

[54] MOTION IMPARTING APPARATUS

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[58] Field of Search 415/23, 125; 416/79; 98/116, 94

[56] References Cited

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755,199	3/1904	Wellman.....	415/125
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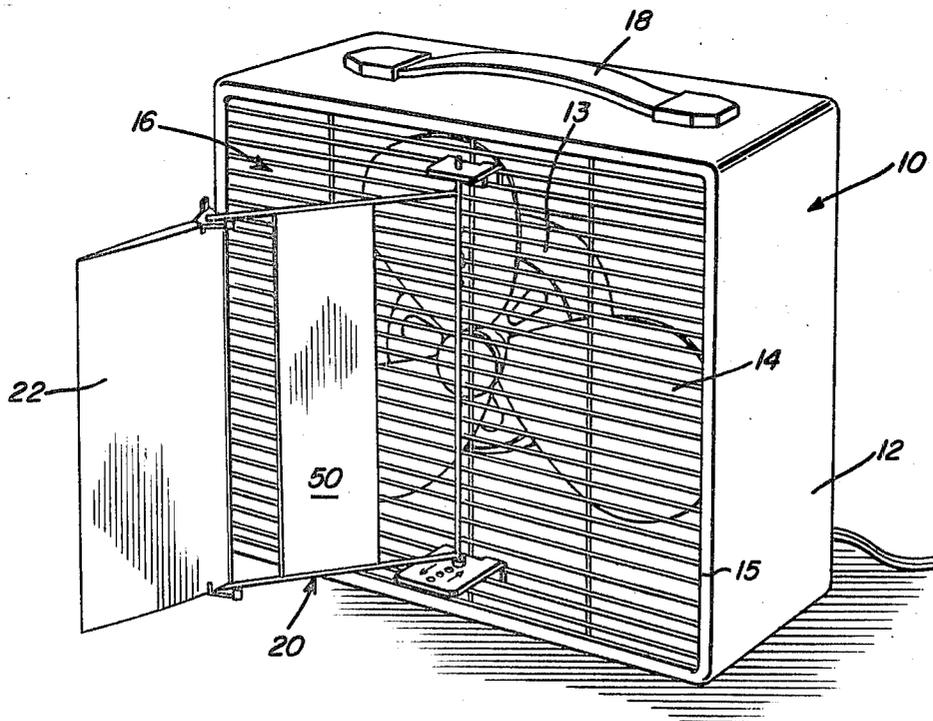
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[57] ABSTRACT

A motion imparting apparatus having a member pivotally mounted in a fluid stream. An airfoil is pivotally connected to the member for cooperating with the fluid stream and being moved thereby to pivot the member. The airfoil stalls at extreme end positions of the swing of the member, and changes positions relative to the member to swing back-and-forth across the fluid stream. The apparatus may be mounted on a fan, and the like, for deflecting air dispensed thereby, or the member may be connected to and actuate in a known manner a suitable mechanism. The frequency of oscillation of the airfoil is varied by adjusting the angle of the pivot axis of the member in a direction parallel to the direction of flow of the fluid stream.

