Aug. 25, 1925. 1,551,278

C. AALBORG

ELECTRIC FAN

Filed Oct. 19, 1922 3 Sheets-Sheet 1

Fig. 1.

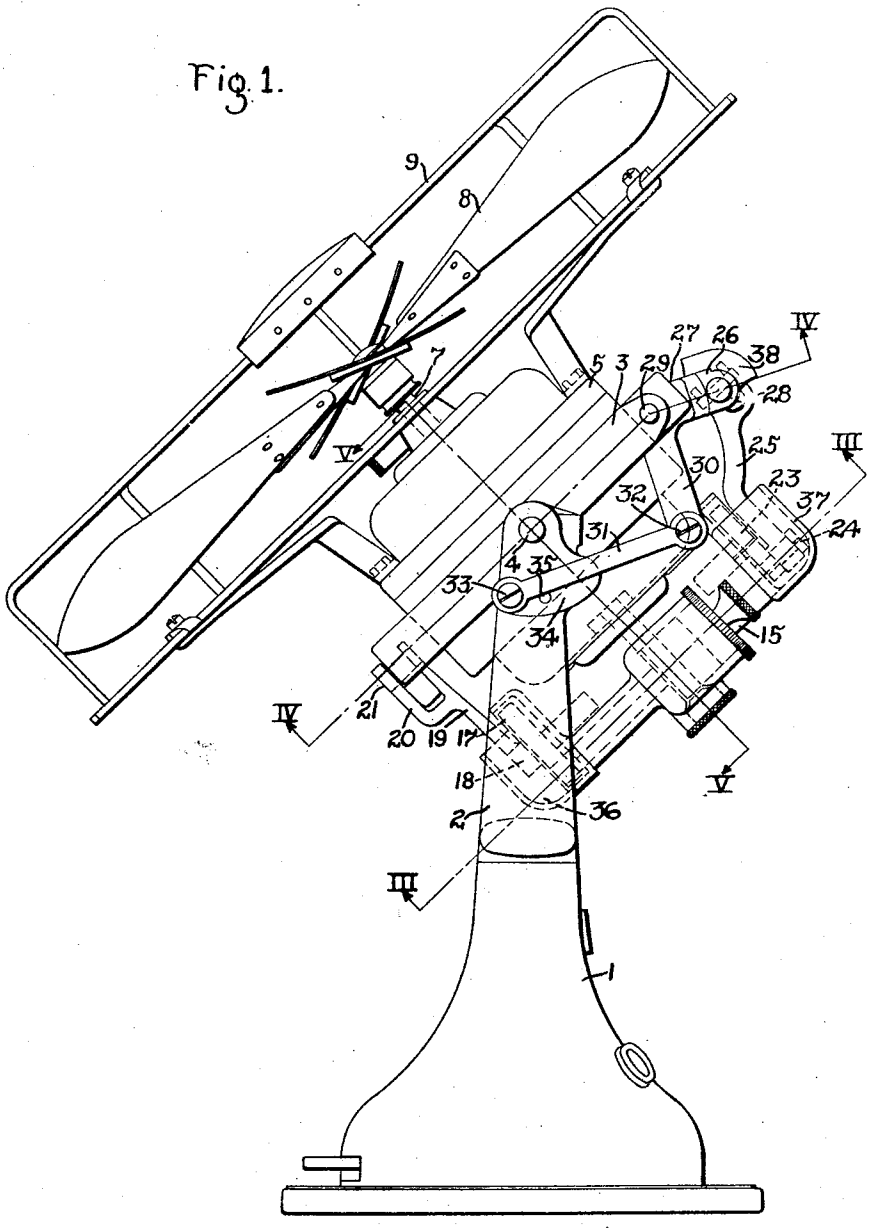

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Fig. 2.

