June 7, 1932. L. M. PERSONS 1,861,608

FAN AND MEANS FOR DIRECTING THE AIR CURRENT THERETHROUGH

Filed Dec. 21, 1929 2 Sheets-Sheet 1

Fig. 1

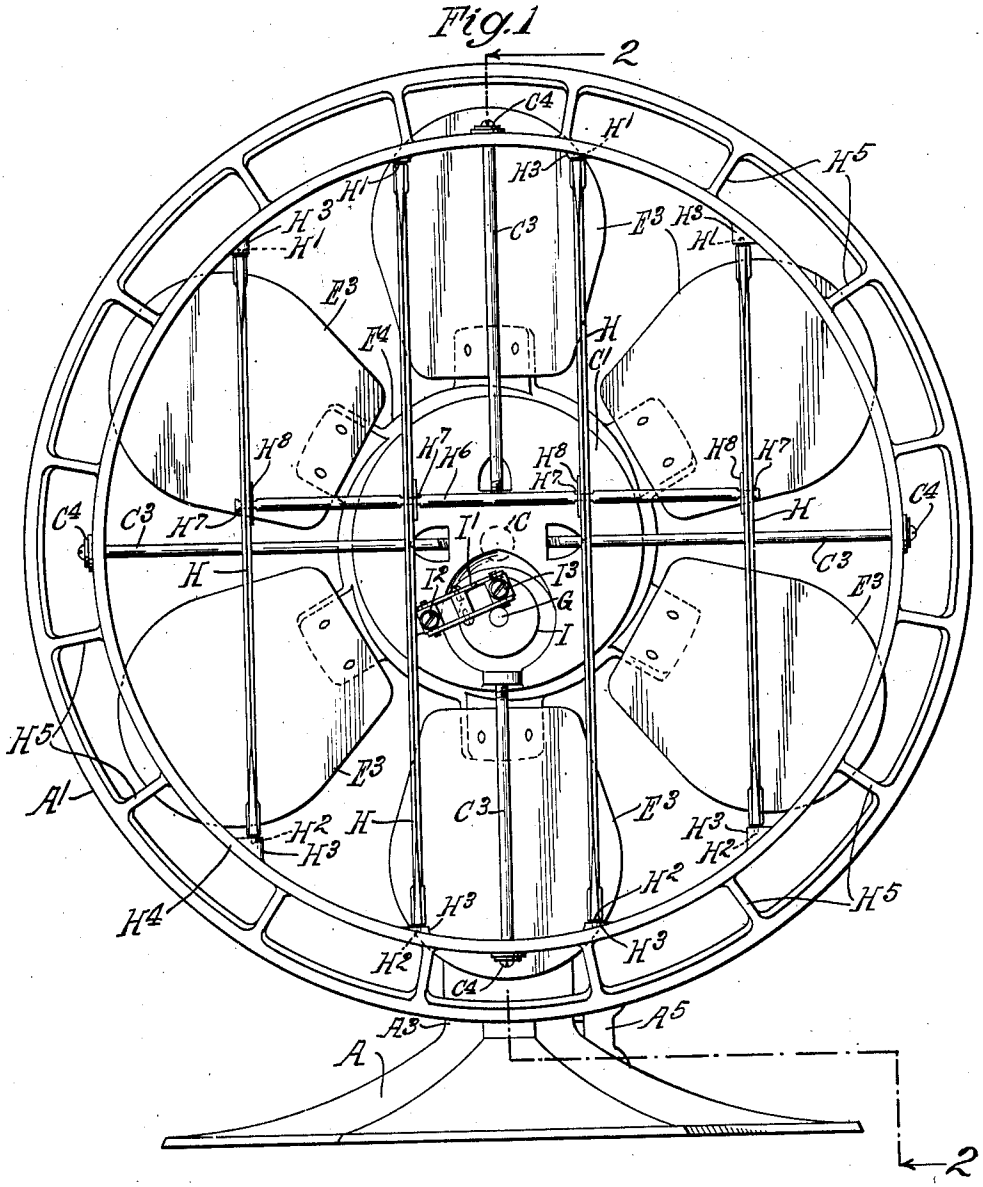


