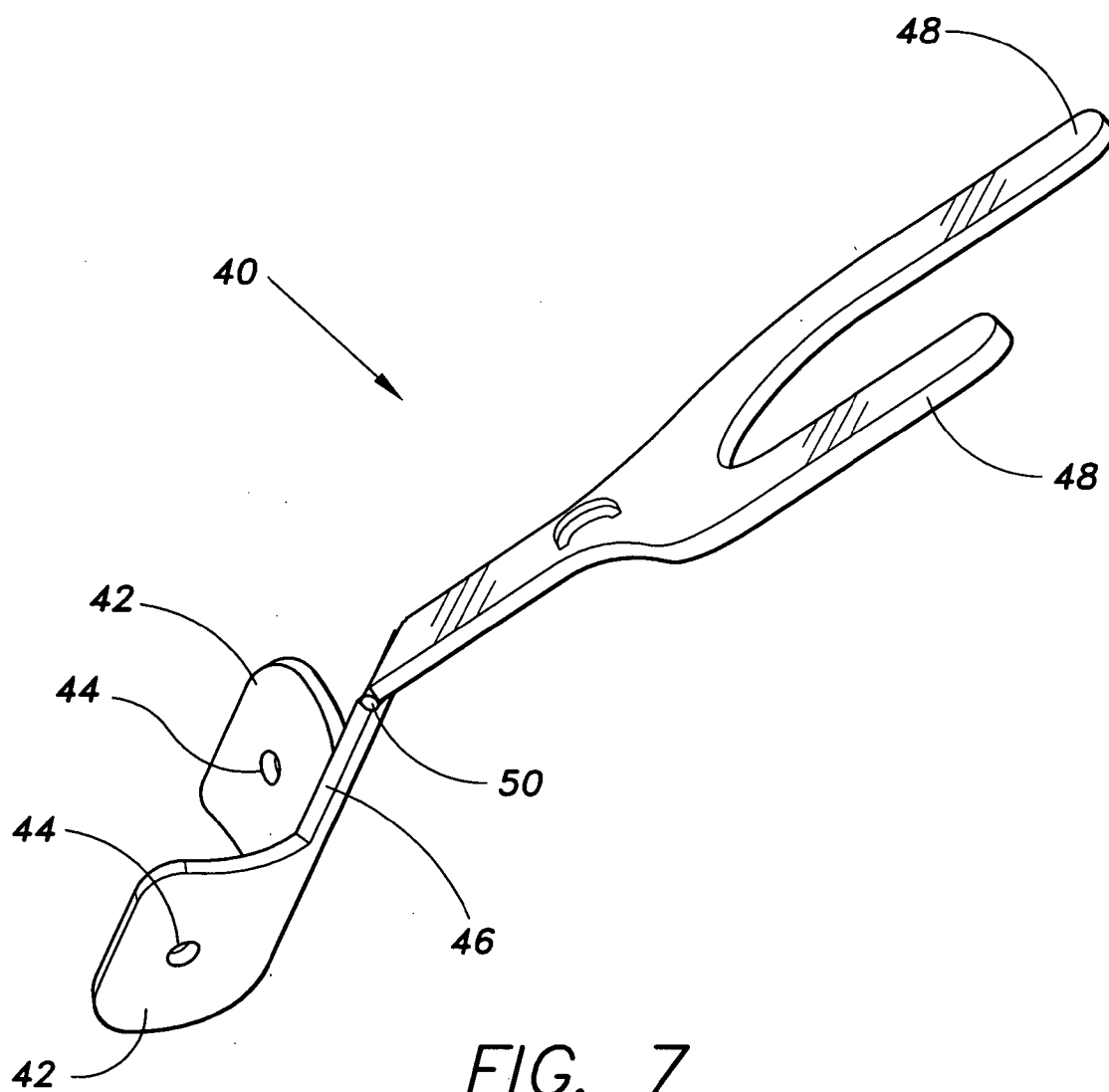


FIG. 6



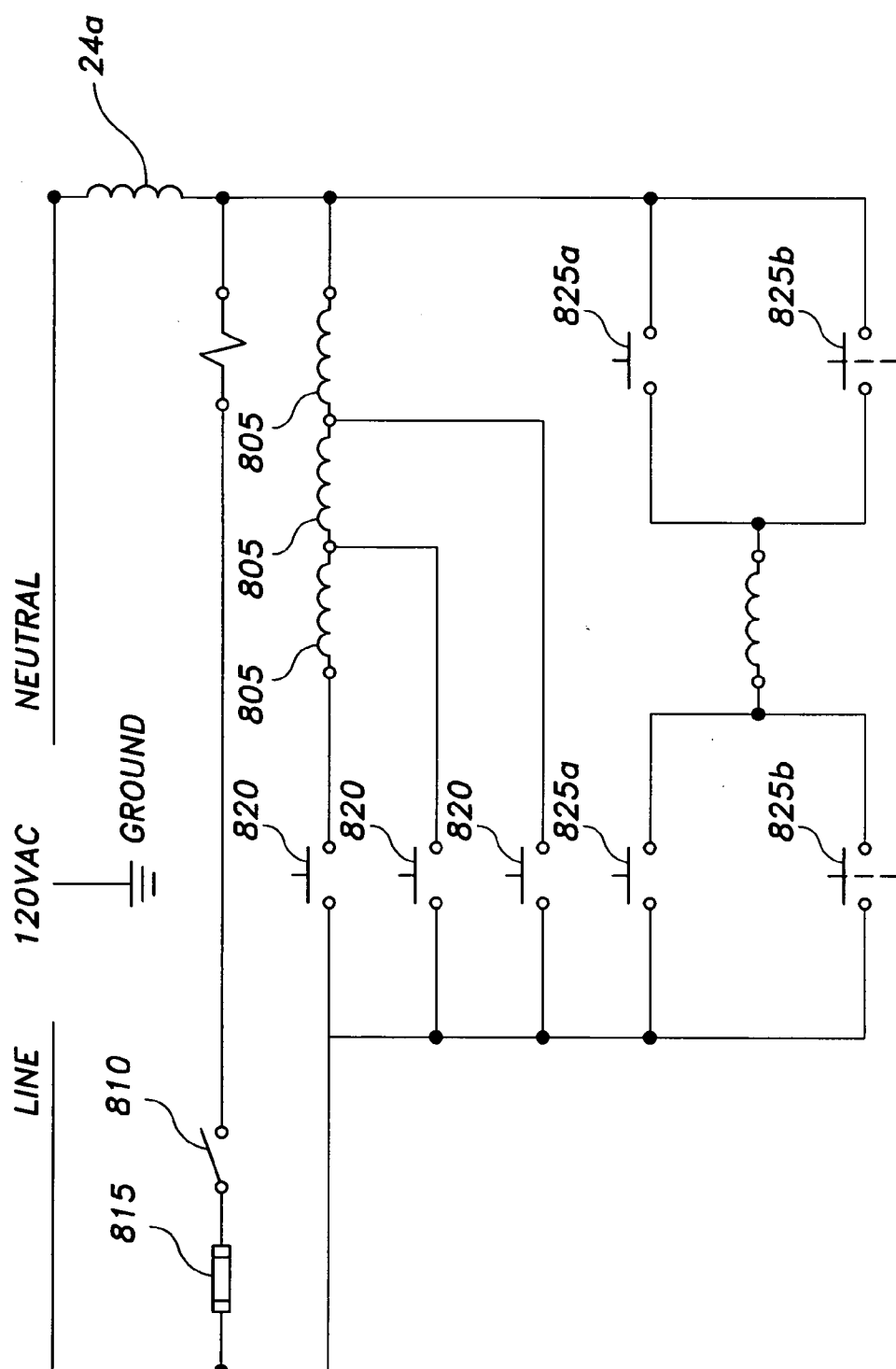


FIG. 8A

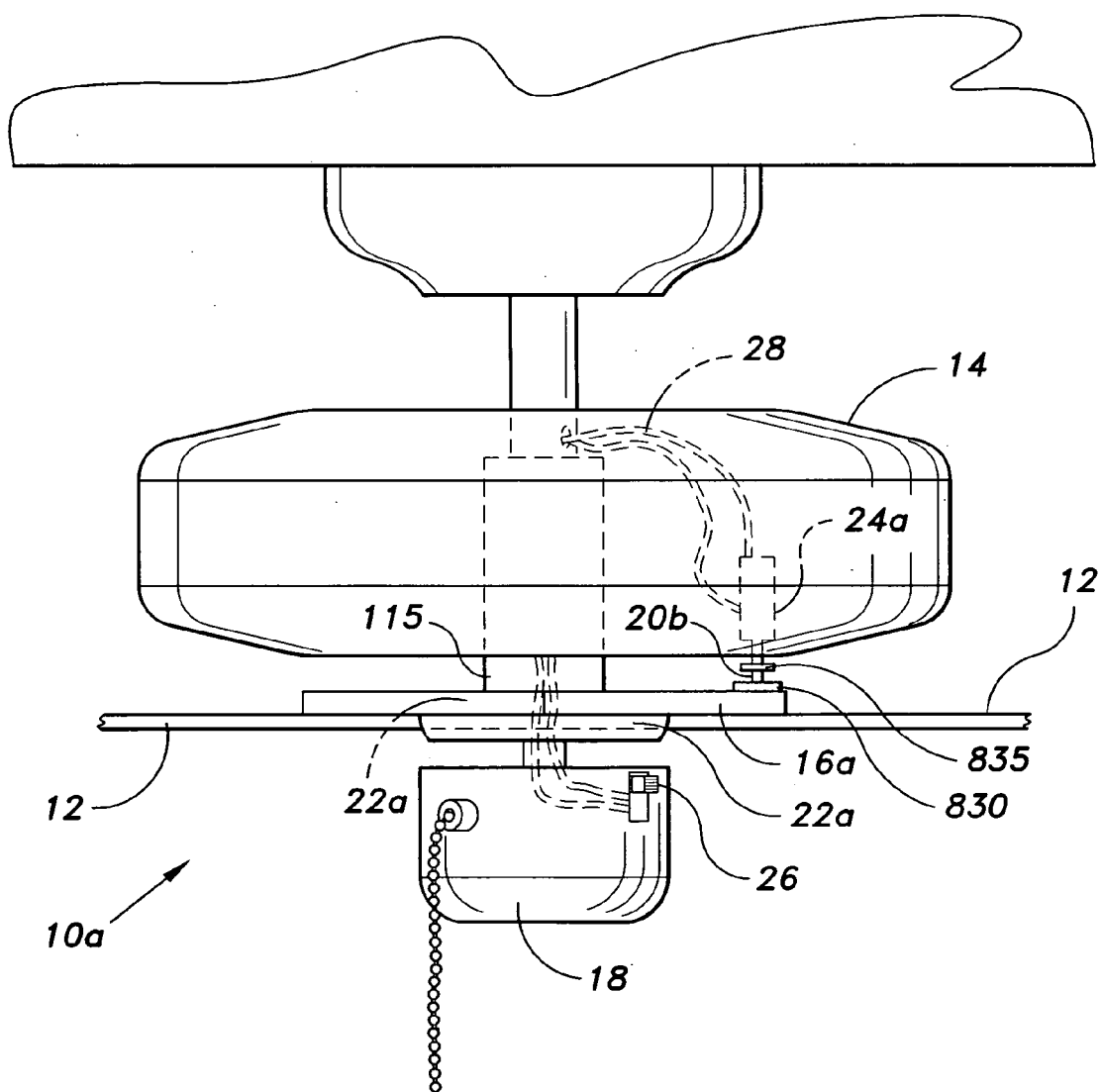


FIG. 8B

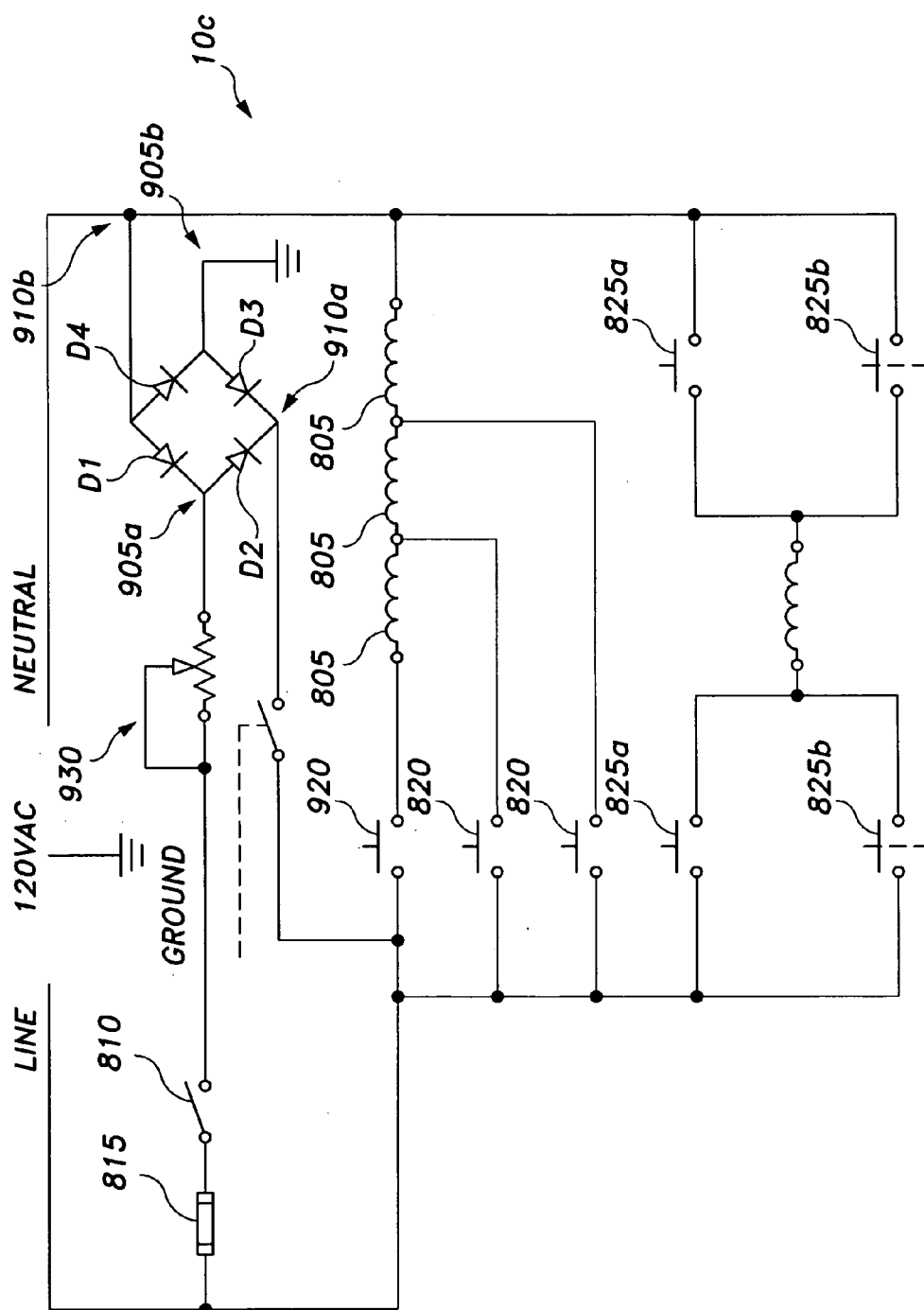


FIG. 9

CEILING FAN

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Patent Application Ser. No. 60/706,448, filed Aug. 9, 2005.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to ceiling fans. More specifically, the invention relates to a ceiling fan having one or more mechanisms for preventing rotation of the ceiling fan rotor during blade cleaning or other ceiling fan maintenance activity.

[0004] 2. Description of the Related Art

[0005] Ceiling fans are used in many homes to circulate the air in rooms in an economical manner. The fans are often ornamental, matching the furniture and interior decoration. Over time, the fan blades accumulate a layer of dust sediment, particularly on their leading edges, caused by cutting through the dust-filled air. The dust is unattractive at the least, and if the dust particles collect in the fan bearings, the rotation of the fan blades during operation may be hindered. Therefore, the dust must be regularly cleaned from the blades, and the bearings and motor may occasionally need to be cleaned and oiled for smoother operation.

