May 22, 1956 A. L. COLLINS 2,746,673

OSCILLATING AND LIKE MECHANISM FOR ELECTRIC FANS

Filed Oct. 25, 1954 4 Sheets-Sheet 1

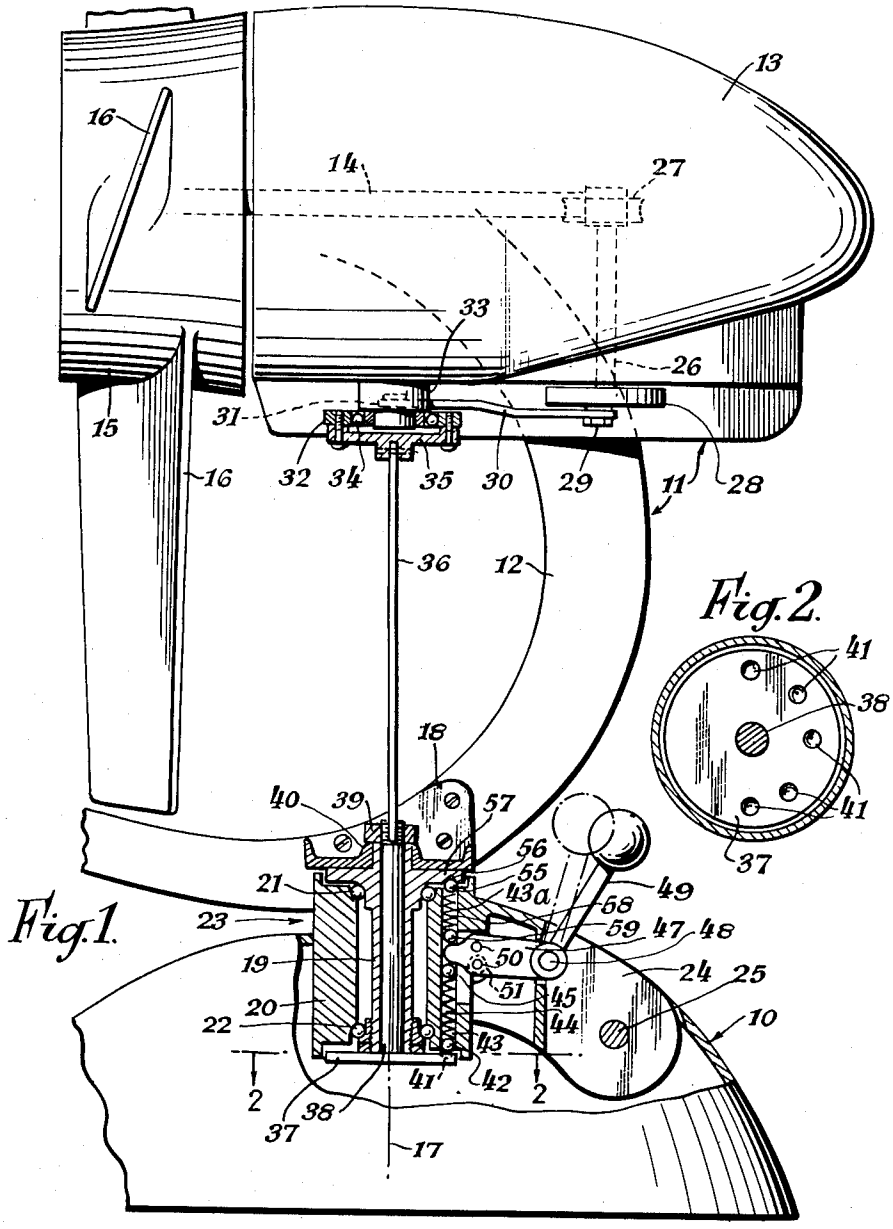

Fig. 1.

Fig. 2.

