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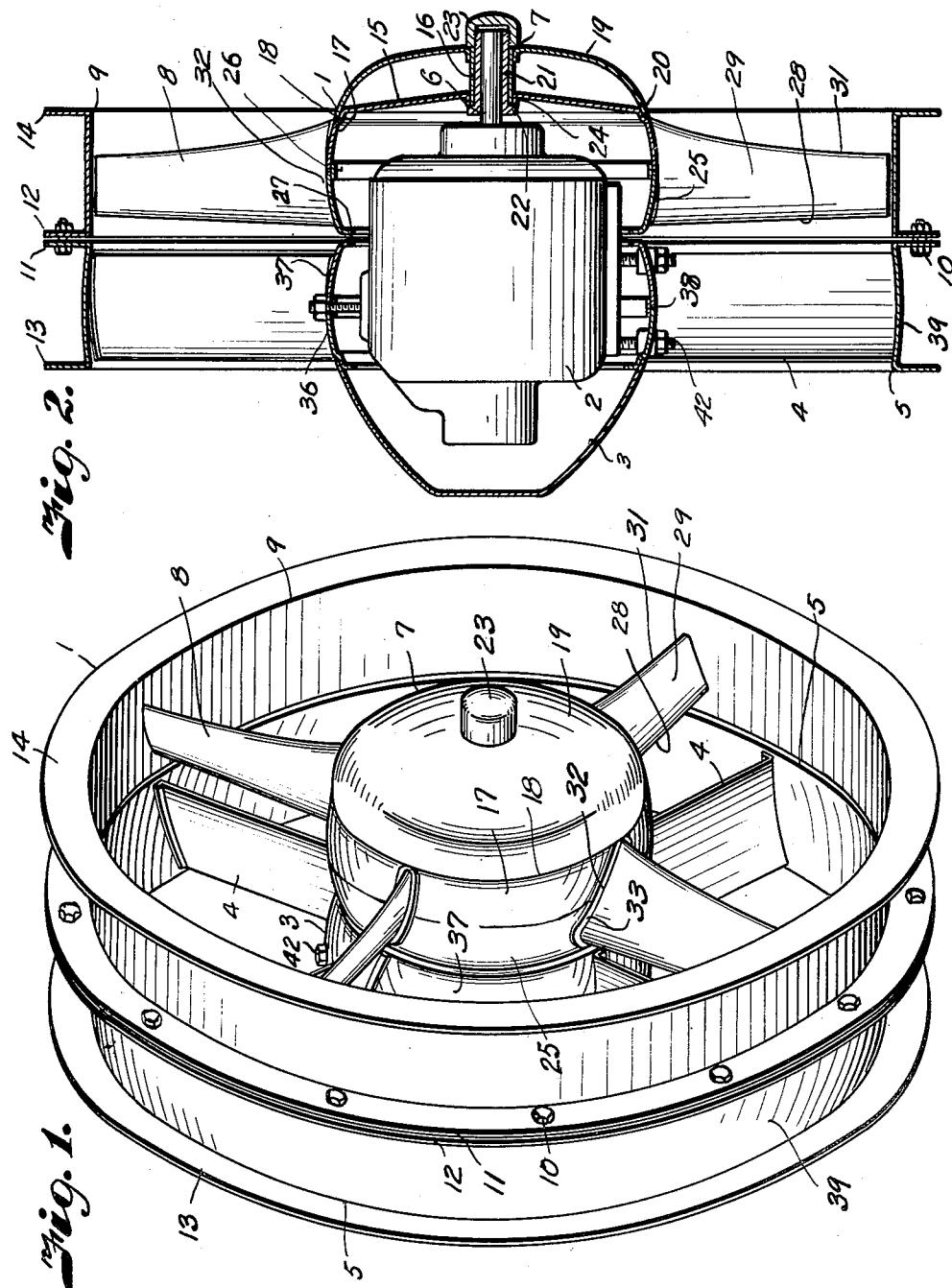
R. D. MOORE

2,596,781

FAN

Filed Dec. 29, 1945

2 SHEETS—SHEET 1



INVENTOR.

Robert D. Moore

BY

Fishburn & Mullendore

ATTORNEYS.