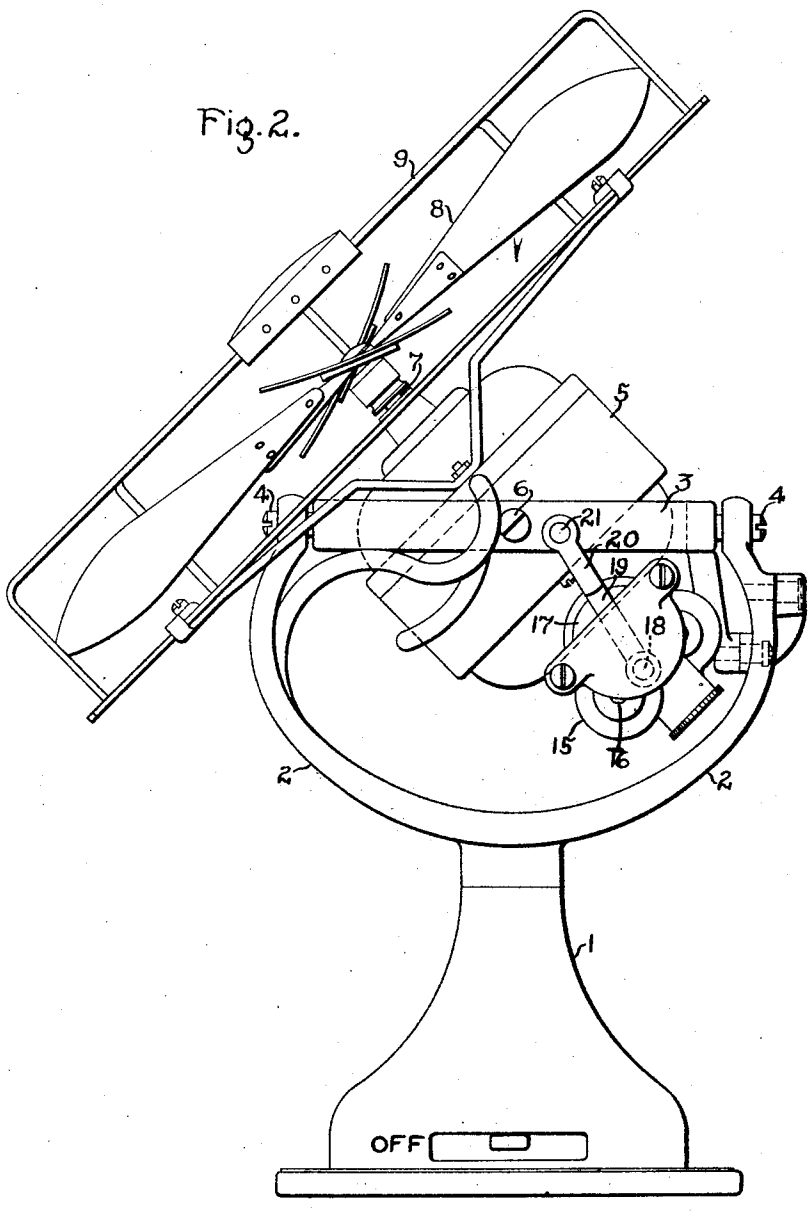

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Fig. 3.

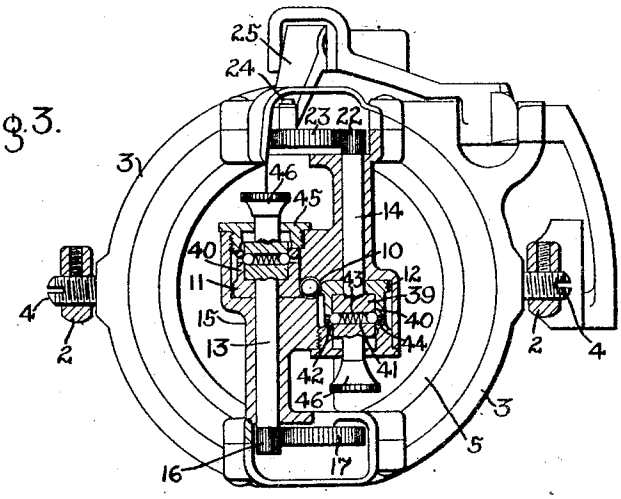


Fig. 4.