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OSCILLATING AND LIKE MECHANISM FOR ELECTRIC FANS

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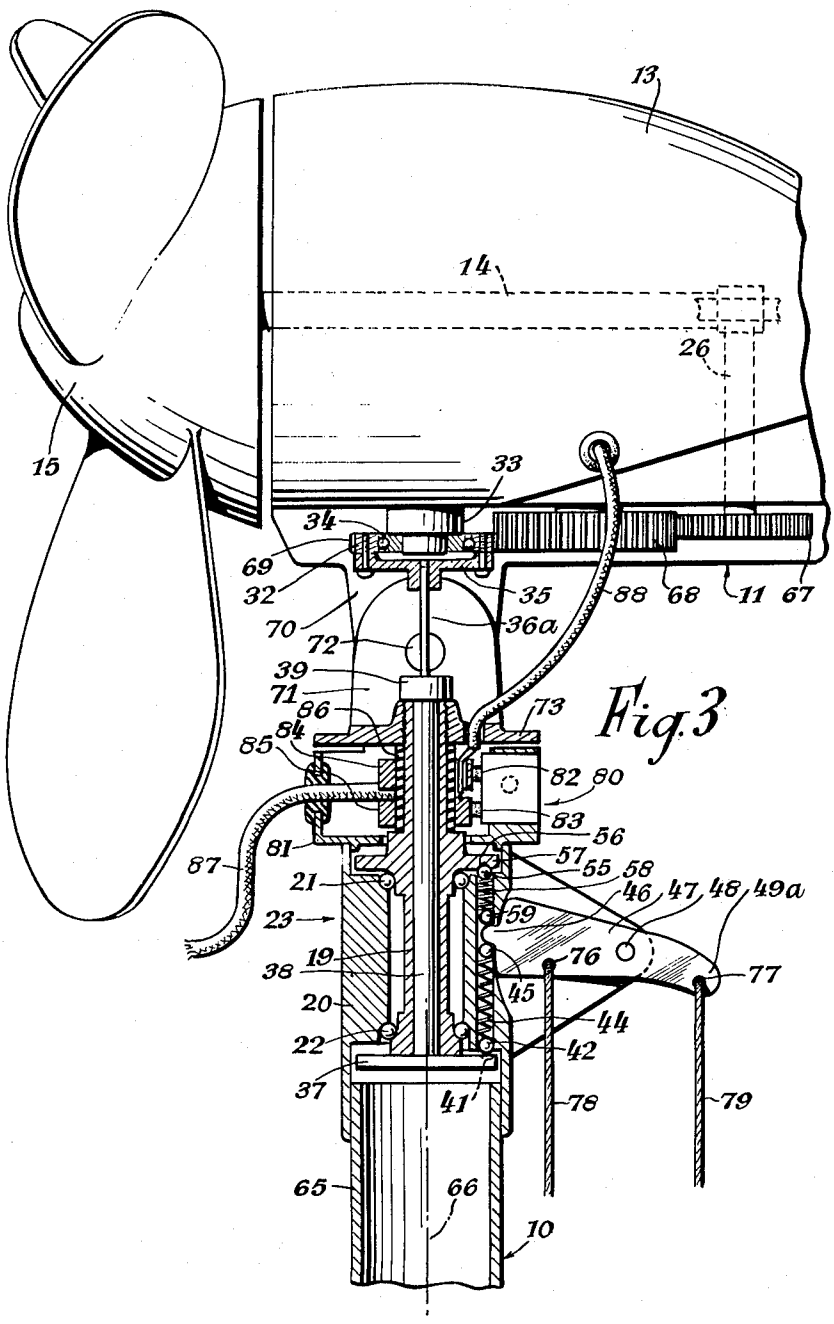

Fig. 3

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OSCILLATING AND LIKE MECHANISM FOR ELECTRIC FANS

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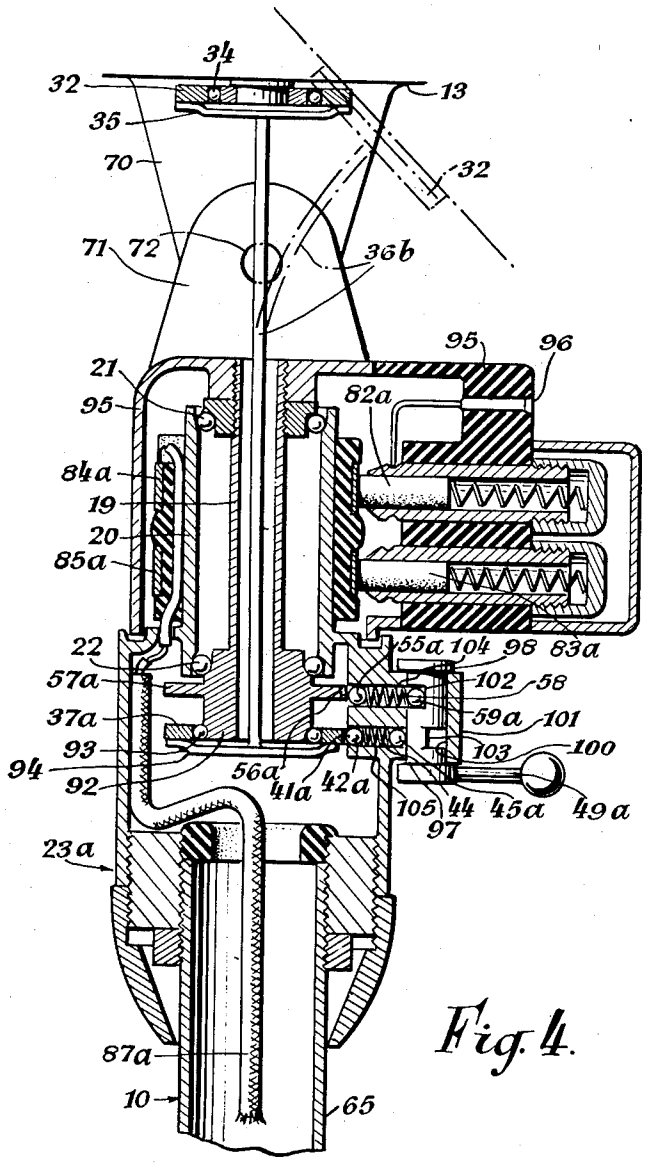

Fig. 4.