9 Claims, 6 Drawing Figures



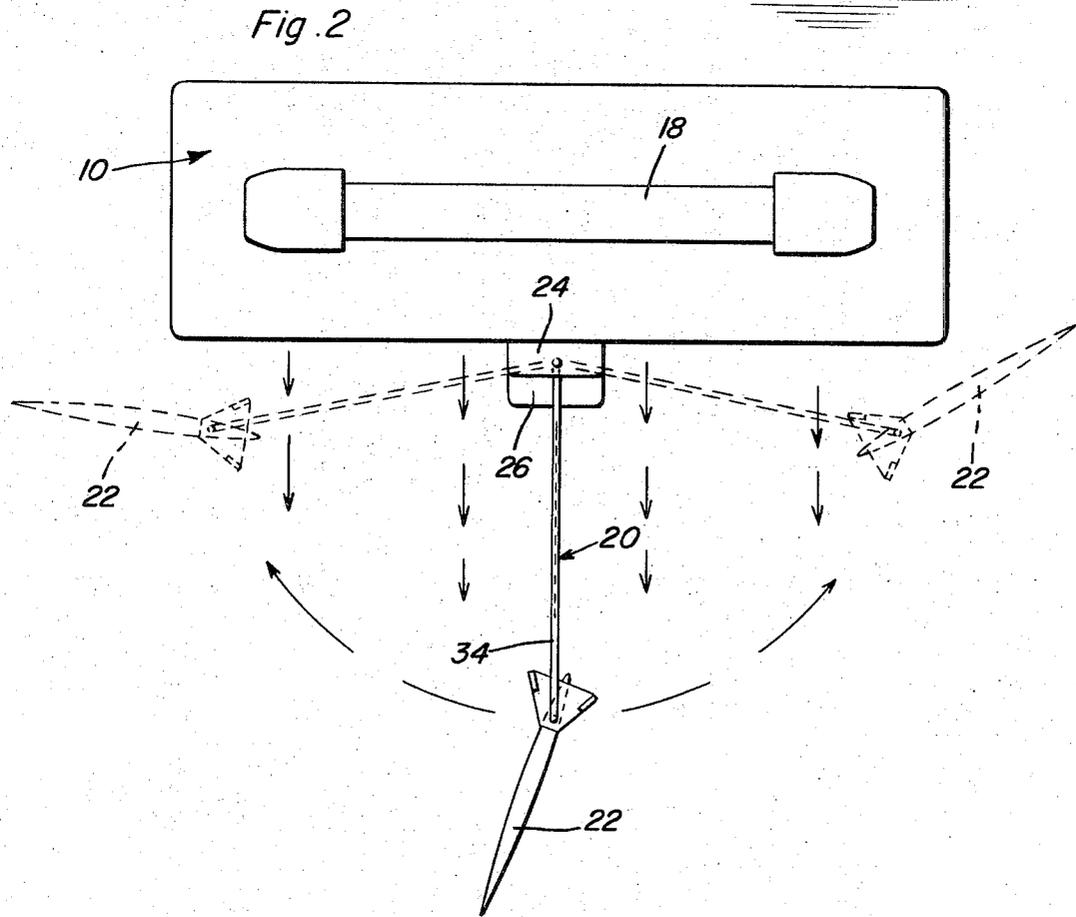
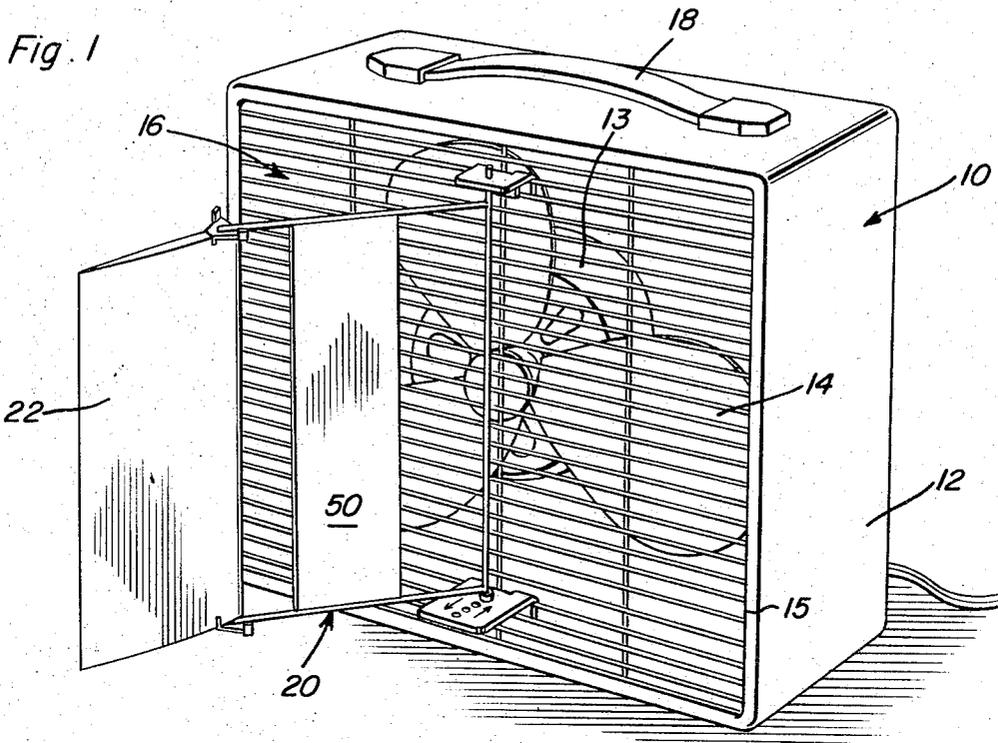