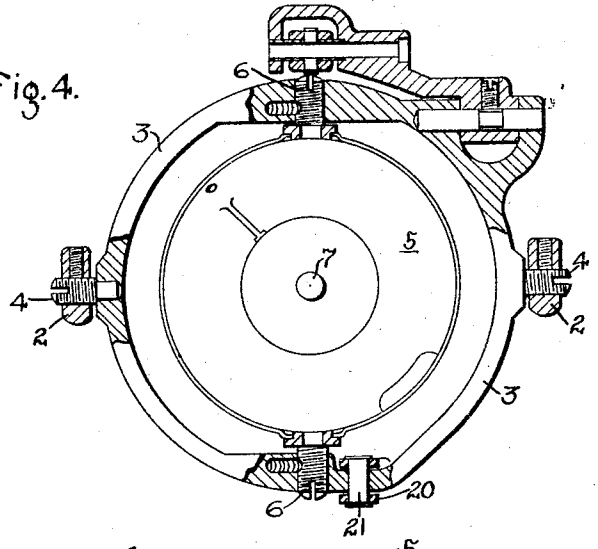
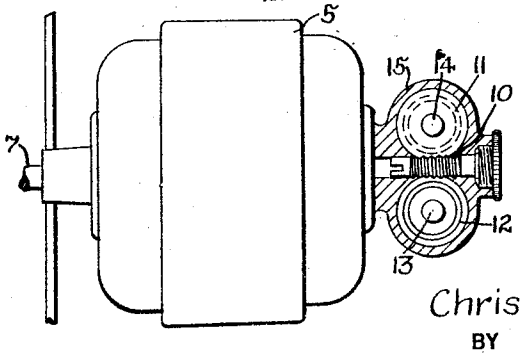


Fig. 5.



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UNITED STATES PATENT OFFICE.

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ELECTRIC FAN.

Application filed October 19, 1922. Serial No. 595,499.

To all whom it may concern:

Be it known that I, CHRISTIAN AALBORG, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Electric Fans, of which the following is a specification.

My invention relates to electric fans and it has particular relation to oscillating mechanism therefor.

One of the objects of my invention is to provide a fan, of the character designated, having mechanisms for simultaneously oscillating the fan in two directions, whereby the fan will be caused to traverse a substantially circular or elliptical path to direct a current of air throughout an area of general hemi-spherical shape.

Another object of my invention is to provide a device, of the character designated, in which the several oscillating mechanisms operate independently of each other and which may be selectively disengaged to effect a single oscillatory movement in either of two intersecting paths.

A further object of my invention is to provide a device, of the character set forth, that embodies means for quickly and easily regulating the extent of the arc of travel of the fan.

A still further object of my invention is to provide a fan, of the character designated that is adapted for either table or desk use or for wall or ceiling mounting.

In the accompanying drawings:

Figure 1 is a side elevational view of a fan embodying an oscillating mechanism constructed in accordance with my invention.

Figure 2 is a view taken at right-angles to that illustrated in Figure 1 and illustrating the fan mechanism as occupying a different position.

Figure 3 is a horizontal sectional view, taken on line III—III of Figure 1, of the driving and clutch mechanism.

Figure 4 is a horizontal sectional view taken on line IV—IV of Figure 1.

Figure 5 is a fragmentary vertical sectional view taken on line V—V of Figure 1.

Referring to the drawings, a fan constructed in accordance with my invention is illustrated as comprising a base or pedestal 1, the upper end of which is provided with a yoke portion having two outwardly and upwardly curved arms 2. An annular member or ring 3 is mounted between the arms 2 of the yoke portion of the pedestal by means of diametrically disposed studs or trunnions 4, which are journaled in apertures provided adjacent to the upper extremities of the arms 2.

A motor 5 is pivotally mounted within the ring 3, and on an axis which extends transversely to that of the pivotal movement of the ring 3, by means of diametrically disposed studs or trunnions 6 that are carried by the casing of the motor 5. One end of the motor shaft 7, is provided with a plural-blade fan or fan wheel 8, which is inclosed by a suitable cage or guard 9, carried by the motor casing.

The other end of the motor shaft 7 is provided with a worm 10 (Figures 3 and 5) that meshes with and drives a pair of oppositely disposed worm wheels 11 and 12 that are fixed to the inner extremities of oppositely extending transverse jack shafts 13 and 14, respectively. The jack shafts 13 and 14 are rotatably and slidably mounted in a housing 15, which is suitably secured to the main casing of the motor 5 and which incloses the worm 10 and worm wheels 11 and 12.

A pinion 16 is carried by the outer end of the shaft 13, and meshes with and drives a gear wheel 17 which is mounted upon the housing 15. The gear wheel 17 is provided with a crank pin 18, to which an upwardly extending pitman rod 19 is pivotally connected. The upper end of the pitman rod 19 is bifurcated, as indicated at 20, and is pivotally connected to the ring 3 by means of a pin 21, at a point adjacent to the pivotal mounting of the motor 5.