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OSCILLATING AND LIKE MECHANISM FOR ELECTRIC FANS

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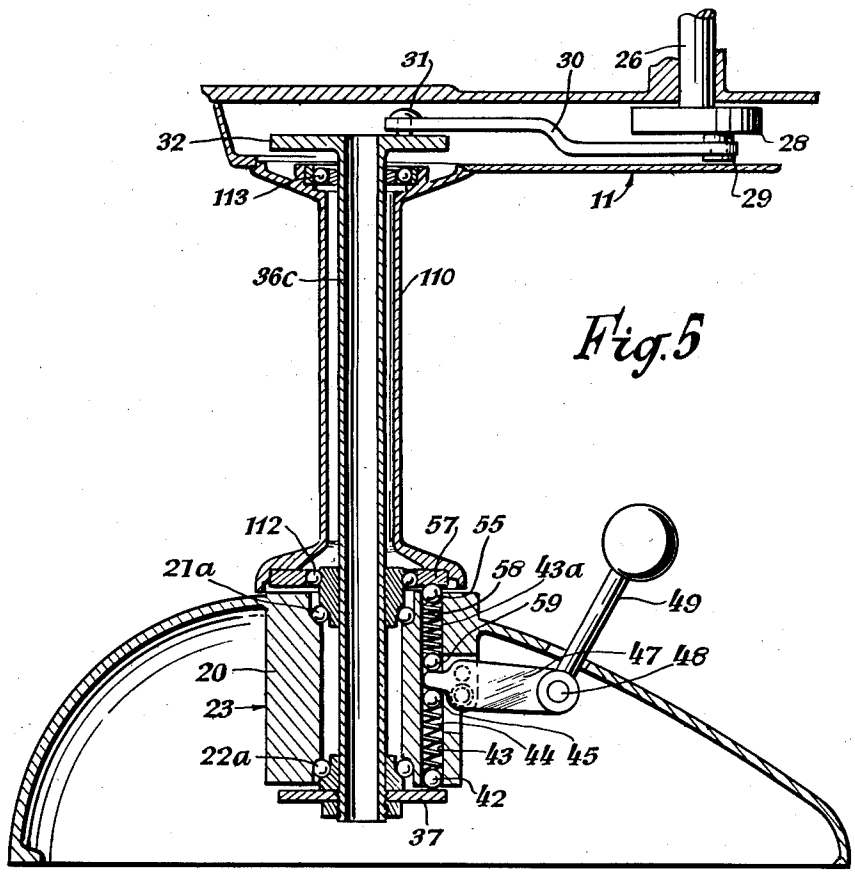

Fig. 5

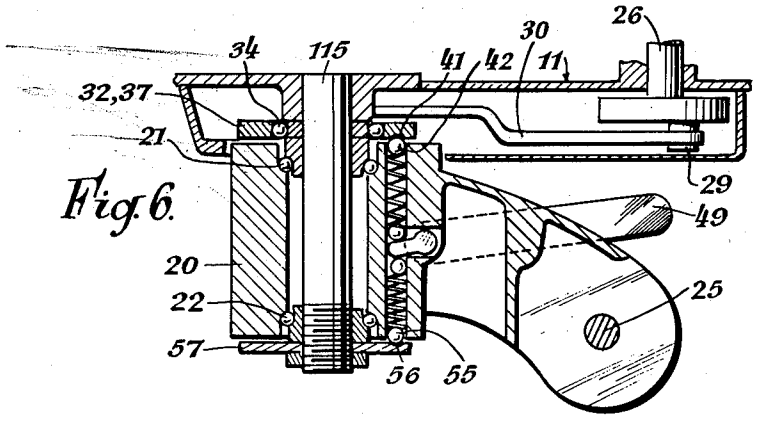

Fig. 6.

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Patented May 22, 1956

2,746,673

OSCILLATING AND LIKE MECHANISM FOR ELECTRIC FANS

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Application October 25, 1954, Serial No. 464,450

8 Claims. (Cl. 230—256)

This invention relates to oscillating and like mechanism for electric fans and it has for an object to provide a form and construction of mechanism which is very convenient to operate and is simple to manufacture.