Fig. 3

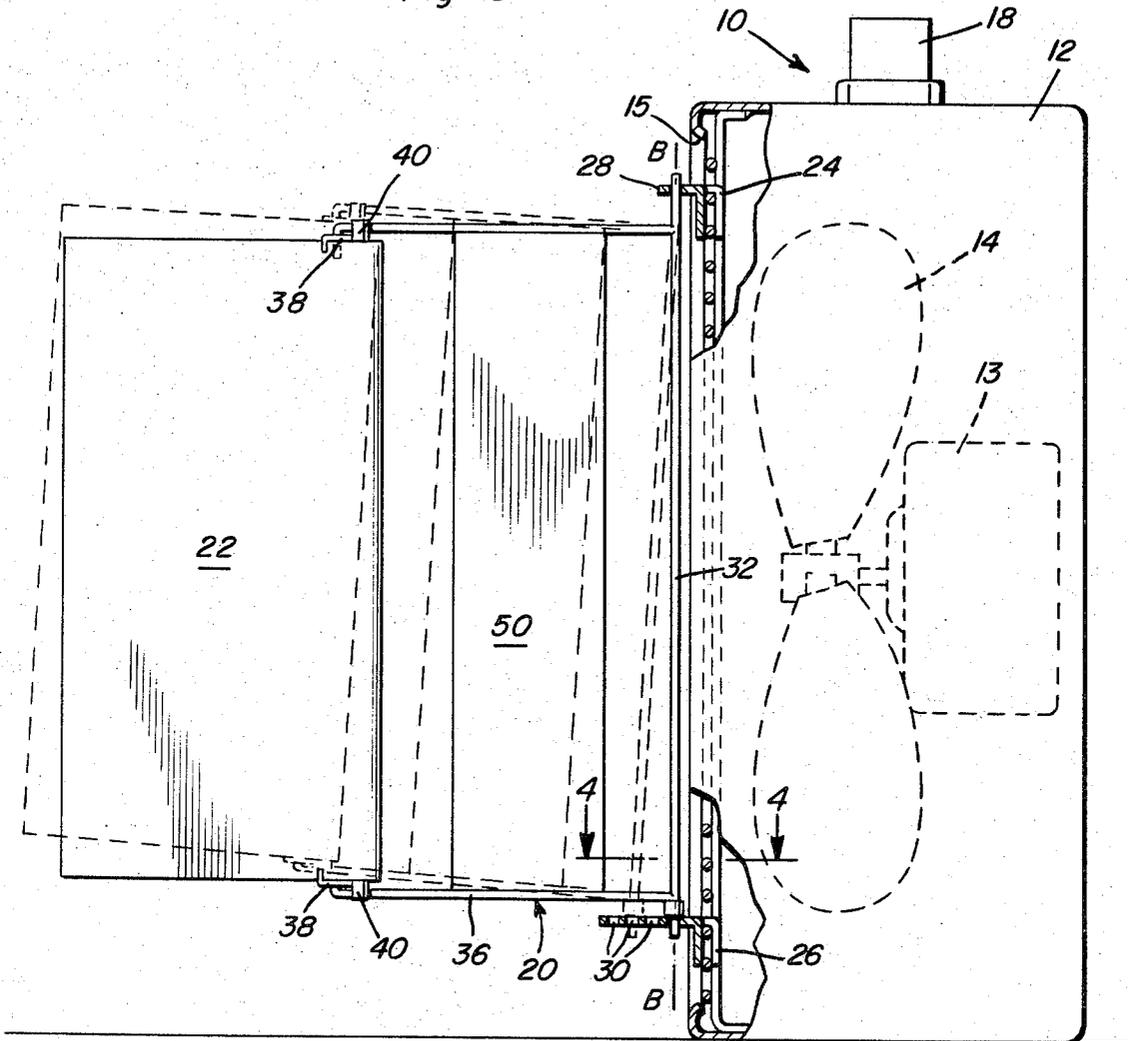


Fig. 5

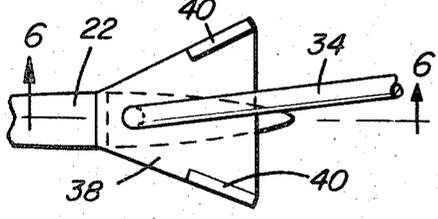


Fig. 6

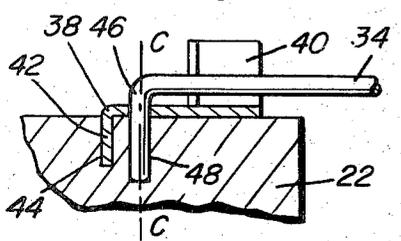
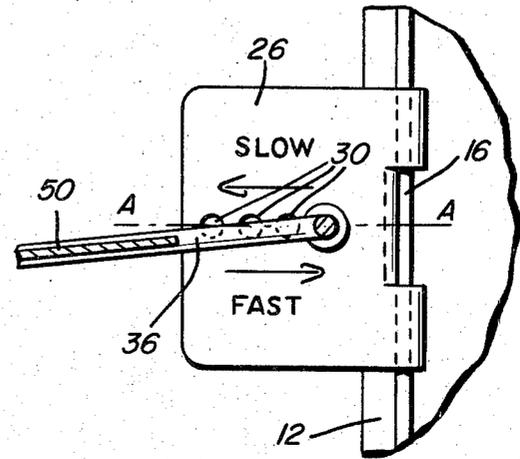


Fig. 4



MOTION IMPARTING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to motion imparting apparatus, and particularly to a fan air dispenser for distributingly deflecting air emanating from a fan.

2. Description of the Prior Art

Many arrangements have been proposed for using the energy of a fluid stream to impart motion. Water wheels and windmills are especially well known and have been long used.

In particular, it is generally known to distribute air from a fan, and the like, by using a portion of the energy of air emanating from the fan to move deflecting shutters. An example of this approach may be found in U.S. Pat. No. 755,199. A deflecting device is set out in this patent having a small propeller rotated by the fan propeller to oscillate a plurality of shutters through a drive train. This known arrangement, however, is relatively complicated, having many moving parts, low efficiency, short life, and high maintenance.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide fluid actuated, motion imparting apparatus which is simple of construction and efficient of operation.

It is another object of the present invention to provide a simple and efficient air deflector for a fan, and the like.

These and other objects are achieved according to the present invention by providing a motion imparting apparatus having: a pivotally mounted member arranged in a fluid stream; and an airfoil pivotally connected to the member and arranged for cooperating with the fluid stream and pivoting the member. The member is arranged to swing between two extreme end positions, and the airfoil stalls and changes positions relative to the member at each end position for changing the direction of swinging movement of the member and airfoil.

Preferably, a motion imparting apparatus according to the present invention is used with a conventional fan having a frame. The member is pivotally mounted on the fan frame as by a pair of brackets affixed to the frame. Each of these brackets may be provided with an opening receiving a rod forming part of the member. A pair of codirectionally extending arms complete the member, and are attracted to the rod and the airfoil. In this manner, the airfoil acts to deflect air from the fan.

One of the brackets is advantageously provided with a plurality of openings for selectively receiving an associated end of the rod. These openings are arranged along a line extending away from the fan for permitting varying of the angle of a longitudinal axis of the rod with respect to the fan. This variation will change the frequency of oscillation of the airfoil.

Desirably, a vane is mounted between the arms of the member for assisting the airfoil in deflecting the fluid stream.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout.