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Fig. 2

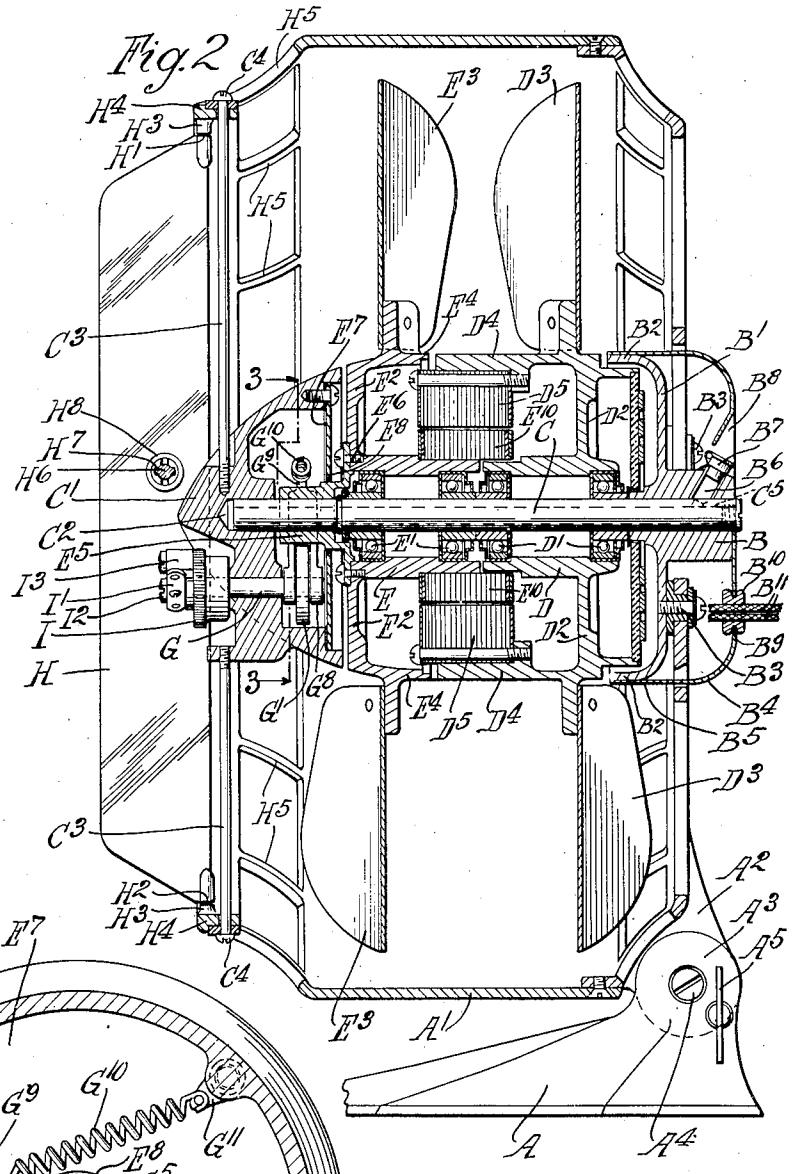
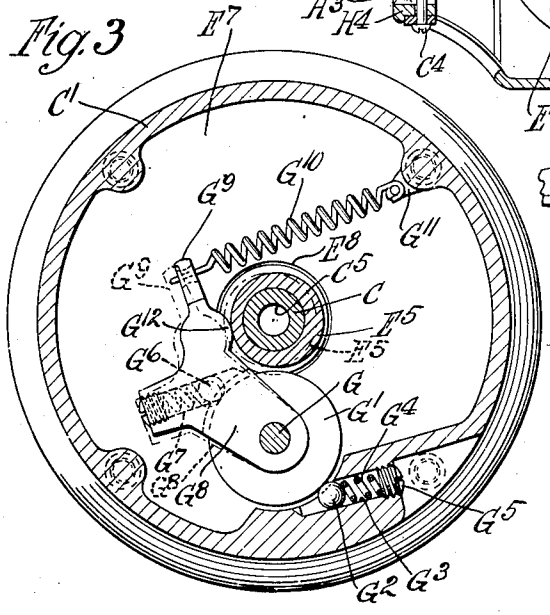