It is now well known to arrange for the electric driving motor and fan rotor to be mounted so as to oscillate or rotate bodily (herein referred to generically as "turning") in order that the currents of air produced by the fan may be distributed in space instead of being confined to a stationary beam. Usually the turning can be initiated or stopped at will by manipulation of a control means but in the known arrangements this control means is closely associated with the motor and is therefore disposed upon that portion of the fan which turns, so that if it is to be manipulated easily and safely it is usually necessary first to switch off the fan before putting the turning mechanism into or out of operation. By the present invention this inconvenience can easily be overcome, and moreover the improved fan may readily be adapted for remote control by cords or other means operable while the fan is running. In the present specification the term "base" is intended to include any part of the structure which remains stationary while the head is turning.

In an electric fan comprising a base, a head which includes an electric motor and fan rotor and which is mounted with freedom to turn relative to said base, and turning mechanism driven by said motor so as to be operative between the head and the base, according to the invention a control member, which mechanically controls the operation of the turning mechanism, is mounted on the base and remains stationary when the head is turning.

According to another aspect of the invention an electric fan is provided comprising a base, a head which includes an electric motor and fan rotor and which is mounted with freedom to turn relative to said base, and turning mechanism driven by said motor so as to be operative between the head and the base, wherein the turning mechanism includes an anchorage member, a brake device adapted to hold the anchorage member against turning relative to the base, and a control member which is disposed upon the base and is adapted to bring the brake device into and out of action to control the turning of the head.

Moreover in an electric fan having its electric motor and fan rotor mounted pivotally upon a base so as to form a head arranged to turn and also having turning mechanism driven by said motor, according to another aspect of the invention the turning mechanism comprises an anchorage member movable relative to the base, a brake device for arresting movement of said anchorage member and thereby rendering the turning mechanism operative, and a control device mounted on said base so as to be free of the turning movement of said head.

Preferably a locking device is provided which is operative between the base and the head to hold the latter against turning, the control member for the brake device conveniently also operating the locking device, one being released while the other is applied. The brake device

may have a non-positive holding action which can be overcome by the force of the turning mechanism if turning movement of the head is obstructed; also the locking device may have a non-positive holding action, which can be overcome by turning the head manually.

A turning mechanism suitable for oscillating the head may comprise a crank driven continuously by the motor and a connecting rod connecting the crank to the anchorage member. The brake device operable between the body and the anchorage member may comprise a non-positive locating means such as a spring-pressed ball or other resilient catch member on one element adapted to co-operate with one or more recesses in the surface of the other element. If desired a locking device for checking turning of the head relative to the base may be arranged on the same principle. Moreover the control means may be in the nature of a change-over device adapted to throw either the brake device or the locking device into action at will, the other being rendered inoperative.

The invention is illustrated by way of example in the accompanying diagrammatic drawings, in which:

Figure 1 is a side elevation of the table fan, the controlling means for the turning action being shown in section;

Figure 2 is a fragmentary sectional plan taken on the line **2—2** of Figure 1 and showing the braking member;

Figure 3 is a sectional elevation of a modified construction of fan mounting, this being particularly suitable where the head is required to turn continuously;

Figure 4 is a fragmentary sectional elevation of a further construction of mounting;

Figure 5 is a similar view of yet another embodiment of the invention; and

Figure 6 is a similar view of another arrangement.

The table fan shown in Figure 1 has a base **10** upon which a head is mounted, said head being indicated generally at **11** and being in the form of a guard cage, one of the main structural members of which is shown at **12**. The head also includes an electric driving motor **13**, on the spindle **14** of which a fan rotor **15** is fitted, the blades of the fan being shown at **16**. The head **11** is arranged to be movable bodily about an axis **17**, this angular movement being herein referred to as "turning." For this purpose a bracket **18** is secured rigidly to the guard cage **12** and is formed with a depending tubular stem **19** which is pivotally mounted in a tubular barrel **20** by means of two ball races **21** and **22**. The tubular barrel **20** forms part of a control unit which is indicated generally at **23** and includes a rearwardly-directed lug **24** which is attached to the stand **10** by means of a horizontal bolt **25**, the arrangement being such that the control unit **23** can be swung upwards or downwards through a limited angle and clamped in any desired position within this range. By this means the cage **11**, together with the turning axis **17**, can be tilted to suit the desired working conditions.