[0006] The fan blades typically rest on a set of bearings, which allow the blades to rotate with as little friction as possible. When the fan is turned off, the slight friction from the bearings and the air resistance against the blades causes the fan blades to slowly stop rotating. However, not much force is required to start the blades rotating without power applied to the motor, i.e., free-wheeling. This creates a potentially troublesome and possibly dangerous situation for someone attempting to clean or repair the fan and its blades. Moreover, German Patent No. DE 3942344, issued to Weller and published Jul. 18, 1991, appears to disclose a directional rotation lock for a synchronous motor. Additionally, European Patent EP 0 823,557, issued to Pearce and published Feb. 11, 1998 discloses a blade ring attachment system for a ceiling fan. However neither patent either alone or in combination discloses or suggests the exact features of the present invention.

[0007] A mechanism for easily locking the fan blades in place while the fan is turned off would help prevent injury from accidentally rotating fan blades during blade cleaning and fan maintenance. Thus, a ceiling fan having one or more rotor locking mechanisms solving the aforementioned problems is desired.

SUMMARY OF THE INVENTION

[0008] The ceiling fan of the present invention has at least one locking mechanism, i.e., rotor brake, that may be an integral subsystem of the ceiling fan, or an add on attachment kit, either of which holds the fan rotor stationary to prevent the fan blades from rotating, i.e., freewheeling during cleaning or other maintenance of the fan.

[0009] The rotor brake may comprise an electrically actuated mechanical system that prevents rotation of the rotor.

Alternatively, the rotor brake may comprise an electrically actuated electromagnetic field to prevent rotation of the rotor.

[0010] In yet another embodiment, the rotor brake may comprise a retractable or pivotal yoke that attaches to the fan so that the yoke may extend or pivot to engage a stationary fan blade or rotor extension to prevent the blades from rotating. The yoke may be operated by a switch, a pull chain, or manually.

[0011] These and other features of the present invention will become readily apparent upon further review of the following specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 is an environmental, elevational view of one embodiment of a ceiling fan according to the present invention.

[0013] FIG. 2 is an environmental, elevational view of one embodiment of a ceiling fan according to the present invention.

[0014] FIG. 3 is an environmental, perspective view of yet another embodiment of a ceiling fan according to the present invention.

[0015] FIG. 4 is an enlarged scale perspective view of the locking mechanism shown in FIG. 3, according to the present invention.

[0016] FIG. 5 is an environmental, perspective view of a further embodiment of a ceiling fan according to the present invention.

[0017] FIG. 6 is an enlarged scale plan view of the locking mechanism shown in FIG. 5, according to the present invention.

[0018] FIG. 7 is a perspective view of the locking mechanism shown in FIG. 6, according to the present invention.

[0019] FIG. 8A is a schematic diagram showing an electrically actuated rotor brake, according to the present invention.

[0020] FIG. 8B is a side view of a fan using the electrically actuated friction pin in combination with brake pad, according to the present invention.

[0021] FIG. 9 is a schematic diagram showing a DC electromagnetic rotor brake, according to the present invention. Similar reference characters denote corresponding features consistently throughout the attached drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] The present invention is a ceiling fan 105a having a locking mechanism, i.e., rotor brake designated generally as 10a in FIG. 1. As shown in FIGS. 1, 8A and 9, the ceiling fan generally operates by applying alternating current (AC) to stator windings 805 which are affixed to a section of stator shaft 110 inside housing 14 and disposed in such a manner as to provide a rotating magnetic field. A metal, substantially cylindrical rotor 115 is disposed proximate to and concentric to the stator so that the rotor 115 can respond to the rotating magnetic field by following the field, i.e., rotating with the field. Outside of the housing 14, a rotor extension in the form

of a central hub **16a** is attached to the rotor **115** and also to fan blades **12**. Thus the rotary motion of rotor **115** is transferred through the central hub in order to impart rotary motion to the fan blades **12**.