Fig. 3



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# UNITED STATES PATENT OFFICE

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## FAN AND MEANS FOR DIRECTING THE AIR CURRENT THERETHROUGH

Application filed December 21, 1929. Serial No. 415,747.

My invention relates to an improvement in transmissions and has for one object the provision of improved means for transmitting energy from a rotating fan shaft to rotate air directing vanes positioned forwardly of a fan structure. Another object is the provision of an improved gear reduction. Another object is the provision of improved means for deflecting the blast of air delivered by a fan in order to distribute it or sweep it across a greater area of delivery. Other objects will appear from time to time in the course of the specification and claims.

I illustrate my invention more or less diagrammatically in the accompanying drawings, wherein—

Figure 1 is a front elevation;

Figure 2 is a section on the line 2—2 of Figure 1; and

Figure 3 is a section on the line 3—3 of Figure 2.

Like parts are indicated by like symbols throughout the specification and drawings.

Referring to the drawings, A generally indicates any suitable base, normally fixed, and $A^1$ any suitable fan frame member. The frame member may be provided with a lug or lugs $A^2$ opposed to corresponding members $A^3$ on the base A, whereby the frame member $A^1$ may be rotated about the general center $A^4$. $A^5$ indicates any suitable means, for example a thumb screw, for setting the parts at any desired position of adjustment.

Associated with the frame member $A^1$ is the hub bearing B with its circumferential projection $B^1$ terminating in the inwardly turned lip or edge $B^2$. The portion $B^1$ may be secured to the frame member $A^1$ as at $B^3$. $B^4$ is any suitable housing member the edges $B^5$ of which overlie and may be clamped frictionally against or about the edge portion $B^2$ of the member $B^1$. $B^6$ is any suitable oiling passage controlled by the cup or cover $B^7$ in line with an aperture $B^8$ of the member $B^4$. The member $B^4$ is cut away as at $B^9$ to receive the insulating sleeve $B^{10}$ through which may pass any suitable power lines $B^{11}$, whereby the motor may be actuated.

C indicates a shaft fixed in the hub or sleeve B. The forward end of the shaft is received in the aperture $C^2$ of the forward supporting member $C^1$. This supporting member, which is shown in the form of the nose of a bullet may be secured, as by the tension members or bolts $C^3$ to the forward rim of the member $A^1$ as at $C^4$. The securing structure will be clear from Figure 1. The shaft C may be provided with a central axial lubricating passage $C^5$ in communication with the duct $B^6$.

Rotated about the shaft C in opposite directions of rotation are the field and armature structures of a duplex fan. For example I illustrate the hub structure D mounted upon the roller or ball bearings $D^1$ which permit free rotation above the shaft. This hub has associated with it the outwardly projecting web $D^2$ upon which are mounted a plurality of inclined fan blades $D^3$, herein shown as six in number. The web is provided at its outer edge with a generally cylindrical flange $D^4$, upon which may be mounted the field wiring or coils $D^5$.

E indicates a second hub, mounted on the roller bearing $E^1$ for rotation about the shaft. Its outwardly projecting web $E^2$ carries six fan blades $E^3$ pitched oppositely to the fans $D^3$. A circumferential flange $E^4$ extends closely adjacent the edge of the flange $D^4$, thus forming the more or less closed housing structure about the motor thus formed. $E^5$ indicates a sleeve rotatable in unison with the hub E and secured thereto as by the screws $E^6$. It extends about the end of the shaft C, rotating thereabout, and being positioned within the nose or bearing member $C^1$ of the shaft. $E^7$ indicates any suitable closure for the hollow of the member $C^1$, with a central aperture $E^8$ corresponding closely to the exterior of the sleeve $E^5$. Mounted on the sleeve E is the armature $E^{10}$.