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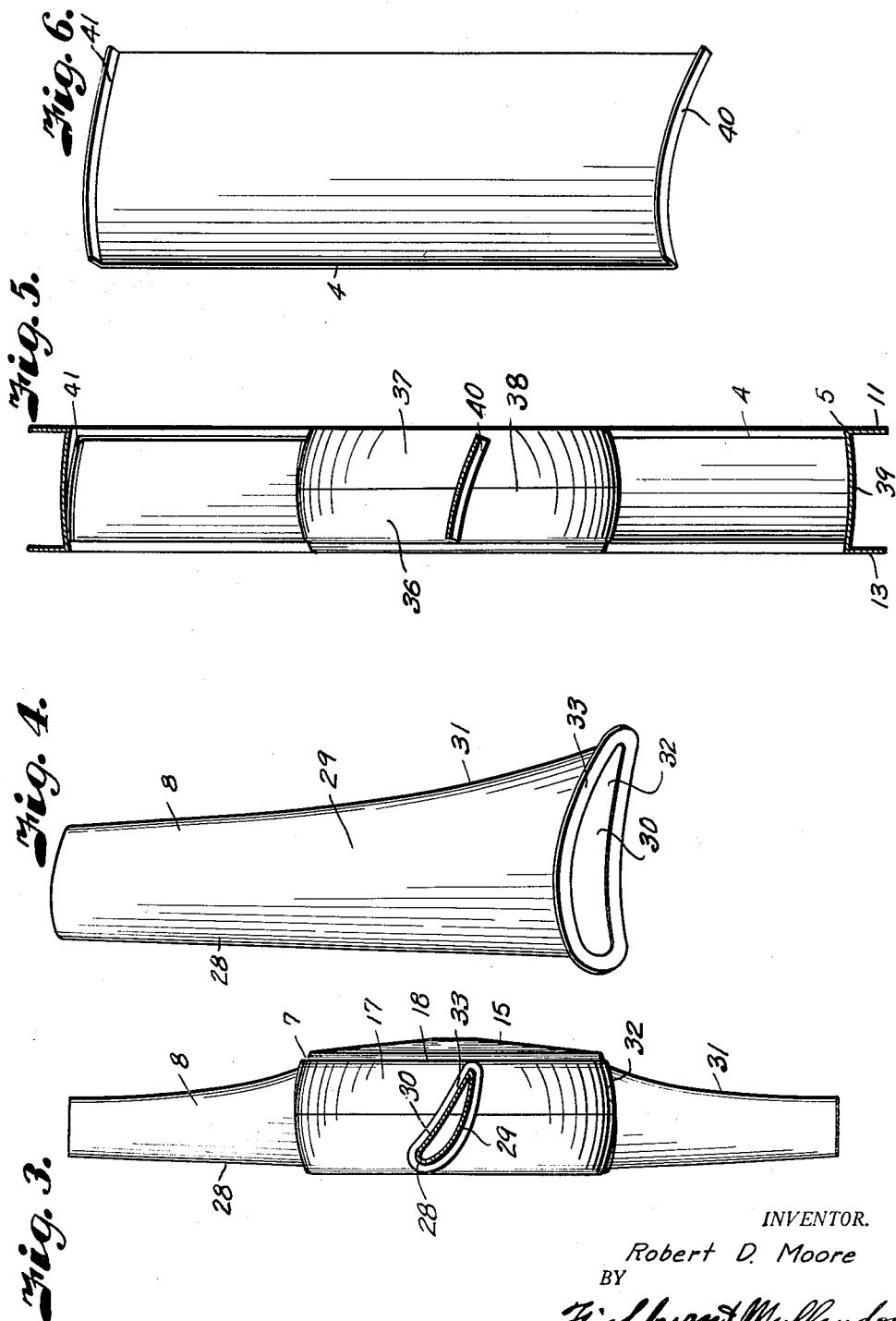
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2 SHEETS—SHEET 2



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FAN

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This invention relates to fans, and particularly those of relatively large capacity. The capacity rating and operating efficiency of this type fan is dependent, among other factors, upon the number, shape and size of the blades, and the pitch or angle at which the blades are mounted. It has, therefore, been economically impractical to always obtain a fan exactly suited and capable of operating efficiently for a particular job. This is because manufacturers have reduced their manufacturing and sales expense by standardizing on fans of certain ratings; otherwise, manufacturing costs for producing a great variety of fans, capital investment and storage would make such fans excessively high in cost.