As the shaft 13 and gear wheel 17 are rotated by means of the worm 10 and worm wheel 11, the pitman rod is caused to exert pressure against its pivotal connection to the ring 3. The point of pivotal connection between the pitman rod 19 and the ring 3 may, however, be considered as fixed with respect to the motor 5, and the action of the gear wheel 17 and the crank pin 18 thus causes the entire motor casing, fan, and the oscillating mechanism carried by the motor casing to oscillate about the trun-

nions 6, and within the ring 3, as is best illustrated in Figure 2.

The outer extremity of the shaft 14 is also provided with a pinion 22 (Figures 1 and 3) which meshes with and drives a gear wheel 23 that is carried by the motor frame. The gear wheel 23 is provided with a crank pin 24 to which a pitman rod 25 is pivotally connected. The pitman rod 25 extends upwardly and is pivotally connected to a transversely extending arm 26 of a bell-crank lever 27, by means of a pin 28.

The bell-crank lever 27 is pivotally mounted upon the ring 3 at 29, and the other arm 30 thereof extends downwardly and is pivotally connected to one end of a link 31 at 32. The link 31 extends inwardly and is pivotally connected at 33, to a rack 34 that is provided on one of the arms 2 of the pedestal or base 1. The rack 34 is preferably provided with a plurality of apertures 35 by means of which the link 31 may be secured to the arm 2 at different points to regulate the direction of oscillatory movement imparted to the ring 3 by its directly associated driving mechanism as will be hereinafter set forth.

Shields or guards 36, 37, and 38 are provided to respectively inclose the gear wheels 17 and 23 and the pivotal connection 28 between the link 35 and the bell-crank lever 27. These guards not only function to protect an operator from the moving parts but also prevent the escape of oil and exclude dust and other foreign matter from the bearing elements.

When the cranks 18 and 24 are set at an angle of 90° from each other and both are operating the fan will move in a practically circular path, but when the cranks are set at zero and 180° angles, respectively, or the reverse, the fan will oscillate in the one or the other of two intersecting planes. If, however, the cranks are set at any other angles than those mentioned the fan will move in an elliptical path, the relation of the two diameters of the ellipse depending on the angular relation between cranks.

Assuming that the several parts of the apparatus occupy the positions illustrated in Figure 1 of the drawings, the operation of the mechanism is as follows: When the gear wheel 23 and the crank pin 24 are caused to rotate by means of the worm 10, worm wheel 12, shaft 14, and pinion 22, the pitman rod 25 tends to move the bell-crank lever 27 about its pivot 29 and to cause the arm 30 thereof to swing outwardly. The arm 30 is, however, prevented from swinging outwardly by means of the link 31, which connects the lower portion of the arm 30 to the arm 2 of the base. The resulting action is that the bell-crank lever 27, is caused to descend bodily in substantially its initial position with respect to the horizontal and causes the ring 3 to move about the pivot 29 with respect to the lever 27 and to rock about its pivotal support 4. When the crank pin 24 reaches the limit of its upward throw, the movement of the several parts are reversed and the ring 3 is thereby caused to oscillate in a direction transverse to the oscillatory movement of the motor 5 and fan 8 carried thereby.

The movements of the motor 5 and fan 8 with respect to the ring 3 and that of the ring 3 with respect to the pedestal or base 1 have been described as occurring simultaneously. It may, however, be desired that the one or the other of the oscillatory movements shall occur separately. That is to say, in certain instances, it may be desirable to either have the ring remain stationary in a horizontal or tilted position with respect to the base and to have the motor oscillate therein, or to have the motor remain stationary with respect to the ring and to have the ring and the motor both oscillate bodily with respect to the base. It may also be desired to change the angular relation between the cranks. In order, therefore, to effect these independent movements the following mechanism is provided.

The shafts 13 and 14 are slidably mounted in the housing 15, as has been previously described and the worm wheels 11 and 12 are rotatably mounted upon the shafts 13 and 14. Each of the shafts 13 and 14 is provided with an enlargement or collar 39 which slidably engages cylindrical extensions 40, provided on the worm wheels 11 and 12. The collars 39 are each provided with diametrically disposed apertures 41, within which a plurality of balls 42 are mounted for radial movement. A spring 43 is also disposed within each of the apertures 41 and between the balls 42 and tends to bias the balls 42 outwardly against the inner surface of the cylindrical portions 40 of the worm wheels. The inner surface of each of the cylindrical portions 40 may be provided with a longitudinal groove 44, to provide a seat for the balls 42.