Referring more particularly to the transmission or power reduction means, Figure 3 illustrates the parts on a somewhat large scale. Considering Figures 2 and 3 together, G indicates a rotatably mounted shaft having an axis generally parallel with the axis of the shaft C. Mounted upon the shaft G for rotation in unison therewith is the roller $G^1$. It will be understood that the shaft

G rotates only in response to rotation of the roller $G^1$ and is held against rotation when the roller $G^1$ is locked against rotation. Opposed to one face or one point about the circumference of the roller $G^1$ is an overrunning stop member or ball $G^2$ positioned in the passage $G^3$ and normally thrust therealong and against the surface of the roller $G^1$, as by the spring $G^4$ the compression of which may be controlled by the exteriorly accessible screw $G^5$. Opposed to another portion of the circumference of the roller $G^1$ is the opposite spring thrust ball or stop member $G^6$, positioned in the aperture or passage $G^7$ in the lever or arm structure $G^8$. The structure $G^8$ is pivoted for rotation about the shaft G. Its opposite end, as at $G^9$ is shown as engaged by the spring $G^{10}$. The opposite end of the spring is secured to the abutment $G^{11}$ in the interior of the member $C^1$. $G^{12}$ is a bearing portion or element associated with the member $G^8$ and opposed to the sleeve $E^5$. Note that the exterior periphery of the sleeve $E^5$ is eccentric in relation to its axis of rotation about the shaft C. Thus, in response to rotation of the motor the eccentric sleeve $E^5$ rotates about the sleeve C and therefore imparts an oscillation to the lever $G^8$, causing it to rotate through a limited arc, backwards and forwards, about the shaft G. Assuming that the member $G^8$ is initially in the dotted line position of Figure 3, rotation of the eccentric $E^5$ permits it to move into the full line position, in response to the pull of the spring $G^{10}$. During such movement the roller $G^1$ overruns the ball $G^6$ but is in clamping relationship with the ball $G^2$, which is spring thrust against its face. The result is that when the outer end of the member $G^8$ is given a clockwise movement, taking the parts in the position in which they are shown in Figure 3, the roller $G^1$ is held against movement by the ball $G^2$ and overruns the ball $G^6$. On the contrary, when the parts move from the full line position to the dotted line position, the ball $G^6$ exercises a clamping action and the roller $G^1$ is given a counter clockwise rotation, overrunning the ball $G^2$ and thrusting it against spring pressure. The result is a step by step uni-directional rotation of the roller $G^1$ and with it of the shaft G in response to the rotation of eccentric sleeve $E^5$, as the motor is actuated.

This gear reduction is important in controlling the movement of the vanes, below described, which serve to deflect the current of air delivered by the fan. I illustrate, for example, a plurality of vanes H. Said vanes, in the form of the device herein shown, are pivoted at top and bottom, as at $H^1$ $H^2$, for rotation about vertical axes. I illustrate them for example as pivoted to abutments or lugs $H^3$ upon the ring $H^4$ which forms the forward rim of the member $A^1$, being spaced therefrom as by the connecting elements $H^5$. These vanes are secured together, for unitary rotation, as by the spacing element $H^6$ which is reduced at intervals as at $H^7$ to receive the washers $H^8$ each of which engages one of said vanes.

In order to effect the oscillation of the vanes I employ the rotatable member I positioned on the outer end of the shaft G and rotating in unison therewith. $I^1$ indicates a link connecting the rotatable member I with one of the vanes H, $I^2$ $I^3$ indicating any suitable flexible or universal connection whereby the rotary movement of the member I may be translated into the oscillatory movement of the vane H. The vanes being secured together for unitary movement it will be understood that rotation of the eccentric $E^5$, in unison with the rotation of the armature of the motor, effects a constant oscillation to and fro of the vanes H. Owing to the high degree of gear reduction, which may be as much as 100 to 1, the oscillation of the vanes is extremely slow in relation to the normal rate of rotation of the motor. For example a rotation of 500 R. P. M. of the motor at a gear reduction of 100 to 1, would cause a rate of oscillation of the vanes of 5 to the minute, the vanes making one excursion in each direction during each full rotation of the member I.