FIG. 1 is a perspective view showing a motion imparting apparatus according to the present invention mounted on a conventional box fan for deflecting air emanating from the fan.

FIG. 2 is a top plan view showing the motion imparting apparatus and fan of FIG. 1 with two moved positions of the motion imparting apparatus.

FIG. 3 is a side elevational view, partly cut away and in section, showing the motion imparting apparatus and fan of FIGS. 1 and 2 with a moved position shown for the motion imparting apparatus to change the frequency of oscillation thereof.

FIG. 4 is a fragmentary, sectional view taken generally along the line 4—4 of FIG. 3.

FIG. 5 is a fragmentary, top plan view showing a detail of the motion imparting apparatus.

FIG. 6 is a fragmentary, sectional view taken generally along the line 6—6 of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 of the drawings shows a fan 10 having a frame 12, a motor 13, a propeller 14, an opening 15 covered by a grille 16, and a carrying handle 18. Motor 13 is mounted in frame 12 in a suitable, known manner (not shown), and may be a standard electric motor. Since fan 10 is of a conventional kind, commonly available on the market, it will not be discussed in further detail herein.

Referring now to FIG. 2 of the drawings in addition to FIG. 1, an apparatus according to the present invention for imparting motion has a member 20 arranged in a fluid stream emanating from fan 12, as shown by the flow arrows in FIG. 2, and a symmetrical airfoil 22 pivotally connected to member 20 and arranged for being moved by the fluid stream. Member 20 is pivotally mounted on frame 12 as in a manner to be discussed below, and movement of airfoil 22 pivots member 20 between two extreme end positions shown in broken lines in FIG. 2. Airfoil 22 stalls and changes positions relative to the member at each end position so as to change the direction of swinging movement of airfoil 22. The full line and left-hand showings of airfoil 22 in FIG. 2 are for a clockwise swinging movement as viewed in FIG. 2, and the right-hand broken-line showing in the same figure is the position of airfoil 22 at the end of a counterclockwise swinging movement and before airfoil 22 stalls so as to swing in the clockwise direction.

Member 20 is illustrated as mounted on frame 12 by a pair of brackets 24 and 26. Bracket 24 is provided with an opening 28, while bracket 26 is provided with a plurality of openings 30 (FIG. 4). Member 20 is formed by a rod 32 having ends arrangeable in openings 28, 30, and a pair of codirectionally extending arms 34 and 36 mounting airfoil 22 and connected to rod 32 between brackets 24, 26. Openings 30 are arranged along a line A—A extending perpendicularly away from fan 10, and permit varying of the angle of longitudinal axis B—B of rod 32 with respect to fan 10 to change the frequency of oscillation of airfoil 22.

FIGS. 5 and 6 of the drawings show a preferred manner of pivotally mounting airfoil 22 to arms 34, 36. A pair of brackets 38, each having two stops 40, are anchored in airfoil 22 as by flanges 42 being inserted in slots 44 cut into airfoil 22. Openings 46 in brackets 38 permit bent ends of arms 34, 36 to pass through brack-

ets 38 and into holes 48 provided in airfoil 22. Stops 40 limit pivotal movement of airfoil 22 about axis C—C (FIG. 6) to, for example, 60° of arc.

A vane 50 is advantageously mounted in a known manner between arms 34, 36 to assist airfoil 22 in deflecting the fluid stream emanating from fan 10. Vane 50 also serves to rigidify member 20.

The operation of the fan air dispenser apparatus according to the present invention may be readily understood from the above description and from the drawings. Since airfoil 22 is always at an angle, perhaps with arms 34, 36 abutting a stop 40, with respect to a, for example, compressible fluid stream, an airflow in this instance, well known aerodynamic principles will cause airfoil 22 to have a greater pressure on a one symmetrical surface than on the other, and to accordingly move across the fluid stream. When member 20 reaches an end position, a, for example, 170° arc being possible, airfoil 22 will, by proper design, have reached its stall angle with respect to the fluid stream, causing airfoil 22 to lose lift and pivot about axis C—C as much as 60° to change its angle of attack with respect to the fluid stream. This new angle of attack will cause airfoil 22 to be moved by the fluid stream toward the other end position. Airfoil 22 and vane 50 will deflect air from fan 10 in the direction of airfoil 22. The oscillating frequency of airfoil 22 is controllable by changes the angle of access B—B as much as, for example, 3° from the vertical, or from the plane of fan 10. The fastest oscillations will be at the vertical; a change from the vertical creating flow parallel to airfoil 22 and decreasing in a known manner the lift forces on airfoil 22.

