June 9, 1959 P. L. HAIMS 2,889,980

AIR CIRCULATOR

Original Filed July 13, 1954

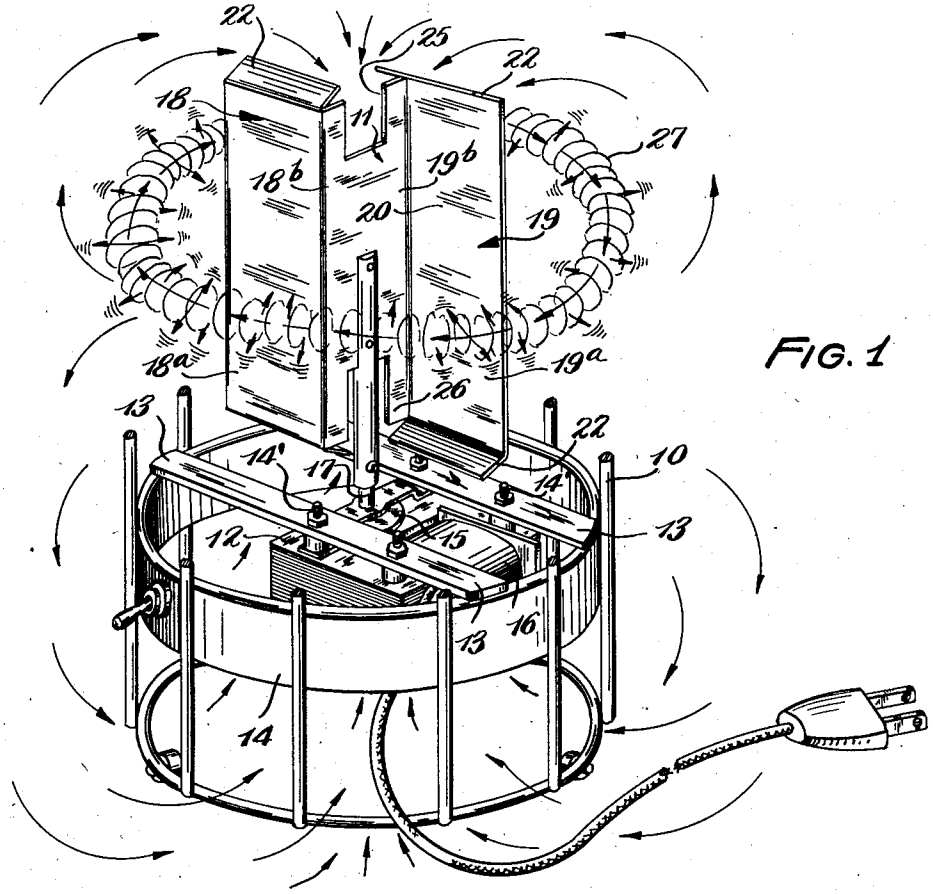



FIG. 1

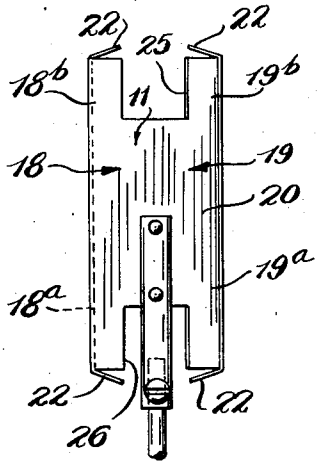



FIG. 2

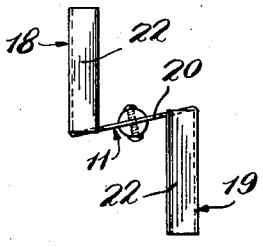



FIG. 3

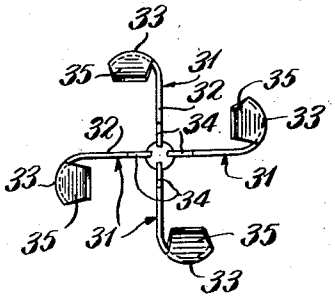



FIG. 4

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# AIR CIRCULATOR

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Continuation of application Serial No. 443,018, July 13, 1954. This application October 17, 1956, Serial No. 616,569

4 Claims. (Cl. 230—134)

The present invention relates to an apparatus for displacing air, and more particularly to an apparatus for vibrating and moving air. The present application is a continuation of abandoned application Serial No. 443,018, filed July 13, 1954.

Conventional fans used for cooling purposes rely on a blast of air to produce a cooling effect. Such a blast is often objectionable to people in the area and many persons for reasons of health, as well as for other reasons, cannot, or prefer not to, subject themselves to the type of air current or blast produced by the conventional fan. Furthermore, an air stream from a conventional fan often prevents use of the fan in an office where there are loose papers that may be disturbed, and, in addition, stirs up loose dirt, etc., which increases the impurities and foreign particles present in the air. This latter action of a conventional fan is particularly objectionable to people suffering from respiratory ailments.