[0023] As shown in FIG. 1, rotor brake **10a** for the ceiling fan is preferably an integral subsystem of the ceiling fan **105** that can keep the rotor **115** stationary in order to prevent the fan blades **12** from rotating during cleaning and maintenance of the fan. The rotor brake **10a** has at least one electrically actuated locking pin **20** capable of extending to be received by at least one corresponding locking pin receiver, such as mating hole or socket **22a**, being disposed on the fan blades **12** or central hub rotor extension **16a**, as shown in FIG. 1. The locking pin actuators **24a** may be comprised of, for example, without limitation, solenoids which are disposed in the fan's main housing **14**.

[0024] As shown in FIG. 2, an alternative embodiment of the rotor brake **10b** may include electric actuators **24b** disposed in the fan blades **12** or disposed in central hub rotor extension **16a** to activate locking pins **20** to cause the locking pins **20** to extend from the fan blades **12** or rotor extension **16a** into locking pin receivers **22b** in the main housing **14**. The electric actuators **24b** may be energized by a power source that is switched on or off by switch **26** housed in the lower housing **18**, and are connected to the switch **26** by interior wiring **28** running through the center axis of the rotor extension **16** and extending to the actuators **24b** via a slip ring (not shown).

[0025] The locking pins **20** may optionally be selectively actuated by a remote switch, such as in a nearby wall or a hand-held device, thereby allowing the actuators **24b** to be energized even when the power to the fan motor is turned off. This remote actuation of the locking pins **20** allows for safer cleaning and maintenance of the fan **105** and fan blades **12**.

[0026] Moreover, it should be clearly understood that actuators of, for example, without limitation, type **24a** or type **24b** may be disposed within an interior space of the housing **14** in positions that enable the locking pins **20** to engage locking pin receivers of, for example, without limitation type **22a** or type **22b**, being disposed on a section of the rotor **115** that is within the housing **14** in order to lock the rotor in a stationary position when the actuators **24a** or **24b**, or other suitable type actuators are energized.

[0027] As an alternative to locking pins **20**, FIG. 8B shows an actuator **24a** attached to a friction pin **20b**. The free end of the friction pin is attached to a brake pad **830**. The friction pin **20b** may have an adjustment wheel **835** capable of adjusting the stroke of the friction pin **20b**. When the actuator **24a** is energized, friction pin **20b** applies pressure through brake pad **830** to a rotating fan surface such as central hub rotor extension **16a** to hold the rotor **115** stationary. Alternatively, the actuator **24a** and friction pin **20b** may be disposed within housing **14** so as to apply braking directly to the rotor **115**.

[0028] In embodiments using either locking pin **20** or friction pin **20b**, the actuators may be energized as shown in FIG. 8A. An exemplary actuator **24a** is connected in an independent loop comprising brake switch **810**, fuse **815** and **120** VAC power supply having line, neutral and ground lines. When the switch **810** is in the closed position braking

actuators, including actuator **24a** is energized to apply the rotor brake, such as rotor brake **10a**, rotor brake **10b**, and the like. As further shown in FIG. 8A, power applied to the stator windings **805** should be interrupted, i.e., switches **820** should be open before applying power via switch **810** to the rotor brake actuator **24a**. Motor directional switches **825a** and **825b** may be open or closed during operation of the rotor brake **10a**, **10b**, and the like. In yet another embodiment, as shown in FIG. 9, the fan with rotor brake **105** may comprise a rotor brake **10c** having an electromagnetic field generator **805** (one or more of the stator coils) that selectively activates an electromagnetic field proximate to the rotor **115** to prevent rotation of the rotor **115**. Preferably, the electromagnetic field is non-time varying in order to provide magnetic poles that have substantially constant direction and amplitude.

[0029] The rotor **115**, being preferably formed from a stack of electrical steel laminations is electromagnetically responsive to magnetic fields generated in its proximity and will align itself with the constant direction/constant amplitude field to thereby maintain the attached blades **12** in a fixed position.