When the parts occupy the positions described, the gear wheels 11 and 12 are operatively connected to their respective shafts to transmit movement to the gear wheels 17 and 23. The shafts 13 and 14 project through apertures provided in cylindrical screw plugs 45 and are provided with knobs or handles 46. If it is desired to disconnect either of the worm wheels 11 and 12 from its corresponding shaft, in order to discontinue the operation of either of the oscillating mechanisms, the shafts 13 and 14 are slid in an axial direction, by means of the handles 46, sufficiently to cause the balls 42 to move out of engagement with the cylindrical portion 40 of the gear wheels 11 and 12 to a position in which they engage an an-

nular recess 47, provided in the inner surface of the screw plug 45. When in this position, the worm wheels 11 and 12 may rotate freely upon the shafts 13 and 14 without transmitting movement thereto. The sliding movement of the shafts 13 and 14 within the housing 15, while sufficient to disengage the ball clutch mechanisms from the worm wheels 11 and 12 is not sufficient to move the pinions 16 and 22 from intermeshing engagement with the gear wheels 17 and 23.

In order to adjust the mechanism provided for oscillating the fan wheel about the axis 4—4 and 6—6, one of the shafts 13 or 14 is released from its worm wheel through the manipulation of a handle 46, and the other is rotated to change the position of the crank pin 18 relative to the crank pin 24. Assume that the shaft 13 is released, then the shaft 14 may be rotated to give the gear 23 an angular motion relative to the gear 17 to set the crank pin 24 in any desired position relative to the crank pin 18. As described previously, by changing the relative positions of the crank pins, the amplitude of oscillation of the fan wheel about either axis may be varied to change the length and shape of the paths described by the fan wheel. In this manner, the fan wheel may be given an oscillatory movement about a single axis, confining its path to a single plane at right-angles to said axis or a circulatory movement, in which case it oscillates about more than one axis simultaneously. When the fan wheel is given a circulatory movement, the path which it describes may be varied at will in the manner set forth in a preceding paragraph.

While I have described a mechanism in which the gear ratios are substantially equal, it will be apparent that the ratios of the pinions 16 and 22 and gear wheels 17 and 23 may be such as to cause a combination of movements by means of which the fan is caused to traverse an elliptical rather than a circular path. Moreover, a single transverse reduction gear shaft and clutch mechanism may be employed to accomplish the desired result without departing from the nature and scope of my invention.

By means of the above-described construction, a very efficient and compact oscillating fan mechanism is provided by means of which a current of air may be so directed as to displace the air throughout a relatively large area in a room.

I claim as my invention:

1. In a fan, in combination, a fan wheel, a motor adapted to rotate the fan wheel, and means cooperative to move the fan wheel as it rotates, said means being adapted to effect the movement of the fan wheel in paths of different shape.

2. In a fan, in combination, a fan wheel disposed to oscillate about a plurality of axes, a motor adapted to rotate the fan wheel, and means cooperative to oscillate the fan wheel about said axes as it rotates, said oscillating means being adjustable to effect the movement of the fan in paths of different shape.

3. In a fan, in combination, a motor disposed to oscillate about a plurality of axes, a fan wheel carried by the motor, and means cooperative to oscillate the motor about said axes to effect a movement of the fan wheel, said oscillating means being adjustable to vary the amplitude of oscillation about any one axis.

4. In a fan, in combination, a motor disposed to oscillate about a plurality of axes, a fan wheel carried by the motor, and means cooperative to effect a movement of the fan wheel in a predetermined path, said oscillating means being adjustable to vary the shape of said path.

5. In a fan, in combination, a fan wheel disposed to oscillate about a plurality of axes, separate means cooperative to oscillate the fan about each axis, said fan-wheel oscillating means being adapted to permit selective operation, thereby to control the movement of the fan.

6. In a fan, in combination, a fan wheel disposed to oscillate about a plurality of axes, separate means cooperative to oscillate the fan about each axis simultaneously, said fan-wheel oscillating means being adjustable to vary the amplitude of oscillation and adapted to permit selective operation, thereby to control the movement of the fan.