It is, therefore, a principal object of the present invention to provide a fan construction involving standardized parts having a relatively wide flexibility in arrangement so that they may be readily and inexpensively assembled into a fan having a rating particularly adaptable to a job in hand. Therefore, when the fan is installed, it is capable of economical and efficient operation.

Other objects of the invention are to provide a fan hub and blade construction which permits a firm and secure anchorage of the blades; to provide a hub and blade construction whereby the blades may be mounted on the hub at any desired angle; and to provide a hub and blade construction whereby the blades may be mounted in any desired number and position about the periphery of the hub.

It is a further object of the invention to provide a fan equipped with guide vanes that may be mounted at any desired angle and located in any desired number about the axis of the fan.

In accomplishing these and other objects of the invention hereinafter pointed out, I have provided improved structure, the preferred form of which is illustrated in the accompanying drawings wherein:

Fig. 1 is a perspective view of a fan constructed in accordance with the present invention.

Fig. 2 is a vertical section through a fan.

Fig. 3 is a side elevational view of the rotor element of the fan, particularly illustrating shape of the hub and mounting of the blades.

Fig. 4 is a perspective view of one of the blades.

Fig. 5 is a detail section of the air guiding section of the fan.

Fig. 6 is a perspective view of one of the fins for the section of the fan shown in Fig. 5.

Referring more in detail to the drawings:

1 designates a fan constructed in accordance with the present invention and which includes a motor 2 concentrically mounted within a central housing member or cowling 3 carried by radial vanes 4 within an annular ring 5 later described.

The power shaft 6 of the motor carries a

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central member or hub 7 having special construction and which carries a plurality of fan blades 8, also constructed in accordance with the present invention and which are rotatable within a ring 9 secured to the ring 5 by fastening devices 10 that extend through abutting annular flanges 11 and 12 on the respective rings. The rings also preferably have flanges 13 and 14 on their outer edges by which the fan may be mounted in a particular installation.

The hub 7 is illustrated as including a somewhat coned disk portion 15 on a sleeve 16 that is mounted on the motor shaft. The periphery of the disk portion 15 terminates in a lateral outwardly curving flange 17 that is of substantially spherical contour for a purpose later described. The juncture of the flange 17 with the disk 15 is preferably provided with an inset shoulder 18 to seat a cowling plate 19 fixed to the outer end of the sleeve 16 and rounding toward the disk portion 15 so that the terminal rim 20 thereof seats within the inset shoulder 18. The cowling and sleeve may be retained on the shaft of the motor in various manners, however, in the illustrated instance the sleeve 16 is mounted on a bushing 21 anchored to the shaft 6. The sleeve is retained in seating contact with an annular flange 22 of the bushing by a cap 23 having threaded connection with the outer end thereof as shown in Fig. 2. If desired, the disk portion 15 and cowling 19 may be provided with inwardly extending flanges 24 that are adapted to be attached to the sleeve 16 as by welding or the like. The flange 17 cooperates with an annular ring 25 having substantially the same curvature and width but arranged reversely so that the larger rims thereof abut and are adapted to be secured by a band 26 that is attached thereto. The inner portion of the ring 25 terminates in an inwardly extending flange 27 to enhance the rigidity thereof.

It is thus obvious that the ring and flange thus provide a hub having the annular contour of the band or belt of a sphere, the center point of which is in the axis of the hub. The spherical contour of the hub forms an important part of the present invention in that it facilitates mounting of the blades 8 in any position and at any desired angle about the periphery thereof as now to be described.

50 The blades 8 may be of suitable shape and formed of a single thickness of metal; however, in the illustrated instance the blades have an airfoil cross section and are preferably formed of sheet material bent to provide a rounding edge 55 face 28 and forwardly and inwardly curving side faces 29 and 30 interconnected at the front edge face 31 of the blade. The inner or root ends 32 of the blades are spherically concave to conform to the spherical contour of the hub as best 60 shown in Fig. 4 and are provided with a lateral flange 33 extending thereabout and which may be formed by bending the material of the blade

outwardly from the face thereof. The blades may be of various length and contour but the flange or attaching portions thereof are shaped to correspond with the contour of the hub. The blades and hubs, thus constructed may be kept as stock parts and any number of blades may be used with a hub to provide a fan of a given diameter and capacity rating for a certain R. P. M. Since the attaching flanges 33 of the fan blades conform to the spherical shape of the hub, they set firmly thereagainst in any position about the periphery of the hub and the blades may be turned at any pitch angle desired for a particular job. The blades may be attached in position by fastening the flanges to the hub of the fan, for example, by welding.