For bringing about the turning motion the electric motor **13** is provided with a downwardly-directed shaft **26** which is geared to the motor spindle **14** by worm gearing **27** and is therefore adapted to rotate continuously at a slow speed for the whole time that the fan rotor **15** is running. At its lower end the shaft **26** is provided with a crank disc **28** carrying a crank-pin **29**, and this is coupled by a connecting rod **30** to an anchor pin **31** fitted upon the marginal part of a circular anchorage member **32**. The anchorage member **32** is arranged to be rotatable relative to a spigot **33** formed upon the bottom of the driving motor **13**, a ball bearing **34** being interposed in order to reduce friction. It will be apparent that when the anchorage member **32** is held stationary (by means

to be hereinafter described) the anchor pin **31** is fixed in space and therefore the rotating crank pin **29** and connecting rod **30** have the action of oscillating the head **11** about the axis **17**, as is well known in connection with electric table fans; on the other hand, when the anchorage member **32** is free to rotate, the motion of the crank pin **29** merely causes said anchorage member **32** to oscillate idly, the head **11** remaining stationary. For the purpose of controlling the anchorage member **32** it is provided with a diametral bridge **35** which is connected by a shaft **36** to a braking member **37** disposed at the bottom of the control unit **23**, said braking member **37** being in the form of a circular disc fast upon a spindle **38** which is freely rotatable in the tube **19** and forms the lower part of the shaft **36**. The spindle **38** is held against downward movement by a collar **39** which bears against a boss **40** formed upon the bracket **18**.

The upper surface of the braking member **37** is formed with an arcuate series of spaced recesses **41**, these being shown more clearly in Figure 2, and they are adapted to be engaged by a ball **42** which fits snugly but slidably within a bore **43** formed in the wall of the tubular barrel **20**, said ball being adapted to cooperate with the recesses **41** so as to form a non-positive locating means for the braking member **37**. The ball **42** is arranged to be pressed resiliently downwards by a stiff coiled compression spring **44** disposed within the bore **43**, the upper end of said spring being engaged by a ball **45** adapted to be acted upon by the extremity **46** of a control arm **47**, this having a fulcrum at **48** and being rigid with a control lever **49** projecting upwards from the control unit **23**. The control arm **47** is formed with two holes **50**, either one of which is adapted to be engaged by a resilient ball catch **51** adapted to hold said arm **47** in its raised or its lowered position. In Figure 1 the arm **47** is shown in its raised position in which it allows the coiled compression spring **44** to assume its natural length so that it exerts very little or no force upon the ball **42**; on the other hand when the arm **47** is in its lowered position its extremity **46** presses down the spring **44** through the medium of the ball **45**, thereby causing the ball **42** to engage one or other of the recesses **41** with sufficient firmness to hold the anchorage member **32** sufficiently strongly to bring about a reliable turning of the head **11** under the force provided by the motor shaft **26** and crank pin **29**.

It will thus be seen that the anchorage member **32** can be held by lowering the control arm **47**, thereby bringing about an oscillatory turning of the head **11**; on the other hand, by raising the control arm **47**, the braking member **37** and the anchorage member **32** are freed so that the head **11** can remain stationary. The coiled compression spring **44**, the ball **42** and the recesses **41** together form non-positive locating means for the braking member **37** and these parts are so designed that the normal gripping action will be ample for holding the anchorage member **32** stationary during normal operation of the fan, but if the turning movement of the head **11** should become impeded by an obstacle, then the braking member **37** can turn relative to the ball **42**, thus preventing the fan being overturned or doing any damage.

When the control arm **47** is raised it has the effect of non-positively locking the head **11** and for this purpose the bore **43** is continued upwardly as indicated at **43*a*** and contains a ball **55** adapted to engage a recess **56** formed in a locking disc **57**, this conveniently being integral with the inner race of the ball bearing **21**, and therefore being fast in relation to the bracket **18** and the head **11**. The ball **55** is adapted to be pressed upwardly by a coiled compression spring **58** disposed within the bore **43*a***, the lower end of said spring being engaged by a ball **59** pressing against the extremity **46** of the control arm **47**. Again the spring **58** is so designed that when the control arm **47** is in its lowered position, said spring **58** can rest freely within the bore **43*a***, leaving the ball **55** substantially out of engagement with the locking disc **57**, but when the control arm **47** is raised, the spring **58** is compressed, causing the ball **55** to be pressed into the recess **56** with sufficient firmness to locate the head **11**. Whenever desired however the head **11** can be turned manually, thereby forcing the ball **55** downwards against the force of the spring **58**. The locking disc **57** can conveniently be provided with a series of recesses **56** adapted to provide a selection of "locked" positions for the head **11**.

In the example shown in Figure 3 the head **11** comprises mainly the electric motor **13** and bladed fan rotor **15**, these parts being mounted upon the top of a pedestal **65** which forms the base **10**. The turning movement of the head **11** in this case takes the form of a continuous rotation about the vertical axis **66** of the base **10**, and this motion is brought about by connecting the slow vertical shaft **26** of the motor **13** with the anchorage member **32** by means of a driving gear wheel **67** on the shaft **26** meshing with an idler gear wheel **68**, which latter in turn meshes with teeth **69** formed around the periphery of the anchorage member **32**. Thus when the anchorage member **32** is held stationary the gearing **67**, **68** causes the head **11** to turn continuously, but when the anchorage member **32** is free, it turns idly under the driving influence of the gear wheel **67** and the head **11** remains stationary. For enabling this result to be achieved the motor **13** is mounted in the following manner.