7. In a fan, in combination, a fan wheel, a motor for driving the fan wheel, said motor being disposed to oscillate about a plurality of axes, and means cooperative to effect the oscillation of the motor, said fan wheel being mounted to move with the motor, said oscillating means being adapted to permit variation of the amplitude of oscillation of the motor about the axes, thereby to effect a movement of the fan in paths having different shapes.

8. In a fan, in combination, a motor disposed to oscillate about a plurality of axes, a fan wheel carried by the motor, and separate means cooperative to oscillate the motor about each axis to effect a movement of the fan, said oscillating means being adapted to permit selective operation, thereby to control the movement of the fan.

9. An electric fan comprising a main support, a supplementary support pivotally mounted thereon, a fan motor pivotally mounted on said supplementary support, and independent means for oscillating said supplementary support and said fan motor.

10. An electric fan comprising a main support, a supplementary support pivotally mounted thereon, a fan motor pivotally

mounted on said supplementary support and independent mechanism for selectively oscillating said supplementary support and said fan motor.

11. An electric fan comprising a main support, a supplementary support pivotally mounted thereon, a fan motor pivotally mounted on said supplementary support and independent mechanisms for selectively oscillating said supplementary support and said fan motor about transversely extending axes.

12. An electric fan comprising a main support, a supplementary support pivotally mounted thereon, a fan motor pivotally mounted on said supplementary support, means for oscillating said supplementary support with respect to said main support and said fan motor with respect to said supplementary support and means for selectively disconnecting said oscillating means from said supplementary support and from said fan motor.

13. An electric fan comprising a main support, a supplementary support pivotally mounted thereon, a fan motor pivotally mounted on said supplementary support, means for oscillating said supplementary support with respect to said main support and said fan motor with respect to said supplementary support, means for selectively disconnecting said oscillating means from said supplementary support and from said fan motor, and means for regulating the degree of oscillatory movement of said supplementary support with respect to said main support.

14. In a fan, in combination, a fan wheel disposed to oscillate about a plurality of axes, a motor adapted to rotate the fan wheel, and means cooperative to oscillate the fan wheel in a plane at right-angles to any one of said axes.

15. In a fan, in combination, a fan wheel disposed to oscillate with a plurality of axes, a motor adapted to rotate the fan wheel, and means cooperative to oscillate the fan wheel in a plane at right-angles to any one of said axes, said oscillating means being adapted to effect simultaneously the oscillation of the fan wheel in a plurality of planes at right-angles to the different axes.

16. An electric fan comprising a main support, a supplementary support pivotally mounted thereon, a fan motor pivotally mounted on supplementary support, a plurality of oppositely extending shafts carried by said fan motor, oscillating mechanism for connecting one of said shafts to said main support to cause said supplementary support and said fan motor to oscillate with respect to said main support, oscillating mechanism for connecting the other of said shafts to said supplementary support to cause said fan motor to oscillate with respect to said supplementary support, and clutch mechanism for selectively disconnecting said shafts from said oscillating mechanisms.

17. An electric fan comprising a main support, a supplementary support pivotally mounted thereon, a fan motor pivotally mounted on said supplementary support, reduction gear mechanism carried by said fan motor, crank arms carried by said fan motor, link mechanism operatively connecting one of said crank arms to said main support to cause said supplementary support and said fan motor to oscillate with respect to said main support and link mechanism operatively connecting the other of said crank arms to said supplementary support to cause said fan motor to oscillate with respect to said supplementary support.

18. An electric fan comprising a main support, a supplementary support pivotally mounted thereon, a fan motor pivotally mounted on supplementary support, a plurality of oppositely extending shafts carried by said fan motor, oscillating mechanism for connecting one of said shafts to said main support to cause said supplementary support and said fan motor to oscillate with respect to said main support, oscillating mechanism for connecting the other of said shafts to said supplementary support to cause said fan motor to oscillate with respect to said supplementary support, clutch mechanism for selectively disconnecting said shafts from said oscillating mechanisms, and means for selectively causing said fan motor to oscillate about one or the other of said axes or about both at once.

19. In a fan, in combination, a fan wheel, a motor adapted to rotate the fan wheel, and means cooperative to move the fan wheel as it rotates, said means being adjustable to effect oscillatory and circulatory movements of said fan wheel.

In testimony whereof, I have hereunto subscribed my name this 13th day of October 1922.

CHRISTIAN AALBORG.