The principal object of the present invention is to provide an air displacing apparatus for producing a cooling effect which does not rely on a blast of air.

Another object is to provide an apparatus of the character referred to which causes the air to vibrate or pulsate in addition to producing a general but gentle movement of air.

Still another object of the present invention is to provide an air displacing apparatus which creates an annular body of compressed air and which pulsates the body to set up air vibrations which radiate outwardly from the apparatus.

Still another object is to provide an air displacing apparatus in which rotating blades cause displacement of air inwardly of the blades and in which air in front of the rotating blades is allowed to spill over to the rear side of the blades, the spill-over preferably being controlled to determine the movement of air displaced by the apparatus.

A further object of the present invention is to provide a new and improved air displacing apparatus in which a blade is rotated about an axis and includes a blade portion inclined in the direction of rotation with respect to a diametral plane of the axis and in which the blade portion is provided with lips or scoops at its edges extending transversely of the axis of rotation to direct the air inwardly of the blade portion, the blade also including another blade portion in the diametral plane with the latter blade portion having cutouts for permitting spill-over from the front side of the blade to the rear side thereof.

The present invention resides in certain constructions and combinations and arrangements of parts and further objects and advantages thereof will be apparent from the following detailed description made with reference to the accompanying drawings forming a part of this specification for all matters shown therein, whether or not expressly described, and in which:

Fig. 1 is a perspective view of an air displacing apparatus, with parts cut away, embodying the present invention.



Fig. 2 is an elevational detail view of the rotor of the present invention, and

Fig. 3 is a plan view of the rotor of Fig. 2.

Fig. 4 is a plan view of another modification of the present invention.

While the present invention is susceptible of embodiment in various types of air moving apparatuses and in similar devices, it is particularly useful when embodied in an air displacing apparatus which is designed to be used in homes and in offices.

Referring to the drawings, the air displacing apparatus shown therein comprises a wire cage member **10** enclosing a fan rotor **11** and a motor **12** for driving the rotor. The cage **10** is shown in Fig. 1 with the upper part thereof cut away, but it will be understood that the cage is substantially cylindrical in configuration with a closed top to prevent accidental contact with the rotor **11**.

The motor **12** for driving the rotor **11** is dependingly supported from a pair of horizontal strips **13** extending transversely of the cage **10** and connected to an annular band **14** which forms a portion of the cage. The motor **12** is shown as suspended from the strips **13** by bolts **14'** and as having an armature **15** and a field coil **16**. The armature **15** has a vertical axis and a vertical armature shaft **17** which is connected to the rotor **11** and which lies along the axis of rotation of the latter. The rotor **11** comprises blades **18, 19** preferably formed from sheet metal. The blades **18, 19** comprise blade portions **18*a***, **19*a*** joined by a wall **20** which lies in a vertical plane through the axis of rotation of the rotor **11**. The wall **20** provides blade portions **18*b***, **19*b*** of the blades **18, 19**, respectively, which extend generally radially of the axis of rotation and the blade portions **18*a***, **19*a*** extend outwardly from the vertical edges of the blade portions **18*b***, **19*b*** in the direction of rotation of the rotor and preferably define an acute angle with the wall **20**. In the illustrated embodiment the rotor **11** is illustrated as rotating in a clockwise direction and the inclination of the vertical blade portions **18*a*** and **19*a*** is such that when the blades are rotated clockwise the air displaced thereby is moved inwardly of the outer side edges of the blade portions.

Each of the blade portions **18*a***, **19*a*** is deflected at its upper and lower edges, which extend generally transversely of the rotor axis and are shown as being substantially horizontal, to form a lip or scoop **22**. The scoops **22** cause the air displaced thereby to move inwardly of the upper and lower horizontal edges of the blades **18, 19**. It can now be seen that the rotor **11** differs substantially from the conventional fan in that the air is displaced inwardly of the blades or toward the center of the blades rather than outwardly of the blades. Because of this construction masses of compressed air are built up in front of the blades **18, 19** as the latter are rotated.

The rotor **11** is connected to the armature shaft **17** by a sleeve **23** having one end which telescopes over and is fixed to the shaft. The other end of the sleeve has an axially extending slot which receives the wall member **20**, the sleeve lying along the longitudinal center line of the wall member **20**.

In the preferred and illustrated embodiment the wall **20** is provided with upper and lower cutouts **25, 26**, the cutouts opening, respectively, into the upper and lower edges thereof. The cutouts **25, 26** allow the air in front of the rotating blades **18, 19** to spill over to the back side of the blades and control the location of an annular body of air which is set up upon the rotation of the blades. This annular body of air is designated in Fig. 1 by the reference character **27** and encircles the rotor **11** at approximately its mid point if the cutouts **25, 26** are of approximately equal depth and size. It is believed that the annular body of air is created by the collision of the air around the apparatus attempting to move into the

vacuum which trails the blades **18**, **19** and the air which spills over from the front of the blades **18**, **19**. In any case, an annular body of compressed air will be created by an apparatus embodying the present invention and the location of the body may be controlled by the shape and relative size of the cutouts **25**, **26**. For example, if the cutout **25** is shortened the annular body of air **27** will move upwardly and be located near the upper end of the rotor **11**. Conversely, if the cutout **26** is shortened or made smaller, the annular body of air **27** will move downwardly toward the lower end of the rotor **11**.