The cowling for the motor may also be formed in a manner similar to the hub of the fan in that it includes ring sections 36 and 37 of spherical contour and joined together as at 38 to form the belt of a sphere having a center in the axis of fan rotation. The outer ring 5 has its web portion 39 curved on a radius from a center common to the center of radius for the rings 36 and 37.

The guide vanes 4 are suitably shaped and here illustrated as comprising a single thickness of material having the ends shaped and provided with flanges 40 and 41 in conformity with the contour of the rings 36 and 37 whereby the vanes may be positioned at any angle and in any desired position about the axis of the fan. Since the vanes may be located at any desired position, it is obvious that any number of vanes desired may be assembled within the unit and secured in position by welding the flanges at the ends thereof in a manner similar to attachment of the blades previously described.

The motor may be mounted concentrically within the cowling; for example, by fastening devices 42 carried by the rings 36 and 37 as shown in Fig. 2.

From the foregoing it is obvious that I have provided a fan construction which is adapted for standardization of parts so that the parts may be assembled in any desired relationship to provide a fan that will operate efficiently for any given job. It is also obvious that I have provided a relatively strong and rigid attachment for the blades since they are to fit the spherical contour of the hub in any of the positions in which they may be mounted. It is also obvious that I have provided a fan with an air directing section having vanes that may be similarly arranged and securely mounted.

What I claim and desire to secure by Letters Patent is:

1. A fan including a hub member comprising complementary sheet metal sections and having annular portions provided with spherical surfaces and abutting edges of a diameter equal to the equatorial diameter of a sphere corresponding with said spherical surfaces, means joining said abutting edges with said annular portions cooperating to form the central belt of a sphere, blades having concave inner ends corresponding in curvature to said central belt whereby the blades may be selectively positioned at any desired location and pitch angle about said central belt, and means for securing the blades in said selected positions.

2. A fan including a hub member comprising complementary sheet metal sections having annular portions provided with spherical surfaces and abutting edges of a diameter equal to the equatorial diameter of a sphere corresponding with

said spherical surfaces, a ring underlying said abutting edges and welded to the annular portions to form the central belt of a sphere, blades having concave inner ends corresponding in shape to said central belt whereby the blades may be selectively positioned at any desired location and pitch angle about said central belt, and means for securing the blades in said selected positions.

3. A fan including a hub member comprising complementary sheet metal sections, one of said sections having a disk portion provided with a lateral annular portion having a spherical surface and an annular terminal edge of a diameter equal to the equatorial diameter of a sphere corresponding with said spherical surface, the other section being of ring-shape and having an annular spherical surface and an annular terminal edge corresponding with and abutting said terminal edge of said one section, means joining said abutting terminal edges to form the central belt of a sphere, blades having concave inner ends corresponding in shape to said central belt whereby the blades may be selectively positioned at any desired location and pitch angle about said central belt, and means for securing the blades in said selected positions.

4. A fan including a hub member comprising complementary sheet metal sections, one of said sections having a disk portion provided with a lateral annular portion having a spherical surface and an annular terminal edge of a diameter equal to the equatorial diameter of a sphere corresponding with said spherical surface, the other section being of ring shape and having a corresponding annular spherical surface and an annular terminal edge corresponding with and abutting said terminal edge of said one section, a ring underlying said abutting edges and welded to the said sections to connect said sections in forming the central belt of a sphere, blades having concave inner ends corresponding in shape to said central belt whereby the blades may be selectively positioned at any desired location and pitch angle about said central belt, and means for securing the blades in said selected positions.

5. A fan including a sheet metal hub having a peripheral surface conforming in shape to the central belt of a sphere, a disc extending inwardly from an edge portion of the hub, sheet metal blades having their root ends spherically concave to correspond in curvature with said peripheral surface, means for fixedly securing the entire root ends of the blades to any selected spaced peripheral portions of the hub with the entire root end of each blade contacting the respective selected peripheral portion throughout so as to thus dispose the blades at any selected pitch angle relative to the axis of rotation of the fan.

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