A pair of lugs, one of which is seen at **70**, is formed upon the lower part of the motor **13**, and these are respectively attached by clamping bolts to a pair of upwardly-directed lugs, one of which is shown at **71**, the corresponding bolt being indicated at **72**. The two lugs **71** are mounted rotatably upon the top of the pedestal **65** and for this purpose they are formed integrally upon a circular plate **73** having a depending tube **19** which is mounted pivotally in a tubular barrel **20** by means of ball bearings **21** and **22**, these parts being similar to those in Figure 1. The locking member **57** is again in the form of a disc which is fast upon the tube **19** and is formed with one or more recesses **56** adapted to be engaged by a ball **55** under the influence of a coiled compression spring **58** to form non-positive holding means for the locking member **57** when the control arm **47** is in its raised position. The control unit **23** in Figure 3 also includes a circular braking member **37** formed with recesses, one of which is seen at **41**, for engagement by a ball **42**, again so as to secure a non-positive holding action under the compressive force of a coiled spring **44**. The braking member **37** is disposed at the lower end of a rod **38** which extends rotatably through the tube **19** and has a collar **39** attached to its upper end so as to hold the braking member **37** against downward movement. A flexible shaft **36*a*** adapted to transmit torsion extends between the upper end of the rod **38** and the bridge portion **35** of the anchorage member **32**, so that when the braking member **37** is held against turning, the anchorage member **32** is similarly held. Nevertheless the flexible nature of the shaft **36*a*** enables the motor **13** to be tilted relative to the horizontal by suitable adjustment of the lugs **70**, **71**, the adjustment being locked by tightening the bolt **72**. When the motor is inclined in this way it still turns about the vertical axis **66**, the shaft **36*a*** bending in order to follow the orbital movements of the spigot **33**.

The control arm **47** is extended outwards, as indicated at **49*a*** so as to form an operating lever which can be moved manually if desired. For relatively inaccessible positions however the control arm **47** is formed with a pair of holes **76** and **77** disposed at opposite sides of the fulcrum **48** and adapted to receive depending cords **78** and **79** or like control members; thus to move the control arm **47** downwards the cord **78** is pulled and to move it upwards the cord **79** is pulled.

In order that electric current may be fed to the electric motor **13** while it is turning, a slip ring device **80** is

incorporated in the control unit **23**. The tubular barrel **20** is fitted at its upper part with a casing **81** carrying a pair of electrically-insulated brushes **82** and **83** which engage a pair of insulated slip rings **84** and **85**, respectively, mounted upon an insulating sleeve **86** upon the tube **19**. A flexible electric conductor **87** leads the supply to the brushes **82** and **83**, while a conductor **88** leads from the slip rings **84** and **85**, and passing through the plate **73**, feeds current into the electric motor **13**.

If desired of course the construction shown in Figure 3 can be used in connection with a fan, the head of which has an oscillatory turning movement, a connecting rod and crank-pin mechanism (similar to that in Figure 1) being substituted for the gearing **67**, **68** and **69**.

The arrangement shown in Figure 4 is a modified construction which performs the same general function as that in Figure 3. The control unit **23** is mounted at the top of a pedestal **65** forming the base **10** and it incorporates a tubular barrel **20** carrying the ball bearings **21** and **22**, by which the tubular spindle **19** is mounted. The locking member is again in the form of a disc shown at **57***a*, but in this instance it is disposed at the lower end of the tubular barrel **20**. Moreover it has notches such as that indicated at **56***a*, formed in its periphery for engagement by a ball **55***a* to form the non-positive holding means. A collar **92** fitted to the lower end of the tube **19** forms the inner race of a ball bearing **93** upon which the braking member **37***a*, is fitted, said braking member in this instance being of annular shape. It also has one or more notches **41***a* formed in its circumference for engagement by a corresponding ball **42***a* to serve as non-positive holding means. A disc **94** secured to the braking member **37***a* serves as the attachment for a flexible shaft **36***b* which extends up the bore of the tube **19** and is attached to the bridge member **35** of the anchorage member **32**.

A rotatable casing **95** is fixed to the tubular shaft **19** and carries the lug **71** by which the electric motor **13** is mounted, said motor having depending lugs **70** as in the preceding example. In this case however a pair of conducting brushes **82***a* and **83***a* are adapted to cooperate with a pair of slip rings **84***a* and **85***a*, the brushes being mounted upon the rotatable housing **95** while the slip rings are on the stationary tubular barrel **20**. The current supply is fed into the control unit by a conductor **87***a* leading to the two slip rings **84***a* and **85***a*; these rings transfer current to the brushes **82***a* and **83***a*, which feed it to the motor by way of a plug socket **96**.