The arrows in Fig. 1 indicate the general air movement for the illustrated apparatus and as shown therein air is drawn into the top and bottom of the apparatus and is expelled to cooperate in forming an annular body of compressed air. Tests have shown that air moves toward the described apparatus from substantially all points around the apparatus and that even some air will sift through the compressed air body **27**. Consequently the air movement toward the apparatus is a gentle movement which does not produce an objectionable draft and the air issuing from the apparatus has its energy expended in the compressed air body **27** which does not cause a draft to persons in the vicinity of the apparatus since it is normally located very close to the apparatus itself.

In addition to creating the annular body of air **27** the present invention causes the body to pulsate and set up air vibrations which radiate outwardly from the apparatus. Therefore, while the apparatus produces a gentle movement of air toward the apparatus, it also causes vibration of air which is readily transmitted to points distant from the apparatus and will produce a substantial cooling effect even though a person in that vicinity may not be aware of the air movement.

While the illustrated embodiment utilizes a pair of blades, it will be understood that additional blades may be provided. Also the blades may be curved as illustrated in Fig. 4 rather than angular as shown in Figs. 1 through 3.

Referring to Fig. 4 a rotor **30** is shown as having four blades **31** having portions **32** extending radially of the axis and blade portions **33** at their radially outward ends which are curved in the direction of rotation of the rotor to scoop the air inwardly of the rotor. As in the first described embodiment the blade portions **32** are provided with cutouts **34** similar to the cutouts **25**, **26** of the first described embodiment and upper and lower air deflecting portions **35** on the blade portions **33** which correspond to the lips or scoops **22** of the first described embodiment. Only the upper cutouts **34** and deflecting portions **35** appear in the drawing, it being understood that the blade portions **33** have lower cutouts corresponding to the cutouts **26** and lower deflecting portions **35**. Although the cutouts in both of the described embodiments have been shown as square type cutouts, they may be of any shape or configuration.

Although the present invention has been shown as embodied in a device particularly adapted for use in a closed room, it will be understood that rotors embodying the present invention may be used with various types of apparatuses for displacing air or for conditioning air and that the invention is also suitable for use in automotive vehicles.

It can now be seen that the present invention provides a new and improved apparatus for displacing and vibrating air and that the objects heretofore enumerated and others have been accomplished.

While the preferred embodiment has been described in considerable detail, it is hereby my intention to cover all modifications, constructions and arrangements which fall within the ability of those skilled in the art and the scope of the appended claims.



Having thus described my invention I claim:

1. In an air displacing apparatus, a rotor rotatable about an axis in a first direction and comprising first and second blade members displaced from each other about said axis, said blade members each having axially elongated first portions extending outwardly of the axis in a generally radial direction, said first portions each having an outer boundary edge extending generally parallel to the axis, second portions extending from said edges in the direction of rotation of said rotor and having marginal edges extending transversely of the axis of rotation and intersecting said first portions, and air deflecting members extending from said marginal edges in the direction of rotation of said rotor.

2. In an air displacing apparatus, a rotor rotatable about an axis in a first direction comprising first and second blade members displaced from each other about said axis, said blade members each having first portions extending outwardly of the axis in a generally radial direction, said first portions each having an outer boundary edge extending generally parallel to the axis, second portions extending from said edges in the direction of rotation of said rotor and having marginal edges extending transversely of the axis of rotation and intersecting said first portions, and air deflecting members extending from said marginal edges in the direction of rotation of said rotor, said first portions having air passages therein permitting air flow from the leading to the trailing faces of the blade members.

3. In an air displacing apparatus, a rotor rotatable in a first direction about an axis comprising first and second blade members displaced from each other about said axis, said blade members each having first portions with marginal edges extending outwardly of the axis in a generally radial direction and an outer boundary edge extending generally parallel to the axis, second portions extending from said outer boundary edges in the direction of rotation of said rotor and having marginal edges extending transversely of the axis of rotation and intersecting said first portions, and air deflecting members extending from said marginal edges in the direction of rotation of said rotor, said blades having apertures in said first portions opening into each of the generally radially extending edges.

4. In an air displacing apparatus, a rotor rotatable in a first direction about an axis and comprising a wall member extending outwardly from the opposite sides of said axis in generally radial directions, air deflecting members extending from the outer edges of said wall member in the direction of rotation of the rotor and having marginal edges extending transversely of said axis, and second air deflecting members extending from said marginal edges in the direction of rotation of the rotor.

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