It will be realized that whereas I have described and shown a practical and operative device, nevertheless many changes might be made in the size, shape, number and disposition of parts without departing from the spirit of my invention. I therefore wish my description and drawings to be taken as in a broad sense illustrative and diagrammatic rather than as limiting me to my specific showing.

In particular, except so far as I limit myself specifically by the language of my claims, I do not wish to be limited to the details of the transmission shown since other gear reductions and driving means may be employed, whereby the rotation of a rotor element may be translated into the oscillation of an air directing vane. Also, whereas I have described and shown a multiple motor and fan, or a fan in which fan elements of opposite pitch rotate in opposite directions, it will be understood that my deflecting vanes may be applied to a simple or single fan operated for example by motor with a fixed feed and a rotating armature and shaft.

The use and operation of my invention are as follows:

One object of my invention is to provide means for deflecting or spreading the current of air delivered from a fan. For example I employ vanes and means for oscillating these vanes in such fan that they deflect the air current delivered by the fan. As the vanes are slowly oscillated the current is in effect swung about through an arc, to get an effect

similar to that obtained by rotation of the entire fan structure.

I employ a motor, herein shown as a motor in which both field and armature rotate, such member being associated with a duplex fan. Whether or not this particular type of fan is used, an essential feature of my application is the provision of deflecting vanes positioned in the line of delivery of air from a fan. These vanes oscillate in response to rotation of the fan or of the fan actuating means. I illustrate a form of speed reduction which may be used with other structures than the fan and vane structure herein shown but which is particularly adapted for the use herein shown. The transmission and speed reduction are peculiarly simple and easy to manufacture and there is a minimum of noise and a minimum of wear.

I claim:

1. In a fan structure, a rotary fan element, a motor adapted to rotate said fan element, means for actuating said motor, an air deflecting vane positioned in the line of delivery of said fan, and means for oscillating said vane progressively step by step in either direction in response to rotation of said motor.

2. The structure of claim 1 characterized by the interposition between said vane and said motor of a transmission and gear reduction, said transmission including a rotary element and a universal connection between said rotary element and said vane adapted to translate rotation of said element into oscillation of said vane.

3. The structure of claim 1 characterized by the interposition between said vane and said motor of a transmission and gear reduction, said gear reduction including an eccentric and means for rotating it in response to rotation of said motor, a rotary member and means for imparting to said rotary member a step by step uni-directional rotation in response to rotation of said eccentric.

4. The structure of claim 1 characterized by the interposition between said vane and said motor of a transmission including an eccentric and means for rotating it in response to rotation of the motor, a rotary vane actuating member, and means for imparting uni-directional rotation to said rotary member in response to rotation of said eccentric.

5. The structure of claim 1 characterized by the interposition between said vane and motor of a transmission including a member rotatable in response to the rotation of the motor, a rotary, vane actuating member, and means for imparting a uni-directional step by step rotation of said last mentioned vane actuating member in response to rotation of said first mentioned rotary member.

6. The structure of claim 1 characterized by the interposition between said vane and motor of a transmission including a rotary, vane actuating member, and means for imparting a uni-directional step by step rotation thereto in response to rotation of the motor at the rate of one step for each rotation of the motor.

7. The structure of claim 1 characterized by the interposition between said vane and motor of a transmission including a vane actuating member, and means for imparting to it a uni-directional step by step rotation in response to rotation of the motor, said means including an overrunning driving connection between said member and the motor.

Signed at St. Louis, State of Missouri, this 17th day of December, 1929.

LAURENCE M. PERSONS.