For the purpose of controlling the turning movements of the electric motor **13** a control lever **49***a* extends radially from the lower end part of a cam member **97** which is substantially cylindrical in shape with a head **98** at its upper end. It fits rotatably within a bore **100** formed in a boss **101** on the side of the control unit **23** and it has at displaced points in its periphery a pair of segmental recesses **102** and **103** which register (for different positions of the control lever **49***a*) with bores **104** and **105**, respectively, containing the balls **55***a* and **42***a*. In the position of the control lever **49***a* shown in Figure 4 (corresponding to the turning position of the fan) the recess **103** is out of engagement with the ball **45***a* so that the latter rests against a circumferential portion of the member **97**. The coiled compression spring **44** is therefore compressed and its forces the ball **41** hard against the circumference of the braking member **37***a*, thereby locking the latter non-positively when said ball **42***a* engages one of the notches or recesses **41***a*. This of course prevents rotation of the braking member **37***a* and therefore holds the anchorage member **32** stationary by means of the flexible shaft **36***b*. On the other hand the recess **102** is in a position to receive the ball **59***a* which has the action of relieving substantially the whole of the stress in the compression spring **58**; therefore the ball **55***a* is substantially free and exerts no restraint upon the locking member **57***a*. By turning the control lever **49***a* through a suitable angle the conditions are reversed, the recess **103** being brought into engagement with the ball **45***a* to free the braking member **37***a*, while the ball **59***a* is pushed into the bore **104** to stress the compression spring **58** and thereby hold the locking member **57***a*.

The construction shown in Figure 5 is particularly suitable for table fans and enables a compact and simple design of oscillating fan to be obtained. The base **10** embodies the control unit which is again indicated at **23** and carries a control lever **49** movable angularly about a fulcrum **48** to raise and lower a control arm **47**. The control unit **23** is of substantially the same form as that in Figure 1 and includes a tubular barrel **20** having a passage **43**, **43***a* containing the two locking balls **55** and **42** with their corresponding springs **58** and **44** actuated by the arm **47** through balls **59** and **45** to hold non-positively either the locking member **57** or the brake member, the other of said members being freed. In this case the ball bearings **21***a* and **22***a* in the barrel **20** form the mounting for a shaft **36***c* which is in the form of a rigid tube having the brake member **37** fast upon its lower end, while its upper end carries the anchorage member **32** in the form of a disc; thus when the brake member is held by the ball **42**, the anchorage member is prevented from rotation. The shaft **36***c* is utilised as a convenient pivotal mounting for the head, which latter includes a downward tubular stem **110** having a flange at its lower end to receive the locking member **57**, the latter being journalled upon the shaft **36***c* by a ball bearing **112**; the upper end of the stem **110** is firmly attached to the bottom of the electric motor **13** and contains a ball bearing **113** also mounted upon the shaft **36***c*. The motor **13** (with the usual fan rotor—not shown) is free to turn upon the shaft **36***c* when the ball **55** is released, the oscillatory motion being imparted to it by the crank disc **28**, crank pin **29** and connecting rod **30**, which latter is pivoted to an eccentrically-placed stud **31** on the anchorage member **32**, this of course being held stationary by the holding action of the ball **42** on the brake member **37** when the control arm **47** is in its lowered position. To render the head **11** stationary the control arm is raised, thereby freeing the brake member **37** and causing the ball **55** to hold the locking member **57**.

Figure 6 shows another simple construction of mounting which is suitable for use where the turning control is disposed closely adjacent the anchorage member. The head **11** comprises an electric motor body **13** having secured rigidly to its underneath, a vertical shaft **115** extending through the tubular barrel **20**, within which it is pivotally mounted by ball bearings. Firmly secured to the bottom of the shaft **115** is the locking member **57** having the recesses **56** which are engaged by the spring-pressed ball **55** as in the preceding examples. The anchorage member **32** is mounted upon the shaft **115** by a ball bearing **34** and in this instance it also forms the brake member **37** for it is formed on its underneath surface with one or more recesses **41** for engagement by the spring-pressed ball **42**. In the example shown a connecting rod **30** and crankpin **29** are indicated, to produce an oscillatory turning movement, but of course gearing or other mechanism could equally well be used to couple the spindle **26** to the anchorage member **32**, **37** to produce any other required form of turning motion.

It will be understood that the details described above are given by way of example only, and that various other changes may be made. Although the invention is concerned primarily with the control of the turning movement of the head by manual operation of a control member disposed on the stationary base, it will be appreciated that other means such as a mechanical linkage or even an electromagnetic system may be used for actuating the control member on the base where remote control is required, for the invention still has the advantage that mechanical or electrical connections need not be taken to the head which turns.