By using a fan air dispenser apparatus according to the present invention, a body flow of air is directed in an aerodynamically clean manner as a whole, not as, in the manner of a stationary deflector, a side track which causes back pressure on the fan. Additional linkages such as bell cranks and rods (not shown) could be provided to actuate additional deflectors (not shown) mounted vertically for lateral movement and horizontally for vertical movement to deflect air up and down. These additional linkages would be actuated in a known manner by member 20.

The motion imparting apparatus, including airfoil 22, according to the present invention, could be used for other purposes than deflecting air from a fan, and the like. By arranging airfoil 22 in a suitable airstream, motion of member 20 could be imparted to any suitable, known device requiring energy. Thus, apparatus according to the present invention may be used in the same manner as a windmill, and the like.

For a device such as the invention presented herein, the relative sizes of certain elements, such as arms 24 and 36 and airfoil surface 22, are considered to be of some significance to performance. To better enable those skilled in the art to make and use this invention, the following dimensions, taken from a test model, are presented as part of this disclosure. It should be noted that for a symmetrical airfoil, such as used on the model, the center of lift is upstream of the pivot point.

Airfoil Surface (22)

Chord	7¾"
Span	12 3/16"
Pivot Point	2½" from leading edge
Range of Pivotal movement	± 30° relative to arms

Airfoil Surface (22)-Continued

34 and 36

Pivotal Arms

Upper Arms (34)	11"
Lower Arms (36)	12"

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed as new is as follows:

1. Apparatus for imparting motion, comprising a pivotally mounted member arranged in a fluid stream, the member including:

- a. an arm having a pair of spaced ends, and pivotally mounted at a one of the ends;
- b. an airfoil pivotally connected to the other of the ends, the arm and airfoil arranged for pivoting about substantially vertical axes between two extreme end positions and the airfoil arranged for swinging the other of the ends, and the airfoil being arranged for changing positions relative to the arm and the fluid stream as the arm approaches each end position for changing the direction of swinging movement of the airfoil; and
- c. stop means for causing the other of the ends and the airfoil to engage one another and determine the angle of the airfoil relative to the arm and the fluid stream in each position of the airfoil.

2. A structure as defined in claim 1, wherein the arm is pivotally arranged centrally of the fluid stream for permitting the airfoil to deflect the fluid stream, and further including a vane affixed to the arm and arranged substantially parallel to the airfoil for assisting the airfoil in deflecting the fluid stream.

3. A structure as defined in claim 1, wherein the airfoil is symmetrical.

4. A structure as defined in claim 1, further including a fan having a frame, and means for vertically pivotally mounting the one end of the arm on the frame centrally of the fan.

5. A structure as defined in claim 4, wherein the mounting means includes a pair of brackets affixed to the frame in a common vertical plane, each bracket provided with an opening, and the member includes a rod arranged in the openings and the arm is a pair of codirectionally extending arms mounted on the airfoil and connected to the rod between the brackets.

6. A structure as defined in claim 5, wherein one of the brackets has a plurality of openings arranged along a line extending away from the fan for receiving the rod and permitting varying of the angle of a longitudinal axis of the rod with respect to the fan for changing the frequency of oscillation of the airfoil.

7. A structure as defined in claim 6, further including a vane mounted between the arms, the airfoil and vane being arranged for deflecting the fluid stream.

8. A structure as defined in claim 5, further including a vane mounted between the arms, the airfoil and vane being arranged for deflecting the fluid stream.

9. A structure as defined in claim 4, wherein the mounting means includes means for varying the frequency of oscillation of the member pivoting means.

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