[0030] As shown in FIG. 9 power supplied to achieve the rotor braking effect comprises a DC power source as provided by bridge rectifier **D1-D4** having AC and ground input at **905a** and **905b** respectively. Negative output at **910b** is applied to one of the stator windings **805**, while positive voltage output provided at **910a** can be selectively routed to the remaining end of the stator winding **805**. A field strength adjustment may be made by setting potentiometer **930** to a position that provides appropriate resistance to turning of the rotor **115**. The rotor braking effect can be applied when switch **810** is closed. The braking system is protected by fuse **815**. Switch **920**, or either of switches **820** may be closed to complete the braking circuit. Directional switches **825a** are preferably open and non-operational during the braking effect mode of this embodiment. Additionally, in lieu of using the stator coils, a stationary auxiliary brake winding (not shown) may be provided as an attachment to a stationary, non-rotational section of the ceiling fan, e.g., the stator **110**. The auxiliary brake winding must be disposed in a manner similar to the existing stator windings **805** to have a similar braking effect on the rotor **115** when energized.

[0031] In an alternative embodiment, as shown in FIG. 3, ceiling fan **105b** has a rotor **115** that is attached to blade iron rotor extensions **16b**. An attachable rotor brake **30** may be provided to attach to the outside of ceiling fan lower housing **18**. As shown, rotor brake **30** includes arms **36** that can extend or pivot up from a body **34** to form a yoke that engages either the stationary fan blade **12** or the stationary fan blade iron rotor extension **16b** to prevent the blades **12** from rotating. As shown in FIG. 3, the locking mechanism **30** is an extendable attachment secured to the lower housing **18** using an existing lower housing screw **32**. Referring to FIG. 4, the base **34** of extendable attachment has two telescoping arms **36** extending in a diverging manner upwardly from the base **34** to form a yoke. The screw **32** is inserted into an aperture **38** that passes through the base **34**, before the screw **32** is tightened into the lower housing **18**. For additional strength, an adhesive backing (not shown) may be used on the base **34** to help hold the base **34** against the lower housing **18**. When the telescoping arms **36** are fully extended, they form a yoke around a fan blade **12** to

prevent the blades 12 and rotor 115 from rotating. These arms 36 may be operated by a switch, a pull chain, or manually.

[0032] In a further embodiment as shown in FIG. 5, the locking mechanism 40 is a pivoting yoke attachment secured to the side of the lower housing 18 using existing lower housing screws. Referring to FIGS. 6-7, the pivoting yoke attachment 40 includes a curved base 42, with apertures 44 sized to receive a screw (not shown) before the screw is tightened into the lower housing 18. The base 42 is curved to mate flush over a portion the outer surface of the lower housing 18. A neck 46 extends vertically from the top of the base 42. Two diverging arms 48 extend substantially vertically from the top of the neck 46. The neck 46 includes a hinge 50, which allows the user to pivot the arms 48 from a substantially vertical position to a substantially horizontal position. When in the substantially vertical position, the arms 48 surround a fan blade 12 and prevent the fan blade assembly from rotating. A pull chain 52 attached to the neck 46 or arms 48 allows the user to utilize an actuator (not shown) to pull the arms 48 down into the horizontal position.

[0033] It is to be understood that the present invention is not limited to the embodiments described above, but encompasses any and all embodiments within the scope of the following claims.

We claim:

1. A ceiling fan, comprising:
 - motor; the motor comprising a stator having electromagnetic windings capable of providing a rotational electromagnetic force when the stator is electrically energized;
 - the motor further comprising a rotor that is proximate to and disposed concentric to the stator;
 - the rotor being rotation ally responsive to the rotational electromagnetic force provided by the stator;
 - a motor housing that surrounds the motor;
 - fan blades, the fan blades being connected to the rotor so that when the rotor is rotating, the fan blades rotate in a corresponding manner;
 - a rotor brake, the rotor brake being capable of being selectively applied to keep the fan blades in a stationary position when the rotational electromagnetic force is not present, thereby allowing a user to clean the fan blades without them free-wheeling during the cleaning process.
2. The ceiling fan according to claim 1, wherein the rotor brake comprises an electrically actuated mechanical system to prevent rotation of the rotor.
3. The ceiling fan according to claim 2, wherein the electrically activated mechanical system comprises: at least one locking pin being non-rotation ally disposed and extending from a stationary non-rotatable portion of the ceiling fan at a predetermined radial distance from the center axis of rotation of the ceiling fan blades; at least one corresponding locking pin receiver being disposed in at least one ceiling fan blade, while being adapted to receive the locking pin; and, an electric actuator capable of extending the locking pin to engage the locking pin receiver so that the ceiling fan blade assembly is prevented from rotating.