What I claim is:

1. An electric fan comprising a base, a head which includes an electric motor and a fan rotor, and which is mounted to turn relative to the base, turning mechanism driven by the motor and including an anchorage member, a releasable brake device arranged to hold said anchorage member stationary to render the turning mechanism operative to turn the head, and a control member which is disposed upon the base and controls the brake device, which brake device comprises a plunger member on the base, a brake rotor movable with the anchorage member and having a recess engageable with the plunger member, and a spring operatively interposed between the control member and the plunger member, so that said spring, when stressed by the control member, presses the plunger member into operative engagement with said recess and at the same time enables the engagement of the plunger member and brake rotor to give way if the head in turning encounters an obstruction.

2. An electric fan comprising a base, a head which includes an electric motor and a fan rotor, and which is mounted to turn relative to the base, turning mechanism driven by the motor and including an anchorage member, a ball bearing connecting the anchorage member with the head so as to allow free relative rotation therebetween, a releasable brake device arranged to hold said anchorage member stationary to render the turning mechanism operative to turn the head, and a control member which is disposed upon the base and controls the brake device, which brake device comprises a plunger member on the base, a brake rotor movable with the anchorage member and having a recess engageable with the plunger member, and a spring operatively interposed between the control member and the plunger member, so that said spring, when stressed by the control member, presses the plunger member into operative engagement with said recess and at the same time enables the engagement of the plunger member and brake rotor to give way if the head in turning encounters an obstruction.

3. An electric fan comprising a base, a head which includes an electric motor and a fan rotor, and which is mounted to turn relative to the base, turning mechanism driven by the motor and including an anchorage member, a releasable brake device arranged to hold said anchorage member stationary to render the turning mechanism operative to turn the head, a locking member which is rotatable as one with the head, a locking plunger member engageable with a recess formed in the locking member, and a control member which is disposed upon the base and controls both the brake device and the locking plunger member, which brake device comprises a plunger member on the base, a brake rotor movable with the anchorage member and having a recess engageable with the plunger member, and a spring operatively interposed between the control member and the plunger member, so that said spring, when stressed by the control member, presses the plunger member into operative engagement with said recess and at the same time enables the engagement of the plunger member and brake rotor to give way if the head in turning encounters an obstruction.

4. An electric fan according to claim 3, in which a spring is operatively interposed between the locking plunger and the control member, which spring enables the engagement of the locking plunger member and the locking member to give way if turning force is applied to the head to change its angular position while the locking plunger member is engaged.

5. An electric fan comprising a base, a head which includes an electric motor and fan rotor and which is mounted to turn relative to said base, turning mechanism driven by said motor so as to be operative between the head and the base, the turning mechanism including an anchorage member, a brake device adapted to hold the anchorage member against turning relative to the base, a control member which is disposed upon the base and is adapted to bring the brake device into and out of action to control the turning of the head, the brake device comprising a brake rotor movable as one with the anchorage member and having a recess in its surface, a brake plunger disposed within a passage in the base, into which passage the control member extends, and a compression spring interposed between the control member and the brake plunger so that the control member acts through said compression spring to press the brake plunger into engagement with the recess in the brake rotor to locate the brake rotor non-positively against turning.

6. An electric fan according to claim 5, including a locking rotor rotatable as one with the head, a locking plunger disposed within that end of the passage opposite to the brake plunger and aranged to engage a recess in the locking rotor, and a compression spring interposed between the control member and the locking plunger whereby force is applied by the control member through the compression spring to the locking plunger to lock the head non-positively against rotation.

7. An electric fan comprising a base, a head which includes an electric motor and a fan rotor and which is mounted with freedom to turn relative to said base, turning mechanism including an anchorage member which is disposed on the head and is rotatable relative to said head but needs to be held stationary to make the turning mechanism effective, a brake device on the base, a flexible shaft resistant to torsion connecting the anchorage member to the brake device, thereby enabling the head to be tilted relative to the axis of turning, and a control member which is disposed upon the base and is adapted to bring the brake device into and out of action to control the turning of the head.

8. An electric fan comprising a base, a head which includes an electric motor and fan rotor and which is mounted with freedom to turn relative to said base, turning mechanism driven by said motor so as to be operative between the head and the base, and including an anchorage member which needs to be held stationary to bring the turning mechanism into action, a control unit which is mounted on the base, a rigid shaft which is carried by the control unit and upon which the head is pivotally mounted so as to enable said head to execute the turning motion, said anchorage member being fixed to said rigid shaft, which control unit comprises a brake device engageable with the rigid shaft to hold the anchorage member against turning, a locking device operable to hold the head against turning, and a movable control member arranged in one position to bring the brake device into operation and in another position to bring the locking device into operation.

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