4. The ceiling fan according to claim 3, wherein the electric actuator is a solenoid.

5. The ceiling fan according to claim 2, wherein the electrically activated mechanical system comprises: at least one locking pin being non-rotation ally disposed and extending from a stationary non-rotatable section of the ceiling fan at a predetermined radial distance from the center axis of rotation of the ceiling fan blades; at least one corresponding locking pin receiver being disposed in a rotor extension, the rotor extension being connected to the rotor, the locking pin receiver in the rotor extension being adapted to receive the locking pin; and, an electric actuator capable of extending the locking pin to engage the locking pin receiver so that the ceiling fan blade assembly is prevented from rotating.

6. The ceiling fan according to claim 5, wherein the electric actuator is a solenoid.

7. The ceiling fan according to claim 2, wherein the electrically activated mechanical system comprises: at least one locking pin being non-rotation ally disposed within a stationary non-rotatable portion of the ceiling fan at a predetermined radial distance from the centeraxis of rotation of the ceiling fan blades; at least one corresponding locking pin receiver being disposed in the rotor, the locking pin receiver being adapted to receive the locking pin; and, an electric actuator capable of extending the locking pin to engage the locking pin receiver so that the ceiling fan blade assembly is prevented from rotating.

8. The ceiling fan according to claim 2, wherein the electric actuator is a solenoid.

9. The ceiling fan according to claim 2, wherein the electrically activated mechanical system comprises: at least one friction pin being non-rotation ally disposed within a stationary non-rotatable section of the ceiling fan at a predetermined radial distance from the center axis of rotation of the ceiling fan blades; a brake pad being attached to a free end of the friction pin; and, an electric actuator capable of extending the friction pin so that the brake pad frictionally engages a rotating component of the ceiling fan in order to prevent the blade assembly from rotating.

10. The ceiling fan according to claim 9, wherein the rotating component of the ceiling fan is the rotor.

11. The ceiling fan according to claim 9, wherein the rotating component of the ceiling fan is a central hub, the central hub being connected to the rotor and having a flat disc-like surface suitable for frictional engagement with the friction pin brake pad.

12. The ceiling fan according to claim 9, wherein the electric actuator is a solenoid.

13. The ceiling fan according to claim 1, wherein the rotor brake comprises a yoke that attaches to the fan so that the yoke may be disposed to engage a stationary, rotatable fan member attached to the rotor of the fan to prevent the blades from rotating when power is not applied to the fan motor.

14. The ceiling fan according to claim 13, wherein the engagement of the yoke to the rotatable fan member is mechanically actuated.

15. The ceiling fan according to claim 13, wherein the engagement of the yoke to the rotatable fan member is electrically actuated.

16. The ceiling fan according to claim 13, wherein the rotatable fan member is selected from one of the following: a fan blade iron, a fan blade.

17. The ceiling fan according to claim 1, wherein the rotor brake comprises a selectively activated electromagnetic field

generator that applies an electromagnetic field proximate to the rotor to prevent rotation of the rotor, thereby holding the blades stationary.

18. The ceiling fan according to claim 17, wherein the electromagnetic field is non-time varying in order to provide magnetic poles that have substantially constant direction and amplitude.

19. The ceiling fan according to claim 17, wherein the electromagnetic field generator is selected from one of the following: at least one of the stator windings of the motor, at least one stationary auxiliary brake winding, the at least

one stationary auxiliary brake winding being attached to a stationary, non-rotational portion of the ceiling fan.

20. A rotor brake kit for ceiling fans, comprising:

a base;

a yoke extending from the base; means for securing the base to a stationary, non-rotatable section of the ceiling fan, so that the yoke is capable of engaging one of the following: a fan blade, a fan blade iron, to prevent the fan blades from rotating.

* * * * *